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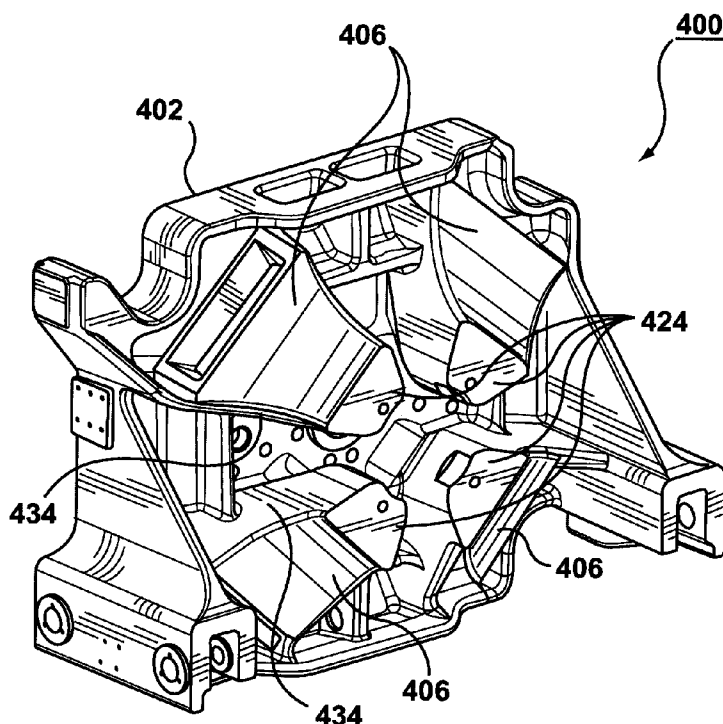
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(54) Title: MOLDING-SYSTEM PLATEN



(57) Abstract: Disclosed are molding-system platens, molding systems having molding-system platens, and/or a method of a molding-system platen.

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MOLDING-SYSTEM PLATEN**TECHNICAL FIELD**

5 The present invention generally relates to, but is not limited to, molding-systems, and more specifically the present invention relates to, but is not limited to, molding-system platens, and/or to molding systems having molding-system platens, and or to methods of molding-system platens.

BACKGROUND OF THE INVENTION

10 PCT Patent Application Number 05/084909A1 (Inventor: Nagata, Yoshihiko; Published: 2005-09-15) appears to disclose a mold-support device for an injection-molding system.

15 United States Design Patent Number 472,566 (Inventor: Okada, Norihito; Published: 2003-04-01) appears to disclose a platen of a molding system.

20 United States Patent Number 6,984,121 (Inventor: Fischbach, Gunther et al; Published: 2006-01-10) appears to disclose a platen for an injection-molding machine.

25 United States Patent Number 6,746,232 (Inventor: Becker et al; Published: 2004-06-08) appears to disclose a platen for an injection-molding machine, in which the platen includes flexible connectors at the corners to support bushes for tie bars.

30 United States Patent Number 6,439,876 (Inventor: Glaesener, Pierre; Published 2002-08-27; Assignee: Husky Injection Molding Systems Limited) appears to disclose a mold-support platen of a molding system.

35 FIG. 1 provides views of a platen 1 according to U.S. Patent 6,439,876. The top-most image is a perspective-frontal view of the platen 1. The lower-most image is an end view of the platen 1. The image between the top-most and bottom-most images is a perspective-rearward view of the platen 1. The platen 1

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includes a mold-support face 4 (hereafter referred to as the "face 4"). A peripheral wall 30 extends rearward of the face 4. The face 4 includes force-receiving faces 24 extending posterior of the face 4. The face 4 has clearances for tie bars 18 at the four corners of the face 4. Walls 34 extend rearward from the face 4.

FIGS. 2A and 2B are cross-sectional views of the platen 1 of FIG. 1. The platen 1 is used in a molding system 2. The face 4 supports a mold 8 that includes mold halves. One of the mold halves is attachable to the face 4, while the other of the mold halves is attachable to a stationary platen 10. An injection unit 12 is used to process a molding material that is to be injected into a cavity defined by the mold 8. A clamping block 14 includes clamping mechanisms used to actuatably move a clamp column 16 attached to the platen 1 so that the platen 1 is movable away from and toward the stationary platen 10 so that the mold 8 may be closed and opened. The clamping block 14 is known to those skilled in the art of molding machinery and thus the clamping block 14 will not be discussed. The tie bars 18 attach the stationary platen 10 with the clamping block 14 so that a clamping force may be applied to the mold 8. The force-receiving face 24 is offset rearward from the face 4 so that a clamping force that is applied to the platen 1 is divergently transmitted from the force-receiving face 24 across the face 4. The force-receiving face 24 is smaller than the face 4. A border 26 surrounds the face 4. The width of the border 26 extends from the outer edge of the face 4 toward the outer edge of the force-receiving face 24. For some implementations, the footprint of the force-receiving face 24 is approximately equal to the footprint of the clamp column 16. However, the footprint of the force-receiving face 24 is depicted as larger than the footprint of the clamp column 16.

The clamp column 16 is a force-acting area or structure in that the clamping force is transmitted through the clamp column 16 to the mold 8. The footprint of the mold 8 is larger than the footprint of the clamp column 16 such that a portion of the mold 8 extends from a central portion of the face 4 and into the border 26. Upon application of a clamping force, the border

26 becomes warped (that is, the border 26 is bend toward the clamping block 14), and as a result the portion of the mold 8 that is connected to the border 26 will open and thus it will experience inadvertent flashing during injection of the molding material into the mold 8. This is a problematic condition.

FIG. 2B is a side view of the platen 1 of FIG. 2A in which a clamping force is applied to the mold 8. The clamping force is generated by the clamping block 14. The generated clamping force includes a first-force component 20 and a second-force component 22 that are equal to each other in magnitude but applied opposite to each other across the mold 8. The first-force component 20 is transmitted to the mold 8 along a pathway that extends from the clamping block 14 through the tie bars 18 into the stationary platen 10 and to the mold 8. The second-force component 22 is transmitted along a pathway that extends from the clamping block 14 through the clamp column 16 and into the platen 1 and then to the mold 8.

A central portion of the face 4 is positioned within the footprint of the clamp column 16, and the central portion of the face 4 does not warp or bend when the second force-component 22 is applied to the mold 8. However, the force component 22 is transmitted divergently across the border 26, and as such (disadvantageously) the border 26 becomes warped by the force component 22. When the border 26 becomes warped, the mold 8 will flash (that is, molding material will inadvertently leak out from the mold 8 during injection of the molding material). The border 26 bends back toward the clamping block 14 (because the force component 22 is unequally distributed (or diluted) across the border 26). Since not as much of the force component 22 reaches the border 26, the border 26 does not get pushed as much as, for example, the central portion of the face 4.

Therefore, in order to counter act backward bending of the border 26, persons skilled in the art may consider the following option: apply a higher clamp force (tonnage) via the column 16 in order to keep the mold-support faces of the platen 1, 10 parallel with each other. However, a negative consequence

may occur, amongst other things, as a result of the foregoing option (which may not completely motivate the person skilled in the art away from the option): if the clamping force is increased, more energy would be required to generate and apply the clamping force to the platen 1 and thus the molding system 2 may be more expensive to operate.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention, there is provided a molding-system platen, including a face, and a canopy linking to and stiffening the face.

