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[54] **MOLD HAVING VENT PASSAGEWAYS TO OBVIATE TRIMMING OF FLASH**

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[52] **U.S. Cl.** .... **425/4 R**; 249/141; 425/225; 425/546; 425/812; 425/817 R

[58] **Field of Search** .... 425/4 R, 225, 425/546, 812, 817 R; 249/141; 264/328.9

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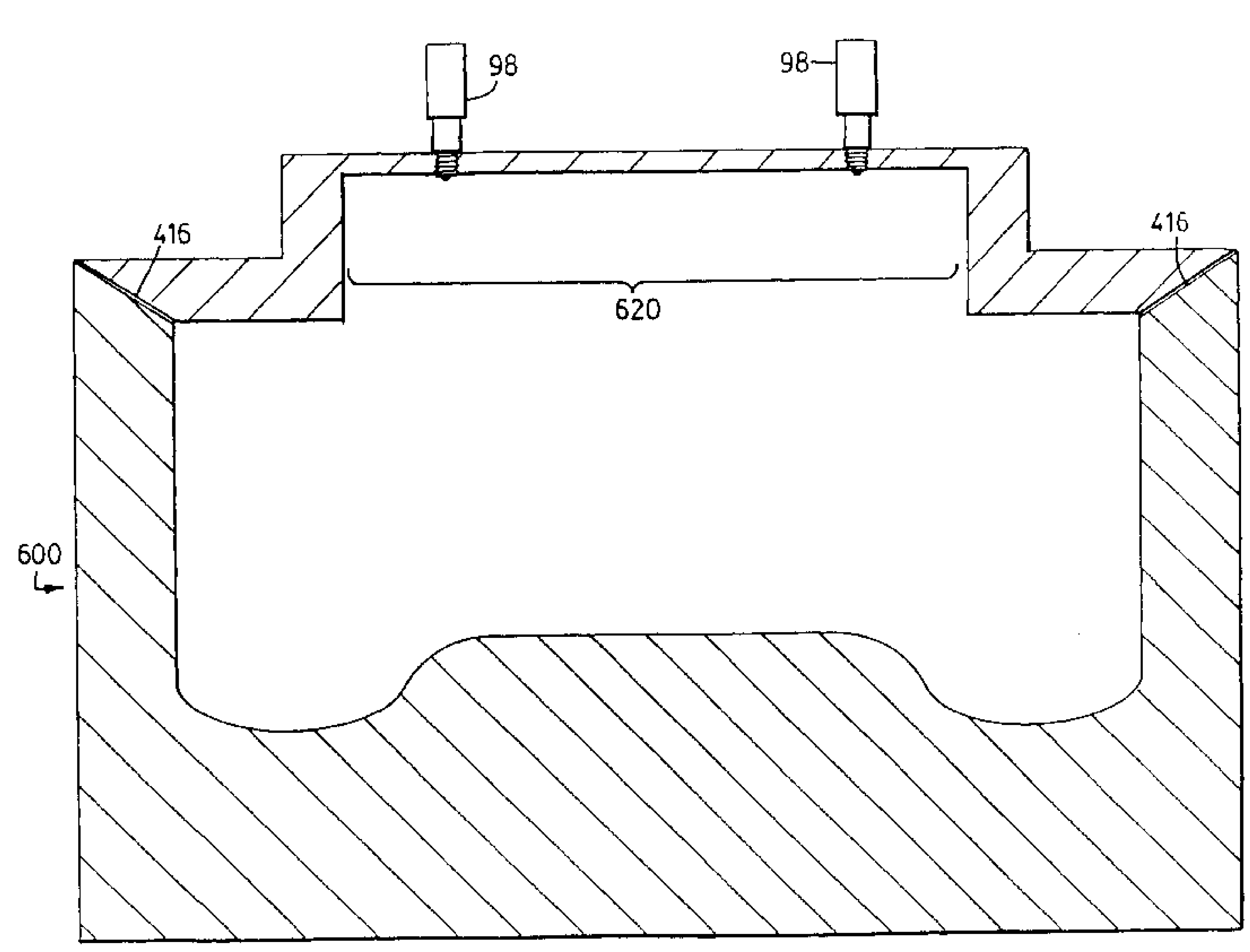
[57] **ABSTRACT**

A mold for producing foamed articles includes an upper mold and a lower mold which define a mold cavity. A vent is provided in communication with the mold cavity and has a vent passageway with an entrance and an exit. Structure is also provided for sealingly engaging the upper mold with the lower mold to cause, in cooperation with the predetermined size and shape of the vent passageway, liquid foam polymeric composition expanding inside the mold cavity to enter the vent entrance but to not exit from the vent exit to cause at least partial curing of the foam composition within the vent passageway. Preferably, the vent may be ribbon-shaped so that a ribbon of foamed composition adheres to the foamed article and may be folded flat against the article thus avoiding the labor step of trimming the flash from the product. Additionally, [or alternatively,] the vent may include a vent passageway with an obstruction disposed therein to provide one or more openings between the outer surface of the obstruction and the inner surface of the vent passageway. The foam composition in these openings may be expelled by driving the obstruction axially within the passageway. Again, the labor step of hand trimming the flash is avoided.

16 Claims, 7 Drawing Sheets



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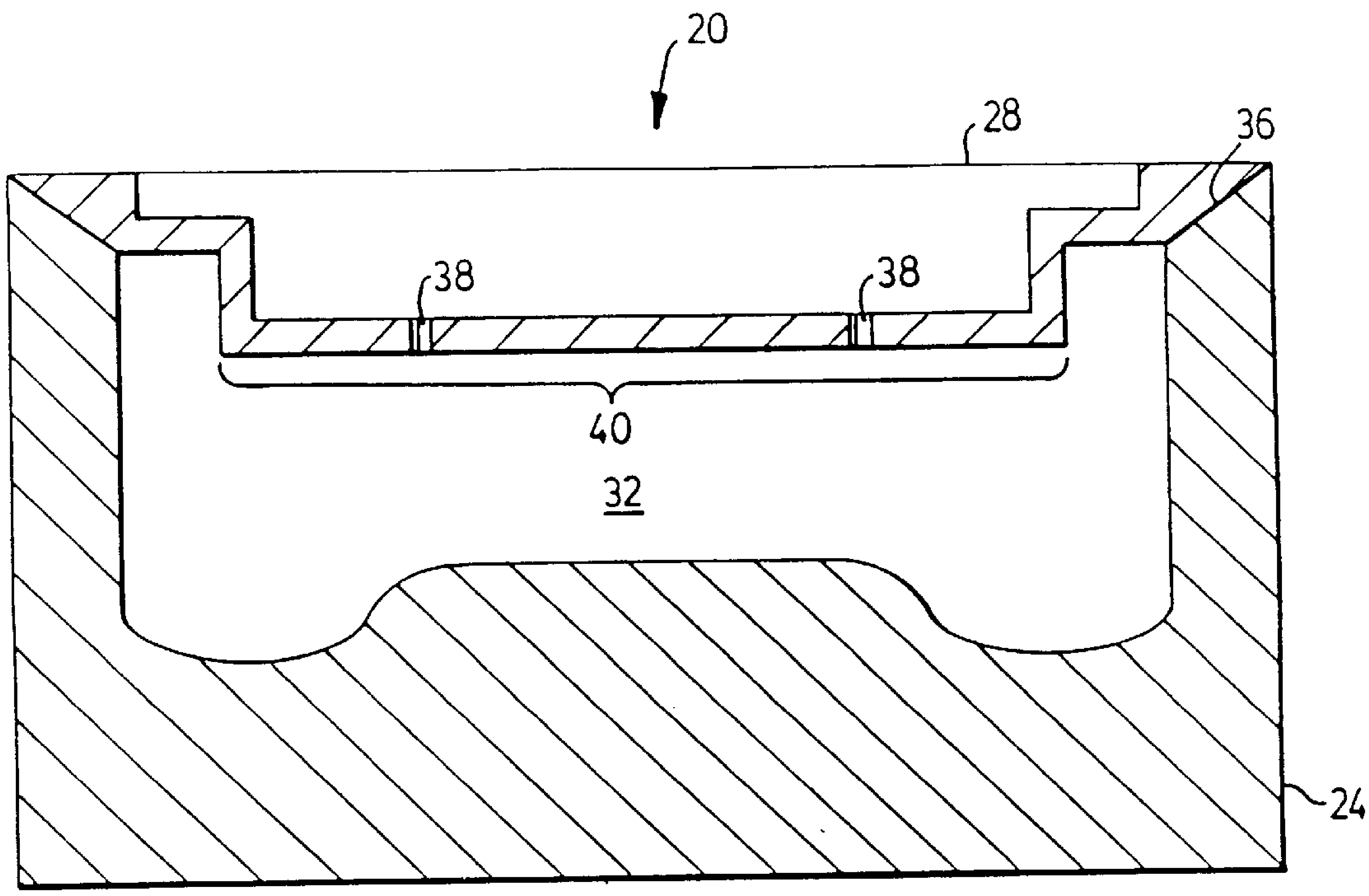

