

Description

TECHNICAL FIELD

This invention relates to method and system for making a hollow-shaped body from molten resin by injection molding and, in particular, to method and system for making a hollow-shaped body from molten resin by injection molding wherein pressure is relieved within the hollow-shaped body before a mold of the system is opened.

BACKGROUND ART

It is well known in the plastic molding art to use pressurized fluid in conjunction with the injection molding of articles. The pressurized fluid is typically nitrogen gas which is introduced into the molten resin.

Pressurized fluid serves many purposes. First, it allows the article so formed to have hollow interior portions which result in weight and material savings. Secondly, it minimizes the molded in stresses by eliminating high second stage injection pressure. This also reduces part weight in that the gas is used to fill out the part. Thirdly, the pressurized fluid applies outward pressure to force the plastic against the surfaces of the mold cavity while the article is setting up. This enhances surface quality by eliminating sink marks, especially in areas of the article having thicker plastic sections, such as structural ribs or bosses.

Presently, there are two primary methods employed to relieve the internal pressure in a hollow-shaped body while still located in its respective mold. One method is to relieve the gas through the gas-injection supply through the use of valving. One problem with this approach is that the orifice becomes clogged with resin or other contaminants rendering the orifice non-functional and thereby disrupting normal production.

The second method is commonly called sprue break. This method is performed by disengaging the injection nozzle from the sprue bushing of the mold, thereby exposing the gas channel in the sprue to the atmosphere.

The U.S. Patent to Friederich 4,101,617 discloses a method for injection molding of hollow-shaped bodies wherein the pressure is relieved directly into the part. The Friederich patent discloses a sprue break as well as opening the interior of the hollow body to relieve the internal pressure.

The U.S. Patent to Hendry 4,474,717 discloses a fluid-assisted injection molding method and system including a probe having a head with one or more fluid orifices. In one embodiment the probe is retractable. Pressure within the hollow-shaped body is relieved through the probe.

The U.K. Patent Application 2,139,548 discloses an injection molding process wherein pressurized fluid is injected into a stream of plastic material at one or more selected positions in the mold space through a passageway which projects into the path of the molten resin. Pressure within the resulting hollow-shaped body is relieved through the passageway.

DISCLOSURE OF THE INVENTION

An object of the present invention is to provide an improved method and system for making hollow-shaped bodies from molten resin by injection molding, wherein pressure is relieved within the hollow-shaped body by cutting a hole through the cooled resin and into a fluid aperture formed during the method.

In carrying out the above objects and other objects of the present invention, a method for making a hollow-shaped body from a molten resin in an injection molding system is provided. The system includes a mold having an injection aperture and an injection nozzle. The method includes the steps of injecting an amount of molten resin sufficient for the preparation of the hollow-shaped body from the injection nozzle through the injection aperture and along the resin flow path in the mold. Then a fluid is injected into the mold under pressure to distribute the molten resin over the interior surfaces of the mold wherein a fluid aperture in communication with the interior of the hollow-shaped body is formed. The hollow-shaped body is then cooled to a temperature beneath the softening point of the resin and the pressure within the hollow-shaped body is relieved. The pressure is relieved by cutting a hole through the cooled resin into the fluid aperture. Finally, the mold is opened to remove the hollow-shaped body.

The injection molding system constructed in accordance with the present invention further includes a fluid injection mechanism for injecting the fluid and a cutting mechanism which cuts a hole through the cooled resin in communication with the fluid aperture.

Preferably, the cutting mechanism includes a cutting member mounted for movement in a controlled fashion between a molding position and a relieving position within the mold. The cutting member has a surface which at least partially defines the resin flow path.

Also, preferably, the cutting mechanism includes a fluid-relieving aperture formed therein which is in communication with the fluid aperture in the relieving position of the cutting member, so that the pressure is relieved through the fluid-relieving aperture in a controlled fashion in the relieving position of the cutting member.