According to a second aspect of the present invention, there is provided a molding system, having a molding-system platen, including a face; and also including a canopy linking to and stiffening the face.

According to a third aspect of the present invention, there is provided a method, including linking to and stiffening a face with a canopy.

A technical effect of the present invention is to mitigate the disadvantages associated with known molding-system platens (at least in part) as will become apparent in view of the description of the exemplary embodiments provided below.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the exemplary embodiments of the present invention (including alternatives and/or variations thereof) may be obtained with reference to the detailed description of the exemplary embodiments along with the following drawings, in which:

FIG. 1 provides views of a platen according to U.S. Patent Number 6,439,876;

FIGS. 2A and 2B are cross-sectional views of the platen of FIG. 1;

FIGS. 3A and 3B are side views of a molding-system platen according to a first exemplary embodiment;

FIGS. 4A to 4C are perspective views of a molding-system platen according to a second exemplary embodiment;

FIGS. 5A and 5B are perspective views of a molding-system platen according to a third exemplary embodiment; and

5 FIGS. 6A and 6B are perspective views of a molding-system platen according to a fourth exemplary embodiment.

The drawings are not necessarily to scale and are sometimes illustrated by phantom lines, diagrammatic representations and
10 fragmentary views. In certain instances, details that are not necessary for an understanding of the embodiments or that render other details difficult to perceive may have been omitted.

15 **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)**

FIGS. 3A and 3B are side views of a molding-system platen 100 (hereafter referred to as the "platen 100") according to the first exemplary embodiment. The platen 100 is used in a molding
20 system 102 which may be supplied separately from (or supplied with) the platen 100. In FIG. 3A, a clamping force is not applied to the platen 100 while in FIG. 3B the clamping force is applied to the platen 100.

25 The platen 100 includes a mold-support face 104, and also includes a canopy 106 linking to, and stiffening, the mold-support face 104 (hereafter referred to as "the face 104").

According to a variation, the face 104 includes a border 126,
30 and the canopy 106 stiffens the border 126.

The face 104 is configured to support a mold (such as a mold 108). The platen 100 also includes the canopy 106 that is linked to the face 104, and the canopy 106 stiffens the face
35 104. The mold 108 is sold separately from the platen 100. The canopy 106 is a covering (or a layer, or a roof-like projection) that is suspended over the face 104.

The molding system 102 uses the mold 108. The mold 108 has mold
40 halves, in which one of the mold halves is attachable to the

face 104, while the other of the mold halves is attachable to a stationary platen 110. An injection unit 112 is used to process a molding material that is to be injected into a cavity defined by the mold 108. A clamping block 114 includes clamping mechanisms used to actuatably move a clamp column 116 that is attached to the platen 100, so that the platen 100 may be moved away from and toward the stationary platen 110, so that the mold 108 may be opened and closed accordingly. The clamping block 114 is known to those skilled in the art of molding machinery and thus details of the clamping block 114 will not be described. Tie bars 118 attach the stationary platen 110 to the clamping block 114 so that a clamping force (generated by the block 114) may be applied to the mold 108. The face 104 includes a force-receiving face 124 that is offset rearward from the face 104 so that the clamping force applied to the platen 100 may be divergently transmitted from the force-receiving face 124 across the face 104. The force-receiving face 124 is smaller than the face 104. The canopy 106 is positioned between the face 104 and the force-receiving face 124.

A border 126 surrounds the face 104. The width of the border 126 extends from the outer edge of the face 104 toward the outer edge of the force-receiving face 124. The footprint of the force-receiving face 124 is larger than the footprint of the clamp column 116. According to a variation, the footprint of the force-receiving face 124 is approximately the same size as the footprint of the clamp column 116. The clamp column 116 is a force-acting area or structure in that the clamping force is transmitted through the clamp column 116 into the platen 100 and over to the mold 108. The face 104 includes a force-receiving face 124 offset rearward from the face 104.

FIG. 3B is a side view of the platen 100 of FIG. 3A in which a clamping force is applied to the mold 108. The clamping force has two force components which are: a first-force component 120 and a second-force component 122 that are equal to each other in magnitude but applied opposite to each other across the mold 108. The first-force component 120 is transmitted to the mold 108 along a pathway that extends from the clamping block 114,

through the tie bars 118 into the stationary platen 110 and to the mold 108. The second force component 122 is transmitted along a pathway that extends from the clamping block 114 through the clamp column 116 into the platen 100 and then to the mold 108.

The technical effect of the arrangement of the platen 100, amongst other things, is that a lower clamp force may be applied to the mold 108. The clamping force is also called "tonnage". The clamp force applied to the platen 100 is lower in comparison to the clamp force applied to the platen 1 of FIGS. 1, 2A, 2B (in which the platen 1 does not include a canopy). The canopy 106 increases stiffening of the face 104 so that a lower clamping force may be applied to the mold 108. While the canopy 106 adds some weight to the platen 100, the canopy 106 adds just enough to obtain the required amount of stiffening of the face 104 without unnecessarily increasing the inertia of the platen 100 to the point where the cycle time of the molding system 102 is reduced too much. It was determined that deflections associated with the platen 100 approximate closely to the deflections associated with the (known) platen 1. It may be possible to construct platen 100 to have less weight than the platen 1 of FIG. 1 and so the efficiency of the platen 100 is improved in terms of a weight-to-deflection ratio.

Another technical advantage, amongst other things, of the platen 100 is that the canopy 106 stiffens the border 126 sufficiently enough so that the mold 108 avoids experiencing flashing when a lower clamping force is applied to the mold 108.

Another technical advantage, amongst other things, of the platen 100 is that the canopy 106 permits thinner walls to extend from the face 104.

Referring to FIGS. 3A and 3B, preferably the force-receiving face 124 is offset rearward from the face 104. The force-receiving face 124 is configured to receive a force (such as a clamping force) from a force-imparting structure (such as a

clamp column 116 working in cooperation with the clamping block 114). The canopy 106 is positioned offset rearward proximate of the border 126. The border 126 surrounds the face 104. The canopy 106 is preferably offset sufficiently enough from the face 104 to substantially suppress deflection of the border 126 responsive to a force (such as a clamping force) that acts to deflect the border 126.

Another technical effect is that the faces 104 and 124 may be placed closer together, thereby permitting the platen 100 to be smaller.

The foregoing description of the first exemplary embodiment is equally applicable to the other exemplary embodiments.

FIGS. 4A to 4C are perspective views of a molding-system platen 200 (hereafter referred to as the "platen 200") according to the second exemplary embodiment. To facilitate an understanding of the second exemplary embodiment, elements of the second exemplary embodiment (that are similar to those of the first exemplary embodiment) are identified by reference numerals that use a two-hundred designation rather than a one-hundred designation (as used in the first embodiment). For example, the canopy of the second exemplary embodiment is labeled 206 rather than being labeled 106.

