

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DONGHEE AMERICA, INC. and DONGHEE ALABAMA, LLC,
Petitioners

v.

PLASTIC OMNIUM ADVANCED INNOVATION AND RESEARCH,
Patent Owner

U.S. Patent 8,122,604

Issue Date: February 28, 2012

Title: Method for Fastening an Accessory to a Plastic Fuel Tank

CASE: Unassigned

**DECLARATION OF DR. DAVID O. KAZMER IN SUPPORT OF
PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT 8,122,604**

I, Dr. David O. Kazmer, hereby declare that the following is accurate and true to the best of my knowledge under the penalties of perjury:

I. BACKGROUND

A. Engagement

1. I have been retained by Orrick, Herrington & Sutcliffe LLP on behalf of its clients Donghee America, Inc. and Donghee Alabama, LLC (“Donghee”) to provide my opinion concerning the validity of claims 1, 2, 4, 7, and 8 (the “challenged claims”) of U.S. Patent No. 8,122,604 (hereafter referred to as “the ’604 Patent” (Ex. 1001)).

2. I am being compensated for my time at my normal rate of \$500 per hour. My compensation is not contingent on the outcome of this matter or the specifics of my testimony.

B. Personal Qualifications

3. My curriculum vitae is provided in Appendix A. I am currently a tenured Full Professor in, and the Chair of, the Department of Plastics Engineering at the University of Massachusetts Lowell. As a faculty member, my teaching and research focuses on plastic product design and plastics manufacturing process development. Currently, I am teaching undergraduate and graduate courses in product design, mold engineering design, and process analysis, instrumentation, and control. My current research projects include plastics feedscrew design for extrusion

and molding applications, modeling of polymer flow and structural behavior in plastics manufacturing processes and resultant products, simulation and design of 3D printing processes, and processing of microcrystalline cellulose fibers in polymer melts including the copolymer ethylene-vinyl alcohol (EVOH).

4. I joined the faculty of the University of Massachusetts Amherst in 1995 as an Assistant Professor in the Department of Mechanical and Industrial Engineering. I received tenure in 2000, and in 2001, I took a leave of absence to be Director of Research & Development for Dynisco HotRunners, a supplier of plastics molding machine and injection mold systems. After returning from my leave of absence in 2002, I relocated to the University of Massachusetts Lowell where I was promoted to Full Professor in 2005 and have served as the Associate Dean for the College of Engineering.

5. Prior to my academic appointment, I was a practicing engineer in industry. During 1991 and 1992, I was a Design and Process Development Engineer at General Electric (“GE”) Plastics. During 1990 and 1991, I was a Mechanical Engineer at GE Research and Development. During 1988 and 1989, I was an Application Engineer at GE Plastics. My work at GE focused primarily on the design and manufacture of engineered plastic products; I have personally worked on the design and manufacture of injection molded, thermoformed, and blow molded plastic products as well as their associated molds and molding processes. In

addition, my doctoral research led to a commercialized process for dynamic control of melt flow at multiple locations in an injection mold known as Dynamic Feed. Since 2003, I have also been the President of Kazmer Research LLC, which is involved in technology development and strategic consulting related to product development, manufacturing, simulation software development, and quality control system design.

6. I completed a bachelor's degree in Mechanical Engineering at Cornell University (December, 1989) and a master's degree in Mechanical Engineering at Rensselaer Polytechnic Institute (May, 1991). Subsequent to my work at GE, I received a doctoral degree in Mechanical Engineering at Stanford University (June, 1995), where my research led to a method for dynamic control of melt flow at multiple locations in an injection mold and led to a commercial product called Dynamic Feed.

7. I am a member of the American Society of Mechanical Engineers, the Institute of Electrical and Electronics Engineers, the International Polymer Processing Society, and the Society of Plastics Engineers, among others. I am the past chair of the American Society of Mechanical Engineering's Technical Committee on Design for Manufacturing, the focus of which is to improve the performance, quality and cost aspects of plastic products and plastics manufacturing processes. I am also an Associate Editor for the Journal of Polymer Plastics

Technology and Engineering as well as the Journal of Advances in Polymer Technology. I have also served as an Associate Editor for the Journal of Mechanical Design.

8. As an active researcher, I have authored more than two hundred juried publications in journals and conference proceedings related to plastics product design and manufacturing as well as the books Injection Mold Design Engineering (Hanser Publishers, 1st edition 2007 and 2nd edition 2016) and Plastics Manufacturing Systems Engineering (Hanser Publishers, 2009). The former book, while directed specifically to injection molds, is relevant to blow molding and provides a Chapter on variant molding processes including injection blow molding and insert molding.

9. The quality of my work has been recognized by more than twenty awards including my election to Fellow by both the American Society of Mechanical Engineers and the Society of Plastics Engineers, and being the 2012 recipient of the Kos Ishii-Toshiba Award for “Sustained and Meritorious Contributions to Design for Manufacturing and Life Cycle, particularly in the areas of plastic product design and plastics manufacturing process development.”

10. I am a named inventor of multiple U.S. Patents, including, Nos. 5,556,582, 6,254,377, 6,287,107, 6,309,208, 6,343,921, 6,343,922, 6,361,300, 6,436,320, 6,464,909, 6,514,440, 6,585,505, 6,589,039, 6,632,079, 6,638,049,

6,713,002, 6,767,486, 6,769,896, 6,824,379, 7,175,418, 7,408,551, 8,753,553, 9,446,544. The technology described in these patents all pertain to the design and manufacture of high quality plastic products.

11. I have personally designed injection and blow molded plastic products including the molds and machinery that produces them. My expertise is directed to advanced products and process design including analysis of structural performance; design of assemblies, fits, and tolerances; modeling and control of molded part dimensions; simulation of production processes, shrinkage, and long-term performance; among others.

II. METHODOLOGY

A. Claim Construction

12. I understand that the claims of a patent define the invention to which the patentee is entitled exclusive rights. The first step in considering the validity of the claims is to determine how the words of each claim should be construed.

13. I understand that claims in an inter partes review (“IPR”) before the Patent and Trademark Appeal Board (“PTAB”) are given their broadest reasonable interpretation that is consistent with the patent specification. I understand that the words of a claim are generally given their ordinary and customary meaning, which is the meaning that the term would have to one of ordinary skill in the art in question

at the time of the invention. I understand that the specification is the single best guide to the meaning of a claim term.

14. I understand that extrinsic evidence, which “consists of all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises,” can also be considered in the claim construction analysis. While less significant in determining the meaning of a claim term than intrinsic evidence, dictionaries and treatises can be used to better understand the underlying technology and construe claim terms as long as the dictionary definition does not contradict any definition found in or ascertained by a reading of the intrinsic evidence. It is my understanding that extrinsic evidence in the form of expert testimony can be useful for a variety of purposes, such as to provide background on the technology at issue, to explain how an invention works, to ensure that the PTAB’s understanding of the technical aspects of the patent is consistent with that of a person of ordinary skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field.

15. Below, I provide my opinion as to the proper broadest reasonable interpretation of the terms “accessory,” “parison,” and “core,” each of which is recited in claim 1 of the ’604 Patent.

16. The specification of the '604 Patent provides the following definition of the term "accessory": "Within the context of the invention, the term 'accessory' is understood to mean: [i] any functional object or device which is generally associated with the fuel tank in its usual mode of use or operation and which cooperates with the latter in order to fulfil certain useful functions; or [ii] a support for one or more such devices. Non-limiting examples of such devices are: liquid pumps, level gauges, delivery tubes, reservoirs or baffles internal to the fuel tank, ventilation devices, electronic units and stiffening bars." Ex. 1001, '604 Patent at 3:7-17. Based on this definition, it is my opinion that the broadest reasonable interpretation of "accessory" is "any functional object or device which is generally associated with the fuel tank in its usual mode of use or operation and which cooperates with the latter in order to fulfil certain useful functions, or a support for one or more such devices."

17. The specification of the '604 Patent provides the following definition of the term "parison": "The moulding of fuel tanks generally starts with a parison. The term 'parison' is understood to mean that a preform, generally extruded, which is intended to form the wall of the tank after being moulded to the required shape and dimensions." Based on this definition, it is my opinion that the broadest reasonable interpretation of "parison" is "a preform, generally extruded, which is

intended to form the wall of the fuel tank after being molded to the required shape and dimensions.” Ex. 1001,’604 Patent at 4:63-67.

18. The specification of the ’604 Patent provides the following definition of the term “core”: “According to an advantageous variant of the invention, the mould also includes a core. By this is meant a part of appropriate size and shape for it to be able to be inserted between the mould impressions and in particular to be introduced into the parison during moulding.” This definition comports with the concept of “core” which is well-known in the art. Based on this definition, it is my opinion that the broadest reasonable interpretation of “core” is “a part of appropriate size and shape for it to be able to be inserted between the mold impressions and in particular to be introduced into the parison during molding.” Ex. 1001,’604 Patent at 5:33-37.

B. Legal Standards for Patentability

19. I understand that in order for a patent to be valid, the invention must meet the requirements of novelty and nonobviousness, among other requirements.

20. I understand that a claim is invalid if it is anticipated or obvious.

21. I understand that anticipation of a claim requires that each and every limitation recited in a claim must be disclosed either expressly or inherently in a single prior art reference. I further understand that, to be considered anticipatory, a written prior art reference must be enabling and describe the applicant’s claimed

invention sufficiently to have placed it in possession of a person of ordinary skill in the field of the invention. Thus I further understand that the disclosure of prior art is considered from the perspective of one of ordinary skill in the art.

22. I understand that obviousness of a claim requires that the claim be obvious from the perspective of a person of ordinary skill in the relevant art at the time the invention was made. In analyzing obviousness, I understand that it is important to understand the scope of the claims, the scope and content of the prior art, the differences between the claims and the prior art, the level of ordinary skill in the relevant art, and any relevant secondary considerations. In determining whether the subject matter of a claim would have been obvious, one or more prior art references may be combined in order to encompass the claimed invention in such a way that the combination of elements, features or limitations would have been obvious at the time the invention was made to one of ordinary skill in the art.

23. I understand that secondary considerations can include evidence of commercial success caused by an invention, evidence of a long-felt need that was solved by an invention, evidence that others copied an invention or evidence that an invention achieved a surprising result. I understand that such evidence must have a nexus, or causal relationship to the elements of a claim, in order to be relevant to the obviousness or non-obviousness of the claim.

C. One of Ordinary Skill In The Art

24. I understand that the application that led to the '604 Patent was filed on February 12, 2007, as PCT application 12/278,525. I understand that the '604 Patent purports to claim ultimate priority to a French application filed on February 13, 2006. I have therefore analyzed the validity of the '604 Patent as of that day or somewhat before, understanding that as time passes, the knowledge of a person of ordinary skill in the art (hereafter referred to a "POSITA") will increase. In forming my opinion, I have relied on the '604 Patent, its claims and specification, its prosecution history, and my own experience and expertise of the knowledge of one of ordinary skill in the relevant art in this timeframe.

25. With respect to understanding and applying the claims of the '604 Patent, I believe one of ordinary skill would be a degreed Mechanical or Plastics engineer with three years of experience directly related to plastics product design and molding. Alternatively, I believe that a non-degreed practitioner with ten years of experience directly related to plastics product design and molding could also be considered one of ordinary skill in the art.

26. I believe that I would qualify as at least one of ordinary skill in the art in the relevant timeframe of the '604 Patent, and that I currently have a sufficient level of knowledge, experience and education to provide an expert opinion in the field of the '604 Patent. My testimony in this declaration is given from the

perspective of one of ordinary skill in the art at the time of the February 13, 2006 priority date of the '604 Patent unless otherwise specifically indicated. This perspective is true even if the testimony is given in the present tense.

D. Materials Considered

27. In forming my opinion, I have considered my own knowledge and experience as well as the materials referred to in this declaration including:

- The '604 Patent, its claims, specification, and prosecution history (Exs. 1001 and 1002);
- U.S. Patent No. 6,726,967 to Vorenkamp et al., titled “Adapter for welding objects to plastic” (hereinafter referred to as “Vorenkamp”) (Ex. 1003);
- European Patent Pub. No. EP 1110697 A2 to Van Schaftingen et al., titled “Method for producing hollow objects made of thermoplastic material,” and a certified translation of it (hereinafter referred to as “Van Schaftingen”) (Ex. 1006);
- U.S. Patent Application Publication No. US 2004/0129708 to Borchert et al., titled “Fuel tank with a carrier for carrying functional components and said carrier” (hereinafter referred to as “Borchert”) (Ex. 1004);

- PCT Pub. No. WO 2006/008308 A1 to Criel et al., titled “Method for fastening an accessory in a plastic fuel tank” (hereinafter referred to as “Criel”) (Ex. 1005);
- Plaintiff Plastic Omnium Advanced Innovation and Research’s Initial Claim Charts for the ’604 Patent (hereinafter referred to as “Infringement Contentions”) (Ex. 1009);
- U.S. Patent Application No. US 2006/0102634 to Potter et al., titled “Fuel tank system having enhanced durability and reduced permeation,” filed November 15, 2004 (hereinafter referred to as “Potter”).

E. Approach

28. All of the opinions provided in this report are: (a) based upon sufficient facts and data to allow me to reach the opinions contained in this report; (b) the product of reliable principles and methods; (c) a reliable application of those principles and methods to the facts of the case; and (d) based upon information of a type reasonably relied upon by experts in the arts applicable and analogous to the ’604 Patent, including but not necessarily limited to technical dictionaries, technical descriptions, technical publications, product data sheets, schematics, patent specifications, and patent claims.

29. This report also considers the validity of the '604 Patent in light of the prior art listed above in Section II.D.

30. In order to reach the opinions set forth hereafter, I have reviewed the language of each claim of the '604 patent. For undefined terms within the challenged claims, I considered what a POSITA (previously defined in Section II.C) would understand the term to mean in light of the '604 Patent's claims, specification, and prosecution history and according to the ordinary knowledge and practices by one of ordinary skill in the art. I then reviewed the materials cited above and performed my own independent analysis of the '604 Patent's claim language and considered whether each claim element was expressly anticipated by the prior art or otherwise obvious given the understanding of one of ordinary skill.

31. I reserve the right to supplement or amend this Report if additional information becomes available.

III. THE '604 PATENT

A. Claims and Prosecution History

32. It is my understanding that the '604 Patent was issued on February 28, 2012, based on PCT application 12/278,525 filed on February 12, 2007 with foreign application priority dating to February 13, 2006. The '604 Patent claims a method for fastening an accessory at two or more points of a wall of a plastic fuel tank, this fastening taking place during the actual manufacture of the tank by molding.

33. Claim 1 claims a “method for fastening an accessory to a plastic fuel tank,” with the method comprising three elements. One element (referred to hereafter as “1a”) requires “fastening an accessory at at least two fastening points on a wall of the plastic fuel tank during the actual manufacture of the fuel tank by molding.” A second element (referred to hereafter as “1b”) requires the accessory to be provided, “at least at one of the at least two fastening points, with a fastening part in such a way that, although the accessory is fastened to the wall of the fuel tank, the accessory is moveable relative to the at least one of the at least two fastening points on the wall of the fuel tank.” A third element (referred to hereafter as “1c”) requires “the molding of the fuel tank includes blow-molding by blowing a parison, the method further comprising inserting a core into the parison during the blow-molding and fastening several accessories to the parison via the core.” These elements are enumerated simply for identification and are not intended to denote any requirement for their relative order in the claimed method.

34. The dependent claims 2, 4, 7, and 8 provide for specific features and methods that depend on claim 1. Claim 2 requires the required fastening part to be a “tab molded as one part of the accessory” or otherwise “attached to the accessory.” Claim 4 requires the tab of claim 2 to be “rigid but attached to a flexible portion of the accessory.” Claim 7 requires the method of claim 1 in which the fastened accessory is “moveable relative to all the fastening points.” Claim 8 requires the

blow-molding parison to be cut along “two diametrically opposed lines, so as to obtain two separate portions.”

35. In reading the file history of the '604 Patent, it is my understanding that the Examiner ruled that Potter disclosed most of the filed claims excluding some elements of the filed dependent claims. Subsequently, claim 1 was revised to include element 1c requiring the molding of the fuel tank to include blow-molding by blowing a parison, the method further comprising inserting a core into the parison during the blow-molding and fastening several accessories to the parison via the core.

IV. INVALIDITY ANALYSIS

A. Overview

36. I have reviewed the '604 Patent and related prior art in view of the knowledge of one of ordinary skill in the art. It is clear to me that this type of fastening method was well known in the prior art and there were many examples of such fastening methods that were used to provide accessories within fuel tanks. As set forth below it is my opinion that:

- Claims 1, 2, 4, 7, and 8 are rendered obvious under § 103 by Vorenkamp in view of Van Schaftingen.

- Claims 1, 2, 4, and 7 are anticipated under § 102 by Borchert. Claim 8 is rendered obvious under § 103 by Borchert in view of Van Schaftingen.
- Claims 1, 2, 7 and 8 are anticipated under § 102 by Criel. Claim 4 is rendered obvious under § 103 by Criel in view of Borchert.