The advantages accruing to the method and system of the invention are numerous. For example, decompression is controlled to thereby eliminate moldings having stress cracks, warpage and unsightly surfaces.

The objects, features and advantages of the present invention are readily apparent from the following detailed description of the best modes for carrying out the invention when taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a schematic view, partially broken away and in cross-section, of a conventional fluid-assisted injection molding system including a mold in its open position, a source of fluid and its associated control valve and an injection molding machine having a nozzle;

FIGURE 2 is a block diagram illustrating the various steps of the method of the present invention;

FIGURE 3 is an end view, partially broken away and in cross-section, illustrating a first embodiment of the present invention;

FIGURE 4 is a view, partially broken away and in cross-section, illustrating a second embodiment of the present invention;

FIGURE 5 is a view, partially broken away and in cross-section, illustrating a third embodiment of the present invention;

FIGURE 6 is a view, partially broken away and in cross-section, illustrating a fourth embodiment of the present invention;

FIGURE 7 is a view, partially broken away and in cross-section, illustrating a fifth embodiment of the present invention; and

FIGURE 8 is an enlarged view, partially broken away, of a punch pin of FIGURE 7.

BEST MODES FOR CARRYING OUT THE INVENTION

Referring now to FIGURE 1, there is illustrated a conventional gas-assisted injection molding system, generally indicated at 10, for making a plastic body from plastic resin. A general understanding of the different components of the system 10 is useful in understanding the method and system of the present invention.

Briefly, the injection molding system 10 includes an injection molding machine, generally indicated at 12, having a nozzle, generally indicated at 14, for injecting predetermined amounts or shots of molten resin. The injection molding machine 12 includes a hydraulic screw ram 16 which is disposed in a bore 18 formed in a barrel 20 of the injection molding machine 12. The ram 16 plasti-

cizes and advances resin towards the nozzle 14. Upon complete plasticization of the resin, the screw ram 16 is hydraulically advanced towards the threaded portion 22 of the barrel 20 to inject molten plastic through the nozzle 14, as is well known in the art.

The system 10 also includes a pressurized fluid supply 24 which supplies pressurized fluid, (i.e. typically nitrogen gas), to the nozzle 14 through a fluid control valve 26. The valve 26 controls the flow of pressurized fluid from the fluid supply 24 in synchronization with the injection of molten plastic from the nozzle 14, as is also well known in the art.

The system 10 further includes a mold or a mold body, generally indicated at 28. As illustrated in FIGURE 1, the mold 28 comprises a two-plate mold body. One of the plates includes a locating ring 30 for locating the injection end of the nozzle 14. The locating ring 30 is mounted on a clamp plate 32 which, in turn, is fixedly connected to a cavity retainer plate or cavity plate 34. A sprue bushing 36 is disposed within the locating ring 30 and is supported by the clamp plate 32.

Leader pins 38 on the cavity plate 34 provide the male half of the male/female connection of the first plate with the second plate of the two-plate mold 28. In particular, the second plate includes leader pin bushings 49 (only one of which is shown) which slidably receive and retain the leader pins 38 therein in the closed position of the mold 28. The leader pin bushings 40 are retained within a core retainer plate 42. The core retainer plate 42 is fixedly connected to a support plate 44 which, in turn, is connected to an ejector retainer plate 46. The ejector retainer plate 46 is connected to an ejector plate 48 which, in turn, is supported by support pillars 50. The support plate 44 is also fixedly connected to the ends of a U-shaped ejector housing 52 to which the support pillars 50 are also connected.

The plate 46 supports a plurality of return pins 54, ejector pins 56 and a sprue puller pin 58 which extend toward the plate 34 and through the plates 42 and 44. The ejector pins 56 are provided for ejecting parts P formed within the mold 28. The sprue puller pin 58 is aligned with the sprue bushing 36.