The platen 200 includes a mold-support face 204, and also includes a canopy 206 that links to and stiffens the mold-support face 204. The canopy 206 is C-shaped or open-sided. Preferably, the canopy 206 stiffens a border 226 that surrounds the mold-support face 204. The border 226 is a strip of area that surrounds the mold-support face 204. The canopy 206 links to a posterior of the mold-support face 204. The mold-support face 204 has a force-receiving face 224. The canopy 206 increases (improves) a moment of inertia of the border 226 sufficiently enough to substantially suppress deflection of the border 226 responsive to a force acting (via a force-receiving face 224) to deflect or warp the border 206. The mold-support face 204 includes a force-receiving face 224 offset rearward from the mold-support face 204. The canopy 206 has a planar

surface that is sufficiently large enough to substantially suppress deflection of a border of the mold-support surface responsive to a force acting to deflect the border 206. The canopy 206 is substantially symmetrically linked to the mold-support face 204 sufficiently enough to substantially suppress deflection of the border 226 responsive to a force acting to deflect the border 226. The force-receiving face 224 includes at least one pedestal (depicted are four pedestals) that is centrally positioned relative to the mold-support face 204, and the pedestal is offset rearward of the mold-support face 204.

The mold-support face 204 includes a base of a frustum-shaped structure having a pedestal, and the pedestal defines the force-receiving face 224 that is offset rearward from the mold-support face 204. According to a variant, the frustum-shaped structure is conical shaped. According to another variant, the frustum-shaped structure is pyramid shaped.

According to the second exemplary embodiment, the mold-support face 204 includes an upstanding wall 234 that extends posterior of the mold-support face 204, and the canopy 206 is attached to the upstanding wall 234. Peripheral wall 230 extends around the periphery of the face 204, and the canopy 206 attaches the peripheral wall 230 as well as to a portion of the upstanding wall 234. The upstanding wall 234 links the canopy 206 to the mold-support face 204. According to a variant, the upstanding wall 234 is a peripheral wall that extends from the periphery of the mold-support face 204. According to another variant, the upstanding wall 234 is a wall that extends from the force-receiving face 224 and radially out toward the peripheral wall. The foregoing description of the second exemplary embodiment is equally applicable to the other exemplary embodiments. It is within the scope of upstanding wall 234 to include a upstanding post or more than one upstanding post.

Referring to FIG. 4C, the canopy 206 covers, in effect half of the mold-support face 204. In this exemplary embodiment, an ejector plate 236 is used so that the canopy 206 does not interfere with operation and/or servicing of the ejector plate. The ejector plate 236 is optional. According to another

variant, the ejector plate 236 is not used and the canopy 206 extends toward the force-receiving faces 224.

FIGS. 5A and 5B are perspective views of a molding-system platen 300 (hereafter referred to as "the platen 300") according to the third exemplary embodiment. To facilitate an understanding of the third exemplary embodiment, elements of the third exemplary embodiment (that are similar to those of the first exemplary embodiment) are identified by reference numerals that use a three-hundred designation rather than a one-hundred designation (as used in the first exemplary embodiment). For example, the canopy of the third exemplary embodiment is labeled 306 rather than being labeled 106.

The platen 300 includes a mold-support face 304, and also includes a canopy 306 that links to and stiffens the mold-support face 304. The canopy 306 includes a plurality of canopies (306) that each extend between walls 334, and they form in effect a single canopy that substantially extends and covers the posterior of the mold-support face 304. In this exemplary embodiment, an ejector plate is not used so that the canopy 306 may cover the entire posterior of the mold-support face 302. The foregoing description of the third exemplary embodiment is equally applicable to the other exemplary embodiments.

FIGS. 6A and 6B are perspective views of a molding-system platen 400 (hereafter referred to as "the platen 400") according to the fourth exemplary embodiment. To facilitate an understanding of the fourth exemplary embodiment, elements of the fourth exemplary embodiment (that are similar to those of the first exemplary embodiment) are identified by reference numerals that use a four-hundred designation rather than a one-hundred designation (as used in the first embodiment). For example, the canopy of the fourth exemplary embodiment is labeled 406 rather than being labeled 106.

The platen 400 includes a mold-support face 404, and also includes a canopy 406 that links to and stiffens the mold-support face 402. The canopy 406 includes a plurality of

canopies that each extend between walls 434 in an alternating manner or pattern. The canopy 406 covers, in effect, half of the mold-support face 404. In this exemplary embodiment, an ejector plate is used and the canopy 406 does not interfere with operation and/or servicing of the ejector plate (not depicted). The foregoing description of the fourth exemplary embodiment is equally applicable to the other exemplary embodiments.

The description of the exemplary embodiments provides examples of the present invention, and these examples do not limit the scope of the present invention. It is understood that the scope of the present invention is limited by the claims. The concepts described above may be adapted for specific conditions and/or functions, and may be further extended to a variety of other applications that are within the scope of the present invention. Having thus described the exemplary embodiments, it will be apparent that modifications and enhancements are possible without departing from the concepts as described. Therefore, what is to be protected by way of letters patent are limited only by the scope of the following claims:

WHAT IS CLAIMED IS:

1. A molding-system platen (100; 200; 300; 400), comprising:
a mold-support face (104; 204; 304; 404); and
5 a canopy (106; 206; 306; 406) linking to and stiffening the
mold-support face (104; 204; 304; 404).

2. The molding-system platen (100; 200; 300; 400) of claim 1,
wherein the mold-support face (104; 204; 304; 404) includes a
10 border (126; 226; 326; 426), and the canopy (106; 206; 306;
406) stiffens the border (126; 226; 326; 426).

3. The molding-system platen (100; 200; 300; 400) of claim 1,
wherein the mold-support face (104; 204; 304; 404) is
15 surrounded by a border (126; 226; 326; 426), and the canopy
(106; 206; 306; 406) stiffens the border (126; 226; 326; 426).

4. The molding-system platen (100; 200; 300; 400) of claim 1,
wherein the mold-support face (104; 204; 304; 404) includes a
20 force-receiving face (124; 224; 324; 424) offset rearward from
the mold-support face (104; 204; 304; 404), wherein a width of
a border (126; 226; 326; 426) surrounding the mold-support face
(104; 204; 304; 404) extends from a periphery of the mold-
support face (104; 204; 304; 404) to an outer edge of the
25 force-receiving face (124; 224; 324; 424), the mold-support
face (104; 204; 304; 404) is larger than the force-receiving
face (124; 224; 324; 424), and the canopy (106; 206; 306; 406)
is positioned between the mold-support face (104; 204; 304;
404) and the force-receiving face (124; 224; 324; 424).

5. The molding-system platen (100; 200; 300; 400) of claim 1,
wherein the mold-support face (104; 204; 304; 404) includes a
force-receiving face (124; 224; 324; 424) offset rearward from
the mold-support face (104; 204; 304; 404), and a force is
35 divergently transmittable from the force-receiving face (124;
224; 324; 424) across the mold-support face (104; 204; 304;
404).

6. The molding-system platen (100; 200; 300; 400) of claim 1,
40 wherein the mold-support face (104; 204; 304; 404) includes a

force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404), and the force-receiving face (124; 224; 324; 424) includes a pedestal (130; 230; 330; 430) centrally positioned relative to the mold-support face (104; 204; 304; 404), the pedestal (130; 230; 330; 430) is offset from the mold-support face (104; 204; 304; 404).

7. The molding-system platen (100; 200; 300; 400) of claim 1, wherein the mold-support face (104; 204; 304; 404) includes a force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404), and the force-receiving face (124; 224; 324; 424) is configured to receive a force from a force-imparting face (132; 232; 332; 432).