FIG.1

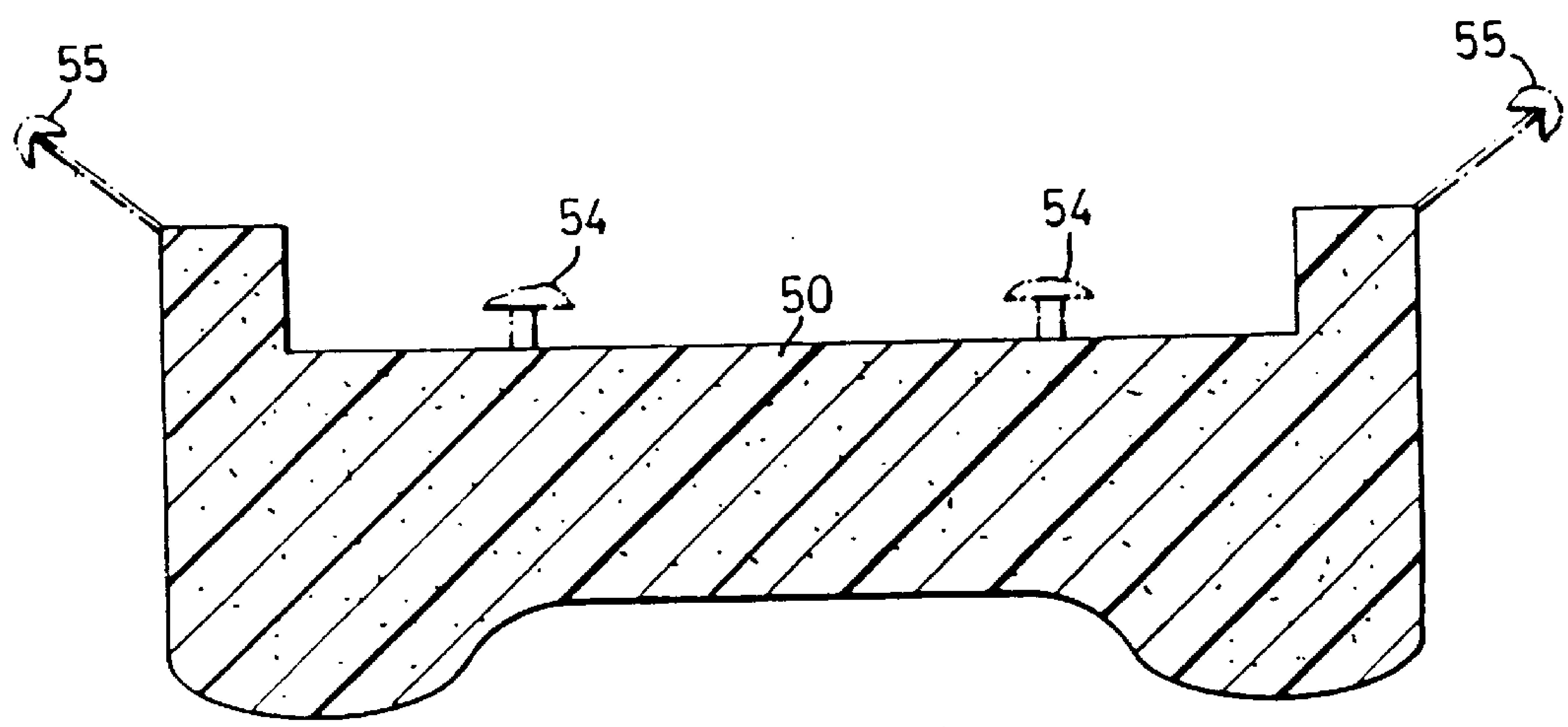

FIG.2

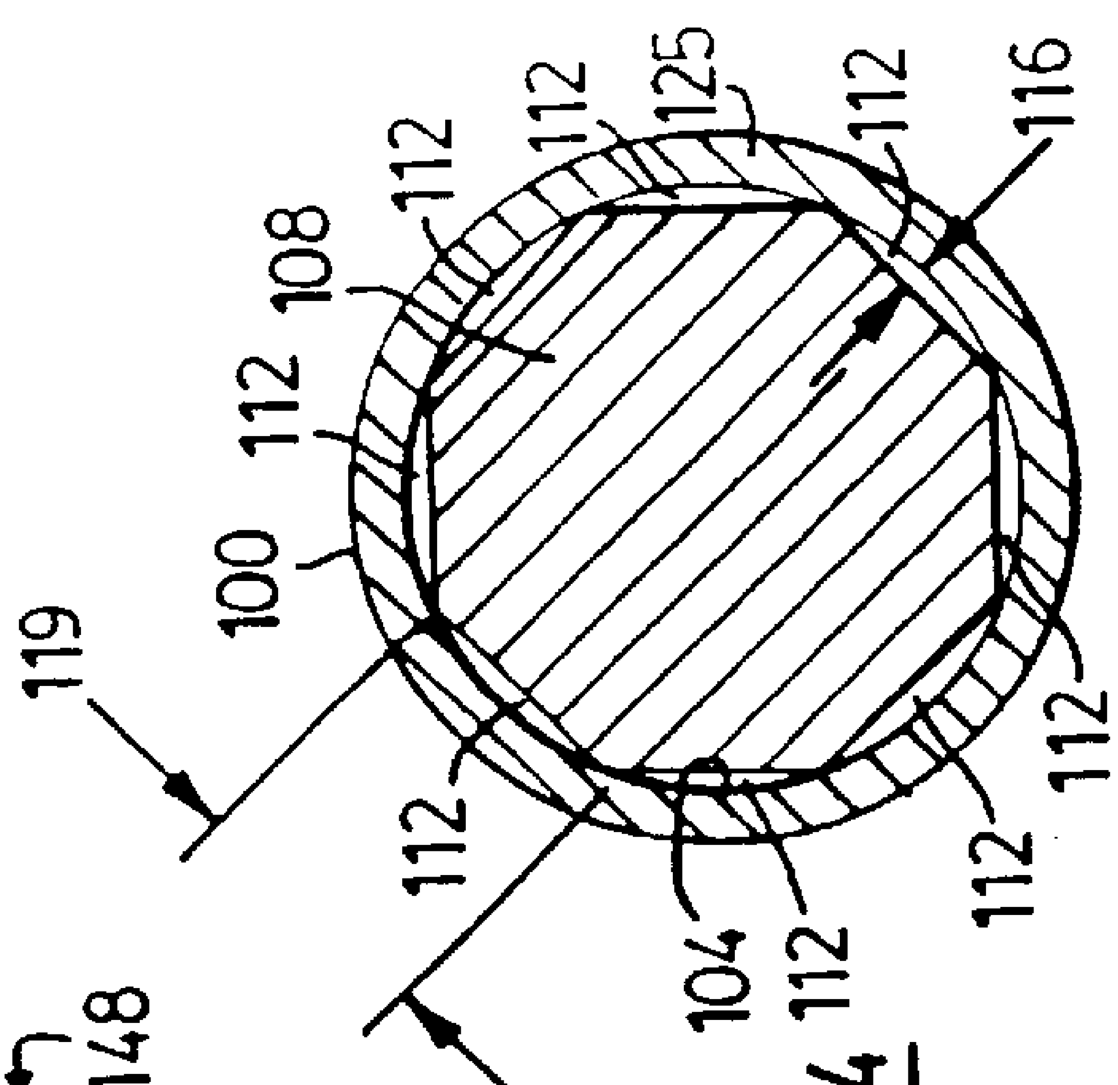

FIG.4

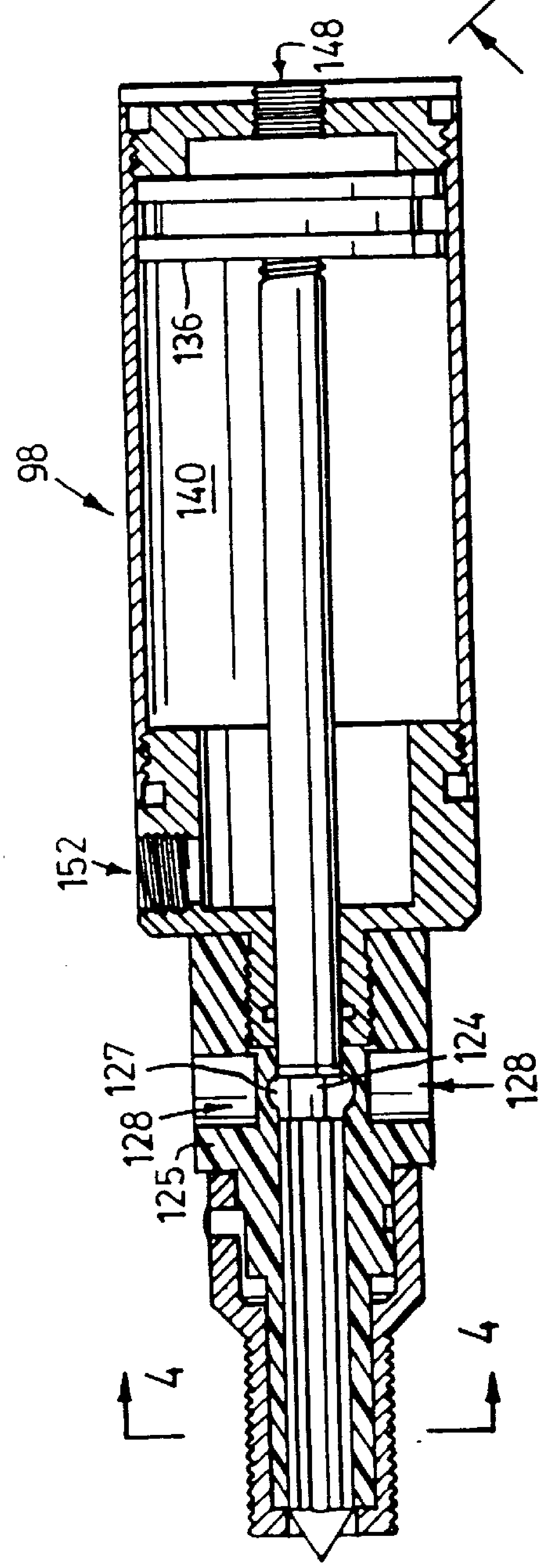

FIG.3

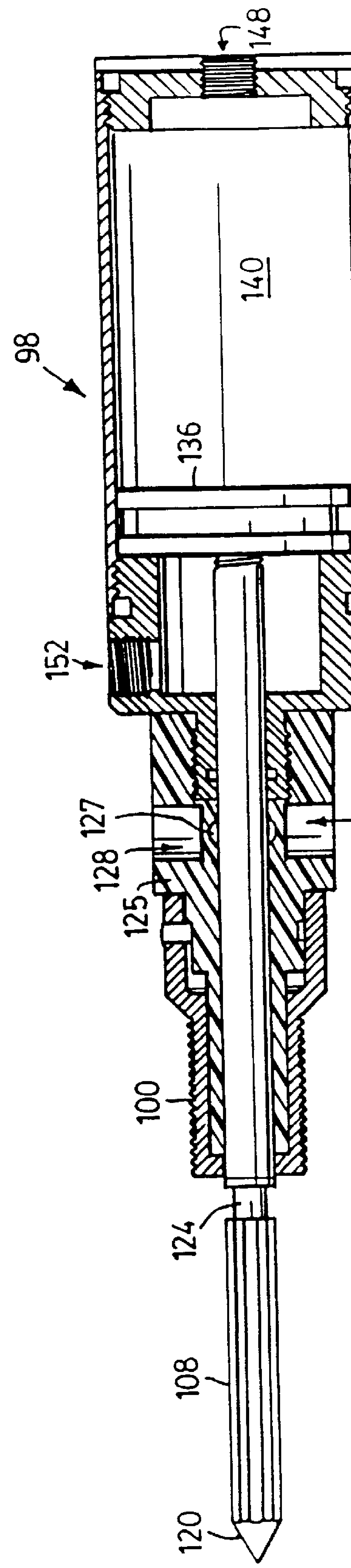

FIG.5

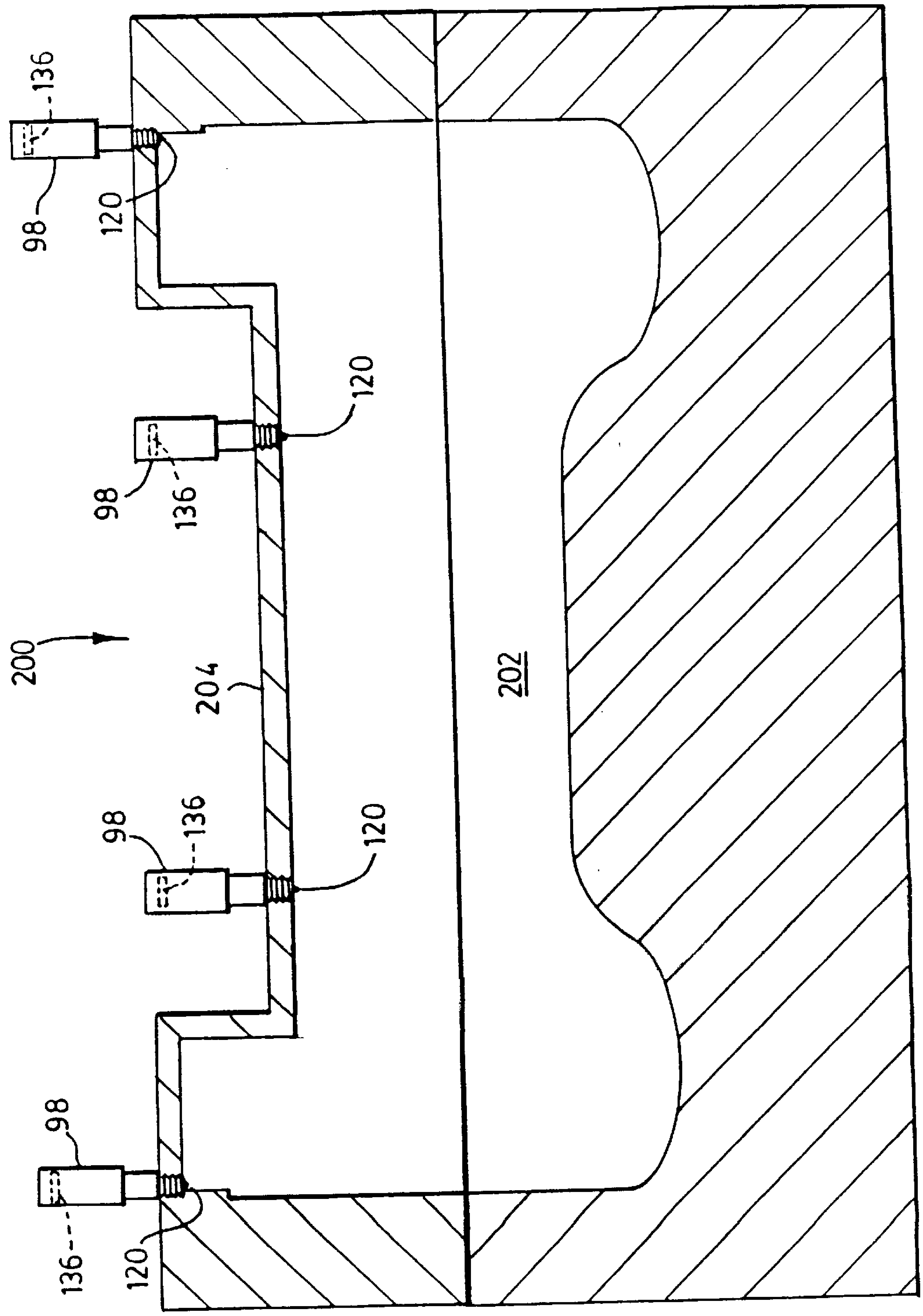

FIG.6

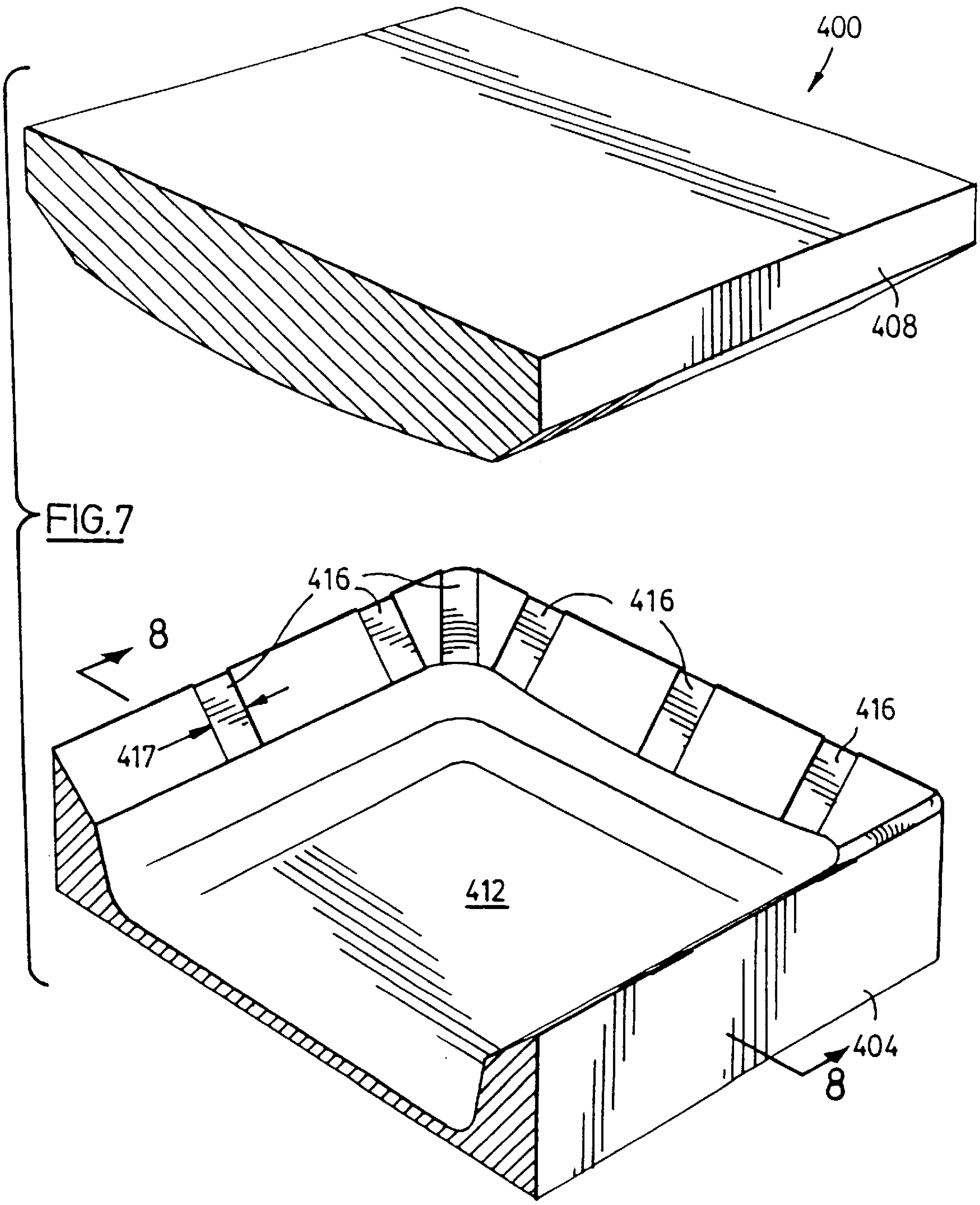

FIG.7

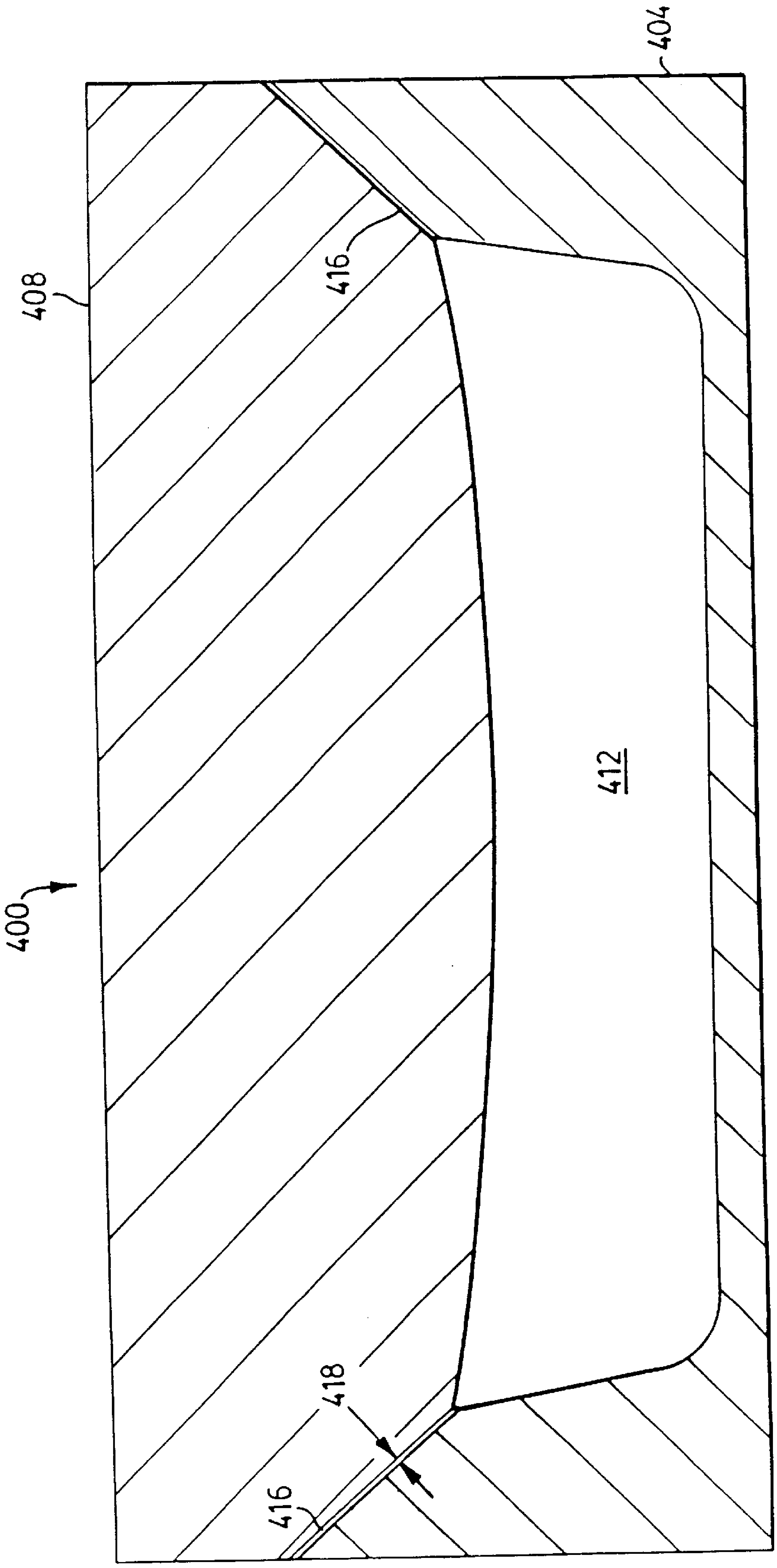

FIG.8

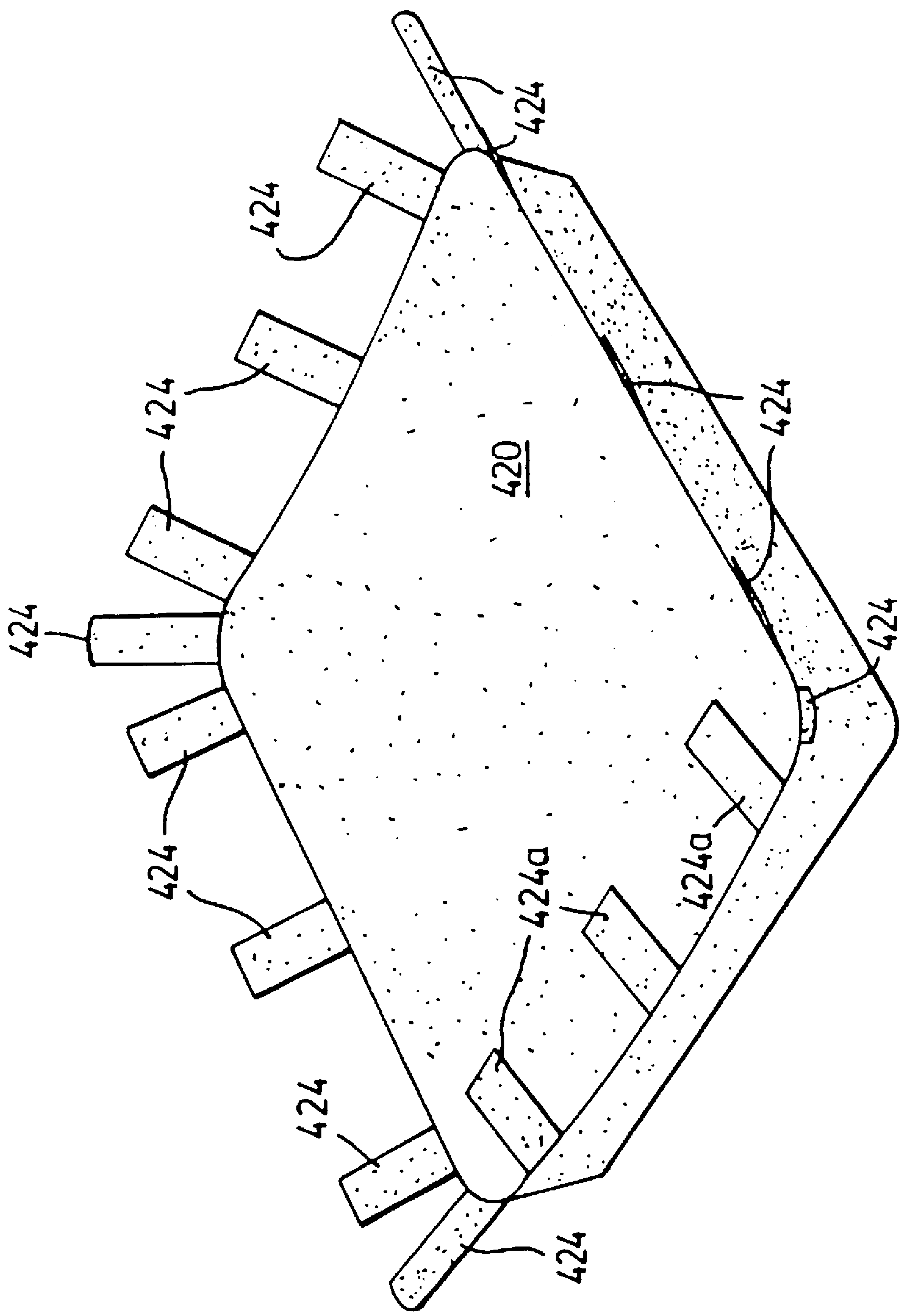

FIG. 9

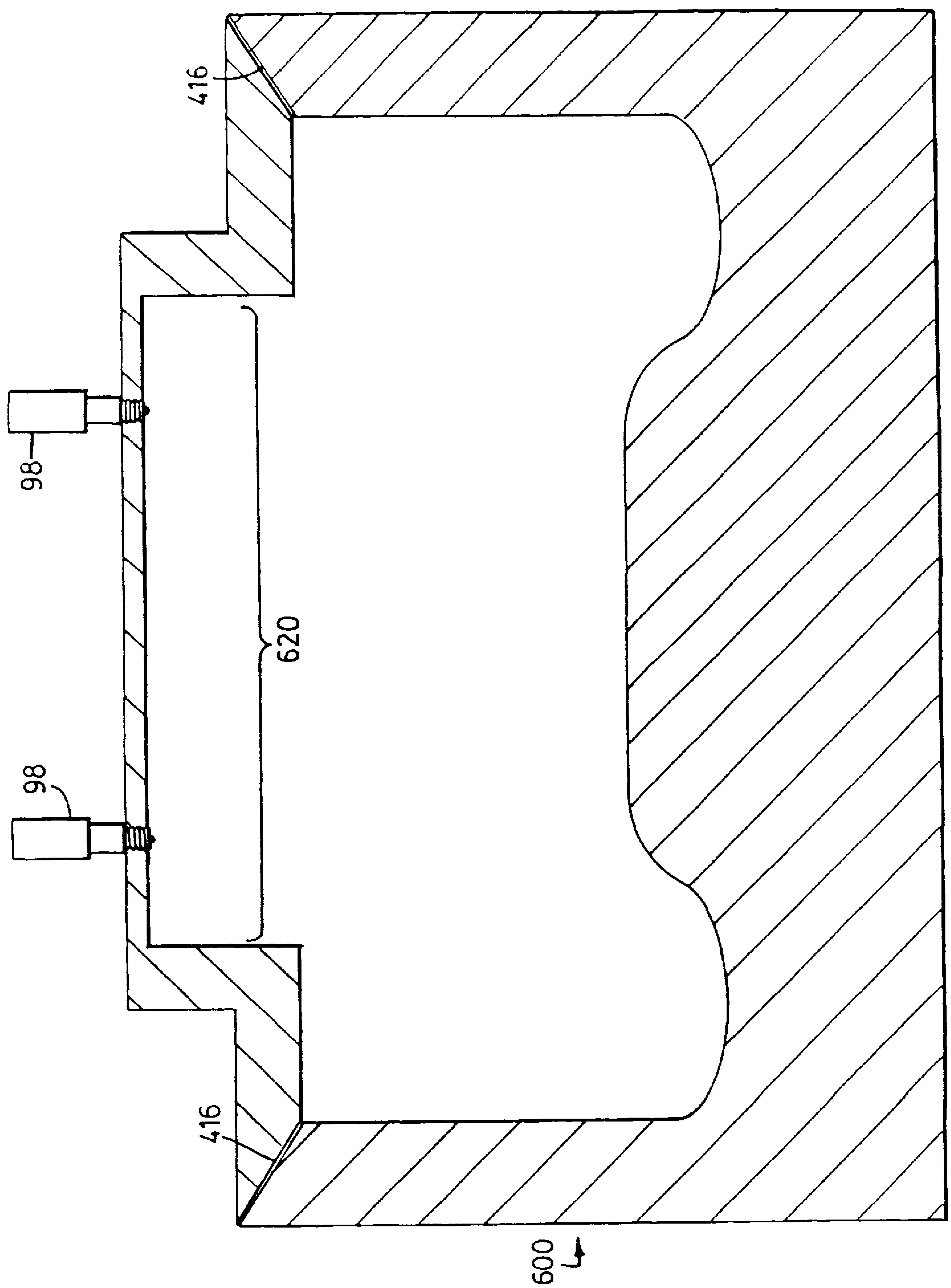

FIG.10

MOLD HAVING VENT PASSAGEWAYS TO OBVIATE TRIMMING OF FLASH

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

This application is a division of application Ser. No. 07/939,704 filed Sep. 2, 1992, now U.S. Pat. No. 5,356,580.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a novel mold for producing foamed articles. Specifically, an aspect of the present invention relates to an improved mold including a vent capable of providing necessary venting of the mold while minimizing extrusion of raw material into the vent, thus reducing wastage. In its most preferred embodiment, the present invention also eliminates the requirement to remove the extruded raw material from the molded article prior to application of a finish (e.g. trim) cover.

The present invention also relates to a novel method of molding articles which reduces wastage resulting from raw material being extruded into the vent during venting of the mold. In its most preferred embodiment, the method reduces or eliminates the requirement to remove the extruded material prior to application of a finish cover.

2. Description of the Prior Art

Many articles are manufactured by placing a raw material into a cavity in a mold wherein the raw material undergoes a physical change (e.g. it expands or foams) and the article produced thus acquires the shape of the cavity. In particular, this technique is commonly employed for producing foamed articles made from polymeric foams such as polyurethane foam, latex (e.g. natural and styrene-butadiene rubber) foam and the like.