As illustrated in FIGURE 1, the parts P are interconnected by a sprue 60, a runner 62 and gates 64 which define a resin flow path from the sprue bushing 36 to cavities 66. Opposing surfaces of male and female mold parts 68 and 70, respectively, define the cavities 66. The mold parts 68 are supported on the plate 46 and the mold parts 70 are supported on the cavity retainer plate 34.

Referring now to FIGURE 2 in combination with FIGURE 3, there is illustrated, in flowchart form,

process steps of the method of the present invention.

In step 96, plastic resin is injected into the mold 28 through an injection aperture formed in the sprue bushing 36.

In step 98, gas is injected into the mold 28 through a fluid aperture 80 under control of the valve 26. However, it is to be understood that the gas may be injected anywhere in the mold 28 and need not be injected through the injection aperture.

In step 100, the gas supports the plastic article or part in the mold cavity 66 against the interior surfaces thereof until the article cools.

In step 102, the gas is vented through an opening formed in the part as described in detail in the embodiment of FIGURES 3 through 7.

In step 104, the mold 28 is opened to remove the part from the mold 28.

Referring now to FIGURE 3, there is illustrated a first embodiment of the present invention having a cutting means or mechanism including a cutting member, generally indicated at 72. The cutting member 72 is in the form of an apertured rotary actuator 72. The rotary actuator 72 may be placed in any relatively "cold area" of the mold 28, such as the sprue, runner or gate. A first mold part 74 of the mold 28 cooperates with the rotary actuator 72 to at least partially define a resin flow path from the sprue bushing 36 to the cavity 66. In particular, both the rotary actuator 72 and the mold part 74 have opposing grooved surfaces 76 and 78, respectively, to form pockets for receiving and retaining the molten resin during injection thereof. Gas is introduced into the resin flow path, for example, through the nozzle 14 into the fluid aperture 80 which is in communication with the interior of the hollow-shaped body.

Obviously, there are numerous choices of gas entry devices possible for controlled gas entry with respect to the part.

After the hollow-shaped body is cooled within the mold to a temperature beneath the softening point of the resin and the resin has solidified within the grooved surfaces 76 and 78, the rotary actuator 72 is actuated to rotate about an axis 82 in controlled fashion from a molding position, illustrated by solid lines in FIGURE 3, to a venting or relieving position, illustrated by phantom lines 84. The lines 84 also define a scrap chute to remove the sheared sucker 97 within the groove 76. In this way, the cooled resin is cut by applying a cutting force tangential to the cold resin. The cutting force consequently is a sheer force. In the position indicated by the phantom line 84, a piece of resin may be removed in any one of a number of ways.

The rotary actuator 72 includes a fluid-relieving aperture 86 which, after rotation of the rotary actuator 72 to the phantom line position 84, is in fluid

communication with the fluid aperture 80 to thereby relieve the pressure within the hollow-shaped body through a vent hole 88, also formed within the actuator 72. The vent hole 88 may be communicated with appropriate valving (not shown) to further control decompression within the hollow-shaped body.

Referring now to FIGURE 4, there is illustrated a second embodiment of the method and system of the present invention. A single prime designation is utilized in FIGURE 4 to the same numbers utilized in FIGURE 3 to indicate a part which is either the same or performs a similar function to the corresponding part in FIGURE 3. The cutting member takes the form of a slide 72' which moves in a linear fashion, rather than in a rotary fashion, as illustrated by the embodiment of FIGURE 3. However, the operation is otherwise substantially identical.

In like fashion, referring now to FIGURE 5, there is illustrated a third embodiment of the method and system of the present invention wherein a double prime designation is given to the same reference numeral which designates the same or similar part or which performs the same or similar function as the corresponding part of FIGURE 3.

In FIGURE 5, a part of the surface 76" is formed by a movable ejector pin, generally indicated at 90. The pin 90 has an inclined surface 92 which cooperates with an inclined surface 94 of a mold part 95 in which the mold part 72" is slidably received in order to eject the sheared sucker 97" of the cooled resin upon movement in the direction of the arrow 82".