8. The molding-system platen (100; 200; 300; 400) of claim 1, wherein the mold-support face (104; 204; 304; 404) includes a base of a frustum-shaped structure having a pedestal (130; 230; 330; 430), the pedestal (130; 230; 330; 430) defines a force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404).

9. The molding-system platen (100; 200; 300; 400) of claim 1, wherein the canopy (106; 206; 306; 406) links to a posterior of the mold-support face (104; 204; 304; 404).

10. The molding-system platen (100; 200; 300; 400) of claim 1, wherein the canopy (106; 206; 306; 406) improves a moment of inertia of the mold-support face (104; 204; 304; 404) sufficiently enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

11. The molding-system platen (100; 200; 300; 400) of claim 1, wherein the canopy (106; 206; 306; 406) is positioned offset rearward proximate of the mold-support face (104; 204; 304; 404) sufficiently enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

12. The molding-system platen (100; 200; 300; 400) of claim 1, wherein the canopy (106; 206; 306; 406) has a planar surface (128; 228; 328; 428), the planar surface (128; 228; 328; 428) is sufficiently large enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

13. The molding-system platen (100; 200; 300; 400) of claim 1, wherein the canopy (106; 206; 306; 406) has a mass, and the mass is substantial enough to suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

14. The molding-system platen (100; 200; 300; 400) of claim 1, wherein the canopy (106; 206; 306; 406) is substantially symmetrically linked to the mold-support face (104; 204; 304; 404) sufficiently enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

15. The molding-system platen (200; 300; 400) of claim 1, wherein the mold-support face (204; 304; 404) includes an upstanding wall (234; 334; 434) extending posterior of the mold-support face (204; 304; 404), and the canopy (206; 306; 406) is attached to the upstanding wall, the upstanding wall links the canopy (206; 306; 406) to the mold-support face (204; 304; 404).

16. A molding system, comprising:
a molding-system platen (100; 200; 300; 400), including:
a mold-support face (104; 204; 304; 404); and
a canopy (106; 206; 306; 406) linking to and stiffening the mold-support face (104; 204; 304; 404).

17. The molding system of claim 16, wherein the mold-support face (104; 204; 304; 404) includes a border (126; 226; 326; 426), and the canopy (106; 206; 306; 406) stiffens the border (126; 226; 326; 426).

18. The molding system of claim 16, wherein the mold-support face (104; 204; 304; 404) includes a mold-support face (104; 204; 304; 404), and the canopy (106; 206; 306; 406) links to
5 and stiffens the mold-support face (104; 204; 304; 404).

19. The molding system of claim 16, wherein the mold-support face (104; 204; 304; 404) is surrounded by a border (126; 226; 326; 426), and the canopy (106; 206; 306; 406) stiffens the
10 border (126; 226; 326; 426).

20. The molding system of claim 16, wherein the mold-support face (104; 204; 304; 404) includes a force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404), wherein a width of a border (126; 226; 326; 426) surrounding the mold-support face (104; 204; 304; 404) extends from a periphery of the mold-support face (104; 204; 304; 404) to an outer edge of the force-receiving face (124; 224; 324; 424), and the mold-support face (104; 204; 304; 404) is larger than the force-receiving face (124; 224; 324; 424).
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21. The molding system of claim 16, wherein the mold-support face (104; 204; 304; 404) includes a force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404), and a force is divergently transmittable from the force-receiving face (124; 224; 324; 424) across the mold-support face (104; 204; 304; 404).
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22. The molding system of claim 16, wherein the mold-support face (104; 204; 304; 404) includes a force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404), and the force-receiving face (124; 224; 324; 424) includes a pedestal (130; 230; 330; 430) centrally positioned relative to the mold-support face (104; 204; 304; 404), the pedestal (130; 230; 330; 430) is offset from the mold-support face (104; 204; 304; 404).
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23. The molding system of claim 16, wherein the mold-support face (104; 204; 304; 404) includes a force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 224; 324; 424) offset rearward from the mold-support face (104;
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204; 304; 404), and the force-receiving face (124; 224; 324; 424) is configured to receive a force from a force-imparting face (132; 232; 332; 432).

5 24. The molding system of claim 16, wherein the mold-support face (104; 204; 304; 404) includes a base of a frustum-shaped structure having a pedestal (130; 230; 330; 430), the pedestal (130; 230; 330; 430) defines a force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404).

10 25. The molding system of claim 16, wherein the canopy (106; 206; 306; 406) links to a posterior of the mold-support face (104; 204; 304; 404).

15 26. The molding system of claim 16, wherein the canopy (106; 206; 306; 406) improves a moment of inertia of the mold-support face (104; 204; 304; 404) sufficiently enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

20 27. The molding system of claim 16, wherein the canopy (106; 206; 306; 406) is positioned offset rearward proximate of the mold-support face (104; 204; 304; 404) sufficiently enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

25 28. The molding system of claim 16, wherein the canopy (106; 206; 306; 406) has a planar surface (128; 228; 328; 428), the planar surface (128; 228; 328; 428) is sufficiently large enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

30 29. The molding system of claim 16, wherein the canopy (106; 206; 306; 406) has a mass, and the mass is substantial enough to suppress deflection of the mold-support face (104; 204; 304; 404).

404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

30. The molding system of claim 16, wherein the canopy (106; 206; 306; 406) is substantially symmetrically linked to the mold-support face (104; 204; 304; 404) sufficiently enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

31. The molding system of claim 16, wherein the mold-support face (204; 304; 404) includes an upstanding wall (234; 334; 434) extending posterior of the mold-support face (204; 304; 404), and the canopy (206; 306; 406) is attached to the upstanding wall, the upstanding wall links the canopy (206; 306; 406) to the mold-support face (204; 304; 404).

32. The molding system platen of claim 18, wherein the mold-support face (104; 204; 304; 404) includes a force-receiving face (124; 224; 324; 424).

33. A method, comprising:

linking to, and stiffening, a mold-support face (104; 204; 304; 404) with a canopy (106; 206; 306; 406).

34. The method of claim 33, further comprising:

stiffening a border (126; 226; 326; 426) of the mold-support face (104; 204; 304; 404) with the canopy (106; 206; 306; 406).

35. The method of claim 33, further comprising:

linking to and stiffening a mold-support face (104; 204; 304; 404) with a canopy (106; 206; 306; 406).

36. The method of claim 33, further comprising:

surrounding the mold-support face (104; 204; 304; 404) with a border (126; 226; 326; 426); and

linking to and stiffening the border (126; 226; 326; 426) with a canopy (106; 206; 306; 406).

37. The method of claim 33, further comprising:

including a force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404); and

5 surrounding the mold-support face (104; 204; 304; 404) with a border (126; 226; 326; 426) having a width extending from a periphery of the mold-support face (104; 204; 304; 404) to an outer edge of the force-receiving face (124; 224; 324; 424), and the mold-support face (104; 204; 304; 404) is larger than
10 the force-receiving face (124; 224; 324; 424).

38. The method of claim 33, further comprising:

divergently transmitting a force from a force-receiving face (124; 224; 324; 424) across the mold-support face (104; 204; 304; 404), the force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404).