B. Obviousness by Vorenkamp in view of Van Schaftingen

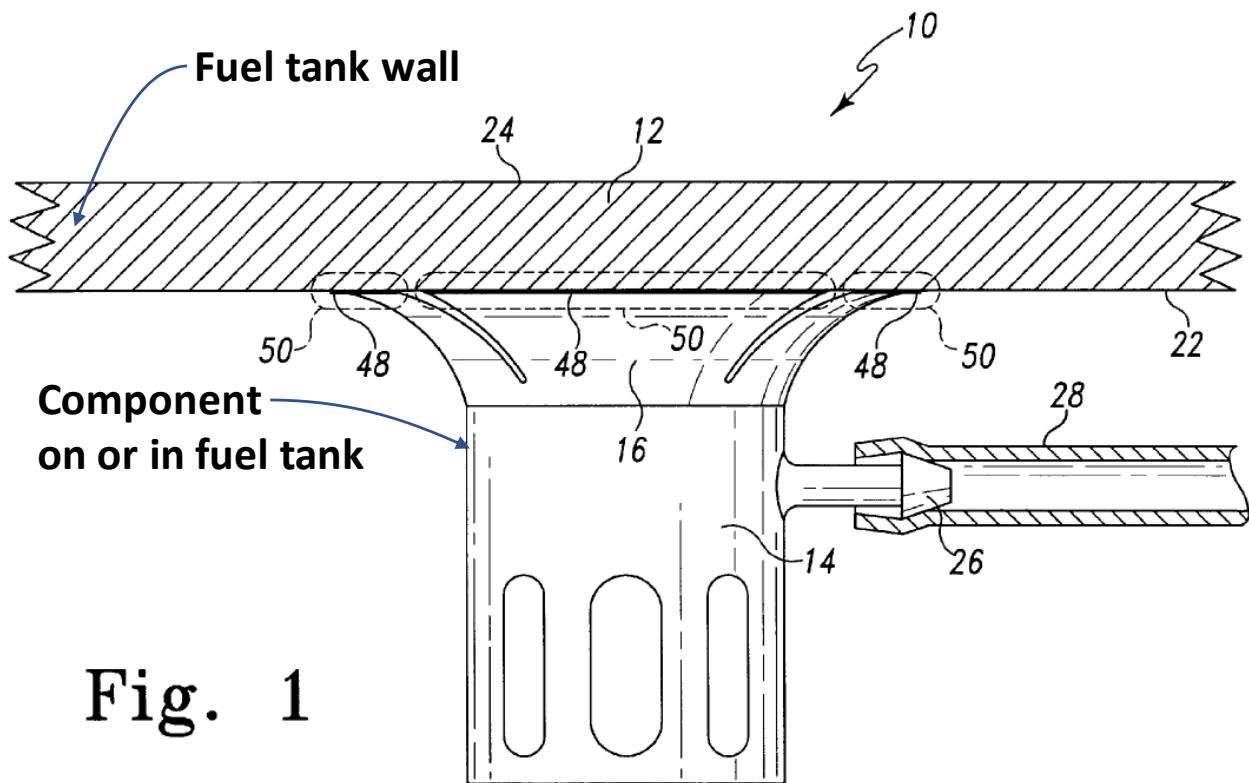
Claim 1, preamble) A method for fastening an accessory to a plastic fuel tank, comprising:

37. Like the '604 Patent, Vorenkamp is specifically directed to a method for fastening an accessory to a plastic fuel tank. The title of Vorenkamp is “Adapter For Welding Objects To Plastic.” The Field of the Invention is stated as “This invention relates to manufacture and forming of plastic, and more particularly to a design and process for welding objects to a surface of the plastic.” Ex. 1003, Vorenkamp at 1:10-12.

38. Vorenkamp’s specification is expressly directed to the fastening of accessories (Vorenkamp uses the term, “component” or “object”) in plastic fuel tanks. For instance, Vorenkamp states “An exemplary application of the adapter is in the area of plastic fuel tank systems. FIG. 1 illustrates one embodiment of a portion of a plastic fuel tank system 10. The plastic fuel tank system 10 includes plastic that is a cross-section portion of a plastic fuel tank 12, at least one object that is a fuel system component 14 and at least one adapter 16.” *Id.* at 3:50-55, 4:27-31

(“The fuel system component 14 may be any object mounted on, or in, the plastic fuel tank 12. Exemplary fuel system components 14 include valves, hoses, pumps, cam-lock rings, structural enhancements and other fuel system related mechanisms and features.”).

39. FIG. 1 of Vorenkamp is reproduced below in demonstrative Kazmer-1.



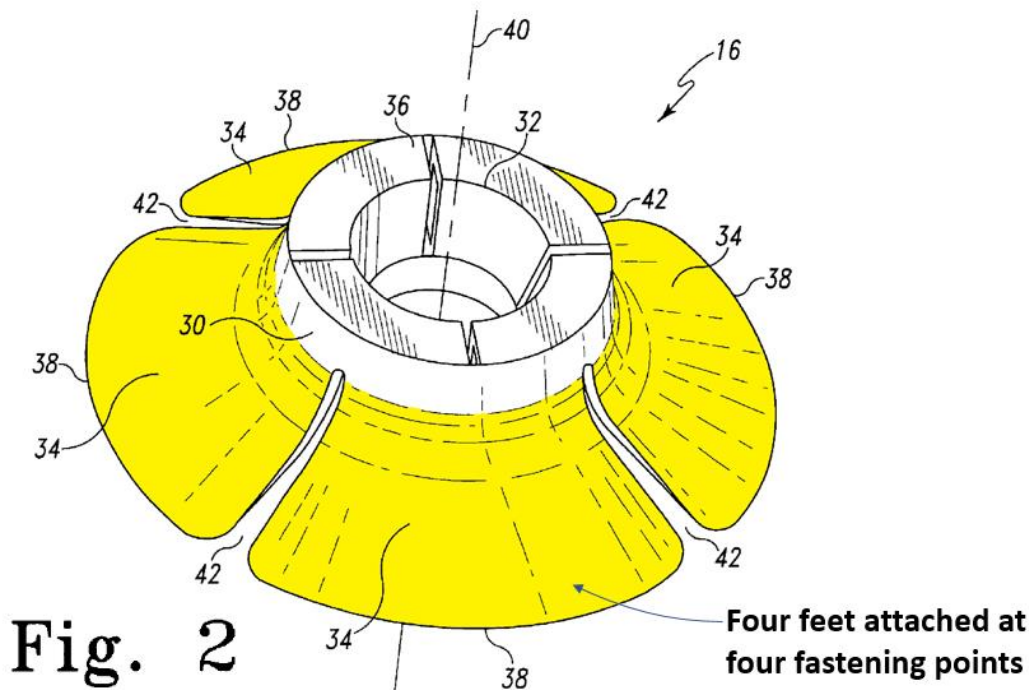
Kazmer-1: Demonstrative of Vorenkamp's FIG. 1

40. Viewing this embodiment and the related specification recited in the preceding two paragraphs, a POSITA would understand that (1) the component 14 and adapter 16 correspond to the accessory of the '604 Patent under the broadest reasonable interpretation of “accessory”, and (2) that Vorenkamp provides a method for welding this accessory to a plastic fuel tank. Therefore, Vorenkamp discloses a

method for fastening an accessory to the fuel tank as required by the claim 1 preamble.

Claim 1a) fastening an accessory at at least two fastening points on a wall of the plastic fuel tank during the actual manufacture of the fuel tank by molding, wherein

41. Vorenkamp discloses that the accessory (adapter 16 and component 14 mounted on it) has multiple feet that attach to the wall of the tank during the manufacturing of the tank. Vorenkamp discloses an embodiment at FIG. 2 that is reproduced below as demonstrative Kazmer-2. Multiple pad-shaped feet 34 are highlighted in yellow. The specification states that “The adapter includes a body, a coupling mechanism and *at least two feet*. The body couples the coupling mechanism with the feet. The coupling mechanism couples an object to the adapter. The feet are formed to extend away from the body and include a *weld zone for contacting the surface of the plastic*.” Ex. 1003, Vorenkamp at 2:33-38 (emphasis added). The specification then states that “FIG. 2 is a perspective view of one embodiment of the adapter 16. The adapter 16 includes a body 30, a coupling mechanism 32 and a plurality of feet 34.” *Id.* at 4:61-63.



Kazmer-2: FIG. 2 of Vorenkamp showing four feet 38, each attached to the tank at different point

42. Viewing FIG. 2 and the recited specification, Vorenkamp discloses that adapter 16 and the component mounted on the adapter are fastened to the wall of the plastic fuel tank, as required in this claim element. Further, the welds zones of the four feet 38 fasten the accessory at at least two fastening points on a wall of the plastic fuel tank as required by this claim element. This is also shown in FIG. 1, which shows for each of the feet “a weld interface 50 between the adapter 16 and the interior wall 22 of the plastic fuel tank 12.” Ex. 1003, Vorenkamp at 7:19-22.

43. Claim element 1a also requires the fastening be made during the actual manufacture of the fuel tank by molding. Vorenkamp discloses this requirement, stating “In one embodiment, the adapter 16 may be advantageously applied *during*

manufacture of a plastic fuel tank 12. In this embodiment, the adapter 16 provides a surface mount for fuel system components 14 on the interior wall 22 of the plastic fuel tank 12. The adapter 16 is placed *inside* the *plastic fuel tank 12 during manufacturing and welds to the surface of the interior wall 22* without compromising the hydrocarbon barrier. As such, the adapter 16 allows internalization of fuel system components 14 to minimize leakage and/or permeation of fuel vapors from within the plastic fuel tank 12.” Ex. 1003, Vorenkamp at 8:54-64 (emphasis added). The welding of the feet 38 to the interior wall 22 of the plastic fuel tank 12 occurs during the actual molding of the fuel tank as required by this claim element. Specifically, the welding of the outside of the feet 38 to the interior wall 22 of the fuel tank occurs upon contact of the outside of the feet 38 with the semi-molten wall 22 given the applied pressure upon forming that causes compressive stresses between the feet 38 and the wall 22.

44. Vorenkamp discloses that the fuel tank can be made by molding. “The plastic is formed into the plastic fuel tank 12 by manufacturing processes such as, for example, *blow molding* or *twinsheet thermoforming*. Blow molding uses a continuous extrusion process to produce molten plastic. The molten plastic is extruded as a hollow parison and formed to a mold.” *Id.* at 4:13-20 (emphasis added). Blow molding and twinsheet thermoforming are both molding processes as required by this claim element.

45. Thus Vorenkamp discloses fastening an accessory at at least two fastening points on a wall of the plastic fuel tank during the actual manufacture of the fuel tank by molding, as required by 1a.

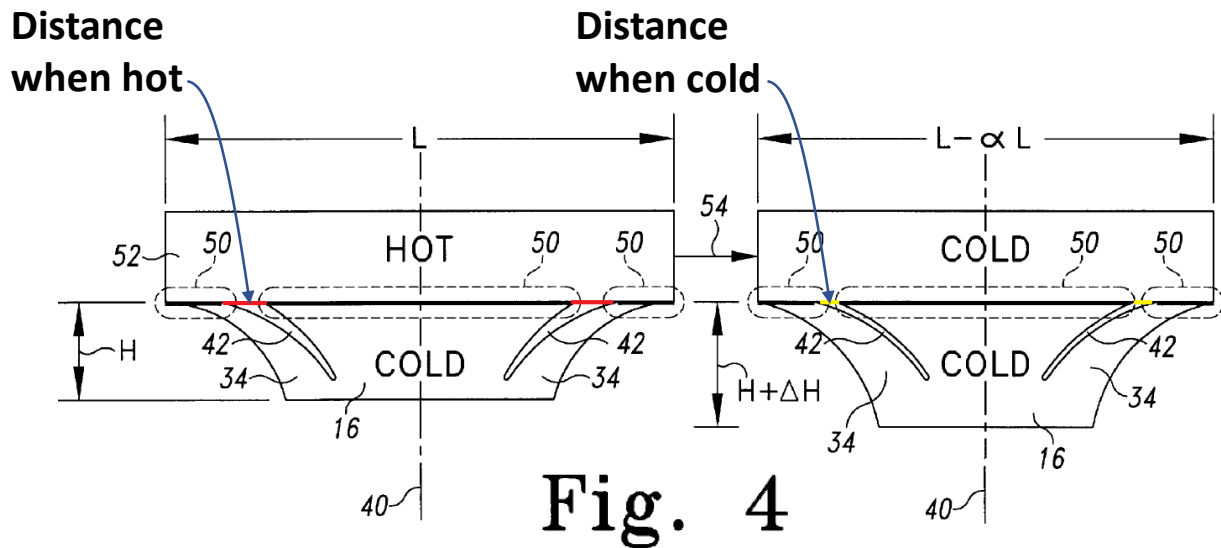
Claim 1b) the accessory is provided, at least at one of the at least two fastening points, with a fastening part in such a way that, although the accessory is fastened to the wall of the fuel tank, the accessory is moveable relative to the at least one of the at least two fastening points on the wall of the fuel tank, and

46. Vorenkamp states “In addition, the adaptor 16 provides a flexible mount to allow some *independent movement* of the plastic fuel tank 12 and the fuel system component 14.” Ex. 1003, Vorenkamp at 4:47-49 (emphasis added). A POSITA would thus understand that an objective of Vorenkamp is to provide a method for flexible mounting that allows for movement of the accessory relative to the fastening points on the wall of the fuel tank.

47. Vorenkamp describes its method for flexible mounting as capable of relieving stress introduced during the cooling of a just manufactured fuel tank: “As further illustrated in FIG. 4, the stresses cause[d] by the shrinkage of the piece of plastic 52 are *absorbed by the flexibility of the adapter* 16. More specifically, the feet 34 of the adapter 16 include sufficient *flexibility to bend in response to the lateral movement of the piece of plastic 52 [i.e., shrinkage of the tank wall]*. The bending of the feet 34 increases the overall height of the adapter 16 to a height of $(H+\Delta H)$. In addition, as illustrated in FIG. 4, and by dotted lines in FIG. 3, the slits 42 between the feet 34 are narrowed and the diameter of the annular ring formed by

the weld zone 46 is reduced. Accordingly, local stresses between the surface of the piece of plastic 52 and the weld zone 46 occurring at the weld interface 50 are relieved.” Ex. 1003, Vorenkamp at 8:12-23 (emphasis added).

48. Kazmer-3 is a demonstrative of Vorenkamp FIG. 4 that indicates the distance between the feet when the wall of the fuel tank is hot with a red line at left as well as the distance between the feet when the wall of the fuel tank is cold with a yellow line at right.



Kazmer-3: FIG. 2 of Vorenkamp showing four feet 38, each providing a fastening point and movement along axis 40

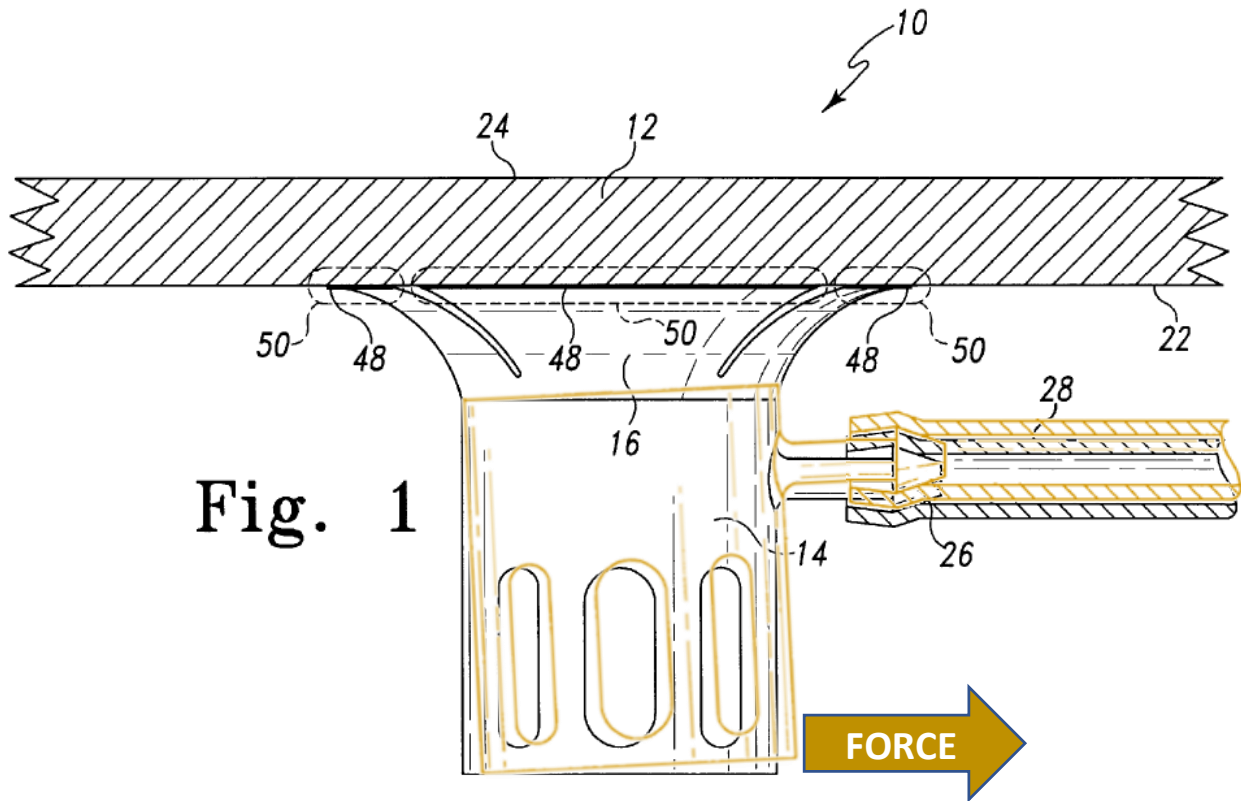
49. The wall of the fuel tank shrinks according to the thermal expansion coefficient and temperature change of the wall of the fuel tank. The slits 42 disclosed by Vorenkamp provide a clearance gap that allows the feet 34 in FIG. 4 to move

relative to each other, and allow the attached component to move along the axis 40 and relative to the fastening points on the wall of the fuel tank.

50. Vorenkamp also discloses that flexible bending of the feet is desirable due to (1) dimensional changes due to swelling of the plastic upon contact with fuel, (2) transient temperatures, and (3) dynamic loading during vehicle operation. Specifically, Vorenkamp states, “In addition, where the piece of plastic 52 is a portion of a plastic fuel tank 12 (FIG. 1), local stresses caused by [1] non-uniform swelling of the piece of plastic 52 and the adapter 16 in the presence of fuel are also absorbed by the flexible bending of the feet 34. Further, stresses caused by other conditions during operation of the plastic fuel tank 12 may also be absorbed. Such stresses include, for example, [2] transient thermal imbalances due to uneven heating and cooling within the plastic fuel tank system 10 (FIG. 1). Another exemplary source of stresses is [3] dynamic loading caused by lateral movement of the fuel system component 14 (FIG. 1) or fuel within the plastic fuel tank 12.” Ex. 1003, Vorenkamp at 8:24-35 (emphasis added).

51. Further, Vorenkamp explicitly states that, “In any situation where forces in directions non-parallel with the central axis 40 impart stresses on the adapter 16 and the piece of plastic 52 the feet 34 may absorb the stresses created.” *Id.* at 8:35-39. Figure Kazmer-4 is a demonstrative based on Vorenkamp FIG. 1 indicating motion of a fuel system component 14 and adapter 16 upon application

of a lateral force (non-parallel with axis 40) that shows how the accessory would move relative to each of the fastening points on the tank wall.



Kazmer-4: Vorenkamp FIG. 1 demonstrating motion of a fuel system component 14 and adapter 16 upon application of a force

52. In view of the foregoing, Vorenkamp discloses fastening an accessory with at least two fastening points in such a way that, although the accessory is fastened to the wall of the fuel tank, the accessory is moveable relative to the at least one of the at least two fastening points on the wall of the fuel tank, as required by 1b.