For example, automotive seats are commonly manufactured from polyurethane cushions which are molded to shape and then covered with a vinyl, cloth or leather finish cover. Polyurethane foams are somewhat unique in that foaming and at least a portion of the polymerization process occur simultaneously. Thus, in the production of polyurethane foam using, for example, a conventional cold foam technique, a typical formulation comprises:

1. Polyol
2. Water
3. Tetramethyl ethane diamine
4. Dimethyl ethanol amine
5. Polyisocyanate

The mixture is dispensed into a mold using a suitable mixing head, after which the mold is then closed to permit the expanding mass within it to be molded. Accordingly, it is convenient generally to refer to the mixture initially dispensed into the mold as "a liquid foamable polymeric composition" or, in this case, "a liquid foamable polyurethane composition". As the composition expands in the mold, polymerization occurs and the polymer so formed becomes solidified.

When molding a liquid foamable polymeric composition to form articles such as polyurethane foam articles, it is conventional to use a clam-shell mold comprising a bottom mold and a top mold which, when closed, define a mold cavity. The mold is opened, the liquid foamable polyurethane composition is dispensed into the mold cavity and the mold is closed as a chemical reaction causes the composition

to expand. After the mold is closed, the composition expands to fill the interior cavity of the mold. Alternatively, the composition may be dispersed into a closed mold. In either case, as the polymerization reaction is completed, the foam cures and permanently assumes the shape of the mold cavity.

As is known to those of skill in the art, it is essential during this process that the mold be adequately vented to allow the air present in the mold to exit the mold as the foamable composition expands. Further, it is essential to allow a portion of the gases (typically CO_2 in the production of polyurethane) generated during polymerization to exit the mold.

Failure to adequately vent the mold results in defective molded articles exhibiting symptoms of improper foaming such as surface hardening (or foam densification) and/or void formation in the finished article due to trapped gas or air bubbles. At the other extreme, excess venting of the mold will also result in defective molded articles due to collapse of the foam prior to curing; this phenomenon is often referred to as the 'soufflé' effect. Thus, proper venting of molds is an important factor in producing acceptable molded articles.

Typically clam-shell molds are designed with drilled or cut passages in the top mold to provide vents. Locating, sizing and deciding upon the number of these vents is a matter of some skill on the part of mold designer and the production engineers, and is often an iterative procedure with more vents being added to various locations or other vents being blocked-off after test runs have been made.

During molding operations some liquid foamable polymeric composition which moves into the vent is wasted. It is generally desired to minimize the amount of wasted material (also known as "flash", "mushrooms", "buds", "pancakes" and the like) for two masons, namely (1) the wasted material adds to the overall expense of producing the finished article, and (2) the wasted material must be removed from the molded article prior to the finish cover being applied, thereby necessitating additional labour and the costs associated therewith.

Accordingly, mold designers and production engineers are continually striving to optimize the compromise between providing enough venting at the proper locations while avoiding excess venting and minimizing material wastage during venting.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a novel method of producing a molded article which obviates or mitigates material wastage during venting.

It is another object of the present invention to provide a novel mold which obviates or mitigates at least some of the above-mentioned problems with prior art.

It is yet another object of the present invention to provide a novel method of producing a molded article from which vent-extruded material need not be removed.

According to a first aspect of the present invention, there is provided a method of producing an article in a mold comprising an upper mold and a lower mold defining a mold cavity, the process comprising the steps of:

dispensing a liquid foamable polymeric composition into the mold cavity;

allowing the liquid foamable polymeric composition to expand to substantially fill the mold cavity; and

venting gases in the mold cavity through at least one vent in the mold to allow the gases to exit from the mold, the size of each vent being selected such that movement of the liquid foamable polymeric composition into the vent is restricted to substantially prevent exit thereof from the vent.

Preferably, the at least one vent is located at the part-line of the mold and comprises a thickness in the range from about 0.002 inches to 0.030 inches, more preferably in the range from about 0.005 inches to about 0.020 inches. Also preferably, the at least one vent is rectangular in cross-section and the polymeric material which enters the vent forms a ribbon of material on said article which need not be removed when a finish cover is applied to said article.

According to a second aspect of the present invention, there is provided a mold for producing foamed articles, the mold comprising:

an upper mold and a lower mold which define a mold cavity; and

at least one vent in communication with the mold cavity, the size of each vent being selected to allow relatively free flow of gases therethrough and to restrict movement of a liquid foam polymeric composition therethrough.

Preferably, the vent includes first and second vents, the first vent being located at the part-line between the top and bottom molds. In this embodiment, it is preferred that the first vent comprises a thickness of from about 0.002 inches to about 0.030 inches, more preferably from about 0.005 inches to about 0.020 inches. It is preferred that the second vent is located in the upper mold and comprises a thickness of from about 0.002 inches to about 0.015 inches, more preferably from about 0.003 inches to about 0.010 inches.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the present invention will be described with reference to the accompanying drawings, in which:

FIG. **1** illustrates a cross-section of a prior an clam-shell mold;

FIG. **2** illustrates a sectional view of an article produced in the prior art mold of FIG. **1**;

FIG. **3** illustrates a cross-section of a vent assembly;

FIG. **4** illustrates a partial section taken along line **4**—**4** in FIG. **3**;

FIG. **5** illustrates the vent assembly of FIG. **3** in a cleaning position;

FIG. **6** illustrates a cross-section of a clam-shell mold employing the vent assemblies shown in FIG. **3**;

FIG. **7** illustrates a perspective view of another clam-shell mold;

FIG. **8** illustrates a section taken along line **8**—**8** when the mold of FIG. **7** is closed;

FIG. **9** illustrates a molded article made in the mold shown in FIG. **7**; and

FIG. **10** illustrates a cross-section of a mold employing the vent assemblies shown in FIG. **3** and the vents shown in FIG. **7**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The most preferred liquid foamable polymeric composition is based upon polyurethane. However, it will be apparent to those of skill in the art that the present invention is applicable to other types of molding operations including, but not limited to, latex foam, neoprene foam, PVC foams and the like.

A prior art mold will first be discussed, with reference to FIGS. **1** and **2**. A typical clam-shell mold, similar to those used for forming an automotive seat cushion from polyurethane foam, is indicated generally at **20** in FIG. **1**. The mold includes a lower mold **24** and an upper mold **28** which are joined by a conventional hinge means (not shown). Lower mold **24** and upper mold **28**, when closed, define a cavity **32** which corresponds to the shape of the automotive seat cushion.

In use, upper mold **28** is released from lower mold **24** and a predetermined amount of liquid foamable polyurethane composition is dispensed into lower mold **24**. Upper mold **28** and lower mold **24** are then sealingly engaged and the liquid foamable polyurethane composition expands, displacing the air within cavity **32**. This displaced air exits cavity **32** through a part-line **36** and through one or more vent passages **38** in upper mold **28**. Further, as the polyurethane composition expands, polymerization occurs along with the evolution of gaseous CO_2 in cavity **32**. This gaseous CO_2 may also exit cavity **32** through part-line **36** and through vent passages **38**. As is well known to those of skill in the art (and beyond the scope of this discussion), the liquid foamable polymeric composition eventually completely polymerizes and cures, acquiring the shape of cavity **32**.

As is also known to those of skill in the art, the amount of liquid foamable polyurethane composition dispensed in cavity **32** must be selected to ensure that cavity will be substantially completely filled, in order to avoid the occurrence of voids and other foaming defects in the molded article. While the determination of the proper amount of liquid foamable polyurethane composition for a particular mold may generally be calculated, as explained below it has heretofore been required to dispense an excess amount of polymeric composition into the mold to compensate for material which moves through and exits part-line **36** and vent passages **38**. This excess, while assisting in ensuring that cavity **32** is filled to avoid the occurrence of voids and other foaming defects in the molded articles, is in fact simply a wastage of valuable raw material.

In prior **[**an**]** *art* molds, during the molding operation, air and the reaction gases produced from the expanding composition exit from cavity **32** through part-line **36** and vent passages **38** until the foam reaches the level of their respective entrances.

At this point, any further expansion of the foam results in movement of the foam into the part-line **36** and/or vent passages **38**. In the simplest case of a cavity without irregularities, the foam reaches the level of the part-line and/or the vent passages at approximately the same time, which usually occurs at or near the maximum expansion point of the foam. Thus, provided that the proper amount of liquid foamable polyurethane composition has been dispensed into the cavity, only a small amount of foam enters the part-line and/or the vent passages as cavity **32** is completely filled.