Referring now to FIGURE 6, there is illustrated a fourth embodiment of the method and system of the present invention wherein again the same or similar part to the corresponding part illustrated in FIGURES 3 through 5 has the same reference numeral, except it has a triple prime designation.

In the embodiment of FIGURE 6, a cylinder 99 is secured to the mold by mounting bolts 101. The cylinder 99 has a shaft 103 which is threadedly secured to the mold part 72"" so that retraction of the shaft 103 causes the mold part 72"" to move in the direction of the arrow 82"". In this way, again a hole is cut in the cooled resin in order to relieve the pressure within the hollow-shaped body.

Referring now to FIGURE 7, there is illustrated a fifth embodiment of the method and system of the present invention wherein the same or similar parts to any of the parts of FIGURES 3 through 6 are illustrated by a quadruple primed numeral.

The cutting member 72"" is a punch pin which is linearly movable by the cylinder 99"". The pin is slidably supported within the mold by a plug and guide bushing 105 which is threadedly secured in the mold. In turn, the bushing 105 is secured within

the mold by a threaded screw plug 107.

The punch pin includes vent flats 86"" to permit controlled venting of the body. The vent flats 86"" are in communication with vent holes 88"" formed in the bushing 105 in the extended position of the punch pin.

The advantages accruing to the method and system of the invention are numerous. For example, decompression is controlled to thereby eliminate moldings having stress cracks, warpage and unsightly surfaces.

While the best modes for carrying out the invention has herein been described in detail, those familiar with the art to which this invention relates will recognize various alternative designs and embodiments for practicing the present invention as defined by the following claims.

Claims

1. A method for making a hollow-shaped body from molten resin in an injection molding system (10) including a mold (28) having an injection aperture and an injection nozzle (14), the method comprising the steps of:-

injecting an amount of molten resin sufficient for the preparation of said hollow-shaped body from said injection nozzle (14) through said injection aperture and along a resin flow path which extends from an injection sprue bushing (36) to a mold cavity;

injecting a fluid under pressure into said resin flow path to distribute the molten resin over the interior surface of said mold cavity (28) and thereby forming a fluid aperture (80) in said resin flow path and in communication with hollow spaces formed within the interior of said hollow-shaped body;

relieving the fluid pressure within the hollow-shaped body by moving a cutting member (72), which partially defines said resin flow path, relative to said resin flow path, thereby cutting a hole through said resin in said resin flow path such that said hole communicates with said fluid aperture (80) and aligning a fluid pressure relieving conduit (86) at least partially defined by said cutting member with said hole such that said fluid pressure relieving conduit (86) communicates with said fluid aperture through said resin flow path and allowing said fluid within said hollow spaces to be exhausted through said fluid pressure relieving conduit (86); and

opening the mold to remove the hollow-shaped body.

2. The method as claimed in claim 1 further comprising the step of controlling the flow of

fluid during the step of relieving.

3. The method as claimed in claim 1 wherein the cutting member (72) applies a cutting force tangential to the cooled resin whereby the cutting force is a shear force, or wherein the cutting member applies a cutting force substantially perpendicular to the cooled resin.
4. An injection molding system (10) for making a hollow-shaped body from molten resin, the system including a mold (28) having an injection aperture, an injection molding machine (12) having a nozzle (14) for injecting an amount of molten resin sufficient for the preparation of the hollow-shaped body from the injection nozzle (14), through the injection aperture and along a resin flow path, and fluid injection means for injecting a fluid under pressure through a fluid aperture to distribute the molten resin over the interior surfaces of the mold wherein the hollow-channel in communication with the interior of the hollow-shaped body is formed, characterised by a movable cutting means (72) at least partially defining said resin flow path and at least partially defining a fluid pressure relieving conduit (84) for cutting a hole through the resin and aligning said conduit (84) with said hole such that said hole communicates with the fluid aperture to relieve the pressure within the hollow-shaped body.
5. The system as claimed in claim 4 wherein the mold has a mold cavity in communication with the resin flow path for forming the hollow-shaped body and wherein the hole is cut in the cooled resin upstream of the cavity.
6. The system as claimed in claim 4 further comprising means for controlling the flow of fluid from the fluid aperture, said means for controlling preferably including a valve for controlling the flow of fluid.
7. The system as claimed in claim 4 wherein said cutting means includes a cutting member (72) mounted for movement in a controlled fashion between a molding position and a relieving position within said mold.
8. The system as claimed in claim 7 wherein said cutting member includes a pocket (76) formed in the surface and wherein resin is received and retained within said pocket (76) during injection of the molten resin.