Claim 1c) the molding of the fuel tank includes blow-molding by blowing a parison, the method further comprising inserting a core into the parison during the blow-molding and fastening several accessories to the parison via the core.

53. Regarding the molding of the fuel tank by blow molding a parison, Vorenkamp states “The plastic is formed into the plastic fuel tank 12 by manufacturing processes such as, for example, *blow molding* or twinsheet thermoforming. Blow molding uses a continuous extrusion process to produce molten plastic. The molten plastic is extruded as a hollow *parison* and formed to a mold.” Ex. 1003, Vorenkamp at 4:13-20. Thus, Vorenkamp provides the molding of the fuel tank that includes blow-molding by blowing a parison as required by this claim element.

54. Vorenkamp, does not disclose that the method comprise the insertion of a core into the parison during the blow molding for fastening several accessories, but this requirement was well known in the art and is disclosed by Van Schaftingen. Van Schaftingen states that “The insertion of accessories into a preform [a parison] intended then to be inflated to produce a hollow body is well known, and is found in numerous industrial applications for manufacturing hollow bodies, in particular for tanks for liquid and gas.” Ex. 1006, Van Schaftingen ¶ 3.

55. Van Schaftingen discloses several methods of inserting accessories into a parison during blow molding. Van Schaftingen states that “Preferably, the inserted accessory, especially when a plurality thereof are inserted, whether identical or not, is supported by a preassembled structure. This approach has the advantage that the preassembled structure supporting the assembly or at least a plurality of the

accessories to be inserted into the hollow body can be produced in a separate process prior to their insertion into the hollow body. This results in a greatly facilitated subsequent assembly by insertion into the hollow body, making it possible to more easily subcontract the production of preassembled structures of relatively complex accessories.” Ex. 1006, Van Schaftingen ¶ 33. The preassembled structure and the accessories supported by the preassembled structure can be inserted, as shown in the illustrated embodiment of Van Schaftingen, into the parison using a robot arm: “A robot (not shown) then positions the structure (5) supporting the accessories to be integrated into the tank.” *Id.* ¶ 46.

56. Van Schaftingen also discloses that the preassembled structure and accessories can be inserted into the parison using films, sheets, or plates: “The method according to the invention is well suited for the implementation of means of positioning bulky objects and preassembled structures which provide a very high precision of assembly in the hollow body. An example of said means is the use of supports in the form of films, sheets or plates made of polyolefin, integral with the object or the structure at such locations that it is possible to support and move the object or the structure while holding it by gripping between clamps. The films, sheets or plates are for example secured to the structure at points situated 180° from each other. Advantageously, the films, sheets or plates extend to the exterior of the perimeter of the sheets and thus enable the continuous holding and positioning of

the object or of the structure during closure of the mold. In this way, the films, sheets or plates are held between the clamping areas of the preform that are intended to be joined together. A preferred method of joining together is welding. Thus, the films, sheets or plates are melted, at least at the surface, during the welding operation with the inner surface of the preform.” Ex. 1006, Van Schaftingen ¶¶ 38-39.

57. Further, Van Schaftingen discloses “An additional means of precise positioning of the bulky objects or preassembled structures inside the hollow body is to provide the films, sheets or plates serving as support with cones of plastic material intended to be inserted exactly in the corresponding parts in relief situated on the edges of the mold, in the welding areas of the preform.” *Id.* ¶ 41.

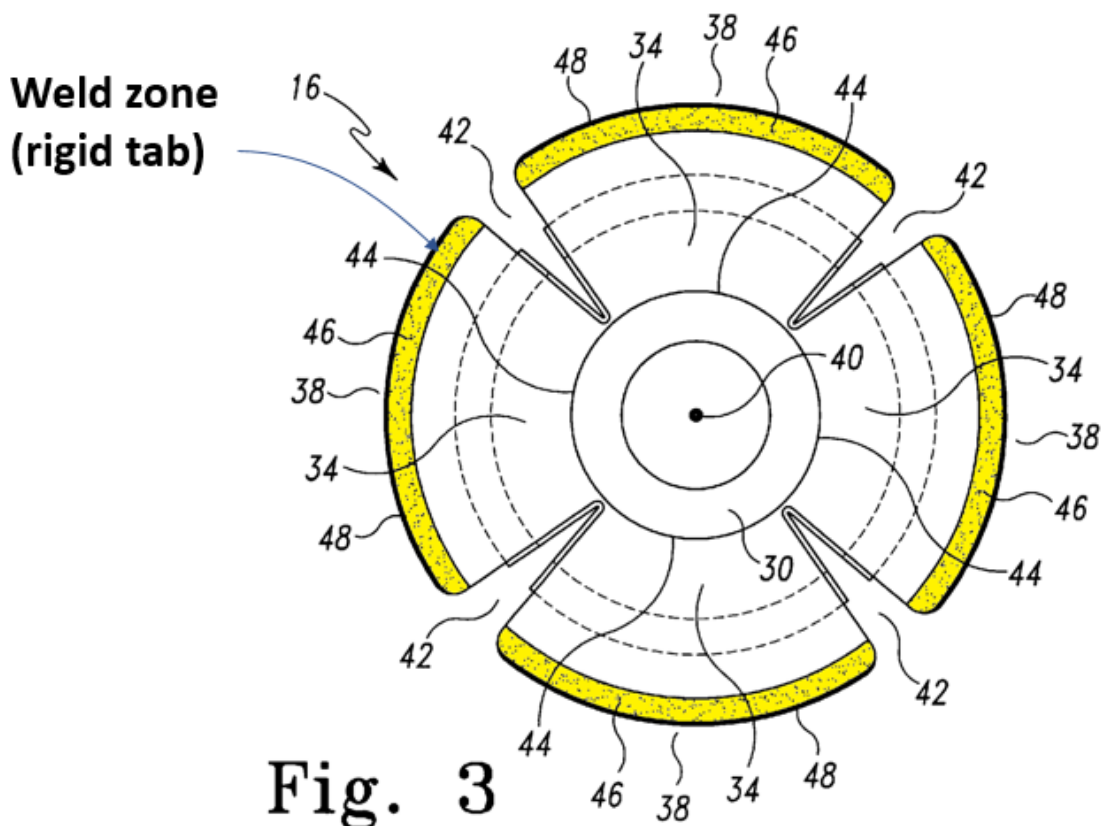
58. Under the broadest reasonable definition of a core, each of the foregoing means is a “core” under the broadest reasonable interpretation of that term. As required by the claim limitation, each of the foregoing cores is capable of fastening several accessories to the parison.

59. It would have been obvious to a POSITA to combine Van Schaftingen’s teaching of inserting a core during blow-molding with the method of attaching an accessory disclosed in Vorenkamp to make the claimed invention. Vorenkamp and Van Schaftingen are directed to the same technical field, not only to blow molding of fuel tanks, but more specifically to installing internal accessories during blow molding. A POSITA would have been motivated to use Van Schaftingen’s teaching

of using a core to insert accessories by the desire to gain the manufacturing advantages of enabling the continuous holding and positioning of Vorenkamp's adapter during closure of the mold and to allow more precise positioning of the adapter inside the tank. *See* Ex. 1006, Van Schaftingen ¶39 (Advantageously, the films, sheets or plates extend to the exterior of the perimeter of the sheets and thus enable the continuous holding and positioning of the object or of the structure during closure of the mold.), ¶41 (“An additional means of precise positioning of the bulky objects or preassembled structures inside the hollow body is to provide the films, sheets or plates serving as support with cones of plastic material intended to be inserted exactly in the corresponding parts in relief situated on the edges of the mold, in the welding areas of the preform.”) A POSITA also would have been motivated to combine the teachings of Vorenkamp with those of Van Schaftingen to be able to mitigate stress in a fuel tank made by Van Schaftingen's process through the use of Vorenkamp's adapter. Such a combination would have been simple for a POSITA to implement, as it would merely require using Vorenkamp's adapter as the preassembled structure in Van Schaftingen's process. As described in this and the preceding subsections, one of ordinary skill in the art would understand that Vorenkamp and Van Schaftingen disclose every element of claim 1 of the '604 Patent. Vorenkamp in view of Van Schaftingen thus renders obvious claim 1 of the '604 Patent.

Claim 2. The method according to claim 1, wherein the fastening part is a fastening tab molded as one part with the accessory or attached to the accessory.

60. Claim 2 of the '604 Patent requires a fastening tab molded or attached to the accessory. Vorenkamp states “As best illustrated in FIG. 1, the weld zone 46 (FIG. 3) of the illustrated embodiment forms a weld interface 50 between the adapter 16 and the interior wall 22 of the plastic fuel tank 12. As illustrated in FIGS. 1 and 3, the *weld zone 46 presents the relatively flat surface* to the interior wall 22.” Ex. 1003, Vorenkamp at 7:19-23 (emphasis added). “In addition, the weld zone 46 presents a large surface area to the interior wall 22. The large surface area improves stability and strength of resulting welds. In addition, the large surface area provides resistance to tilting and decoupling of the adapter 16 from the interior wall 22 during the weld process.” *Id.* at 7:30-35. Vorenkamp also describes the relatively flat weld zone of one embodiment as a “*flange*”: “In this embodiment, the portion of the feet 34 extending back toward the central axis 40 forms a flange. The flange includes the weld zone 46 and the relatively flat surface.” *Id.* at 7:1-3. A POSITA would thus understand that the fastening part (weld zone 46) of the feet 34 that welds to the wall of the fuel tank is a fastening tab as shown in demonstrative Kazmer-5.



Kazmer-5: FIG. 3 of Vorenkamp showing four weld zones 46, each providing a rigid tab attached to a flexible portion of the accessory

61. Vorenkamp also discloses that the fastening part (weld zone 46) can be molded as one part with the adapter or attached to the adapter. For example, Vorenkamp states “In another embodiment, the weld zone 46 is formed by ***folding a predetermined portion of the feet 34 [i.e., molded as one part]*** near the proximal end 38 to extend back toward the central axis 40. In this embodiment, the portion of the feet 34 extending back toward the central axis 40 forms a flange. The flange includes the weld zone 46 and the relatively flat surface...In yet another

embodiment, the weld zone 46 is *separately formed and coupled* with the feet 34 by one of the previously described techniques.” Ex. 1003, Vorenkamp at 6:65-7:9.

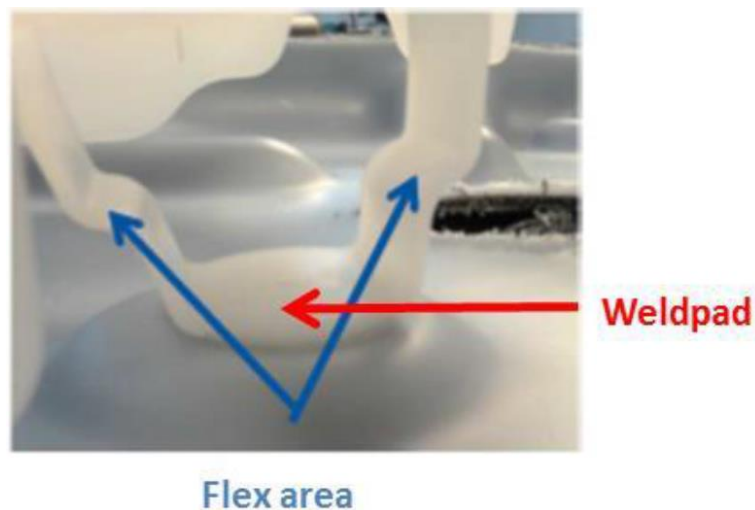
62. Accordingly, Vorenkamp discloses the fastening part is a fastening tab molded as one part with the accessory or attached to the accessory. Vorenkamp in view of Van Schaftingen thus renders obvious claim 2.

Claim 4. The method according to claim 2, wherein the fastening tab is rigid but attached to a flexible portion of the accessory.

63. Vorenkamp discloses that weld zone 46 (fastening tab) can be rigid. “In addition, the weld zone 46 presents a large surface area to the interior wall 22. The large surface area improves *stability and strength* of resulting welds. In addition, the large surface area provides *resistance to tilting and decoupling* of the adapter 16 from the interior wall 22 during the weld process...The interior wall 22 and the feet 34 within the weld zone 46 subsequently melt together to form a *rigid bond at the weld interface 50*.” *Id.* at 7:30-45 (emphasis added). The function of the weld zone of the feet is to provide reliable and secure attachment of the accessory to the tank and so they have a different, more rigid structure than other portions of the feet designed to flex to allow movement. A POSITA would understand that Vorenkamp discloses that the fastening tab (weld zone of the feet) is rigid but attached to a flexible portion (the unwelded portion of the feet).

64. Furthermore, it is my understanding that the Patent Owner contends in a related litigation that a fuel tank baffle’s weldpad is a rigid tab that connects to a

flexible portion of the baffle. See Ex. 1009, Infringement Contentions at 5. Demonstrative Kazmer-6 provides an unaltered image of the alleged infringing design taken from Patent Owner's infringement contentions. As seen in the image, the alleged rigid weldpad and flexible area are part of the same molded baffle accessory, analogous to the rigid weld zone and flexible feet disclosed by Vorenkamp.



Kazmer-6: Patent Owner demonstrative of weldpad and flex area that serve as rigid tab connected to a flexible portion of the accessory

65. As described in the preceding paragraphs, Vorenkamp discloses a fastening tab that is rigid and attached to a flexible portion of the accessory. Vorenkamp in view of Van Schaftingen thus renders obvious claim 4.

Claim 7. The method according to claim 1, wherein all the fastening points where the accessory is fastened to the wall of the fuel tank are provided with the fastening part and wherein the accessory is moveable relative to all the fastening points on the wall of the fuel tank.

66. As I have discussed above regarding claim 1, Vorenkamp discloses embodiments where the feet of the adapter allow the body of the adapter and the component attached to the adapter to move relative to the tank wall relative to each and every fastening point on the tank. The movement takes place at least in the x-y directions (e.g., when the accessory experiences a force in the lateral direction as shown in Kazmer-4) and z direction (e.g., movement along axis 40 as the tank shrinks as shown in Kazmer-3).

67. Vorenkamp discloses that all the fastening points where the accessory is fastened to the wall of the fuel tank are provided with the fastening part and wherein the accessory is moveable relative to all the fastening points on the wall of the fuel tank. Vorenkamp in view of Van Schaftingen thus renders obvious claim 7.

Claim 8. The method according to claim 1, wherein the parison is an extruded tubular parison, which is cut over an entire length along two diametrically opposed lines, so as to obtain two separate portions.

68. Blow molding with two separate portions was known in the prior art and is admitted as such by the '604 patent: "Preferably, the tank is moulded by blowing a parison consisting of two separate parts, which may for example be two sheets. However, these parts preferably result from cutting one and the same extruded tubular parison as described in Application EP 1 110 697 [Van Schaftingen] mentioned above, the content of which for this purpose is incorporated for reference into the present application." Ex. 1001, '604 Patent at 5:4-14.

69. Van Schaftingen states “Preferably, the cutting of the preform is done longitudinally, along a generatrix thereof. In this case, it is particularly beneficial for this cut to be made in the direction of flow of the preform.” Ex. 1006, Van Schaftingen ¶24. “A particularly preferred technique [for making the preform] is one in which the *cut of the preform is made over its full length in duplicate*, that is, *along two distinct lines so as to produce two separate sheets*. A cut along to *parallel generatrices* is particularly preferred.” *Id.* ¶25 (emphasis added).

70. Van Schaftingen teaches that its method of cutting a parison to make a fuel tank enables the insertion of “bulky” accessories during the blow molding of the tank. “The method according to the invention is well suited for the implementation of means of positioning bulky objects and preassembled structures which provide a very high precision of assembly in the hollow body.” Ex. 1006, Van Schaftingen ¶38.

71. It would have been obvious to a POSITA to combine Van Schaftingen’s cutting of a parison with Vorenkamp’s adapter to make the claimed invention. As described above, the two references are directed to the same technical field of installing internal accessories during blow molding. A POSITA would have been motivated to combine Vorenkamp with Van Schaftingen to achieve the manufacturing advantage of enabling the insertion of larger versions of Vorenkamp’s adapters/accessories into a plastic fuel tank. Ex. 1006, Van

Schaftingen ¶38. A POSITA would also have been motivated by a desire to achieve the manufacturing advantage of inserting Vorenkamp's adapters/accessories laterally between the two sheets created by cutting the parison. Ex. 1006, Van Schaftingen ¶29 states "More advantageously, said object can be inserted laterally, even by the upper part of the sheet. In this way, the area or side of the sheet where the available space is less encumbered can be selected. This approach is particularly advantageous for objects of large dimensions."

72. Accordingly, Van Schaftingen discloses the parison is an extruded tubular parison, which is cut over an entire length along two diametrically opposed lines, so as to obtain two separate portions. Vorenkamp in view of Van Schaftingen thus renders obvious claim 8.

C. Anticipation by Borchert

Claim 1, preamble) A method for fastening an accessory to a plastic fuel tank, comprising:

73. Borchert discloses a method for fastening accessories to the interior of plastic fuel tank. The title of Borchert is "Fuel tank with a carrier for carrying functional components and said carrier." Borchert's abstract discloses that these functional components serve a variety functions: "In a fuel tank of plastic material with functional components contained therein for implementing functions such as operational venting, refuelling, refuelling venting and drawing off fuel, the functional components are pre-mounted on a carrier which equipped therewith was

fitted into the tank or which was already integrated into the tank upon shaping thereof.” Ex. 1004, Borchert Abstract. Accordingly, the functional components described by Borchert correspond to the accessories in the claim 1 preamble.