39. The method of claim 33, further comprising:

20 divergently transmitting a force from a force-receiving face (124; 224; 324; 424) across the mold-support face (104; 204; 304; 404), the force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404), the force-receiving face (124; 224; 324; 424) includes a
25 pedestal (130; 230; 330; 430) centrally positioned relative to the mold-support face (104; 204; 304; 404), and the pedestal (130; 230; 330; 430) is offset from the mold-support face (104; 204; 304; 404).

30 40. The method of claim 33, further comprising:

receiving a force from a force-imparting face (132; 232; 332; 432) to a force-receiving face (124; 224; 324; 424) positioned offset rearward from the mold-support face (104; 204; 304; 404).

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41. The method of claim 33, further comprising:

divergently transmitting a force from a force-receiving face (124; 224; 324; 424) across the mold-support face (104; 204; 304; 404), the force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404).

40

404), the mold-support face (104; 204; 304; 404) includes a base of a frustum-shaped structure having a pedestal (130; 230; 330; 430), the pedestal (130; 230; 330; 430) defines a force-receiving face (124; 224; 324; 424) offset rearward from the mold-support face (104; 204; 304; 404).

42. The method of claim 33, further comprising:

linking the canopy (106; 206; 306; 406) to a posterior of the mold-support face (104; 204; 304; 404).

43. The method of claim 33, further comprising:

using the canopy (106; 206; 306; 406) to improve a moment of inertia of the mold-support face (104; 204; 304; 404) sufficiently enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

44. The method of claim 33, further comprising:

positioning the canopy (106; 206; 306; 406) offset rearward proximate of the mold-support face (104; 204; 304; 404) sufficiently enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

45. The method of claim 33, further comprising:

having the canopy (106; 206; 306; 406) include a planar surface (128; 228; 328; 428), the planar surface (128; 228; 328; 428) is sufficiently large enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

46. The method of claim 33, further comprising:

having the canopy (106; 206; 306; 406) include a mass, and the mass is substantial enough to suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force acting to deflect the mold-support face (104; 204; 304; 404).

47. The method of claim 33, further comprising:

substantially symmetrically linking the canopy (106; 206; 306; 406) to the mold-support face (104; 204; 304; 404) sufficiently enough to substantially suppress deflection of the mold-support face (104; 204; 304; 404) responsive to a force
5 acting to deflect the mold-support face (104; 204; 304; 404).

48. The method of claim 33, further comprising:

having the mold-support face (204; 304; 404) include an upstanding wall (234; 334; 434) extending posterior of the
10 mold-support face (204; 304; 404); and

attaching the canopy (206; 306; 406) to the upstanding wall, the upstanding wall links the canopy (206; 306; 406) to the mold-support face (204; 304; 404).

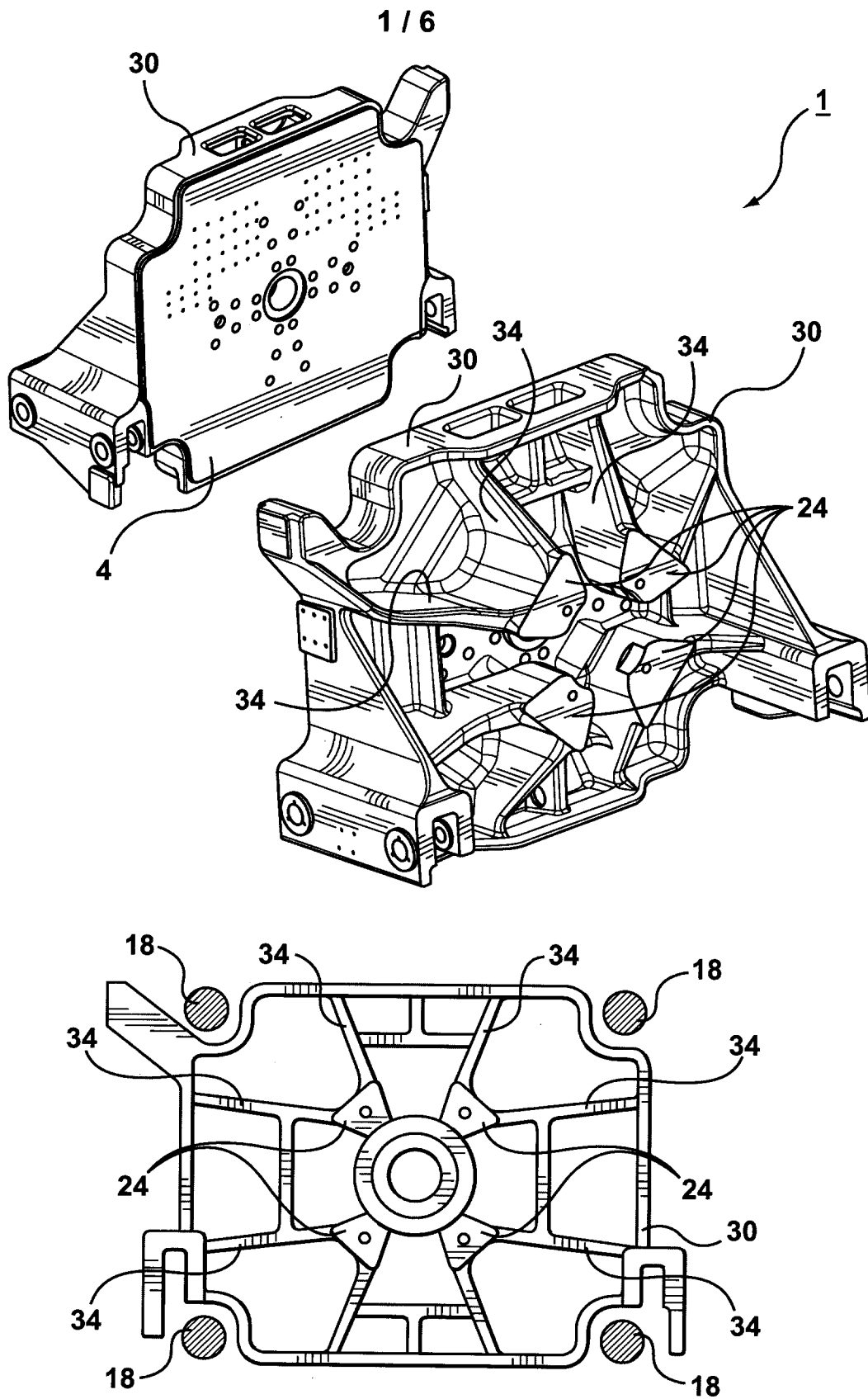


FIG. 1 (PRIOR ART)

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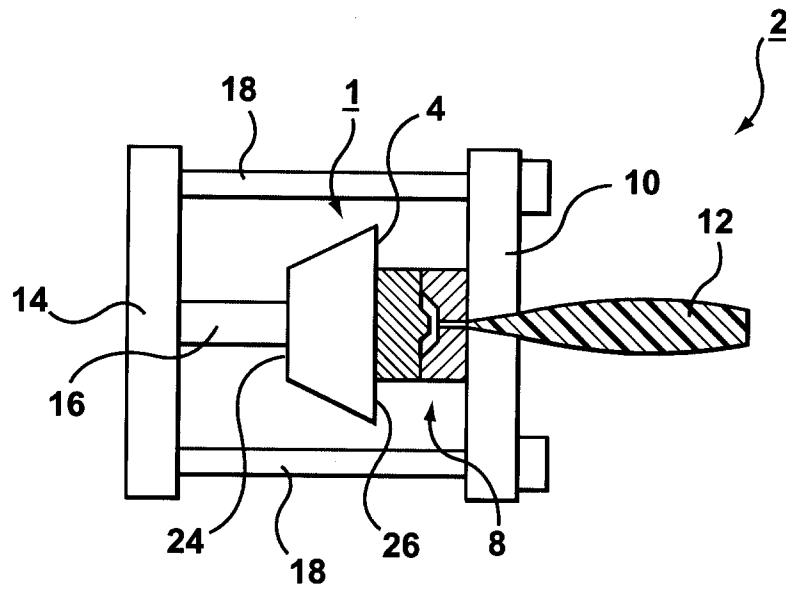