In practice, however, as shown in FIG. **1**, most molds include irregularities in their cavities for various features required on the molded article. In such a case, the thickness and shape of mold cavity **32** typically varies across the cavity and the entrance to part-line **36** and vent passages **38** in the mold may thus be located at different heights depending upon where they communicate with cavity **32**. Further, localized areas of high and low pressure also occur within cavity **32** due to the manner in which the foam and the gases produced collect in and move between the irregularities therein and thus the level of foam in different parts of cavity **32** at different times may vary.

Due to the above-mentioned factors, the foam in the cavity typically reaches the level of the part-line and/or different vent passages at different times while the foam is still expanding. For example, in a region wherein the top of cavity **32** is lower than surrounding regions, such as indicated at **40** in FIG. **1**, the foam may quickly reach the vent passages **38**. As the foam is still rising in the rest of cavity **32** and has not yet cured, a relatively significant amount of foam may enter vent passages **38** in this region.

Again, as the amount of foam which enters the part-line **36** and vent passages **38** reduces the amount of foam remaining in cavity **32** by a like amount, it is necessary that the amount of liquid foamable polyurethane composition placed in cavity **32** include an amount in excess of that required to fill cavity **32** to offset the foam which entered the part-line and vents. This excess amount, while necessary for proper operation of the prior art mold, is essentially wasted material and adds to the cost of forming the article.

Further, as shown in FIG. **2**, the foam which enters vents **38** forms 'mushrooms' **54** (shown in ghosted line) of wasted material on the molded article **50**. Further, the material which enters part-line **36** forms 'pancakes' **55** of wasted material on the moulded article **50**. Typically, mushrooms **54** and pancakes **55** must be disconnected from article **50** and removed from the mold **20** prior to application of a finish cover to ensure a finished covered article which is of acceptable appearance and texture, and to prepare mold **20** for re-use. The necessity of removing mushrooms **54** and pancakes **55** results in an increased labour cost associated with manufacturing the molded product.

In addition to the excess liquid foamable polyurethane composition which is added to offset the material extruded into the vents, excess liquid foamable polyurethane composition is also added to compensate for process variations due to changes in temperature, humidity, ambient pressure and minor changes in the composition of the liquid foamable polyurethane composition. Accordingly, in prior art molds, the wastage of material exiting the vents is inevitable.

Embodiments of the present invention will now be described, with reference to FIGS. **3** through **10**.

The present inventors have determined that it is possible to use the difference in the physical characteristics of the expanding liquid foamable polymeric composition, prior to curing thereof, and the vented gases to design vents which minimize the amount of material which is extruded into the vent passages as wasted material. Specifically, it has been determined that vents may be designed with sizes which provide much different flow rates depending on the viscosity of the fluid flowing therethrough. Thus, gases, which possess a relatively low viscosity, flow relatively easily and quickly through the vent. In contrast, the liquid foamable polymeric composition, which possesses a relatively high viscosity (especially when it reaches the vent as expansion and curing ate near completion), flows much more slowly through the vent due to the restriction the thickness of the vent presents to the foam.

As described hereinafter, the size of the vents is selected such that the gases in the mold may flow through the vents in a relatively unhindered manner while the viscosity of liquid foamable polymeric composition, when it reaches the vent, is such that it flows into and through the vents in a very slow manner, at best. Provided that the vent sizes are properly selected, the liquid foamable polymeric composition will have cured before it has flowed a significant distance into the vent.

As will be apparent to those of skill in the art, vents in accordance with the present invention thus reduce the amount of excess liquid foamable polymeric composition which must be dispensed in the mold to offset the material extruded into the vents.

FIGS. **3**, **4**, **5** and **6** illustrate a fast embodiment of an improved vent assembly **98** in accordance with the present invention which is preferred for use in an upper mold. The vent assembly comprises a mold sleeve **100** with a guide bushing **125** with a cylindrical bore **104** therethrough. A relief pin **108** is located within and engages the inner surface of bore **104**. Relief pin **108** is octagonal in cross-section, as best seen in FIG. **4**, and when located within guide bushing **125** defines eight vent passages **112** which are segment shaped (i.e., which are shaped as portions cut from a geometric figure (e.g. a circle) by one or more points, lines or planes).

The upstream end **120** of relief pin **108** which communicates with the cavity of a mold is preferably tapered and the downstream end includes a narrowed throat **124**. As shown in FIG. **3**, when relief pin **108** is in the venting position, the downstream end of vent passages **112** are in communication with vent chamber **127** which is in turn in communication with vent outlets **128**. Vent outlets **128** exhaust gases to the environment outside the mold. In the operating position shown in FIG. **3**, gases to be vented from a mold cavity travel along vent passages **112** to vent chamber **127** and then exit through vent outlets **128**.

The dimensions of vent passages **112** are selected to allow gases to relatively freely exit cavity **202** and to restrict movement of foam within vent passages **112**. Specifically, due to the relatively high viscosity of the foam, the thickness **116** of vent passages **112** present a restriction to the foam while not restricting the gases. Provided that thickness **116** is properly selected, the width **119** of vent passage **112** is not particularly limited, nor is the shape of the passage **112**.

As will be apparent to those of skill in the art, the diameter of cylindrical bore **104** and cross-sectional shape of relief pin **108** may be varied to provide different total vent areas while maintaining the desired vent thickness. For example, relief pins with between four and eight sides, defining a like number of vent passages, have been successfully tested.

For polyurethane foams, it has been found that a vent passage thickness of less than about 0.010 inches present a suitable restriction. It will be understood by those of skill in the art that the thickness of the vent passage(s) may be varied according to the particular liquid foamable polymeric composition being used. Thus, if a polymer other than polyurethane is being foamed, the thickness may be suitably determined as would be apparent to those of skill in the art through empirical calculations and/or testing.

While vent assembly **98** has been found to be very successful at limiting foam extrusion from the mold, a small amount of foam does enter vent passages **112**. Thus, it is necessary to clean vent passages **112** prior to re-use of the mold. Accordingly, the downstream end of relief pin **108** is connected to a piston **136** in a pneumatic cylinder **140**. By varying the pressure on either side of piston **136** through apertures **148** or **152**, the end of relief pin **108** may be extended or retracted within bore **104**. As relief pin **108** is extended from vent bore **104**, the downstream edge of throat **124** sweeps the interior of vent bore **104**, removing residual extruded foam. As will be understood by those of skill in the art, guide bushing **125** may be fabricated from DELRIN (acetal resin) or any other suitable material. FIG. **5** illustrates relief pin **108** in its extended position and FIG. **3** illustrates relief pin **108** in its operating position.

FIG. **6** illustrates a mold **200** which includes several vent assemblies **98**. Preferably, vent assemblies **98** are installed in an upper mold **204** of mold **200** in locations strategically selected to provide the desired degree of venting. In use, gases are vented from the vent assemblies **98**, as described above, until the foam within cavity **[208]** *202* reaches the entrance to the vent. At this point, as the foam begins to enter vent passages **112**, the restriction presented by vent passages **112** on the foam slows the flow of foam into vent passages **112** such that the foam will have cured before it has entered vent passage to a significant degree, and such that the foam does not exit the vent.

The above-mentioned embodiment provides an advantage over the prior art in that it reduces the amount of excess liquid foamable polymeric composition required to accommodate the foam extruded into the mold vents. Accordingly, the amount of material which enters vent assemblies **98** is reduced when compared to that obtained from conventional mold vents. This results in materials savings and may also results in labour savings since this material need not always be removed from the article or the mold.

Another embodiment of the present invention, will now be described with reference to FIGS. **7**, **8** and **9** which is particularly preferred for use in the part-line between the upper and lower molds. A clam-shell mold is indicated generally at **400** in FIG. **7**. The mold includes a lower mold **404** and an upper mold **408** which define a mold cavity **412**. The mold includes a series of ribbon vents **416** in accordance with the present invention. As shown in FIG. **8**, when mold **400** is closed, ribbon vents **416** extend between mold cavity **412** and the exterior of mold **400**. It has been found that ribbon vents with a thickness indicated at **418**, of about 0.005 inches to about 0.015 inches are particularly suited for use when molding polyurethane foams. As with vent passages **112** of the previous embodiment, when used with other polymeric foamable compositions, thickness **418** may be altered as required.