the mold by a threaded screw plug 107.

The punch pin includes vent flats 86''' to permit controlled venting of the body. The vent flats 86''' are in communication with vent holes 88''' formed in the bushing 105 in the extended position of the punch pin.

The advantages accruing to the method and system of the invention are numerous. For example, decompression is controlled to thereby eliminate moldings having stress cracks, warpage and unsightly surfaces.

While the best modes for carrying out the invention has herein been described in detail, those familiar with the art to which this invention relates will recognize various alternative designs and embodiments for practicing the present invention as defined by the following claims.

Claims

1. A method for making a hollow-shaped body from molten resin in an injection molding system (10) including a mold (28) having an injection aperture and an injection nozzle (14), the method comprising the steps of:-

injecting an amount of molten resin sufficient for the preparation of said hollow-shaped body from said injection nozzle (14) through said injection aperture and along a resin flow path which extends from an injection sprue bushing (36) to a mold cavity;

injecting a fluid under pressure into said resin flow path to distribute the molten resin over the interior surface of said mold cavity (28) and thereby forming a fluid aperture (80) in said resin flow path and in communication with hollow spaces formed within the interior of said hollow-shaped body;

relieving the fluid pressure within the hollow-shaped body by moving a cutting member (72), which partially defines said resin flow path, relative to said resin flow path, thereby cutting a hole through said resin in said resin flow path such that said hole communicates with said fluid aperture (80) and aligning a fluid pressure relieving conduit (86) at least partially defined by said cutting member with said hole such that said fluid pressure relieving conduit (86) communicates with said fluid aperture through said resin flow path and allowing said fluid within said hollow spaces to be exhausted through said fluid pressure relieving conduit (86); and

opening the mold to remove the hollow-shaped body.

2. The method as claimed in claim 1 further comprising the step of controlling the flow of

fluid during the step of relieving.

3. The method as claimed in claim 1 wherein the cutting member (72) applies a cutting force tangential to the cooled resin whereby the cutting force is a shear force, or wherein the cutting member applies a cutting force substantially perpendicular to the cooled resin.
4. An injection molding system (10) for making a hollow-shaped body from molten resin, the system including a mold (28) having an injection aperture, an injection molding machine (12) having a nozzle (14) for injecting an amount of molten resin sufficient for the preparation of the hollow-shaped body from the injection nozzle (14), through the injection aperture and along a resin flow path, and fluid injection means for injecting a fluid under pressure through a fluid aperture to distribute the molten resin over the interior surfaces of the mold wherein the hollow-channel in communication with the interior of the hollow-shaped body is formed, characterised by a movable cutting means (72) at least partially defining said resin flow path and at least partially defining a fluid pressure relieving conduit (84) for cutting a hole through the resin and aligning said conduit (84) with said hole such that said hole communicates with the fluid aperture to relieve the pressure within the hollow-shaped body.
5. The system as claimed in claim 4 wherein the mold has a mold cavity in communication with the resin flow path for forming the hollow-shaped body and wherein the hole is cut in the cooled resin upstream of the cavity.
6. The system as claimed in claim 4 further comprising means for controlling the flow of fluid from the fluid aperture, said means for controlling preferably including a valve for controlling the flow of fluid.
7. The system as claimed in claim 4 wherein said cutting means includes a cutting member (72) mounted for movement in a controlled fashion between a molding position and a relieving position within said mold.
8. The system as claimed in claim 7 wherein said cutting member includes a pocket (76) formed in the surface and wherein resin is received and retained within said pocket (76) during injection of the molten resin.