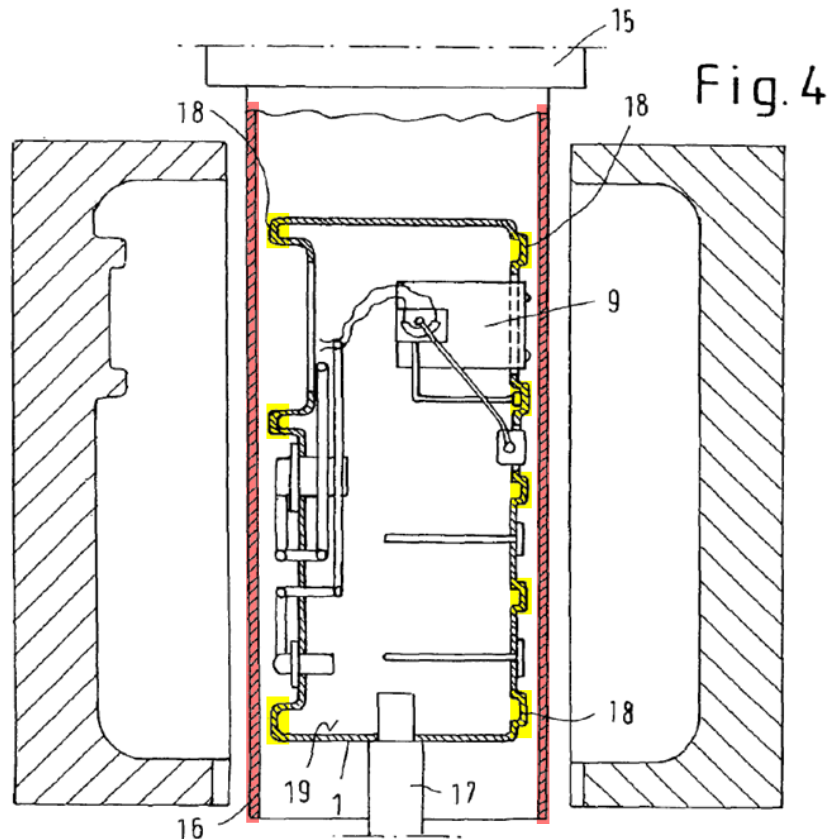
74. In addition, the carrier of Borchert that supports the accessories inside of the tank is itself an “accessory” under the broadest reasonable interpretation of that term. First, Borchert states “The carrier element is welded to the inside surface of the wall of the fuel tank and serves at the same time as an element for breaking up the surge movements of fuel within the tank.” Ex. 1004, Borchert ¶10. Thus, Borchert’s carrier is also a baffle. Second, the carrier is a support for the functional components that are attached to it.

75. Borchert further discloses that “The functional components are pre-mounted on a carrier which, equipped therewith, was introduced into the tank or was already integrated into the tank upon shaping thereof, for example by molding.” *Id.* ¶15. Thus, Borchert discloses a method for fastening an accessory to the fuel tank as required by the claim 1 preamble.

Claim 1a) fastening an accessory at at least two fastening points on a wall of the plastic fuel tank during the actual manufacture of the fuel tank by molding, wherein

76. Borchert discloses that the accessory (the carrier and the components on it) is fastened to the wall of the tank at multiple fastening points by pad-shaped feet 18, as seen in FIG. 4 reproduced below as demonstrative Kazmer-7. The

multiple pad-shaped feet 18 are highlighted in yellow. The accessory 1 is inserted into the parison (shown in pink) and attached during the blow-molding of the fuel tank.



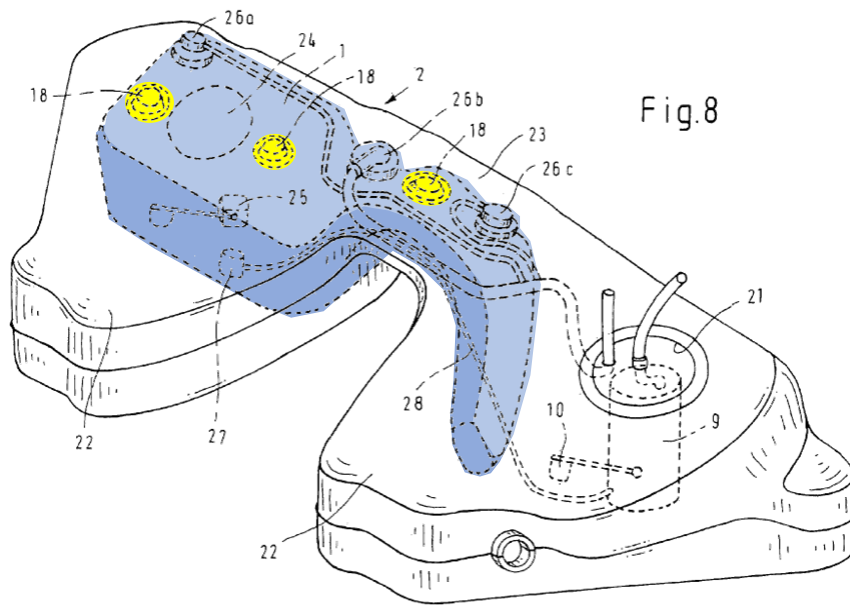
Kazmer-7: FIG. 4 of Borchert showing accessory 1 with pad-shaped feet 18 inserted as a core into the parison 16 during the blow-molding of the fuel tank

77. Specifically, Borchert describes the process depicted in FIG. 4 as follows: “FIG. 4 shows the production procedure in the phase in which a preform 16 which has been expelled from an extrusion head diagrammatically indicated at 15 has been extruded to its full length which approximately corresponds to the length of the desired finished fuel tank 2. In that phase the preform 16 which subsequently forms the external contour of the finished fuel tank 2 is possibly stabilised from

below by the use of supporting air. The functional component carrier 1 equipped with the functional components mounted thereto is now *introduced from below into the opened preform 16* which is extruded between the open mold halves, by way of a holding bar 17. The mold halves of the mold 3 then close around the entire arrangement consisting of the fuel tank 2 and the carrier 1 with its functional components thereon. The preform 16 is expanded by means of blowing air in the mold 3 to its definitive contour which is predetermined by the mold cavity defined by the mold 3. In that procedure the *material of the carrier 1 is welded in the region of pad-shaped support feet 18 to the inside wall surface 19 of the fuel tank 2.*” Ex. 1004, Borchert ¶42 (emphasis added).

78. Thus carrier 1 is fastened at points during the molding of the fuel tank. Specifically, the welding of the pad-shaped support feet 18 to the inside wall surface 19 of the fuel tank occurs upon mold closure when the parison is semi-molten and the force of the mold closure causes compressive stresses between the feet 18 and the wall 19 that causes the surfaces to weld.

79. Borchert discloses another embodiment at FIG. 8 that is reproduced below in Kazmer-8 as a demonstrative, which shows the carrier 1 with multiple pad-shaped feet 18 in a completed tank. The feet that secure the carrier 1 (shown in blue) to the fuel tank 2 are highlighted in yellow.



Kazmer-8: FIG. 8 of Borchert showing attached support feet 18 (yellow) securing carrier 1 (blue) to fuel tank 2

80. Borchert states “By way of a total of five pad-shaped support feet 18, of which only three are visible in FIG. 8, the functional component carrier 1 is supported yieldingly in relation to the inside wall surface 19 of the fuel tank 2, in the chamber 22 which is at the left in FIG. 8 and in the region of the saddle portion 23 of the fuel tank 2, with the support feet 18 being welded to the inside wall surface 19 of the fuel tank body in that region.” Ex. 1004, Borchert ¶50.

81. Therefore, Borchert discloses fastening an accessory at at least two fastening points on a wall of the plastic fuel tank during the actual manufacture of the fuel tank by molding, as required by 1a.

Claim 1b) the accessory is provided, at least at one of the at least two fastening points, with a fastening part in such a way that, although the accessory is fastened to the wall of the fuel tank, the accessory is moveable relative to the at least one of the at least two fastening points on the wall of the fuel tank, and

82. As I have already discussed, Borchert discloses that the multiple support feet 18 of the carrier 1 fasten the carrier (and the accessories in the carrier) to the internal wall of the fuel tank. The support feet 18 are thus fastening parts. Borchert further discloses that though the carrier is fastened to the wall of the tank, the structural features of the carrier allow for flexibility and movement of the carrier (and accessories in it) relative to the fastening points on the wall of the tank. For instance, Borchert states “In accordance with a preferred feature of the invention the functional component carrier is *supported yieldingly* in relation to the inside wall surface of the tank body, thus affording a comparatively high load-carrying capacity for the tank in relation to impact-induced shock loadings. This already arises out of the fact that *the carrier itself is in the form of a hollow body, thus giving a certain degree of flexibility and yielding resilience* due to the nature and structure of the carrier.” Ex. 1004, Borchert ¶17 (emphasis added), ¶42 (“In addition, by virtue of the fact that the carrier 1 is in the form of a *thin-walled hollow plastic body, the carrier 1 is elastic* in itself, thereby overall providing a comparatively yielding arrangement for the carrier 1 in the fuel tank 2. The carrier is thus *supported yieldingly* against the inside wall surface of the tank body by virtue of the resiliently yielding support feet 18 formed integrally in the wall thereof.” (emphasis added)).

83. Borchert further explains that the wall of the carrier surrounding the support feet 18 can have a concentrically wavy configuration that provides

additional flexibility and movement. “The support feet 18 have a certain degree of elasticity, as will be described in greater detail hereafter.” Ex. 1004, Borchert ¶42. “As has been noted hereinbefore the support feet 18 are outwardly extending portions of a pad-shaped or cushion-shaped configuration. The *wall of the carrier 1 is of a concentrically wavy configuration at the edges around the support feet 18*, so that this configuration provides that the support feet 18 are of a *resiliently yielding nature* with a *bellows-like capacity for resilient movement*, thereby ultimately ensuring that the carrier 1 when fitted into the fuel tank 2 does not damagingly stabilise the fuel tank 2, which would be harmful in particular in the case of impact-induced shock loadings on the fuel tank 2.” *Id.* ¶51 (emphasis added).

84. A POSITA would thus understand that Borchert discloses that the accessory is provided, at least at one of the at least two fastening points, with a fastening part in such a way that, although the accessory is fastened to the wall of the fuel tank, the accessory is moveable relative to one or more of the at least two fastening points on the wall of the fuel tank, as required by 1b.

Claim 1c) the molding of the fuel tank includes blow-molding by blowing a parison, the method further comprising inserting a core into the parison during the blow-molding and fastening several accessories to the parison via the core.

85. Borchert discloses embodiments where the tank is made by blow molding a preform (a parison). Borchert states “The preform 16 is expanded by means of blowing air in the mold 3 to its definitive contour which is predetermined

by the mold cavity defined by the mold 3. In that procedure the material of the carrier 1 is welded in the region of pad-shaped support feet 18 to the inside wall surface 19 of the fuel tank 2.” Ex. 1004, Borchert ¶42.

86. Borchert further describes inserting the accessories into the parison during blow molding and fastening them to the parison using holding bar 17: “FIG. 4 shows the production procedure in the phase in which a preform 16 which has been expelled from an extrusion head diagrammatically indicated at 15 has been extruded to its full length which approximately corresponds to the length of the desired finished fuel tank 2. In that phase the preform 16 which subsequently forms the external contour of the finished fuel tank 2 is possibly stabilised from below by the use of supporting air. *The functional component carrier 1 equipped with the functional components mounted thereto is now introduced from below* into the opened preform 16 which is extruded between the open mold halves, *by way of a holding bar 17*. The mold halves of the mold 3 then close around the entire arrangement consisting of the fuel tank 2 and the carrier 1 with its functional components thereon. The preform 16 is expanded by means of blowing air in the mold 3 to its definitive contour which is predetermined by the mold cavity defined by the mold 3. In that procedure the material of the *carrier 1 is welded in the region of pad-shaped support feet 18 to the inside wall surface 19 of the fuel tank 2.*” *Id.* ¶42 (emphasis added). Holding bar 17 is therefore a “core” under the broadest

reasonable interpretation of that term. Borchert's carrier also satisfies the definition of a core, and both the holding bar and carrier could be understood to be collectively a core.

87. Accordingly, a POSITA would understand that Borchert discloses the molding of the fuel tank that includes blow molding by blowing a parison, the method further comprising inserting a core into the parison during the blow-molding and fastening several accessories to the parison via the core. As described in the preceding paragraphs, Borchert expressly provides every element of claim 1 of the '604 Patent and thus anticipates claim 1.

Claim 2. The method according to claim 1, wherein the fastening part is a fastening tab molded as one part with the accessory or attached to the accessory.

88. Claim 2 requires that the fastening part is a fastening tab molded as one part with the accessory or attached to the accessory. The '604 Patent describes a fastening tab as an "excrescence": "This may be a fastening tab (i.e. an excrescence on its overall envelope) moulded as one part with the accessory or attached thereto." Ex. 1001, '604 Patent at 3:59-61. I understand that the definition of an excrescence is "a projection or outgrowth." Support feet 18 are a projection or outgrowth from the "overall envelope" of the carrier. A POSITA would understand that support feet 18 of Borchert are tabs.

89. Borchert explicitly states that the tabs are “formed integrally” or molded as part of the carrier: “It is particularly advantageous in this respect however if the component has resiliently yielding support feet or legs which are formed integrally in the wall of the carrier.” Ex. 1004, Borchert ¶17. This is consistent with FIG. 1, which shows the support feet 18 integrally molded with the carrier 1.

90. Further, the functional components are attached to the carrier and its support feet (tabs). For example, Borchert states “The functional components are pre-mounted on a carrier...” *Id.* ¶15.

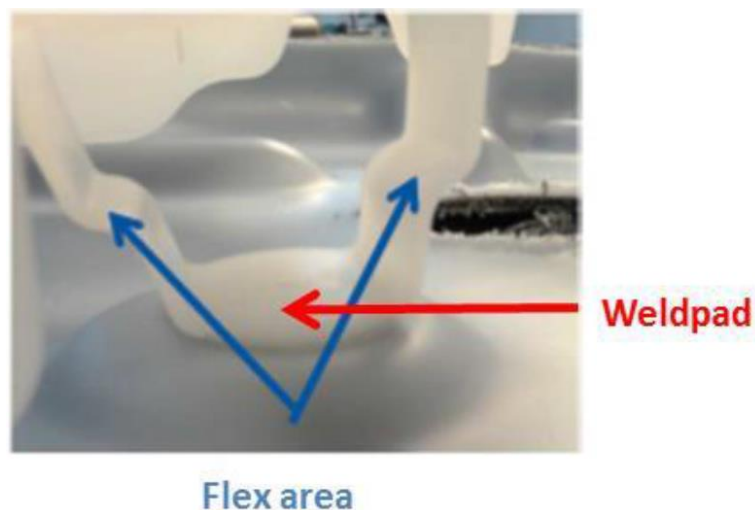
91. Accordingly, Borchert discloses the fastening part is a fastening tab molded as one part with the accessory or attached to the accessory and thus anticipates claim 2.

Claim 4. The method according to claim 2, wherein the fastening tab is rigid but attached to a flexible portion of the accessory.

92. As I have discussed already, Borchert discloses embodiments of its carrier that have a hollow body and a concentrically wavy wall around the area of the support feet 18. These structural features give the body of the carrier flexibility. As Borchert states: “[T]he carrier itself is in the form of a hollow body, thus giving a certain degree of flexibility and yielding resilience due to the nature and structure of the carrier.” Ex. 1004, Borchert ¶17. “The wall of the carrier 1 is of a concentrically wavy configuration at the edges around the support feet 18, so that this configuration provides that the support feet 18 are of a resiliently yielding nature

with a bellows-like capacity for resilient movement, thereby ultimately ensuring that the carrier 1 when fitted into the fuel tank 2 does not damagingly stabilise the fuel tank 2, which would be harmful in particular in the case of impact-induced shock loadings on the fuel tank 2.” *Id.* ¶51. A POSITA would thus understand that the wall of the carrier body is flexible and the support feet (tabs) are rigidly welded to the tank.

93. Furthermore, it is my understanding that the Patent Owner contends in a related litigation that a fuel tank baffle’s weldpad is a rigid tab that connects to a flexible portion of the baffle. *See* Ex. 1009, Infringement Contentions at 5. Demonstrative Kazmer-6 provides an unaltered image of the alleged infringing design taken from Patent Owner’s infringement contentions. As seen in the image, the alleged rigid weldpad and flexible area are part of the same molded baffle accessory, analogous to the rigid support feet and flexible wall of the carrier disclosed by Borchert.



Kazmer-6: Patent Owner demonstrative of weldpad and flex area that serve as rigid tab connected to a flexible portion of the accessory

94. As described in the preceding paragraphs, a POSITA would understand that Borchert discloses a fastening tab that is rigid but attached to a flexible portion of the accessory, and thus anticipates claim 4.

Claim 7. The method according to claim 1, wherein all the fastening points where the accessory is fastened to the wall of the fuel tank are provided with the fastening part and wherein the accessory is moveable relative to all the fastening points on the wall of the fuel tank.

95. As I have already discussed, the carrier is fastened to the internal wall of the fuel tank at the locations of the support feet. The construction of the carrier (hollow body and concentrically wavy wall portions around the areas of the support feet) provides flexibility and allows the carrier to move relative to all the support feet in the presence of an applied load.

96. Accordingly, a POSITA would understand that Borchert discloses that all the fastening points where the accessory is fastened to the wall of the fuel tank are provided with the fastening part and wherein the accessory is moveable relative to all the fastening points on the wall of the fuel tank. Borchert therefore anticipates claim 7.

D. Obviousness by Borchert in view of Van Schaftingen

Claim 8. The method according to claim 1, wherein the parison is an extruded tubular parison, which is cut over an entire length along two diametrically opposed lines, so as to obtain two separate portions.

97. Borchert does not disclose an extruded tubular parison which is cut over an entire length along two diametrically opposed lines, so as to obtain two separate portions. However, such a blow molding method was known in the prior art and is admitted as such by the '604 Patent: "Preferably, the tank is moulded by blowing a parison consisting of two separate parts, which may for example be two sheets. However, these parts preferably result from cutting one and the same extruded tubular parison as described in Application EP 1 110 697 [Van Schaftingen] mentioned above, the content of which for this purpose is incorporated for reference into the present application." Ex. 1001, '604 Patent at 5:4-14.

98. Van Schaftingen states "Preferably, the cutting of the preform is done longitudinally, along a generatrix thereof. In this case, it is particularly beneficial for this cut to be made in the direction of flow of the preform." Ex. 1006, Van Schaftingen ¶24. "A particularly preferred technique [for making the preform] is one in which the *cut of the preform is made over its full length in duplicate*, that is, *along two distinct lines so as to produce two separate sheets*. A cut along to *parallel generatrices* is particularly preferred." *Id.* ¶25 (emphasis added).

99. Van Schaftingen teaches that its method of cutting a parison to make a fuel tank enables the insertion of "bulky" accessories during the blow molding of the tank. "The method according to the invention is well suited for the implementation of means of positioning bulky objects and preassembled structures

which provide a very high precision of assembly in the hollow body.” Ex. 1006, Van Schaftingen ¶38.

