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(54) Titre : CONTENANT COMPOSITE A BASE DE PAPIER POUR DES PRODUITS A DEGAGEMENT GAZEUX, ET
SON PROCEDE DE FABRICATION
(54) Title: PAPER-BASED COMPOSITE CONTAINER FOR OFF-GASSING PRODUCTS, AND METHOD FOR MAKING
SAME

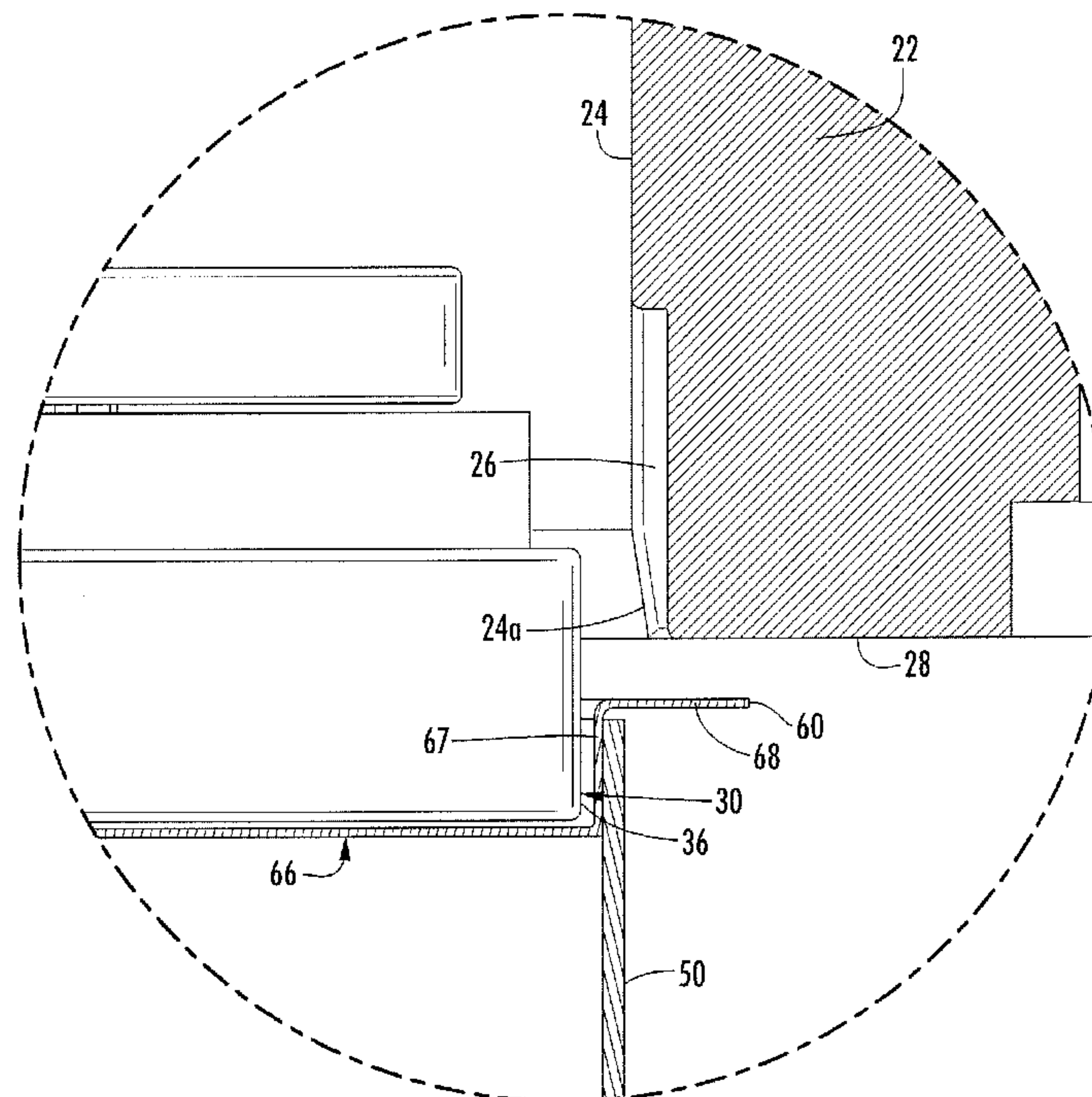


FIG. 3

(57) **Abrégé/Abstract:**

A substantially paper-based composite container for an off-gassing product includes a paperboard can body (50) having a substantially gas - impervious liner (52) attached to an inner surface thereof, and a pair of substantially paper-based end closures