FIG. 2A (PRIOR ART)

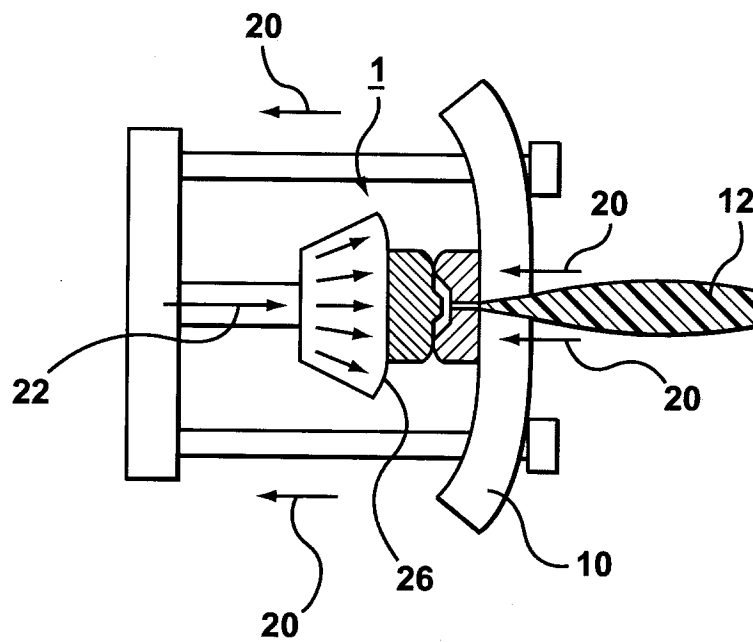


FIG. 2B (PRIOR ART)

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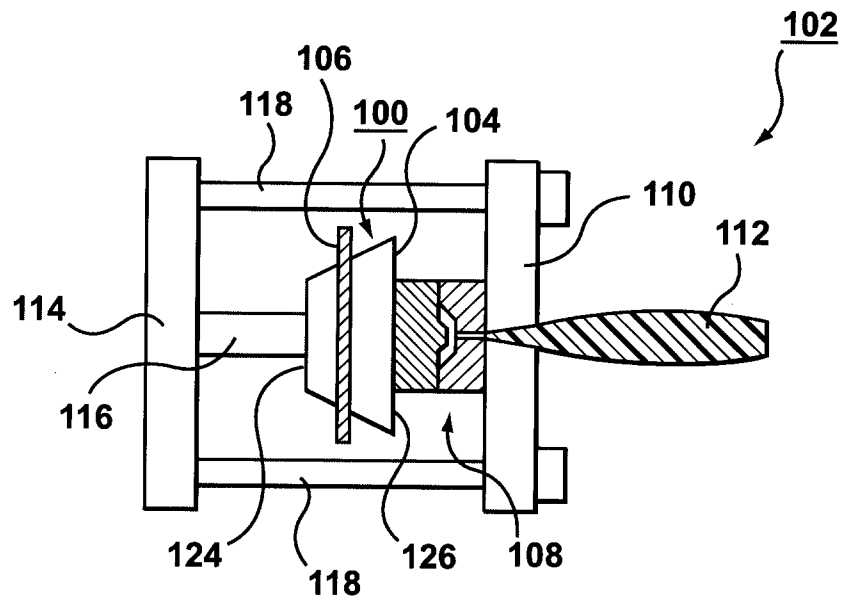