100. It would have been obvious to a POSITA to combine Van Schaftingen’s teaching of cutting the parison with the process disclosed in Borchert to make the claimed invention. Borchert and Van Schaftingen are directed to the same technical field, not only to blow molding of fuel tanks, but more specifically to attaching internal accessories into the fuel tank during the blow molding process. A POSITA would have been motivated to combine Borchert with Van Schaftingen to achieve the manufacturing advantage of more easily inserting Borchert’s carrier (baffle). Borchert’s carrier, which is relatively bulky in the illustrated embodiments, and which can also have “complex contour[s]” (Ex. 1004, Borchert ¶ 46), would have been well suited for use in Van Schaftingen’s process, as Van Schaftingen expressly discloses that an advantage of its process is to allow the insertion of bulky accessories during the molding of the tank (Ex. 1006, Van Schaftingen ¶ 27). A POSITA also would have been motivated by a desire to achieve the manufacturing advantage of inserting Borchert’s bulky carrier (baffle) laterally between the two sheets created by cutting the parison. Ex. 1006, Van Schaftingen ¶29 (“More advantageously, said object can be inserted laterally, even by the upper part of the sheet. In this way, the area or side of the sheet where the available space is less

encumbered can be selected. This approach is particularly advantageous for objects of large dimensions.”)

101. It also would have been obvious to a POSITA to combine the teachings of Borchert with those of Van Schaftingen to make the claimed invention to be able to mitigate stress in a fuel tank made by Van Schaftingen’s process through the use of Borchert’s flexible carrier.

102. Accordingly, a POSITA would have found it obvious to combine the teachings of Borchert with those of Van Schaftingen to provide the method of claim 8 in which the parison is an extruded tubular parison, which is cut over an entire length along two diametrically opposed lines, so as to obtain two separate portions.

E. Anticipation by Criel

Claim 1, preamble) A method for fastening an accessory to a plastic fuel tank, comprising:

103. The title of the Criel is “Method for fastening an accessory in a plastic fuel tank.” From this title, I understand that Criel provides a fuel tank with at least one accessory. The abstract discloses that its fastening method involves the formation of plastic rivets contiguous with plastic of the fuel tank wall: “Method for stake-fastening an accessory (4) into a plastic fuel tank, whereby: - the accessory (4) is equipped with at least one orifice (5) which passes right through the accessory (4); - at least some of the plastic of which the wall of the tank (1) is made is melted; and - some of the molten plastic is forced through the orifice (5) of the accessory

without becoming detached from the remainder of the molten plastic; - the protruding molten plastic is given an appropriate shape (8) to obtain a self- formed plastic rivet, and is left to solidify; the size and shape of the orifice (5) and/or of the solidified plastic (8) being such that the accessory (4) is mechanically fastened to the tank by at least some of the solidified plastic (8), the stake-fastening of the accessory (4) occurring at the time of manufacture of the tank (1) through the moulding of a split or at least two-part parison.” Ex. 1005, Criel Abstract.

104. Criel discloses that the accessories attached using its method are generally “-any object or functional device generally associated with the fuel tank in its conventional mode of use or of operation and which collaborates therewith in order to perform certain useful functions; or -a support for one or several of such devices.” Ex. 1005, Criel at 4:3-7.

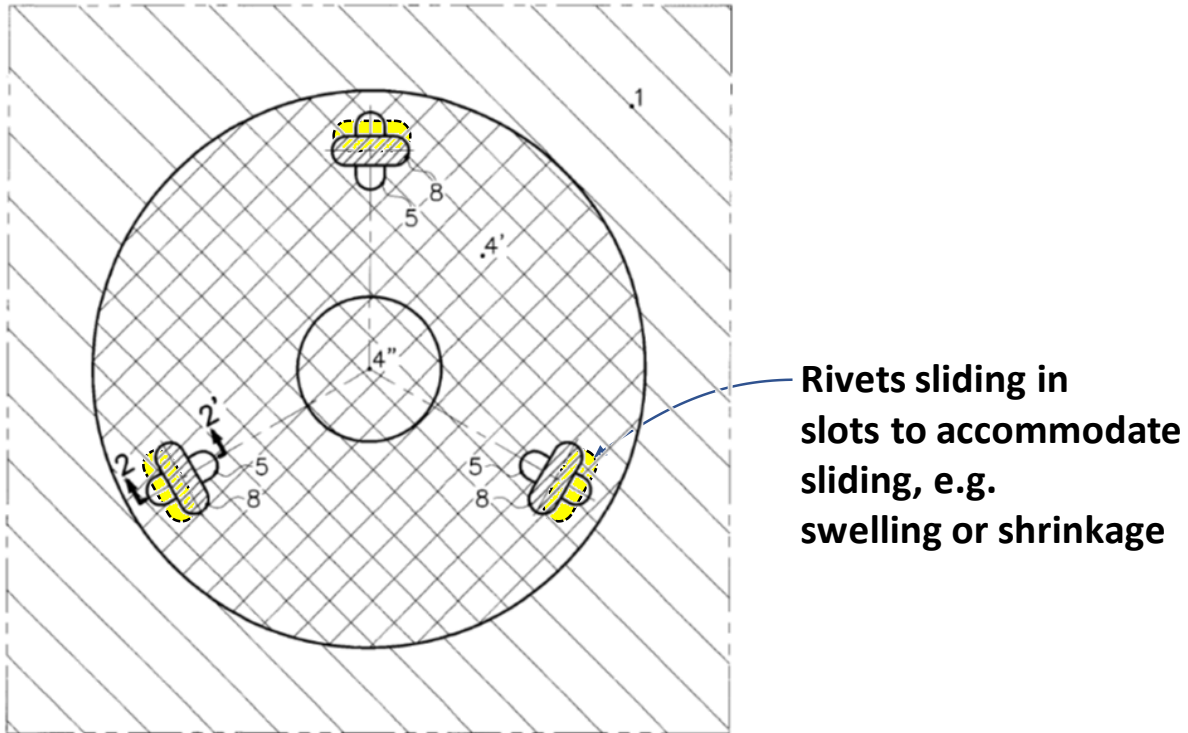
105. The accessory (functional devices and/or supports for such a devices) described by Criel correspond to the accessory required by the claim 1 preamble under the broadest reasonable interpretation of “accessory,” while the plastic fuel tank described by Criel corresponds to the plastic fuel tank required by the claim 1 preamble. A POSITA would thus understand that Criel discloses a method for fastening an accessory to the fuel tank as required by the claim 1 preamble.

Claim 1a) fastening an accessory at at least two fastening points on a wall of the plastic fuel tank during the actual manufacture of the fuel tank by molding, wherein

106. Criel discloses fastening the accessory to the wall of the fuel tank during the manufacture of the tank by molding. The method involves the formation of self-formed plastic rivets through multiple orifices located in the accessory, and thus at multiple fastening points. “In general, in the method according to the invention, recourse is had to several staking orifices.” Ex. 1005, Criel at 5:21-22. Criel subsequently describes an embodiment that uses multiple oblong shaped orifices (5) to secure the accessory: “The present invention also relates to a plastic fuel tank equipped with at least one (support for) accessory in direct contact with part of the wall of the tank and being equipped with several orifices of more or less oblong shape in which and over which plastic identical to that of the wall of the tank is present, these orifices being arranged in such a way that the planes normal to the surface of the accessory at the orifices and comprising the longitudinal axes of the latter intersect on one and the same axis.” *Id.* at 7:35 – 8:5.

107. Figure Kazmer-9 provides a demonstrative of Criel’s Figure 4. The specification states “in Figure 4, the orifice is oblong. The accessory (4) illustrated in these figures comprises a support (4') which allows for ease of staking (illustrated in the form of 3-point staking in these figures) and the accessory proper (4'') secured to it. It can be seen in Figure 4 that the axes (see dotted lines) of the oblong orifices (5) meet at the centre of the support of the accessory (4') which is more or less flat.” *Id.* at 9:21-7. As shown in Figure Kazmer-9, a POSITA would understand that the

slots are provided to accommodate sliding displacement of the rivets, e.g. due to swelling or shrinkage of the materials.



Kazmer-9: Criel FIG. 4 with orifices (5), rivets (8), and accessory (4' and 4")

108. Criel discloses that its riveting method takes place at “the time of manufacture of the tank through the moulding of a split or at least two-part parison.” *Id.* at 2:34-3:7 (“- some of the molten plastic is forced through the orifice of the accessory without becoming detached from the remainder of the molten plastic; - the protruding molten plastic is given an appropriate shape to obtain a self- formed plastic rivet, and is left to solidify; the size and shape of the orifice and/or of the solidified plastic being such that the accessory is mechanically fastened to the tank by at least some of the solidified plastic, the stake-fastening of the accessory

occurring at the time of manufacture of the tank through the moulding of a split or at least two-part parison”).

109. Thus Criel discloses fastening an accessory at at least two fastening points on a wall of the plastic fuel tank during the actual manufacture of the fuel tank by molding, as required by limitation 1a.

Claim 1b) the accessory is provided, at least at one of the at least two fastening points, with a fastening part in such a way that, although the accessory is fastened to the wall of the fuel tank, the accessory is moveable relative to the at least one of the at least two fastening points on the wall of the fuel tank, and

110. Criel discloses that the oblong orifices of the accessory and the specially shaped rivets allow the accessory and the fastening points (rivet locations) to move relative to each other as the tank shrinks or swells. Criel states “It is also often advantageous from a technical standpoint to contrive for the molten plastic not to entirely fill the orifice, and for this to be achieved by means of an appropriate tool (counterform). This approach allows *variations in volume of the plastic (shrinkage upon cooling, swelling upon contact with the fuel) to be accommodated without generating stresses.*” Ex. 1005, Criel at 5:7-11 (emphasis added). “An advantageous embodiment positions the staking orifices, for the oblong or semi-oblong versions, in the direction of the *dimensional changes*. These changes generally occur along lines which meet at a point located at the centre of the various orifices.” *Id.* at 5:25-28 (emphasis added).

111. Therefore, in these embodiments, the fastening points (rivet locations) on the wall of the tank can come closer together as the tank wall experiences shrinkage upon cooling, or the fastening points can move further apart as the tank wall swells upon contact with fuel, without shifting the position of the attached accessory.

112. Thus Criel discloses that the accessory is provided, at least at one of the at least two fastening points, with a fastening part in such a way that, although the accessory is fastened to the wall of the fuel tank, the accessory is moveable relative to the at least one of the at least two fastening points on the wall of the fuel tank, as required by limitation 1b.

Claim 1c) the molding of the fuel tank includes blow-molding by blowing a parison, the method further comprising inserting a core into the parison during the blow-molding and fastening several accessories to the parison via the core.

113. Criel specifically discloses the use of its fastening method in blow molded fuel tanks and the use of a core to fasten the accessories during blow molding of the parison. Criel expressly describes a blow molded embodiment with a core for fastening the accessories: “A method of manufacturing the tank and of fastening the accessory by blow-moulding (in a mould comprising a core and a moulding cavity) which uses such accessories generally runs as follows : - *positioning the accessory on the core*; - initial closing of the mould (moulding cavities brought around the core); - pressing a split or at least two-part parison (or wall of a fuel tank

made of plastic in the molten state) onto the moulding cavities of the mould (by blowing through the core and applying suction behind the moulding cavities); - **advancing a hydraulic ram which is fastened to the core in order to perform the staking**; - pricking the parison using a needle; - degassing, opening the mould, removing the core, closing the mould again and blowing in a conventional manner.” Ex. 1005, Criel at 7:1-13 (emphasis added).

114. Criel also discloses that multiple accessories may be inserted by the core. “According to one advantageous embodiment of the method according to the invention, the accessory is in actual fact a preassembled structure comprising a support and one or several identical or different devices which are fixed by any suitable fastening means.” *Id.* at 4:11-14.

115. As described in the preceding paragraphs, one of ordinary skill in the art would understand that Criel discloses every element of claim 1 of the '604 Patent and therefore anticipates claim 1.

Claim 2. The method according to claim 1, wherein the fastening part is a fastening tab molded as one part with the accessory or attached to the accessory.

116. Claim 2 of the '604 Patent requires that the fastening part is a fastening tab. The '604 Patent describes a fastening tab as an “excrescence”: “This may be a fastening tab (i.e. an excrescence on its overall envelope) moulded as one part with the accessory or attached thereto.” Ex. 1001, '604 Patent at 3:59-61. I understand

that the definition of an excrescence is “a projection or outgrowth.” Support 4’ projects out from the overall envelope of the accessory proper 4’”. A POSITA would understand that disc-shaped support 4’ to be a tab.

117. Criel further discloses that the fastening tab is molded as one part with the accessory or attached to the accessory. Because support 4’ is an accessory, the fastening tab is molded as one part of the accessory.

118. Further, Criel states “According to one advantageous embodiment of the method according to the invention, the accessory is in actual fact a preassembled structure comprising a support and one or several identical or different devices which are fixed by any suitable fastening means. Examples of these means are clipping, screw-fastening, welding, etc. It is also advantageous for the preassembled structure to bear means that allow additional devices that may be added on later to be attached.” Ex. 1005, Criel at 4:11-17. Thus support 4’ (the fastening tab) is also attached to a separate functional device (accessory proper 4’”).

119. Accordingly, Criel discloses the fastening part is a fastening tab molded as one part with the accessory or attached to the accessory, and thus claim 2 is anticipated.

7. The method according to claim 1, wherein all the fastening points where the accessory is fastened to the wall of the fuel tank are provided with the fastening part and wherein the accessory is moveable relative to all the fastening points on the wall of the fuel tank.

120. As I have discussed previously regarding claim 1, Criel discloses that the fastening part support 4' and its oblong orifices are provided at each fastening point (rivet location) and allow for movement of the fastening points relative to the accessory as the tank walls contract or swell.

121. Thus, Criel discloses that the accessory is provided, at each of the fastening points, with a fastening part in such a way that, although the accessory is fastened to the wall of the fuel tank, the accessory is moveable relative to each of those fastening points on the wall of the fuel tank, and anticipates claim 7.

Claim 8. The method according to claim 1, wherein the parison is an extruded tubular parison, which is cut over an entire length along two diametrically opposed lines, so as to obtain two separate portions.

122. Criel expressly discloses an extruded tubular parison which is cut over an entire length along two diametrically opposed lines, so as to obtain two separate portions. Specifically, Criel states: “This approach can be achieved in practice by virtue of the fact that moulding takes place starting from a *split or at least two-part parison*. In particular, advantageously, the stake-fastening occurs at the time of moulding of the tank by: - thermoforming sheets; - compressing/blow-moulding sheets (as described in the aforementioned application WO 01/60592, the content of which for this purpose is also incorporated into this application); - blow-moulding a parison comprising at least one cut-out (*as described in Patent Application EP*

1110697 [Van Schaftingen], the content of which for this purpose is incorporated by reference into this application.” Ex. 1005, Criel at 6:10-21 (emphasis added).

123. Accordingly, Criel incorporates by reference European Patent Pub. No. EP 1110697 A2 (“Van Schaftingen”). In turn, Van Schaftingen discloses that the split or at least two-part parison can be obtained by cutting over an entire length of extruded tubular parison along two diametrically opposed lines, so as to obtain two separate portions. Van Schaftingen expressly states “Preferably, the cutting of the preform is done longitudinally, along a generatrix thereof. In this case, it is particularly beneficial for this cut to be made in the direction of flow of the preform.” Ex. 1006, Van Schaftingen ¶24. Van Schaftingen continues “A particularly preferred technique is one in which the *cut of the preform is made over its full length in duplicate*, that is, *along two distinct lines so as to produce two separate sheets*. A cut along to *parallel generatrices* is particularly preferred.” *Id.* ¶25 (emphasis added).

124. Accordingly, the teachings of Criel (with those of Van Schaftingen incorporated by reference) discloses that the parison is an extruded tubular parison, which is cut over an entire length along two diametrically opposed lines, so as to obtain two separate portions, and thus anticipates claim 8.

F. Obviousness by Criel in view of Borchert

Claim 4. The method according to claim 2, wherein the fastening tab is rigid but attached to a flexible portion of the accessory.

125. Criel does not disclose the fastening tab is rigid but attached to a flexible portion of the accessory. However, a POSITA would have been motivated to combine Criel with Borchert to render claim 4 obvious.

126. As previously discussed, Borchert discloses “The wall of the carrier 1 is of a concentrically wavy configuration at the edges around the support feet 18, so that this configuration provides that the support feet 18 are of a resiliently yielding nature with a bellows-like capacity for resilient movement, thereby ultimately ensuring that the carrier 1 when fitted into the fuel tank 2 does not damagingly stabilise the fuel tank 2, which would be harmful in particular in the case of impact-induced shock loadings on the fuel tank 2.” Ex. 1004, Borchert ¶51.

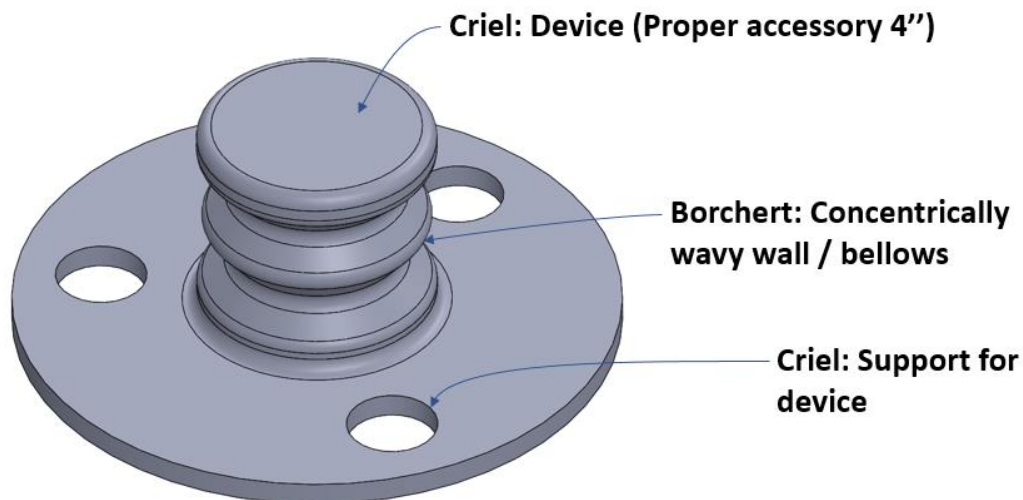
127. Criel’s method, while capable of compensating for stress due to shrinkage and expansion of the tank wall, is not suitable for compensating for impact-induced shock loadings and other dynamic stresses experience during vehicle operation. Further, Criel discloses another embodiment with round orifices and rivets that entirely fill the orifices that does not compensate for stresses. Ex. 1005, Criel at 9:10-11, FIGS. 1, 3.