(57) **Abrégé(suite)/Abstract(continued):**

(60) attached to the opposite ends of the can body, each end closure defining a generally cylindrical sealing panel (67) in contact with an inner surface of the can body. Heat - sealable materials are disposed on opposing surfaces of the sealing panel and can body. The sealing panels of the end closures are attached to the can body by heat seals. The heat seal for at least one of the end closures is discontinuous such that at least one vent channel (70) extends through the heat seal so as to establish fluid communication between an interior of the composite container and the environment outside the composite container. The at least one vent channel is operable to vent excess gas pressure from the interior of the container.

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(54) Title: PAPER-BASED COMPOSITE CONTAINER FOR OFF-GASSING PRODUCTS, AND METHOD FOR MAKING SAME

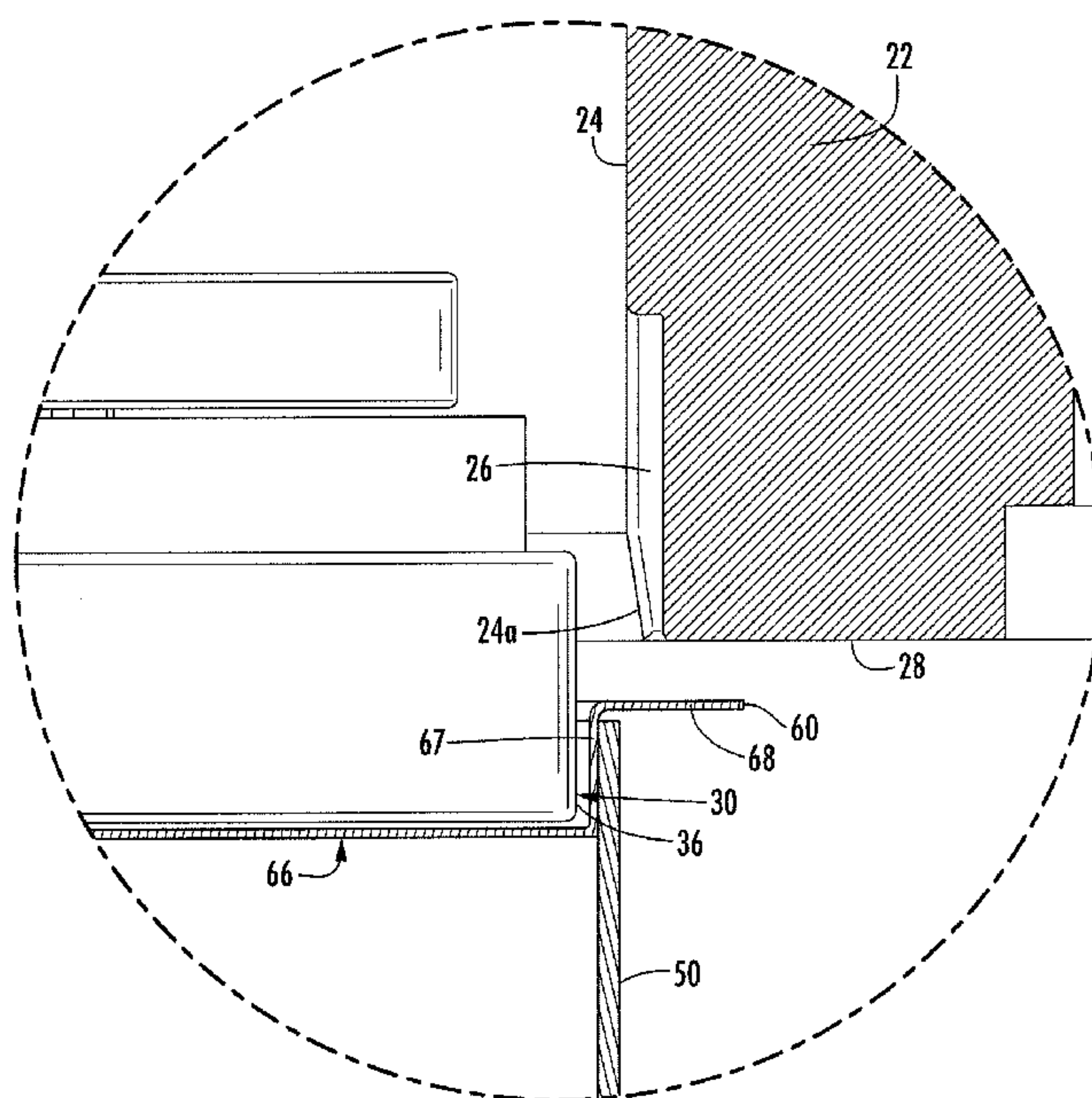


FIG. 3

(57) Abstract: A substantially paper-based composite container for an off-gassing product includes a paperboard can body (50) having a substantially gas - impervious liner (52) attached to an inner surface thereof, and a pair of substantially paper-based end closures (60) attached to the opposite ends of the can body, each end closure defining a generally cylindrical sealing panel (67) in contact with an inner surface of the can body. Heat - sealable materials are disposed on opposing surfaces of the sealing panel and can body. The sealing panels of the end closures are attached to the can body by heat seals. The heat seal for at least one of the end closures is discontinuous such that at least one vent channel (70) extends through the heat seal so as to establish fluid communication between an interior of the composite container and the environment outside the composite container. The at least one vent channel is operable to vent excess gas pressure from the interior of the container.

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PAPER-BASED COMPOSITE CONTAINER FOR OFF-GASSING PRODUCTS,
AND METHOD FOR MAKING SAME

BACKGROUND OF THE INVENTION

The present disclosure relates generally to containers for products, and more particularly relates to paper-based composite containers for off-gassing products.

5 Paper-based composite containers for off-gassing products (e.g., refrigerated dough) have been in the marketplace for many years. A typical dough can has a can body formed of a paperboard body ply wrapped helically about an axis such that a butt joint is defined between the adjacent edges of successive helical turns of the body ply. An impervious liner is attached to the inner surface of the body ply, and a peelable label