FIG. 3A

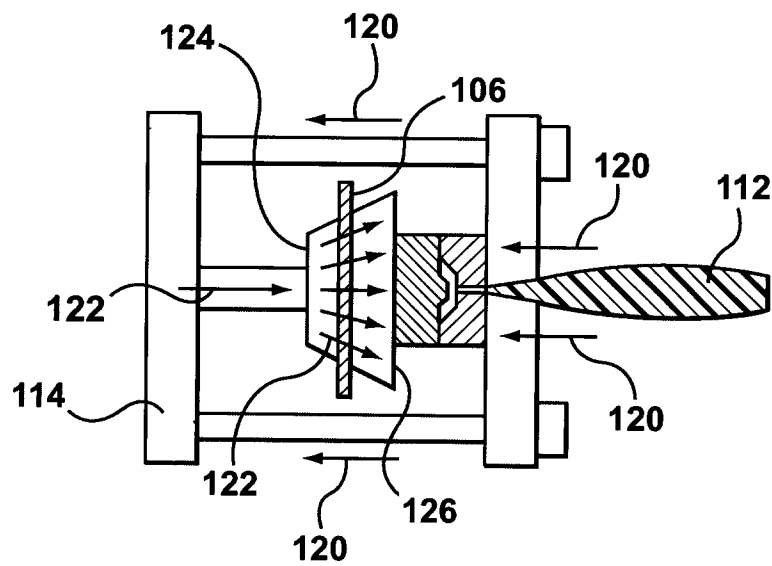
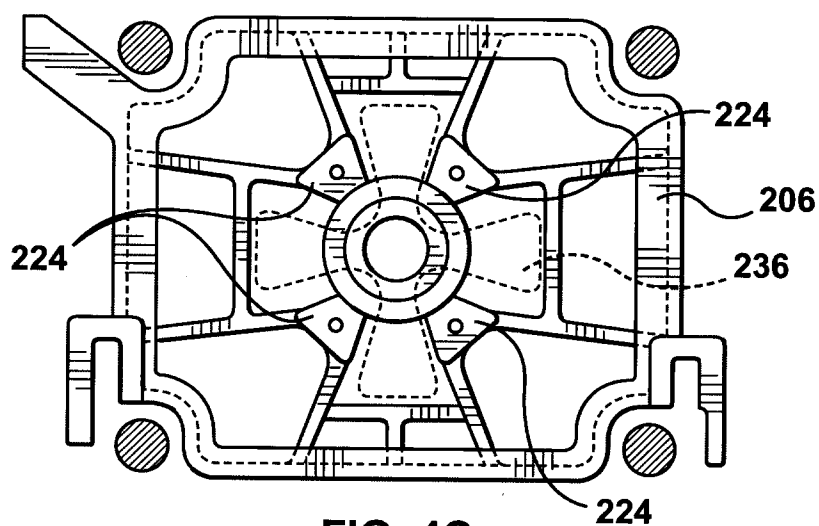
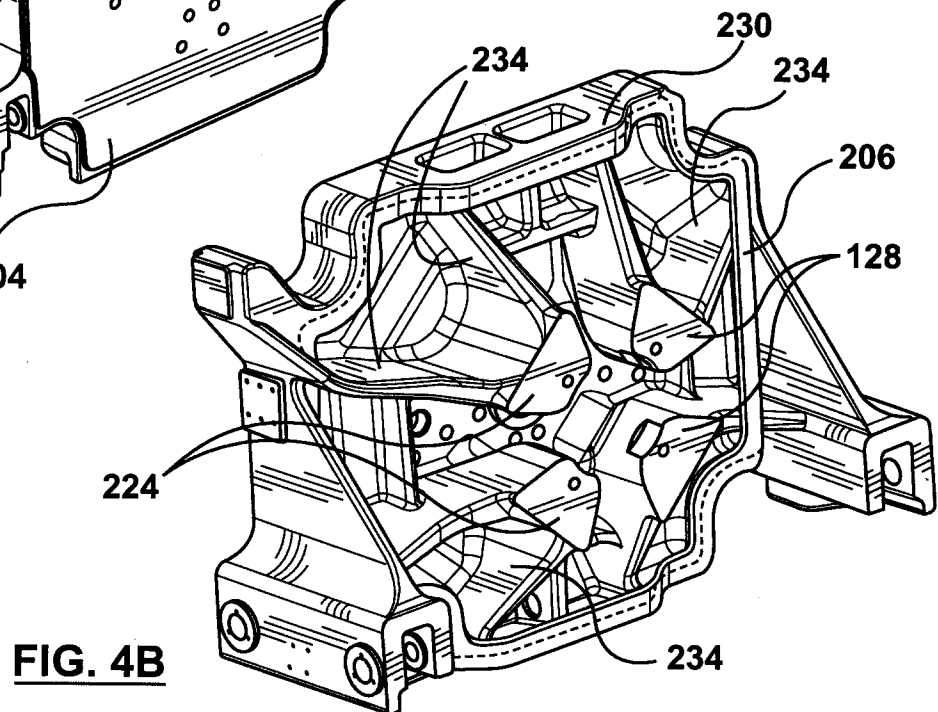
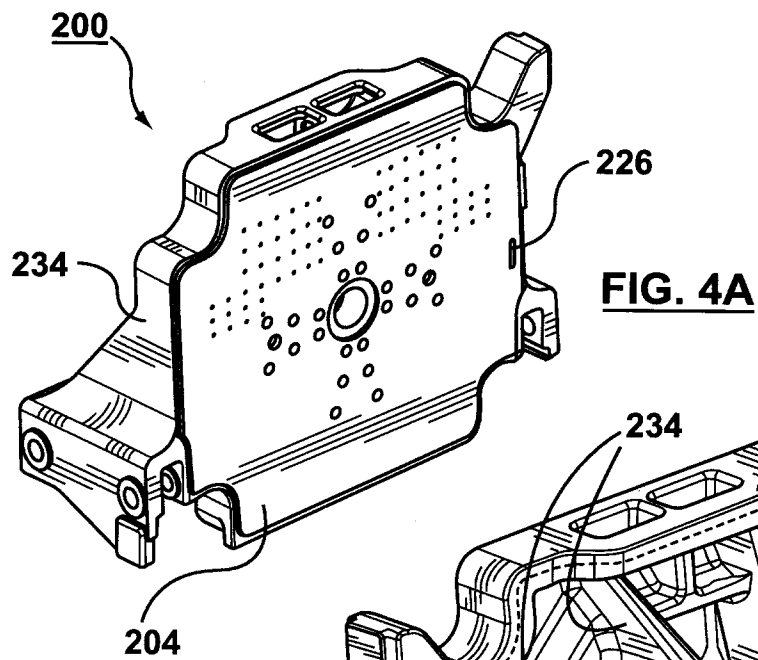


FIG. 3B

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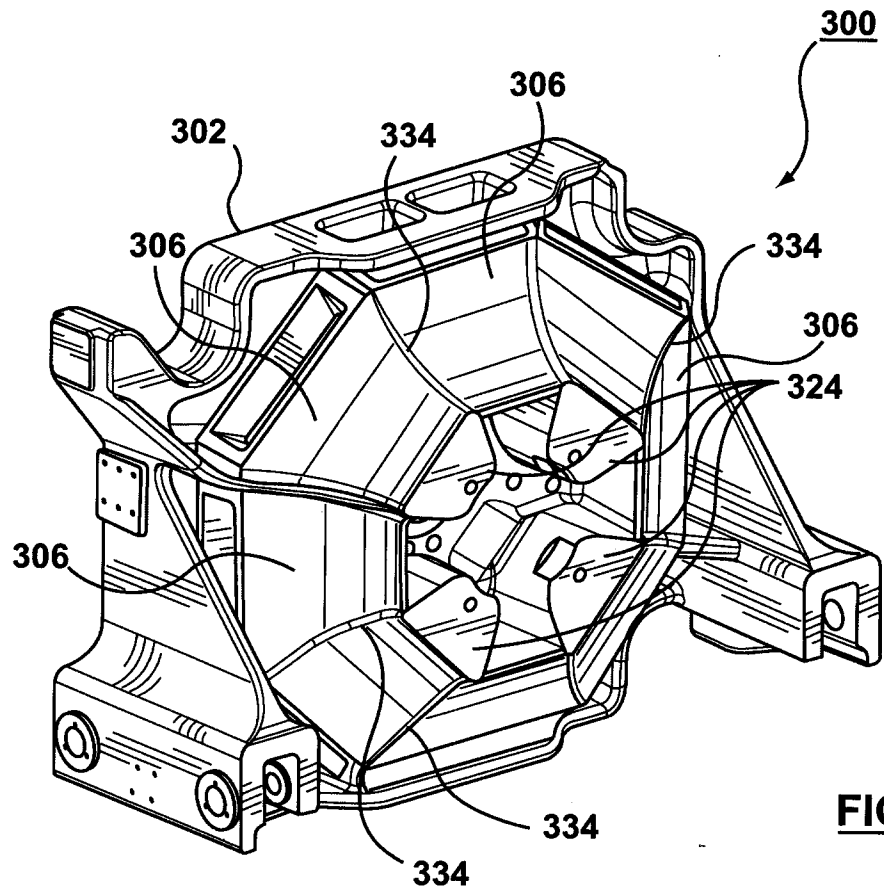