128. A POSITA would have been motivated to combine the riveting method of Criel with the accessory of Borchert having a concentrically wavy wall structure at least to achieve the advantage of Borchert of “comparatively high load-carrying

capacity for the tank in relation to impact-induced shock loadings” (Ex. 1004, Bochert ¶17).

129. Such a combination would have been particularly advantageous where the POSITA needed to incorporate an accessory made of a material that could not be welded to the tank, as Criel discloses that its method “allows an accessory based on a material different from that of the tank to be fastened inside a plastic fuel tank...” Ex. 1005, Criel at 2:8-12.

130. One such example of a combination is provided in demonstrative Kazmer-10, which shows an accessory proper 4" mounted to a side wall of a fuel tank with three fastening parts described by Criel using three mounting orifices with flexible bellow-like structures described by Borchert. The support for the device is a tab that is rigid relative to the concentrically wavy wall of the device.



Kazmer-10: Demonstrative of Criel's mounting orifices and accessory proper 4" combined with Borchert's flexible bellows

131. As described in the preceding paragraphs, a POSITA would find it obvious to combine Borchert and Criel to provide a rigid fastening tab attached to a flexible portion of the accessory.

V. SECONDARY CONSIDERATIONS OF NONOBVIOUSNESS

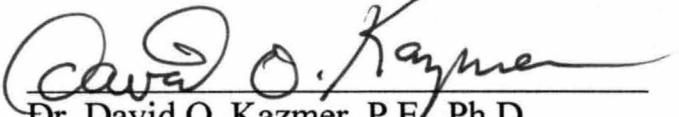
132. I am of the opinion that there are no secondary considerations that would support a finding of nonobviousness. In the event that the patentee presents evidence of secondary considerations, I reserve the right to supplement my opinion to rebut patentee's evidence.

VI. CONCLUSION

133. I am therefore of the opinion that claims 1, 2, 4, 7, and 8 of the '604 Patent are invalid for the reasons given above.

134. I hereby declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct, and that all statements made of my own knowledge are true and that all statements made on information and belief are believed to be true. I understand that willful false statements and the like are punishable by fine or imprisonment, or both (18 U.S.C. § 1001).

Executed on June 8, 2017


Dr. David O. Kazmer, P.E., Ph.D.

APPENDIX A

DAVID O. KAZMER, P.E., PH.D.

Contact Information:

1 University Ave., Dept. of Plastics Eng.,
Univ. Mass. Lowell, Lowell, Massachusetts 01854
(978) 934-2962, Fax (978) 458-4141
david_kazmer@uml.edu, <http://kazmer.uml.edu>
300 Andover Street, Georgetown, Massachusetts 01833
Phone (978) 687-8880; Mobile (978) 397-1356
dkazmer@verizon.net

Principal Areas of Technology Leadership:

- Polymer Processing
- Plastics Product Design
- Machine and Control Systems Design
- Product Design for Manufacturing and Assembly
- Robust/Optimal Design/Manufacturing Strategies

Functional Areas of Expertise:

- Product design and manufacturing process development, especially related to polymer processing such as injection molding, extrusion, blow molding, thermoforming, and 3D printing;
- Mechanical design including concept design, materials selection, layout design, stress and thermal analysis, detailed design, assembly, fits and tolerances, testing, failure analysis;
- Design for manufacturing and assembly including needs analysis, specification, process selection, cost and value analysis, robust design, quality function deployment, design of experiments, response surface analysis, failure modes and effects analysis, and design for X (machining, molding, assembly, etc.);
- Simulation including constitutive modeling of materials, development and solution of differential equations using finite difference and finite element methods, numerical methods, sensitivity analysis, stochastic and Monte Carlo methods, and interfaces;
- Manufacturing process development including system decomposition, axiomatic systems design, partitioning, process instrumentation, signal conditioning, data acquisition, systems integration, hierarchical control systems, development and tuning of control laws, validation, commissioning, deployment, and training;
- Operations management including manufacturing strategy, forecasting, aggregate planning, inventory control, supply chain management, production control systems, operations scheduling, project scheduling, facilities design, quality and assurance, lean;
- Software development including ANSI C, C++, Visual C#, Visual Basic, Fortran, MySQL, Java, Javascript, PHP, Pascal, LabView, and others.

Education:

- Ph.D., 1995, Stanford University, Mechanical Engineering Design Division. Dissertation: Dynamic Feed Control for Injection Molding. Committee: P. Barkan (Chair, deceased), W. Hausman, K. Ishii (deceased), F. Prinz.

- 1991 M. Sci., Rensselaer Polytechnic Institute, Department of Mechanical Engineering, Thesis: Development and Validation of a Radial Flow Analysis Tool. Advisor: D. Lee.
- 1990 B. Sci., Cornell University, Sibley School of Mechanical Engineering, with Distinction.

Experience:

- August, 2016 – present: Professor & Chair, Plastics Engineering, Univ. Mass. Lowell
Teaching and research related to plastics product design and manufacturing. Current research projects include extrusion screw design, 3D printing processes, and materials constitutive modeling. Service as Chair includes strategic planning, faculty performance review, course scheduling, faculty hiring, student advising, accreditation, and alumni/outreach.
- May, 2012 – present: Professor, Plastics Engineering, Univ. Mass. Lowell
Teaching and research related to plastics product design and manufacturing. Current research projects include multivariate sensing, thermoplastic composites, and roll to roll manufacturing. Current service projects include accreditation, engineering leadership for Service-Learning and STEM teaching minor.
- January, 2011 – April, 2012: Associate Dean, James B. Francis College of Engineering, Univ. Mass. Lowell
Responsible for program development, including undergraduate and graduate academic and research programs. See service section for specific contributions.
- September, 2005 – present: Professor, Univ. Mass. Lowell, Plastics Engineering
- January, 2002 – August, 2005: Associate Prof., Univ. Mass. Lowell, Plastics Eng.
- 2001, Director of Research & Development, Synventive Molding Solutions (Peabody, Massachusetts)
Responsible for invention, implementation, and support of advanced melt delivery systems for the plastics industry, including: 1) Dynamic Feed Control for multi-gate closed loop pressure control, 2) hot runner molding of molten magnesium, and 3) an all-electric melt delivery system. Responsibilities included engineering design and management, budgeting responsibilities, market development, and field support.
- June, 2000 – June, 2001: Associate Professor, Univ. Mass. Amherst, Department of Mechanical and Industrial Engineering
- September, 1995 – May, 2000: Assistant Professor, Univ. Mass. Amherst, Department of Mechanical and Industrial Engineering
- 1992-1995, Future Professor of Manufacturing Fellow, Stanford Integrated Manufacturing Association (Stanford, CA)
Performed coursework and research related to manufacturing competitiveness in a joint doctoral business/engineering program funded by the Sloan Foundation. Invented and validated a novel molding process, Dynamic Feed, which was recognized by the U.S. Department of Energy as an Innovative Industrial Process and was licensed and commercialized by Dynisco/Synventive.
- 1992-1994 (part time), Technology Programs Manager, GE Plastics Commercial Development Center (Pleasanton, California)
Developed design methodologies and manufacturing technologies to position GE Plastics as a value added supplier. Translated relevant technology to regional development centers for commercial application. Provided design and processing support on critical applications.
- 1991, Design and Process Development Engineer, GE Plastics Advanced Design Engineering Group (Pittsfield, Massachusetts)
Developed design methodologies and manufacturing technologies to position GE Plastics as a

value added supplier. Translated relevant technology to regional development centers for commercial application.

- 1990, Mechanical Engineer, GE Corporate Research & Development Mechanics of Materials Laboratory (Schenectady, New York)
Investigated industrial plastic conversion processes. Developed process simulations which became part of GE Plastics' design methodology. Examined material characterization techniques to estimate molded product consistency.
- 1988-1989, Applications Engineer Intern, GE Plastics Advanced Design Engineering Group (Pittsfield, Massachusetts)
Performed process simulations to ensure product manufacturability as well as structural analyses to predict and optimize part performance.

Professional Memberships:

- Fellow, American Society of Mechanical Engineers (ASME)
- Fellow, Society of Plastics Engineers (SPE)
- Member, Polymer Processing Society
- Member, Institute of Electrical and Electronics Engineers
- Member, American Society for Engineering Education
- Member, American Association for the Advancement of Science
- Registered Professional Manufacturing Engineer, State of California, License # MF004751

Honors and Awards:

- 2015, Dandeneau Professorship for Sustainable Manufacturing
- 2013, College of Engineering Service-Learning Award
- 2012, ASME Kos Ishii-Toshiba Award (for sustained, meritorious contributions to the use of optimization and other modeling techniques for design and manufacturing)
- 2012, Best Paper Award, ASME International Symposium on Flexible Automation
- 2012, Outstanding Service as Conference Chair, American Society of Engineering Education
- 2011, Fellow, Society of Plastics Engineers
- 2011, Best Paper Award, Society of Plastics Engineers' Injection Molding Division
- 2007, Fellow, American Society of Mechanical Engineers
- 2004, Best Paper Award, 10th ASME Design for Manufacturing Conference
- 2000, University of Massachusetts Amherst, College of Engineering Outstanding Young Faculty Award
- 2000, College of Engineering Outstanding Advisor Service Award
- 1999, Lilly University Teaching Fellowship
- 1998, Office of Naval Research Young Investigator Award
- 1998, Best Paper Award, Society of Plastics Engineers' Design Division
- 1997, College of Engineering Outstanding Advisor Service Award
- 1997, National Science Foundation Career Award

- 1996, College of Engineering Outstanding Advisor Service Award
- 1995, Future Professor of Manufacturing, Stanford Integrated Manufacturing Association
- 1994, Innovative Industrial Process Award, U.S. Department of Energy
- 1993, Best of Program, Lincoln Electric National Design Competition
- 1992, Management award for outstanding achievements in process simulation, GE Plastics Advanced Design Engineering Group
- 1989, Management award for outstanding contributions in application design engineering, GE Plastics Advanced Design Engineering Group
- 1985, Hawken School Coach's Award, to the athlete best exemplifying the School's values of teamwork and fair play

Sponsored Research - Currently Active:

- REU Site: Advanced Materials and Manufacturing, \$356,668, May 1, 2015- April 30, 2018, MSF IUSE Program (led by Carol Barry, with others).
- HEROES: Bi-component Fibers with Nanostructured FR Additives. To United States Army Natick Soldier Research, Development and Engineering Center (NSRDEC) for \$51,469, January 1 – June 30, 2017 (with Ram Nagarajan, Steve Johnston, and Javier Vera-Sorroche).
- Partnership Service Agreement: PlastIndia University Replication Model To United States Army Natick Soldier Research, Development and Engineering Center (NSRDEC) for \$407,245, October 7, 2017 – December 31, 2017 (with Ram Nagarajan and Joe Hartman).
- Planning I/UCRC University of Massachusetts Lowell: Center for Science of Heterogeneous Additive Printing of 3D Materials (SHAP3D). NSF Award Number:1650517 for \$15,000 (January 1, 2017 –). Principal Investigator: Joey Mead; Co-Principal Investigator: Carol Barry, Nese Orbey, David Kazmer, Christopher Hansen.
- UMass Office of Technology Venture grant for commercial and technical feasibility analysis of Fractal Screw Design, \$25,000 (present – June 30, 2018).
- Research Experiences for Undergraduates: Advanced Materials and Manufacturing, National Science Foundation (\$356,668 w/ C. Barry)

Sponsored Research - Proposals Currently In Review:

- HEROES: Soldier Lightweight Integrated Multifunctional Materials” (SLIMM): The Enhancement of Thermoplastic Materials Through the Incorporation of Micro-Cellulose Forms. To United States Army Natick Soldier Research, Development and Engineering Center (NSRDEC) for \$223,419 (with Ram Nagarajan), submitted March 23, 2017. In review.
- Metal-Loaded Plastic Scintillators for Gamma-Ray Spectroscopy and Pulse-Shape Discrimination. To Radiation Monitoring Devices in response to ERBAA16-VOL1-RTA-01A-FP-01, \$249,994, September 1, 2017 – December 1, 2020 (with Javier Vera-Sorroche). In Review.

Sponsored Research - Past:

- 3D Printing of Engineering Thermoplastics (3DPET), Univ. Mass. President's Office Science & Technology Fund (\$150,000, w/ J. Mead and S. Krishnamurthy)

- Next Generation materials and processes for 3D Printing (NG3DP), Univ. Mass. Presidents' Science and Technology Initiatives Fund for \$25,000
- UTeach STEM Replication Grant (Massachusetts Department of Higher Education, \$1,600,000, with A. Greenwood and K. Levasseur, awarded AY2012)
- NSEC Center for High-rate Nanomanufacturing Center for Enabling Tools (NSF- EEC/0832785, (\$10,030,017, with J. Mead of UML, A. Busnaina of Northeastern, et al., awarded AY2008)
- Collaborative Research: Multivariate Remote Process Sensing for Improved Observability in Injection Molding (NSF-CMMI/1000551, \$591,983, with R. Gao of Univ. Connecticut, awarded AY2010)
- Engineering Faculty Engagement in Learning Through Service (EFELTS) (NSF- DUE/1022738, \$274,983, with J. Duffy, awarded AY2011)
- MRI-R2: Acquisition of a Focused Ion Beam - Scanning Electron Microscope (FIB-SEM) for Nano/Micro Fabrication/Characterization (NSF-ECCS/0960022, \$1,150,000 with Xingwei Wang et al, awarded AY2010).
- MKS Instruments, Multivariate Statistical Process Controls for Polymer Processing, \$250,000, funded 2005-2011.
- D. Kazmer and S. Johnston, "FREE: Freshmen Engagement in Engineering," Univ. Mass. Exploration in Teaching and Learning Grant, \$2,300, funded 20008.
- National Science Foundation, Sensors: Self-Powered Spatial Sensing Array for Injection Molding Process Monitoring (with R. Gao of UMass Amherst), UML Budget: \$218,364, Status: funded 2004-2008.
- Mold-Masters Ltd., Technical Feasibility of a Self-Regulating Melt Valve, UML Budget: \$40,000 plus \$20,000 in kind, Status: funded 2004.
- National Science Foundation, Synthesis of Melt Pumps & Brakes for Polymer Processing, UML Budget: \$213,508, Status: funded 2003-07.
- Mold Masters Ltd., Technical Feasibility of Decoupled Gating, UML Budget: \$80,000 plus \$120,000 in kind, Status: funded 2003.
- Thermo-CeramiX LLC, Technical Feasibility of Isothermal Molding, UML Budget: \$15,000 plus \$20,000 in kind, Status: funded 2002.
- National Science Foundation, Remote Sensors for Injection Molding (with R. Gao), Budget: \$310,000, Status: funded 1999-2002.
- GE Plastics, Design for Six Sigma: Phase III, (with T. Blake), Budget: \$35,000, Status: funded 1999.
- Office of Naval Research, Dynamic Cooling for Injection Molding, Budget: \$298,000, Status: funded 1998-2001.
- GE Plastics, Optical Molding Process Development (w. K. Danai), Budget: \$42,000, Status: funded 1998.
- GE Plastics, Tight Tolerance Thermoforming Extension, Budget: \$25,000 with \$10,000 in-kind, Status: funded 1999.
- GE Plastics, Design for Six Sigma: Phase II (with T. Blake), Budget: \$35,000, Status: funded 1998.
- GE Plastics, Tight Tolerance Thermoforming, Budget: \$35,000 with \$10,000 in-kind, Status: funded 1997.
- Sloan Foundation, Integrated Manufacturing Paradigms, Budget: \$35,000, Status: funded 1997.

- GE Plastics, Design for Six Sigma: Phase I, Budget: \$35,000, Status: funded 1996.
- National Science Foundation, Process Tuning and Optimization (with K. Danai), Budget: \$198,000, Status: funded 1996-1999.
- National Science Foundation, CAREER: Synthesis of Engineering Analysis Methods into the Design Process, Budget: \$310,000, Status: funded 1996-1999.
- Univ. Mass. Amherst (research initiation project), Cost of Complexity in Product Design and Manufacture, Budget: \$5,000, Status: funded 1995.
- Industry Consortium (GE Plastics, Hewlett Packard, Dynisco Instruments): Moldability Program, Budget: \$25,000 with \$250,000 in kind, Status: funded 1994-95.
- U.S. Dept. of Energy, Innovative Industrial Processes, Budget: \$40,000, Status: funded 1994.