10 is attached to the outer surface of the body ply. The label holds the butt joint closed until the consumer is ready to open the container. The ends of the can body are closed by metal end closures that are seamed onto the ends of the can body. To open the container, the label is peeled off to expose the butt joint. Often, the pressure of the expanded dough in the container is sufficient to open the butt joint once the label is
15 removed. Otherwise, the butt joint is pressed or rapped against an edge of a countertop to cause it to open. The dough product is removed through the opening created by the separated butt joint.

Paper-based composite containers for other off-gassing products (e.g., roasted coffee) may also be desirable as alternatives to metal-based and plastic-based
20 containers.

Generally, containers for off-gassing products require some type of provision for dealing with the pressure increase that occurs in the container when the products give off gases. Various approaches to this problem have been tried. Some containers include vents to vent the excess gases to the outside of the container, so that the container will
25 not become bulged or distorted by the internal gas pressure. Other containers are designed to have portions that can expand outwardly to reduce the internal pressure, but in a manner that is not aesthetically displeasing.

Heretofore, commercial composite dough containers have employed the venting approach. In some cases, the metal end closures have been seamed onto the can body in such a way that a vent passage is defined between the end closures and the can body.

BRIEF SUMMARY OF THE DISCLOSURE

5 The present disclosure relates to paper-based composite containers for off-gassing products, in which the end closures are not metal but rather are paper-based. Paper-based end closures are not readily attachable to the can body by the seaming technique used with metal end closures, and hence a new approach to their attachment had to be developed. The attachment technique described herein allows secure
10 attachment of the end closures in a hermetic fashion, while also providing a venting function.

 In one embodiment described herein, a substantially paper-based composite container for an off-gassing product comprises: a can body comprising a tubular wall constructed from paperboard wrapped about an axis, the can body having opposite ends
15 each defining an opening, the can body further comprising a substantially gas-impervious liner attached to an inner surface of the paperboard of the can body; and a pair of substantially paper-based end closures attached to the opposite ends of the can body, each end closure defining a generally cylindrical sealing panel in contact with a surface of the can body, a heat seal material being disposed on a surface of the sealing panel and a
20 heat seal material being disposed on the surface of the can body contacted by the sealing panel.