9. The system as claimed in claim 8 further comprising actuating means for moving said cutting member (72) to cut the hole in the resin and optionally further comprising a vent (88) for communicating the fluid aperture in the relieving position of the cutting member (72).

10. The system as claimed in claim 7 wherein said cutting member (72) is movable linearly.

11. The system as claimed in claim 7 wherein said cutting member (72) is movable in a rotary fashion and wherein the cutting means optionally includes a fluid-relieving aperture formed therein and wherein the pressure is relieved through the fluid-relieving aperture, said fluid relieving aperture being in communication with the fluid aperture in the relieving position of the cutting member.

Patentansprüche

1. Verfahren zum Herstellen eines hohlgeformten Körpers aus geschmolzenem Harz mittels eines Spritzgießsystems (10) mit einer Form (28), die eine Einspritzöffnung und eine Einspritzdüse (14) aufweist, mit den Schritten:

Einspritzen einer geschmolzenen Harzmenge, die zum Herstellen des hohlgeformten Körpers ausreicht, ausgehend von der Einspritzdüse (14) durch die Einspritzöffnung, entlang einem Harzfließweg, der sich von einer Angußbuchse (36) zu einem Formhohlraum erstreckt;

Einspritzen eines unter Druck stehenden Fluids in den Harzfließweg, um das geschmolzene Harz über die innere Oberfläche des Formhohlraums (28) zu verteilen und dadurch eine Fluidöffnung (80) im Harzfließweg zu formen, die mit innerhalb des Inneren des hohlgeformten Körpers gebildeten Hohlräumen in Verbindung steht;

Entlasten des Fluiddrucks innerhalb des hohlgeformten Körpers durch Bewegen eines Schneidelements (72), das teilweise den Harzfließweg begrenzt, relativ zu dem Harzfließweg, wodurch eine Öffnung in das Harz in dem Harzfließweg geschnitten wird derart, daß die Öffnung mit der Fluidöffnung in Verbindung steht und daß eine Fluiddruckentlastungsleitung (86), die wenigstens teilweise durch das Schneidelement gebildet wird, mit der Öffnung ausgerichtet wird, so daß die Fluiddruckentlastungsleitung (86) mit der Fluidöffnung über den Harzfließweg in Verbindung steht, wodurch das Fluid innerhalb der Hohlräume durch die Fluiddruckentlastungsleitung (86) abfließen kann;

und

Öffnen der Form, um den Körper zu entformen.

2. Verfahren nach Anspruch 1 mit dem zusätzlichen Schritt, daß der Fluidstrom während der Druckentlastung gesteuert wird.

3. Verfahren nach Anspruch 1, bei dem das Schneidelement eine tangential zu dem gekühlten Harz gerichtete Schneidkraft ausübt, wodurch die Schneidkraft eine Scherkraft ist, oder bei der das Schneidelement eine Schneidkraft im wesentlichen senkrecht auf das gekühlte Harz ausübt.