The width, indicated at **417**, of ribbon vents **416** is not particularly limited. Widths of up to about 6.0 inches have been found to work in a satisfactory manner. In practice, it is contemplated that the limits to vent width **417** will primarily relate to physical limitations imposed by the shape of the article being molded and the requirement to provide an adequate total venting area to cavity **412**.

In use, liquid foamable polyurethane composition is dispensed into mold cavity **412**, and upper mold **408** and lower mold **404** are sealingly engaged. The air in mold cavity **412** and the gases produced by the chemical reaction occurring in the expanding composition are vented through ribbon vents **416**. The viscosity of these gases are such that they flow relatively easily through ribbon vents **416**. Once the level of foam in mold **400** reaches the entrance to ribbon vents **416**, the foam enters ribbon vents **416**. Due to the above-mentioned restriction, which is presented to the expanding composition by vent **416**, the expanding composition can only move slowly through ribbon vents **416**. Provided that the thickness of ribbon vents **416** has been properly selected, the liquid foamable polymeric composition will stop moving therein before it travels a significant distance along the vents and certainly before it reaches the end of ribbon vents **416**.

FIG. **9** illustrates an article **420** fabricated in the mold of FIG. **7** employing ribbon vents **416** in accordance with the present invention. As illustrated, article **420** includes a number of ribbons **424** of extruded material from ribbon vents **416**.

The advantages provided by ribbon vents **416** are many. First, the amount of material extruded into ribbon vents **416** is limited due to the restriction presented by thickness **418** to the foam, thus the amount of raw material wasted is reduced with a resultant economic saving. Second, ribbon vents **416** are relatively inexpensive to manufacture compared to the prior art vents. Third, ribbon vents **416** may be added readily at regular spaced intervals about mold cavity **412**, limited only by the shape of cavity **412**, doing away with much of the iterative design effort on [be half] *behalf* of the mold designer and production engineers which was previously required. Fourth, ribbon vents **416** are easy to clean and in many circumstances are self-cleaning with ribbons **424** being removed from vents **416** when the article **420** produced is removed. Fifth, ribbons **424** of extruded material produced by the ribbon vents **424** have a preferred, 'friendly' shape. Specifically, when ribbon vents **416** with relatively small thickness **418** are employed, the resulting ribbons **424** of extruded material may simply be folded back against article **420** when the finish cover is applied to it while maintaining an acceptable appearance and texture. An example of such folded back ribbons is indicated at **424**a. This obviates the need to remove the ribbons **424** of extruded material and results in a labour savings.

In some circumstances, it is contemplated that it may be desirable to sandblast or otherwise roughen the inner surfaces of ribbon vents **416** to further decrease the rate at which the liquid foamable polymeric composition moves through the vent. Also, it is contemplated that in some circumstances ribbon vents with a thickness of less than 0.002 inches may be employed and that such vents will inhibit substantially all foam extrusion into the vent. In this manner, the vent acts as a differential vent allowing passage of gas but inhibiting passage of foam. However, care must be taken when using such differential vents to ensure that an adequate total venting area is still provided to avoid defects in the molded article.

It is contemplated that in many circumstances, it will be desired to employ both of the above-described embodiments in a single mold. Specifically, as shown in FIG. **10**, a mold **600** may include one or more otherwise isolated regions **620** at which vent assemblies **98** may preferably be employed, while ribbon vents **416** are preferably employed at the part-line of the mold. Due to their isolation from ribbon vents **416** at the part-line of the mold, vent assemblies **98** are employed to ensure that gases which would otherwise be trapped in regions **620** are properly vented. The design of such a mold, will be clearly understood by those of skill in the art, in view of the description above.

As will also be understood by those of skill in the art, further variations are possible without departing from the spirit of the invention disclosed herein.

What is claimed is:

1. A mold for producing foamed articles, comprising:

an upper mold and a lower mold which define a mold cavity;

at least one vent disposed in said upper mold and in communication with the mold cavity, said vent having a vent passageway with an entrance and an exit;

an obstruction disposed in said vent passageway, said obstruction and said vent passageway combining to form at least one opening having an elongated shape which allows movement of a liquid foam polymeric composition to pass from the mold cavity into the vent passageway entrance but prevents the liquid foam polymeric composition from exiting the vent passageway exit to cause at least partial curing of the liquid foam polymeric composition in the at least one opening between the vent passageway and the obstruction; [and]

driving means for driving the obstruction axially within said vent passageway to expel the at least partially cured liquid foam polymeric composition from said at least one opening *said lower mold having a first plurality of vents disposed along one side of the lower mold at a part line between the upper and lower molds;*

said lower mold having a second plurality of vents disposed on a second side of the lower mold which is adjacent the first side, said second plurality of vents being disposed on the part line between the upper and lower mold; and

each of said first and second pluralities of vents having a vent passageway with an entrance and an exit, each said vent passageway being sized and dimensioned to cause liquid foam polymeric composition expanding inside the mold cavity to enter into each said vent passageway entrance but to not exit from each said vent passageway exit so that at least partial curing of the liquid foam polymeric composition occurs within each said vent passageway so that the at least partially cured liquid foam polymeric composition in each said vent passageway does not separate from the mold foam article when the upper mold and lower mold are separated so as to produce the plurality of appendages on the sides of the foamed article.

2. A mold according to claim **1**, wherein said obstruction has an octagonal cross-section so that eight openings are disposed between said obstruction and said vent passageway.

3. A mold according to claim **1**, wherein said driving means comprises a pneumatic piston.

4. A mold according to claim **1**, wherein said vent passageway comprises a plastic material.

5. A mold according to claim **4**, wherein said plastic material comprises an acetal resin guide bushing.

6. A mold according to claim **1**, further comprising means, coupled to said obstruction, for sweeping an interior of said vent passageway to expel liquid foam polymeric composition adhering to the interior of said vent passageway when said driving means drives said obstruction.

7. A mold according to claim **1**, further comprising a plurality of corresponding vents, obstructions, and driving means.

8. A mold for producing foamed articles, comprising:

an upper mold and a lower mold which define a mold cavity;

at least one first vent disposed in said upper mold and in communication with the mold cavity, said first vent having a vent passageway with an entrance and an exit;

an obstruction disposed in said first vent passageway, said obstruction and said first vent passageway combining to form at least one opening having an elongated shape which allows movement of a liquid foam polymeric composition expanding in the mold cavity to pass from the mold cavity into the first vent passageway entrance but prevents the liquid foam polymeric composition from exiting the first vent passageway exit to cause at least partial curing of the liquid foam polymeric composition in the at least one opening between the first vent passageway and the obstruction;

driving means for driving the obstruction axially within said first vent passageway to expel the at least partially cured liquid foamed polymeric composition from said at least one opening; *and*

at least one second vent disposed on a part line between said upper mold and said lower mold and in communication with the mold cavity, the second vent having a second vent passageway with an entrance and an exit, the second vent passageway being elongated with a width substantially greater than a thickness orthogonal to the width to cause the liquid foam polymeric composition expanding inside the mold cavity to enter the second vent passageway entrance but to not exit from the second vent passageway exit to cause at least partial curing of the liquid foam polymeric composition within the second vent passageway.

9. A mold according to claim **8**, wherein said second vent passageway has a thickness orthogonal to the part line of from about 0.002 inches to about 0.030 inches.

10. A mold according to claim **8**, wherein the second vent passageway has a thickness orthogonal to the part line of from about 0.005 inches to about 0.020 inches.

11. A mold according to claim **8**, wherein said second vent passageway has a substantially rectangular cross-section with a width parallel to the part line of substantially 6.0 inches and a thickness orthogonal to the part line of from about 0.005 inches to about 0.020 inches.

12. A mold according to claim **8**, wherein said driving means comprises a pneumatic piston.

13. A mold according to claim **8**, wherein said first vent passageway comprises a plastic material.

14. A mold according to claim **13**, wherein said plastic material comprises an acetal resin guide bushing.

15. A mold according to claim **8**, further comprising means, coupled to said obstruction, for sweeping an interior of said first vent passageway to expel liquid foam polymeric composition adhering to the interior of the second vent passageway when said driving means drives said obstruction.

16. A mold according to claim **8**, further comprising a plurality of second vents disposed on the part line between said upper mold and said lower mold, and a plurality of first vents disposed in said upper mold.

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