FIG. 5A

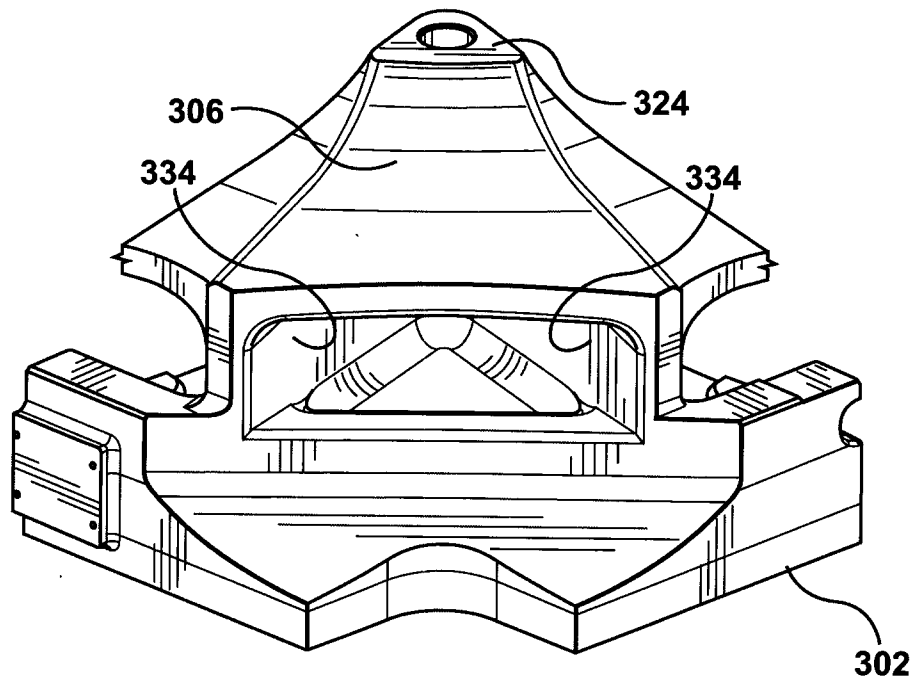
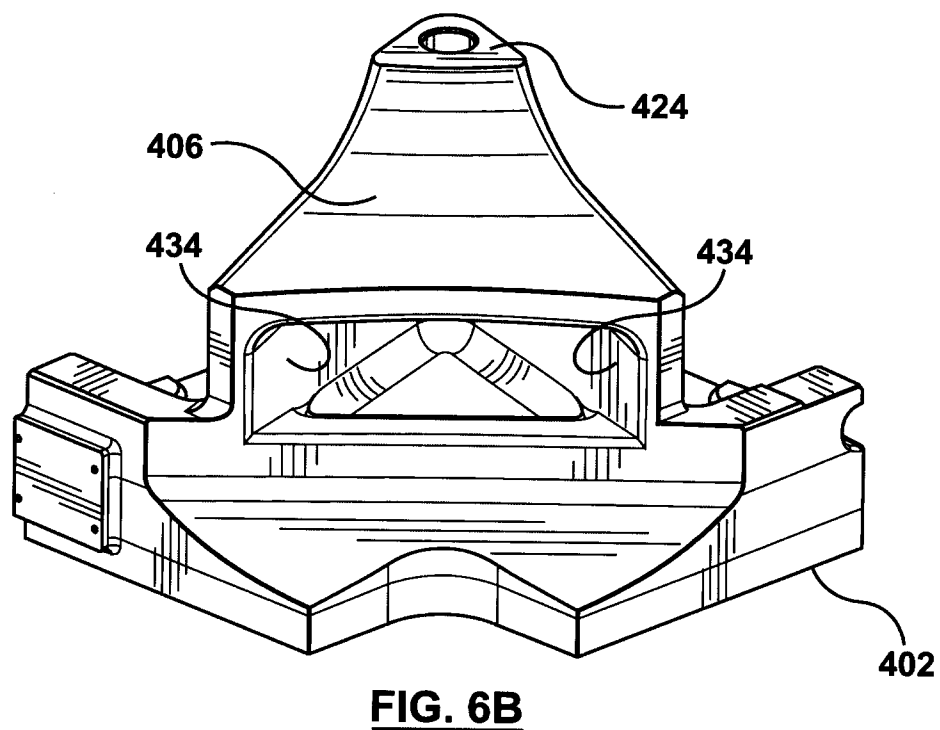
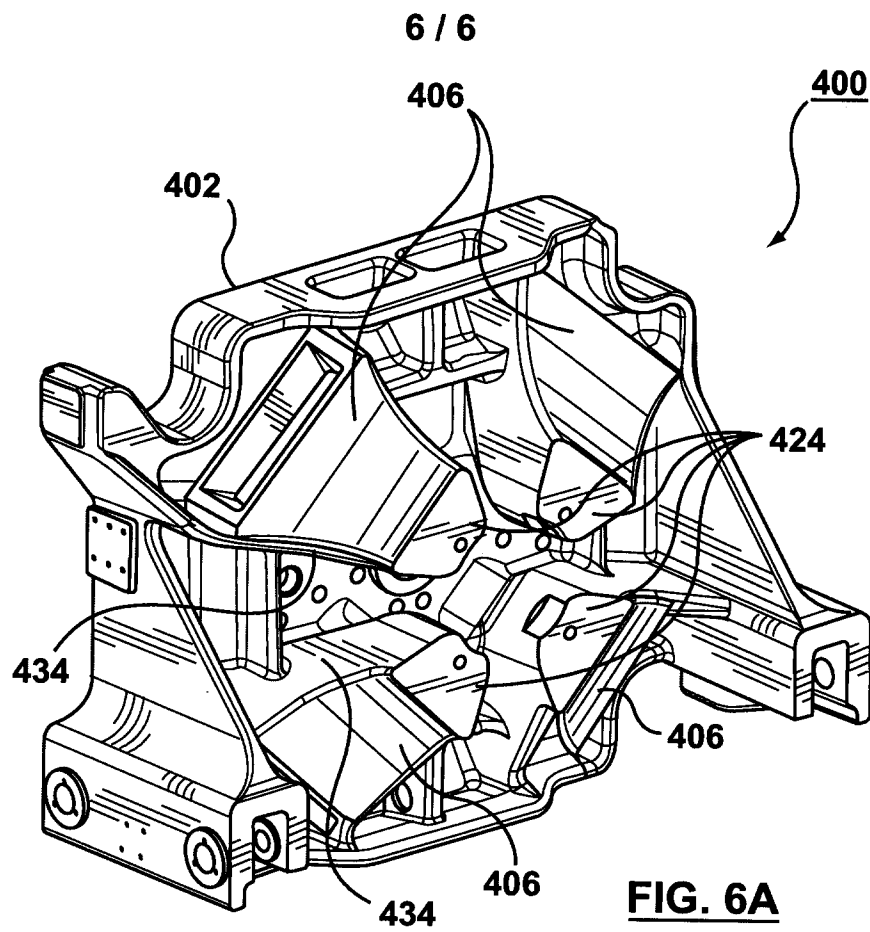


FIG. 5B



INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA2007/000159

A. CLASSIFICATION OF SUBJECT MATTER
IPC: **B29C 45/26** (2006.01) , **B29C 45/17** (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: **B29C 45/*** (2006.01)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)
Delphion, Derwent, Questel-Orbit (Pluspat), CPD with key words, such as: platen, clamping, clamp, rib, support, supporter, supporting, force, deflection, deflecting, warp, warping, bending, structure, transmitting and canopy.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6439876 B1 (GLAESENER, B.) 27 August 2002 (27-08-2002) *cited by applicant* *whole document*	1-48
A	WO 2005/084909 A1 (YOSHIHIKO, N. et al.) 15 September 2005 (15-09-2005) *cited by applicant* *whole document*	1-48
A	US 4571169 (SHIMA, Y. et al.) 18 February 1986 (18-02-1986) *whole document*	1-48

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	
"E" earlier application or patent but published on or after the international filing date	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L" document which may throw doubts on priority claim(s) or which is	"Y" document of particular relevance; the claimed invention cannot be

Date of the actual completion of the international search
10 May 2007 (10-05-2007)

Date of mailing of the international search report
10 May 2007 (10-05-2007)

Name and mailing address of the ISA/CA
Canadian Intellectual Property Office
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50 Victoria Street
Gatineau, Quebec K1A 0C9
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Authorized officer

Pengfei Zhang 819- 953-0654

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CA2007/000159

Information on patent family members

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