4. Spritzgießsystem (10) zum Herstellen eines hohlgeformten Körpers aus geschmolzenen Harz mit einer Form (28), die eine Einspritzöffnung, aufweist, mit einer Spritzgießmaschine (12), die eine Spritzdüse (14) aufweist, um eine geschmolzene Harzmenge, die zum Herstellen des hohlgeformten Körpers ausreicht, ausgehend von der Einspritzdüse (14), durch die Einspritzöffnung und entlang einem Harzfließweg einzuspritzen, und mit Fluideinspritzmitteln zum Einbringen eines unter Druck stehenden Fluids durch eine Fluidöffnung, um das geschmolzene Harz über die Innenoberflächen der Form zu verteilen, wo der hohle Kanal, der mit dem Inneren des hohlgeformten Körpers in Verbindung steht, geformt wird, gekennzeichnet durch bewegliche Schneidmittel (72), die wenigstens teilweise den Harzfließweg begrenzen und wenigstens teilweise eine Fluiddruckentlastungsleitung bilden zum Schneiden einer Öffnung durch das Harz und zum Ausrichten der Fluiddruckentlastungsleitung (84) mit der Öffnung, so daß die Öffnung mit der Fluidöffnung in Verbindung steht, um eine Druckentlastung in dem hohlgeformten Körper zu bewirken.

5. Spritzgießsystem nach Anspruch 4, bei dem die Form einen Formhohlraum aufweist, der mit dem Harzfließweg zum Formen des hohlgeformten Körpers in Verbindung steht und bei dem die Öffnung in das gekühlte Harz stromaufwärts von dem Formhohlraum eingeschnitten wird.

6. Spritzgießsystem nach Anspruch 4 mit zusätzlichen Mitteln zum Steuern des Fluidflusses durch die Fluidöffnung, wobei die Mittel zum Steuern vorzugsweise ein Ventil zum Steuern des Fluidflusses aufweisen.

7. Spritzgießsystem nach Anspruch 4, bei dem das Mittel zum Schneiden ein Schneidelement



(72) aufweist, das in der Form gesteuert beweglich ist zwischen einer Formstellung und einer Entlastungsstellung.

8. Spritzgießsystem nach Anspruch 7, bei dem das Schneidelement eine in der Oberfläche gebildete Tasche (76) aufweist, in der Harz während des Einspritzens des geschmolzenen Harzes aufgenommen und gehalten wird.
9. Spritzgießsystem nach Anspruch 8 mit zusätzlichen Betätigungsmitteln zum Bewegen des Schneidelements (72) zum Schneiden einer Öffnung in das Harz und wahlweise zusätzlich mit einer Entlüftungsbohrung (88), zum Herstellen einer Verbindung mit der Fluidöffnung in der Entlastungsstellung des Schneidelements (72).
10. Spritzgießsystem nach Anspruch 7, bei dem das Schneidelements linear beweglich ist.
11. Spritzgießsystem nach Anspruch 7, bei dem das Schneidelement (72) drehbeweglich ist und bei dem die Schneidmittel wahlweise eine darin geformte Druckentlastungsöffnung aufweisen, wobei der Druck durch die Druckentlastungsöffnung entlastet wird, wenn die Fluid-druckentlastungsöffnung mit der Fluidöffnung in der Entlastungsstellung des Schneidelements in Verbindung steht.

Revendications

1. Procédé de fabrication d'un corps de conformation creuse à partir de résine fondue dans un système de moulage par injection (10) comprenant un moule (28) ayant une ouverture d'injection et une buse d'injection (14), le procédé comportant les étapes consistant à :
 - injecter une quantité de résine fondue suffisante pour la préparation dudit corps de conformation creuse à partir de ladite buse d'injection (14) au travers de l'ouverture d'injection et le long d'une trajectoire d'écoulement de résine qui s'étend à partir d'un mandrin de coulée (36) vers une cavité de moule ;
 - injecter un fluide sous pression dans ladite trajectoire d'écoulement de résine pour distribuer la résine fondue sur la surface interne de ladite cavité de moule (28) et former ainsi une ouverture de fluide (80) dans ladite trajectoire d'écoulement de résine et en communication avec des espaces creux formés à l'intérieur dudit corps de conformation creuse ;