Graduate Advising (principally advised students only):

- T. Coogan, Ph.D., Plastics Engineering, Real-Time Simulation of Fused Deposition Modeling, May, 2018
- B. Weidnecht, Ph.D., Plastics Engineering, Dynamic Extrusion Molding, December, 2018
- T. Coogan, M.S., Plastics Engineering, Simulation of Fused Deposition Modeling, December, 2015
- Amir Moshe, Ph.D., Plastics Engineering, 2015, Transient Constitutive Modeling of Polymer Melts
- Mary Elizabeth Moriarty, M.S., Plastics Engineering, 2014, Induction Heated Roll Molding for Imprinting of Multi-Scale Features in Polymeric Films
- Guthrie Gordon, Ph.D., Plastics Engineering, 2014, A Multivariate Sensor for Indication of Polymer Melt Temperature, Pressure, Velocity, and Viscosity
- G. Geyne, M.S., Plastics Engineering, 2013, Mechanistic Signal Conditioning for Improved Process Observability
- T. Deak, Ph.D., Polymer Engineering, University of Budapest, 2012, Characterization of Thermosets for Electronics Encapsulation
- M. Fisches, MS, Plastics Engineering, Darmstadt University, 2012, In-Situ Viscosity Estimation of Polymer Melts during Injection Molding
- Louay Abou-Shady, M.S., Plastics Engineering, 2010, On-Line Process Monitoring of Extrusion. Supported but graduated with non-thesis option.
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Invited Presentations:

319. D. O. Kazmer, "Multivariate Modeling of Injection Molding", Symposium in Honor of S. Kenig at the Society of Plastics Engineers' Annual Technical Conference, Anaheim, CA, May 8-10, 2017.
320. D.O. Kazmer, "Opportunities and Challenges for 3D Printing", Technology Innovation for Physicians & Surgeons (TIPS), Cleveland, OH, 12-14 October 2016.
321. T. Coogan and D. O. Kazmer, "FDM Bond Strength: Experiments and Simulations Based on Healing Models," 32nd Annual Meeting of the Polymer Processing Society, Lyon, France, July 25-29, 2016.
322. D.O. Kazmer, "3D Printing of Plastics: Overview & Benchmarks", 11th Annual Auto Epcon: Engineering Plastics in High Gear, Troy, MI, May 10, 2016.
323. D.O. Kazmer, "3D Printing of Plastics: Overview & Benchmarks," Shenkar College of Engineering and Design, Ramat Gan, Israel, March 15, 2016.
324. D.O. Kazmer, "Current & Future Research on Rheological Constitutive Modeling," Shenkar College of Engineering and Design, Ramat Gan, Israel, March 15, 2016.
325. D.O. Kazmer, "Single Pellet Extrusion with a Fractal Screw Design," Shenkar College of Engineering and Design, Ramat Gan, Israel, March 16, 2016.
326. D. O. Kazmer, "Modeling of Polymer Rheology", Hochschule Darmstadt University of Applied Sciences, December 11th, 2015, Darmstadt, Germany.
327. D. O. Kazmer, "3D Printing of Polymers: A Constructive Review", Institute of Plastics Processing (IKV) in Industry and the Skilled Crafts at RWTH Aachen University, December 9th, 2015, Aachen, Germany.
328. D. O. Kazmer, "Low Volume Production Strategies: From 3D Printing to Injection Molding," Society of the Plastics Industry Business of Plastics Conference, March 24th, 2015, Orlando, FL.
329. D. O. Kazmer, "Strategies for Teaching Large Classes," UMass Lowell Faculty Development Seminar, April 9, 2014, Lowell MA.
330. D. O. Kazmer, "System Identification and Modeling of Capillary Melt Rheological Data," Northeastern University Chemical Engineering Department Seminar, October 3, 2013, Boston, MA.
331. D. O. Kazmer, "System Identification and Modeling of Capillary Melt Rheological Data," Symposium in Honor of A. Isayev at the SPE Annual Technology Conference, April 23, 2013, Cincinnati, OH.
332. D. O. Kazmer, "Opportunities in the Hot Runners and Plastics Industry," MKS Global Markets Meeting, March 11, 2013.
333. D. Kazmer, "Challenges in Process Simulation," Keynote to the 2012 Molding Innovation Day, September 4-5, 2012, Lowell, MA.
334. D. Kazmer, "Career Strategy: In or Out of the Box?" UML Honors Program, April 2, 2012.
335. D. O. Kazmer, "Why We Need to Improve STEM Education in the Merrimack Valley," Keynote Speaker, STEM Education Summit, Merrimack College, November 7, 2011.
336. D.O. Kazmer, "Explore! Investigate! Invent! Engineering," Professional Development Seminar, The Museum Institute for Teaching Science, Clark University, February 28, 2012.
337. Kazmer, D., "BioModular Multi-Scale Systems," Joint US-Ireland Conference on Bio-Nano Systems, 2010, Lowell, MA.

338. Kazmer, D., "Macro to nano control in plastics molding," University of Akron Polymer Engineering Department Seminar, October 31, 2008, Akron, OH.
339. Kazmer, D. "Comparison of Switchover Methods for Injection Molding," Primaus Users' Group Annual Meeting, September 30th, 2008, Cleveland, OH.
340. Kazmer, D. "Towards Controllability of Polymer Processing," Louisiana State University Mechanical Engineering Seminar, April, 2008.
341. D. Kazmer, "Domain-Centric Education Delivered On-Line," UML College of Engineering Seminar, December 15, 2006.
342. D. Kazmer, "A Data Driven Approach to Attaining 100% Automatic Quality Assurance," Society of Plastics Engineers E-Live Seminar, April 6, 2006.
343. D. Kazmer, "Instrumented Molding Cells", Priamus Users' Group Annual Meeting, October 5, 2005.
344. D. Kazmer, "Advanced Methods for Plastic Product Design and Process Control," Toyota Motor and Suppliers Meeting, Lowell, MA, April 22, 2005.
345. D. Kazmer, "What's the big deal about something very small? The Business of Nano", Rotary Club Meeting, Dracut, MA, May 17, 2005.
346. D. Kazmer, "Self-Regulating Melt Valves for Polymer Processing," SPE Merrimack Valley Meeting, National Plastics Center, May 12th, 2005.
347. D. Kazmer, "Simulation of Polymer Processing," National Science Foundation Center for High Rate Nano-Manufacturing, Lowell, MA, March 26th, 2005.
348. Kazmer, D., "The Economics of Lights Out Manufacturing," *Society of Plastics Engineers Topical Conference on Injection Molding Systems*, Cleveland, OH, October, 2004.
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350. Kazmer, D., "Advances in Molding Technology," *Delphi Central Research, Detroit, MI*, August, 2004.
351. Kazmer, D., "Competitive Molding Technologies," *Society of Manufacturing Engineers EASTEC Lean Manufacturing Conference*, Springfield, MA, May, 2004.
352. Kazmer, D., "Modern Injection Molding," *Northeast Utilities Energy Conservation Seminar*, Berlin, CT, March, 2004.
353. Kazmer, D., "Competing in the 21st Century," *Plastics Institute of America Quarterly Meeting*, Lowell, MA, February, 2004.
354. Kazmer, D., "Fundamentals of Plastic Part Design and Manufacture," *National Manufacturing Week Workshop*, Chicago, IL, 2003.
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358. D. Kazmer, "Decision Based Design: Some Questions," *NSF Open Workshop on Decision Based Design*, 2000. Baltimore, MD.
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361. D. Kazmer, "Trends in the Plastics Industry: Product Development Paradigms and Impact on Human Resources," *Society of Manufacturing Engineers Plastics Molding & Manufacturing Annual Trends Report*, 2000.
362. D. Kazmer, "Quality Control Capability Assessment," *Society of Manufacturing Engineers Plastics Molding & Manufacturing Annual Trends Report*, 2000.
363. Kazmer, D. O., "Engineering Systems Design: Gaining Controllability of Dynamic Processes," *Dartmouth Thayer School of Engineering Jones Seminar*, May 2000.
364. Kazmer, D. O., "Synthesis and Analysis of Quality Control Methods for Intelligent Processing of Polymeric Materials," *Canada National Research Center*, Montreal, Quebec, February 2000.
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Patents:

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388. Kazmer, D. O., Moss, M., "Machine for proportionally controlling fluid delivery to a mold," U.S. Patent # 6,585,505, July 1, 2003.
389. Kazmer, D. O., Moss, M., Bassett, B., Doyle, M., "Apparatus and method for purging injection molding system," U.S. Patent # 6,514,440, February 4, 2003.
390. Doughty, M. A., Firisin, W. D., Hume, W. J., Moss, M. D., Kazmer, D. O., "Controlled injection using manifold having multiple feed channels," International Application No. WO 02/36324, October 25, 2002.
391. Kazmer, D. O., Moss, M., Doyle, M., van Gee, H. "Manifold system having flow control," U.S. Patent # 6,464,909, October 15, 2002.
392. Kazmer, D., Moss, M., "Method using manifold system having flow control," U.S. Patent # 6,436,320, August 20, 2002.
393. Kazmer, D., Moss, M., "Manifold system having flow control using pressure transducers," U.S. Patent # 6,361,300, March 26, 2002.
394. Fuller, N., Moss, M., Kazmer, D. O., Galati, V., "Apparatus and Method for Proportionally Controlling Fluid Delivery to Stacked Molds," International Application No. WO 02/074516, March 19, 2002.
395. Kazmer, D., Moss, M., "Manifold system having flow control using pressure transducers," U.S. Patent # 6,343,922, February 5, 2002.
396. Kazmer, D., Moss, M., "Manifold system having flow control using separate cavities," U.S. Patent # 6,343,921, February 5, 2002.
397. Kazmer, D., Moss, M., "Apparatus for proportionally controlling fluid delivery to a mold," U.S. Patent #6,309,208, October 30, 2001.
398. Kazmer, D., Moss, M., "Electric actuator for a melt flow control pin," U.S. Patent #6,294,122, September 25, 2001.
399. Kazmer, D., Moss, M., Doyle, M., "Dynamic Feed Control System", International Application No. WO/2001/060580, August 23, 2001.
400. Kazmer, D., Moss, M., "Apparatus for proportionally controlling fluid delivery to a mold," U.S. Patent #6,287,107, September 11, 2001.
401. Kazmer, D., Moss, M., "Manifold system having flow control using extended valve pin," U.S. Patent # 6,254,377, July 3, 2001.
402. Kazmer, D., Moss, M., "Manifold system having proportional flow control," International Application No. WO/2001/034364, May 17, 2001.

403. Kazmer, D. O., Moss, M. D., Doyle, M., VanGeel, H., "Manifold System Having Flow Control," International Application No. WO 01/21377, March 29, 2001.
404. Kazmer, D. O., Zhu, L., "A performance-based representation for support of multiple decisions," International Application No. WO/2000/072268, November 30, 2000.
405. Kazmer, D. O., Moss, M. D., "Manifold System Having Flow Control," International Application No. WO WO/1999/054109, October 28, 1999.
406. Kazmer, D. O., Moss, M., "Manifold System Having Flow Control," International Application No. WO 99/54109, May 27, 1998.
407. Kazmer, D. O., "Injection molding gate flow control," U.S. Patent #5,556,582, September 17, 1996.

Other Creative Works:

408. D. Kazmer, "AEEE: Analysis of Energy Efficiency in Extrusion", Matlab codes for modeling of polymer plastication and energy consumption in single screw extrusion processes.
409. D. Kazmer, "Single Screw Extrusion Simulation", by C language program developed with Fluidix Smoothed Particle Hydrodynamic (SPH) Solver using NVIDIA CUDA parallel computing platform (1,000+ cores), <https://www.youtube.com/watch?v=Ha6KsbYBJgw>, Feb. 1, 2016.
410. D. Kazmer, "Single Pellet Extrusion with a Fractal Screw Design", by C language program developed with Fluidix Smoothed Particle Hydrodynamic (SPH) Solver using NVIDIA CUDA parallel computing platform (1,000+ cores), <https://www.youtube.com/watch?v=BWPNSYt9ehU>, Feb. 1, 2016.
411. D. Kazmer, "Extrusion Screw Design Automation", by VisualBasic program developed with SolidWorks Application Programming Interface (API), <https://www.youtube.com/watch?v=gtAtqKPlwAM>, Feb. 1, 2016.
412. D. Kazmer, A. Moshe, T. Coogan, M. Akroyd, D. Cacciola, D. Cote, A. Drammeh, K. Hallab, M. Haque, R. Haraja, R. Heckbert, A. Holub, M. Magaletta, C. McRae, G. Misherfi, T. Moy, K. Newland, H. Nguyen, M. Palacios, J. Pancotti, M. Pinard, B. Porter, R. Rodriguez, A. St. James, D. Van Schalkwijk, R. Wong, M. Yuen, "A Study of 3D Printing: from Pellets to Parts," Poster presentation to Next Generation 3D Printing Workshop, March 31st, 2015.
413. D. O. Kazmer, "On Public Speaking," 2 hour workshop to New Hope Tutorials, Boxford, MA, March 18, 2015.
414. D. Kazmer, D. Willis, S. Kuhn, J. Hartman, and J. Lohmeier, "Transforming Engineering Education through Making (TEEM)," Poster presentation to Univ. Mass. Lowell Teaching Symposium, November 5, 2014.
415. D.O. Kazmer, "Changing Paradigms for Teaching Large Courses", Center for Teaching & Learning, Univ. Mass. Lowell, April 14, 2014.
416. D. O. Kazmer, "Design Thinking," 150 minute workshop for 47.473 Social Psychology Seminar, April 7, 2014.
417. S. R. Bell, D.O. Kazmer, and D. Unger, "Know Science? Know Engineering? Putting Science Practices and Engineering Design Together in Your K-8 Classrooms," 2014 National Conference on Science Education, April 3-6, 2014, Boston, MA.
418. D. O. Kazmer, "Vast Viscosity Variances in Polymer Melt Constitutive Modeling," SPE Eastern Regional Meeting, Lowell, MA, December 19, 2013.
419. S. Latham, D. Hewitt, B. Malloy, and D. Kazmer, "Towards a Better Integration of the Classroom and Co-op Experience", UMass Lowell Annual Faculty Symposium, October 17, 2013.
420. D. Kazmer, C. Farmer, L. Nadelson, "K12 Teacher Preparation for Teaching Engineering," Think-Pair-Share Panel, UTeach Annual Conference, May 18, 2013, Austin, TX.

421. D.O. Kazmer, "Supervised Learning," 3 hour workshop delivered to electrical and computer engineering course no. 16.711 Computational Data Modeling, November 13, 2013.
422. D.O. Kazmer, "Design for Manufacture and Assembly," 1 hour lecture and three 2 hour labs delivered to plastics engineering course no. 25.108 Introduction to Engineering II, March 4-6, 2014.
423. D.O. Kazmer, B. G. Tucker, L. Barrington, E. Reynaud, and J.J. Duffy, "Faculty Perspectives on Service-Learning," 2013 ASEE Northeast Section Meeting, March 14-16, 2013, Norwich, VT.
424. D. Kazmer and A. Chann, "Analysis & Application of Tegril: A Self-Reinforced Polypropylene", report to Milliken Corporation, February 12, 2013.
425. L. Barrington , J.J. Duffy, D.O. Kazmer, E. Reynaud, B.G. Tucker, "Faculty Development and Perspectives on EFELTS & SLICE", NSF TUES Conference, January 24-26, 2013 (Washington, DC).
426. D. O. Kazmer, F. Martin, and P. Chowdhury, "Streamlining for Efficiencies in Education (SEE)", Proposal to Mass. Department of Higher Education (2012).
427. R. Gao and D. Kazmer, "Multivariate Remote Sensing for Improved Observability in Injection Molding", NSF CMMI Conference, July, 2012.
428. David Kazmer, Arun Kumar, and Joey Mead, Invention Disclosure, "Pulsed Field-Assisted Electrophoretic Polymer Self-Assembly."
429. D. Kazmer, "Engineering Minors Comparison," for Univ. Mass. Lowell College of Engineering Academic Advising, June, 2012.
430. D.O. Kazmer and K. Bardaro, "Engineering Salary Modeling and Analysis," American Society of Engineering Education Northeast Section Conference, April 29-30, 2012, Lowell, MA.
431. R. X. Gao and D. O. Kazmer, "A multivariate sensor for injection molding," NSF Design and Manufacturing Grantees Conference, Boston, MA, July 9-12, 2012.
432. E. Reynaud, J. J. Duffy, L. Barrington, J. L. Rhoads, D. O. Kazmer, and B. G. Tucker, "Engineering Faculty Attitudes Towards Service-Learning," Community Engagement Poster Session at ASEE Annual Conference, San Antonio, TX, 2012.
433. D. Kazmer, "Incoming Engineering Student Academic Orientation," presentation and materials for Univ. Mass. Lowell College of Engineering, 2011-2014.
434. D. Kazmer, "Supply and Demand of Engineers," American Society of Engineering Education Northeast Section Conference, April 29, 2011 (Hartford, CT).
435. David Kazmer, Invention Disclosure 2011-026, "A Fractal Zipper for Multi-Scale Alignment and Fastening", January 28, 2011.
436. D. Kazmer, R. Panchal, S. Johnston, "Methods for forming injected molded parts and in-mold sensors therefor," PCT/US2009/040508.
437. R. Gao and D. Kazmer, "Structural Optimization of a Dual-Parameter Sensor and Simulation for Prediction of Unobservable Process States in Injection Molding", NSF CMMI Research and Innovation Conference, January 4-7, 2011, Atlanta, GA.
438. Kazmer, D., "BioModular Multi-Scale Systems," presentation to Joint US-Ireland Conference on Bio-Nano Systems, Lowell, MA, October, 2010.
439. Yingrui Shang, Liang Fang, David Kazmer, Ming Wei, Joey Mead, and Carol Barry, "Numerical Simulation of the Phase Separation of a Ternary Systems on a Heterogeneously Functionalized Substrate," Poster to NSF CHN Site Review, June 2010.
440. D. Kazmer and S. Westerdale, "A Six Sigma Quality Control Methodology," UMetrics User Group Conference, October 1, 2010 (Boston, MA).
441. D. Kazmer, "Some Thoughts on NSF Proposal Development," UML Research Conference, October 26, 2010 (Lowell, MA).
442. D. O. Kazmer, S. Velusamy, S. Westerdale, S. Johnston, R. X. Gao, "Robustness of Switchover Methods for Injection Molding," SPE Plastics Research Online, 2010.

443. Y. Shang, D. Kazmer, M. Wei, J. Mead, and C. Barry “Numerical Simulation of the Phase Separation of a Ternary System on a Heterogeneously Functionalized Substrate,” NSF Center for High Rate Nanomanufacturing Industry Workshop, 2009.
444. R. X. Gao and D. O. Kazmer, “Structural Optimization of a Dual-Parameter Sensor and Simulation for Prediction of Unobservable Process States in Injection Molding,” NSF Design and Manufacturing Grantees Conference, 2009.
445. Y. Shang, D. Kazmer, M. Wei, J. Mead, and C. Barry “Numerical Simulation of the Phase Separation of a Ternary System on a Heterogeneously Functionalized Substrate,” NSTI Nanotech Conference, June 1-5, 2008.
446. Gao, R. X., and D. O. Kazmer, “Design and Analysis of a Self-Powered Sensor Array for Injection Molding Process Monitoring,” NSF Design and Manufacturing Grantees Conference, 2008.
447. Shang, Y., D. Kazmer, “Experimental validation of numerical simulation for phase decomposition of a binary polymer thin film on a patterned substrate,” 5th New England International Manufacturing Workshop, June 7, 2007.
448. B. Fan and D. Kazmer, “Erratum: Low-temperature modeling of the time-temperature shift factor for polycarbonate,” *Advances in Polymer Technology*, v. 25, n. 1, p. 73, DOI 10.1002/adv.20058, Spring, 2006.
449. D. Kazmer, “Self-regulating valves for dynamic control of molten plastics”, Proceedings of 2006 NSF Design, Service, and Manufacturing Grantees and Research Conference, St. Louis, Missouri, 2006.
450. Y. Shang and D. Kazmer, “Simulation of Polymer Morphology in Nano-feature Replication,” Sukant Tripathy Memorial Conference, November 13, 2005.
451. K. Garnavish, D. Kazmer, W. Rousseau, and Y. Shang, “Multi-Scale Simulation of Polymer Processing,” NSF Workshop on Nano-scale manufacturing, May 23, 2005.
452. D. O. Kazmer, “Lean Development,” *Flow Front Magazine*, Moldflow Inc., April, 2005.
453. D. O. Kazmer, Book [Review](#), [Design of Machine Elements](#) by M. F. Spotts, T.E. Shoup, L. E. Hornberger, Eighth Edition, Pearson Prentice Hall, Upper Saddle River, NJ, 2004 (ISBN 0-13-048989-1). Appearing in *Journal of Mechanical Design*, 2003.
454. L. Zhu and D. O. Kazmer, “Engineering Decision Synthesis with an Evolving Feasible Space,” Submitted to *Research in Engineering Design*, 2003.
455. Kazmer, D. O., “Dynamic Cooling for Injection Molding,” Final Report to Office of Naval Research, 2003.
456. Kazmer, D. O., “An Optimization Primer,” paper written for *Introduction to Engineering Course Reader*, August 1, 2003.
457. Kazmer, D., Hatch, D., Zhu, L., “Four Measures of Manufacturing System Performance,” *ASME Journal of Manufacturing Science*, 2002.
458. Zhu, L., and D. O. Kazmer, “An Extensive Simplex Method for Mapping Global Feasibility,” UMass Amherst Invention Disclosure, 2001.
459. Fagade, A., Kazmer, D., “Optimal Component Consolidation In Mechanical Systems,” Report to GE Plastics Advanced Design Engineering Group, 2000.
460. Fagade, A., Kazmer, D., “Early Cost Estimation for Injection Molded Parts,” Report to GE Plastics Advanced Design Engineering Group, 1999.
461. Kazmer, D. O., “Reflection on Teaching and Learning,” speech to *University of Massachusetts’ Celebration of Teaching and Learning*, March 25, 1999.