- relâcher la pression du fluide dans le corps de conformation creuse en déplaçant un organe de coupe (72), qui définit partiellement ladite trajectoire d'écoulement de la résine, par rapport à ladite trajectoire d'écoulement de la résine, en découpant ainsi un trou au travers de ladite résine dans ladite trajectoire d'écoulement de résine de manière que ledit trou communique avec ladite ouverture de fluide (80) et en alignant un conduit de relâchement de pression de fluide (86), défini au moins partiellement par ledit organe de coupe avec ledit trou, afin que ledit conduit de relâchement de pression de fluide (86) communique avec ladite ouverture de fluide, par l'intermédiaire de ladite trajectoire d'écoulement de résine et en permettant audit fluide dans lesdits espaces creux de s'échapper au travers de la conduite de relâchement de pression de fluide (86), et
- ouvrir le moule pour enlever le corps creux.

2. Procédé selon la revendication 1 comprenant en outre l'étape qui consiste à contrôler l'écoulement de fluide pendant l'étape de relâchement.
3. Procédé selon la revendication 1 dans lequel l'organe de coupe (72) applique une force de coupe tangentielle à la résine refroidie afin que la force de coupe soit un effort tranchant ou selon lequel l'organe de coupe applique une force de coupe sensiblement perpendiculaire à la résine refroidie.
4. Système de moulage par injection (10) pour la fabrication d'un corps de conformation creuse à partir de résine fondue, le système comprenant un moule (28) ayant une ouverture d'injection, une machine de moulage par injection (12) ayant une buse (14) pour injecter une quantité de résine fondue suffisante pour la préparation du corps creux à partir de la buse d'injection (14), au travers de l'ouverture d'injection et le long d'une trajectoire d'écoulement de résine et des moyens d'injection de fluide pour injecter un fluide sous pression au travers d'une ouverture de fluide afin de distribuer la résine fondue sur les surfaces internes du moule en formant ainsi un canal creux en communication avec l'intérieur du corps creux, caractérisé par des moyens de coupe mobiles (72) définissant au moins partiellement ladite trajectoire d'écoulement de résine et définissant au moins partiellement un conduit de relâ-



chement de pression de fluide (84) pour découper un trou au travers de la résine et aligner ledit conduit (84) avec ledit trou afin que ledit trou communique avec l'ouverture de fluide pour relâcher la pression dans le corps creux.

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5. Système selon la revendication 4 dans lequel le moule comporte une cavité de moule en communication avec la trajectoire d'écoulement de résine pour former le corps creux et dans lequel le trou est découpé dans la résine refroidie en amont de la cavité. 10
6. Système selon la revendication 4 comprenant en outre des moyens pour contrôler l'écoulement du fluide à partir de l'ouverture pour fluide, lesdits moyens de contrôle comportant de préférence une vanne de commande de l'écoulement du fluide. 15
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7. Système selon la revendication 4 dans lequel lesdits moyens de coupe comprennent un organe de coupe (72) monté de manière à se déplacer en mode contrôlé entre une position de moulage et une position de relâchement dans ledit moule. 25
8. Système selon la revendication 7 dans lequel ledit organe de coupe comporte une poche (76) formée dans la surface et selon lequel la résine est admise et retenue dans ladite poche (76) lors de l'injection de la résine fondue. 30
9. Système selon la revendication 8 comprenant en outre des moyens d'actionnement pour déplacer ledit organe de coupe (72) afin de découper le trou dans la résine et comprenant éventuellement en outre un évent (88) pour la communication avec l'ouverture de fluide dans la position de relâchement de l'organe de coupe (72). 35
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10. Système selon la revendication 7 dans lequel ledit organe de coupe (72) est mobile linéairement. 45
11. Système selon la revendication 7 dans lequel ledit organe de coupe (72) est mobile de façon rotative et dans lequel les moyens de coupe comprennent éventuellement une ouverture de relâchement de fluide qui y est formée et dans lequel la pression est relâchée au travers de l'ouverture de relâchement de fluide, ladite ouverture de relâchement de fluide étant en communication avec l'ouverture de fluide dans la position de relâchement de l'organe de coupe. 50
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