462. Kapoor, D., and D. Kazmer, "Comparison of Sequential Valve Gate Molding to Multi-Cavity Melt Control Injection Molding," Report to GE Plastics, 1998.
463. Kazmer, D. O., "Incorporation of Engineering Analysis into Design Synthesis," *NSF Division of Design, Manufacturing, and Industrial Innovation, Grantees Conference*, Monterrey Mexico, January 1998.
464. Kazmer, D. O., Danai, K., "Automatic Tuning and Regulation of Injection Molding," *NSF Division of Design, Manufacturing, and Industrial Innovation, Grantees Conference*, Monterrey Mexico, January 1998.
465. Fagade, A., Kapoor, D., and D. Kazmer, "Analysis of Design and Manufacturing Complexity," Report to GE Plastics Advanced Design Engineering Group, 1997.
466. Poslinski, A. J., Aslam, S., Kazmer, D. O., "Effects of Viscosity Variation on Injection Molding," *GE Research & Development Technical Information Series Number 92CRD146*, 1992.
467. Kazmer, D. O., "Diskflow Validation Summary," GE Plastics Report, 1992.
468. Kazmer, D. O., "Customer Training Manual on Mold Packing Analysis," GE Plastics Report, 1992.
469. Kazmer, D. O., "Development of a Radial Flow Analysis for Injection Molding," *GE Research & Development Technical Information Series Number 91CRD195*, 1991.
470. Kazmer, D. O., "Adaptive Meshing of Two-Dimensional Evolving Geometries," Rensselaer Polytechnic Institute, Advanced Finite Element Methods Independent Study Report, 1990.

Courses Taught:

- Fall 1995, ME415: Mechanical Systems Design, Enrollment: 14.
- Spring 1996, ME415: Mechanical Systems Design, Enrollment: 20.
- Fall 1996, MIE477: Production Scheduling and Control, Enrollment: 15.
- Spring 1997, MIE415: Mechanical Systems Design, Enrollment: 32.
- Fall 1997, MIE760: Advanced Mechanical Systems Design, Enrollment: 15.
- Spring 1998, MIE415: Mechanical Systems Design, Enrollment: 28.
- Spring 1998, MIE395: Engineering Professionalism Seminar, Enrollment: 20.
- Fall 1998, MIE697M: Modern CAD System Development, Enrollment: 16.
- Spring 1999, MIE415: MIE Capstone Systems Design, Enrollment: 25.
- Spring 1999, MIE395: Engineering Professionalism Seminar, Enrollment: 40.
- Fall 1999, MIE113: Introduction to Mech. & Ind. Eng, Enrollment: 24.
- Fall 1999, MIE697P: Manufacturing Process Design, Enrollment: 15.
- Spring 2000, MIE395: Engineering Professionalism Seminar, Enrollment: 45.
- Spring 2000, MIE415: Mechanical Systems Design, Enrollment: 20.
- Fall 2000, MIE113: Introduction to Mech. & Ind. Eng, Enrollment: 21.
- Fall, 2000, MIE760: Advanced Mechanical Systems Design, Enrollment: 8.
- Spring 2000, MIE415: Mechanical Systems Design, Enrollment: 9.
- Spring 2002, 26.373: Mold Engineering I, Enrollment: 21.
- Fall 2003, 26.524: Process Analysis, Instrumentation, and Control, Enrollment: 9.
- Spring 2003, 26.373: Mold Engineering I, Enrollment: 21.
- Spring 2003, 26.521: Lean Plastics Manufacturing, Enrollment: 10.

- Fall 2003, 25.107: Introduction to Engineering I, Enrollment: 288.
- Spring 2004, 26.373: Mold Engineering I, Enrollment: 23.
- Spring 2004, 26.521: Lean Plastics Manufacturing, Enrollment: 12.
- Fall 2004, 25.107: Introduction to Engineering I, Enrollment: 279.
- Spring 2005, 26.373: Mold Engineering I, Enrollment: 14.
- Spring 2005, 26.521: Lean Plastics Manufacturing, Enrollment: 13.
- Fall 2005, 25.107: Introduction to Engineering I, Enrollment: 307.
- Spring 2006, 26.373: Mold Engineering I, Enrollment: 25.
- Spring 2006, 26.524: Process Analysis, Instrumentation, and Control, Enrollment: 12.
- Fall 2006, 25.107: Introduction to Engineering I, Enrollment: 358.
- Spring, 2007, 26.373: Mold Engineering I, Enrollment: 23.
- Spring, 2007, 26.576: Advanced Mold Design, Enrollment: 11.
- Fall 2007, 25.107: Introduction to Engineering I, Enrollment: 410.
- Spring, 2008, 26.373: Mold Engineering I, Enrollment: 21.
- Spring, 2008, 26.576: Advanced Mold Design, Enrollment: 10.
- Fall, 2009, 26.606: Plastics Manufacturing Systems Engineering, Enrollment: 16.
- Fall, 2009, 26.404: Process Control, Enrollment: 21.
- Spring, 2010, 26.515: Lean Plastics Manufacturing, Enrollment: 28.
- Spring, 2010, 26.576: Advanced Mold Design, Enrollment: 11.
- Fall 2010, 26.404: Process Control, 27 students
- Fall 2010, 26.606 Plastics Manufacturing Systems Engineering, 15 students
- Spring, 2011, 26.218: Introduction to Design, 33 students.
- Spring 2011, 26.515: Lean Plastics Manufacturing, 13 students
- Fall, 2012, 26.404: Process Control. 35 students.
- Fall, 2012, 26.618: Structural Product Design. 17 students.
- Spring, 2013, 26.515.201: Lean Plastics Manufacturing. 18 students.
- Spring, 2013, 26.515.202: Lean Plastics Manufacturing. 18 students.
- Fall, 2013, 26.404: Process Control. 21 students.
- Fall, 2013, UTL.301: Project-Based Instruction. 21 students.
- Spring, 2014, 26.218: Introduction to Design, 51 students registered.
- Spring, 2014, 26.618: Structural Product Design. 12 students registered.
- Fall, 2014, 25.107.104: Introduction to Engineering. 58 students registered.
- Fall, 2014, 26.404: Process Control. 24 students registered.
- Spring, 2015, 26.218.101: Introduction to Design. 30 students registered.
- Spring, 2015, 26.218.102: Introduction to Design. 40 students registered.
- Spring, 2015, 26.515: Lean Plastics Manufacturing. 21 students registered.
- Fall, 2016, PLAS 1070 Introduction to Plastics Engineering. 44 students registered.
- Fall, 2016, PLAS 6180 Structural Product Design. 19 students registered.
- Spring, 2017, PLAS 1070 Introduction to Plastics Engineering. 28 students registered.

- Spring 2017, PLAS 5150 Lean Plastics Manufacturing. 27 students registered.

Service:

- Chair, Department of Plastics Engineering, University of Massachusetts Lowell, 2016-
 - Completed implementation of UML Essential Learning Outcomes (ELO) by aligning course/ABET objectives with UML ELO system. Input course applications to ELO system and responded with revisions and rebuttals for other instructors as appropriate. Worked with other UML administrators to process Plastics ELOs through SIS system.
 - Revised ABET Student Outcome Performance Assessment forms and reported data and procedures to faculty.
 - Led search process for Plastics and Biomedical Engineering faculty, resulting in identification of recommended faculty hires Anne Soucy, Azadeh Sheidaei, and Rosalyn Abbott-Beauregard.
 - Planned and hosted PLASTICS 4.0 faculty recognition event, among other alumni events.
 - Developed and co-leading (with R. Nagarajan) research services agreement with Plastindia Foundation to provide faculty training towards the premier, fully ABET-accredited Plastics Engineering undergraduate program in India
 - Developed articulation agreements with Quinebag Valley Community College (CT) for engineering technology students to enter Plastics Engineering.
 - Developed and implemented faculty survey form to identify faculty teaching & service interests as well as future research opportunities & equipment needs
 - Developing and implementing new department workflows and associated bylaws
 - Reconstituting department Industrial Advisory Board and associated bylaws
- Advisory board member, Pre-Engineering Program, Greater Lawrence Technical High School, 2014-16
 - Assisted in program accreditation with Massachusetts Board of Education
- Chair, Plastics Engineering Faculty Search Committee, 2014-2015. Chair, Biomedical Engineering Faculty Search Committee, 2014-2015.
 - Recommended three faculty hires with unanimous support of faculty.
- Treasurer, Chair of Finance Committee, and Director, 401c(3) Museum Institute for Teaching Science, 2012-2015
 - Provide quarterly review of revenues and expenses, reporting to Board of Directors.
 - Assist in development of strategic plan and actions; implemented MITS dashboard for performance measurement.
 - Reviewed curricular programs, assisting in development of hybrid project-based instruction teaching workshops.
- NEASC Undergraduate Programs Committee, Fall 2012
 - Coordinated undergraduate engineering programs for NEASC site visit.
 - Assisted in authoring and review of NEASC Standard Four: Academic Program
- UML ABET Plastics Engineering Program Accreditation, 2012-2014
 - Prepared draft of department self-study report
 - Planned and implemented the ABET Review Committee (ARC) to review Student Outcome Performance Assessment (SOPA) and ensure continuous improvement

- Served as Chair of the ARC; assessed faculty curricular improvements; prepared draft of thirty day response, final amendment, and supporting exhibits
- UML Engineering Technology Teaching Program Accreditation, Spring 2013
 - Assessed engineering curricula for Department of Higher Education (DHE) review
 - Assisted Dean Anita Greenwood with accreditation report & response
 - Performed DHE Accreditor Review for Fitchburg State Engineering Technology Teaching Program
- Associate Dean, James B. Francis College of Engineering, January, 2011-April, 2012:
 - Conducted faculty interviews and faculty needs analysis of College.
 - Performed student survey of S2011 Welcome Day.
 - Led phone campaign to recruit F2012 Fall Cohort.
 - Developed Women-In-Tech Day with Sciences Associate Dean, Fred Martin
 - Developed one-way and/or two-way articulation agreements with Bunker Hill Community College, Middlesex Community College, Northern Essex Community College, Quinsigamond Community College.
 - Coordinated Deshpande Sandbox activities with CoE faculty.
 - Member of delegation representing UMass Lowell to Deshpande Sandbox in Hubli, India.
 - Analyzed CoE curricula with respect to student failure modes.
 - Analyzed CoE faculty teaching & research workloads.
 - Led \$2.5MM STEP proposal development with NECC, MCC, MIT, & Merrimack College.
 - Developed Energy Engineering Minor with broad faculty consensus.
 - Developed Biomedical Engineering Minor with broad faculty consensus.
 - Developed STEM Teaching Minor with Dean Anita Greenwood.
 - Co-Director of UTeach Teaching Minor; advising engineering student participants.
 - Developed doctoral RA/TA funding model and rolled-out to faculty with WebNow.
 - Proposed invention factory, an experiential model for student learning .
 - Member, University Research and Commercialization Committee.
 - Facilitated College of Engineering ABET review meetings with 12 supporting organizations.
- Reviewer, Commonwealth of Massachusetts Department of Higher Education, 2013. Performed reviews of engineering technology teacher certification programs.
- Lead, UML/FIBSEM Outreach Program. Organized and led field trips for 7th and 8th grade students to learn about microscopy, college majors, and science/engineering careers. Over 400 students visited UML between April 8-12 for a half day program. Another 350 students were directly impacted through the offering of teaching modules about scale, from “quarks to galaxies”.
- Chair, American Society of Engineering Education Northeast Regional Section Conference, April 29-30, 2012. *Arranged reviews for 70 papers; organized 120 posters. Registered 424 participants. Managed budgets & expenses. Authored advance and final programs as well as proceedings. Developed conference planning kit for future ASEE conferences.*
- Member, 2012, of Search Committee for Entrepreneurship Director of CVIP.
- Chair, AY2011 Plastics Engineering Tenure Track Faculty Search Committee, hired Margaret Sobkowicz-Kline.
- Chair, AY2011 Plastics Engineering Non-Tenure Track Search Committee, hired Gonca Altuger

- Founding Board Member, University Faculty Development Center, December, 2010-February, 2011. *Developed mission statement: To inspire and assist the faculty to realize their highest potential for teaching, research, scholarship, and service throughout a productive career.*
- Member, University Research and Commercialization Committee, 2011-.
- Chair, Process Instrumentation and Control Symposium, International Polymer Processing Conference, Banff, Canada, July, 2010.
- Member, University 2020 Strategic Planning Graduate Program Committee, 2009-.
- Chair, Society of Plastics Engineers' Process Monitoring & Control Special Interest Group, 2005-2008. Responsibilities included solicitation and review of papers as well as organization and staffing of sessions.
- Associate Editor, *Advances in Polymer Technology*, 2004-2014.
- Associate Editor, *Polymer Plastics Technology and Engineering*, 2001-2014.
- Independent Reviewer, 21st Century Jobs Fund for Advanced Manufacturing, Research Competitiveness Service at the American Association for the Advancement of Science (AAAS), 2006-.
- Associate Editor, *ASME Journal of Mechanical Design*, 2003-2006.
- Chair, ASME Design for Manufacturing Technical Committee, 2003-2005. Responsibilities included staffing conferences for the DFM tracks at annual Design Engineering Technical Conference, International Mechanical Engineering Congress, and National Manufacturing Week. Also responsible for liaison with Design Education and other technical committees as well as tri-annual reports and meetings with the Design Division Executive Committee.
- Chair, Design for Manufacturing Symposium, International Mechanical Engineering Congress, November, 2004.
- Vice-Chair, ASME Design for Manufacturing Technical Committee, 2001-2003.
- Chair, 6th Design for Manufacturing Symposium, ASME Engineering Design Technical Conferences, 2001.
- Program Chair, 5th Design for Manufacturing Symposium, ASME Engineering Design Technical Conferences, 2000.
- Chair, SPE Processing Instrumentation, Process Monitoring, and Control Special Interest Group, 2005-2008.
- Chair, Molding Technology Symposium, International Polymer Processing Conference, June, 2004.
- Liaison, Service Learning Project for the Tsongas Industrial History Center's Innovation Laboratory, 2004-2008. Incorporated service learning project in the Introduction to Engineering course. Project involved liaison with staff at Tsongas, project development, student instructions in both lectures and sections, co-evaluation of projects, post-processing of evaluations, development of exhibit, individual supervision of final student projects, and final exhibition at Tsongas.
- Member, UML Faculty Senate, 2003-2011.
- Author and Administrator, *Plastics Engineering Web Site*, 2003-2005. Responsibilities have included renovation and deployment of department web site. Surveyed students, faculty, and alumni to characterize requirements. Developed architecture and functionality. Implemented new site with content from Department Chair Robert Malloy and assistance from a computer science graduate student.
- Member, Mold-Masters Advisory Council, 2003-2005.
- Founding Member, ThermoCeramix Technical Advisory Board, 2003-2005.

- Member, University of Massachusetts' Patent Evaluation Committee, 2000-2001.
- Ad Hoc Reviewer, NSF Small Business Initiative Research Program, 2003.
- Member, Collaboration Catalyst Corp. Technical Advisory Board, 2001-2004.
- Ad Hoc Reviewer, Measurement, 2013-.
- Ad Hoc Reviewer, IEEE Sensors, 2009-.
- Ad Hoc Reviewer, Polymer, 2010-.
- Ad Hoc Reviewer, Proceedings of the Institution of Mechanical Engineers, Part B Journal of Engineering Manufacture, 2010-.
- Ad Hoc Reviewer, IEEE Transactions in Industrial Automation, 2009-.
- Ad Hoc Reviewer, IEEE Transactions on Automation Science and Engineering, 2001-.
- Ad Hoc Reviewer, NSF Manufacturing Processes Program, 2009.
- Ad Hoc Reviewer, NSF Engineering Design Program, 2008.
- Ad Hoc Reviewer, IEEE Transaction on Engineering Management, 2004-.
- Ad Hoc Reviewer, Langmuir, 2004-.
- Ad Hoc Reviewer, International Journal of Food Science, 2003-04.
- Ad Hoc Reviewer, American Institute of Aeronautics and Astronautics, 2003-.
- Ad Hoc Reviewer, Artificial Intelligence for Engineering Design, Analysis and Manufacturing, 2003-.
- Ad Hoc Reviewer, Rheological Acta, 2003-.
- Ad Hoc Review, IEEE Transactions on Industrial Informatics, 2010-
- Ad Hoc Reviewer, Polymer Plastics Technology & Engineering, 2000-.
- Ad Hoc Reviewer, Journal of Polymer Composites, 2000-.
- Ad Hoc Reviewer, NSF Manufacturing Equipment Program, 2000-.
- Ad Hoc Reviewer, NSF Manufacturing Processes Program, 2000-.
- Ad Hoc Reviewer, NSF Operations Management Program, 1999-.
- Ad Hoc Reviewer, International Polymer Processing, 1999-.
- Ad Hoc Reviewer, ASME Journal of Manufacturing Science, 1998-.
- Ad Hoc Reviewer, Research in Engineering Design, 1998-.
- Ad Hoc Reviewer, Polymer Engineering & Science, 1997-.
- Ad Hoc Reviewer, NSF Design Engineering Program, 1996-.
- Ad Hoc Reviewer, ASME Journal of Mechanical Design, 1996-.