 The sealing panels of the end closures are attached to the can body by heat seals. The heat seal for at least one of the end closures is discontinuous such that at least one vent channel extends through the heat seal so as to establish fluid
25 communication between an interior of the composite container and the environment outside the composite container. The at least one vent channel is operable to vent excess gas pressure from the interior of the container.

 In embodiments described herein, the heat seal having the at least one vent channel is formed by a plurality of separate, spaced heat seal regions where the heat
30 seal materials on the sealing panel and can body have been heat sealed together, thereby forming the at least one vent channel between the spaced heat seal regions.

The spaced heat seal regions can be spaced apart in a circumferential direction about the can body, the at least one vent channel extending generally axially of the can body.

There can be a plurality of vent channels circumferentially spaced apart.

5 In a specific embodiment suitable for dough containers, the paperboard of the can body is wrapped helically about the axis and a helically extending butt joint is defined in the can body between adjacent edges of successive helical turns of the paperboard. The container includes a label secured about an outer surface of the paperboard of the can body, the label comprising a polymer film. The label is scored to define a helically
10 extending peel strip that is located over the helically extending butt joint. The peel strip is removable from the can body to expose the butt joint while leaving the remainder of the label on the can body.

In embodiments described herein, the end closures comprise a paperboard layer and a barrier layer. The barrier layer can comprise at least one of polymer film and metal
15 foil.

The present disclosure also describes a method for assembling a composite container for an off-gassing product. In one embodiment, the method comprises the steps of providing a can body and a pair of substantially paper-based end closures of the type described above, and positioning the end closures over the openings at the ends of
20 the can body and attaching the sealing panels of the end closures to the can body by forming heat seals therebetween. The heat seal for at least one of the end closures is formed to be discontinuous such that at least one vent channel extends through the heat seal so as to establish fluid communication between an interior of the composite container and the environment outside the composite container, the at least one vent
25 channel being operable to vent excess gas pressure from the interior of the container.

In one embodiment, the heat seal having the at least one vent channel is formed by a plurality of separate, spaced sealing elements that are heated so as to heat and soften the heat seal materials on the sealing panel and can body at a plurality of separate, spaced regions, thereby forming the at least one vent channel between the
30 spaced regions.

The sealing elements can be part of an expandable chuck. In this case, the heat seal can be formed by the steps of: placing the chuck in an unexpanded condition within the opening at the respective end of the can body, the sealing panel of the end closure

being located between the tubular wall of the can body and the chuck; disposing a support ring about the end of the can body, such that the tubular wall of the can body and the sealing panel of the end closure are disposed between the support ring and the chuck; and heating the sealing elements of the chuck and expanding the chuck by
5 moving the sealing elements radially outwardly to compress the sealing panel and tubular wall of the can body between the sealing elements and the support ring, the heated sealing elements causing the heat seal materials on the sealing panel and can body to be softened and to seal together at the spaced regions.

10 In embodiments described herein, between two and ten sealing elements are moved radially outwardly to compress the sealing panel and tubular wall of the can body between the sealing elements and the support ring, thereby forming the heat seal to have between two and ten spaced regions. More preferably, there are between four and eight sealing elements.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

15 Having thus described the disclosure in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

FIG. 1 is a perspective view of a heat-sealing tool, generally from below, for heat-sealing a substantially paper-based end closure to a paperboard can body in accordance
20 with one embodiment of the present invention;

FIG. 1A is an end view of the heat-sealing tool of FIG. 1, from below, showing the sealing chuck of the tool in a retracted (unexpanded) condition;

FIG. 1B is an end view of the heating-sealing tool, from below, showing the sealing chuck in an extended (expanded) condition;

25 FIG. 2 is a side view of the heat-sealing tool positioned above an assembly of a paperboard can body and substantially paper-based end closure, in preparation for heat-sealing the end closure to the can body;

FIG. 3 is a highly magnified detail view of a portion of FIG. 2 as indicated;

FIG. 4 is a side view of the heat-sealing tool and the can body/end closure
30 assembly, after the heat-sealing tool has been lowered into engagement with the can

body/end closure assembly and the sealing chuck has been extended to expand the chuck and heat-seal the end closure to the can body;

FIG. 5 is a highly magnified detail view to illustrate the engagement of the can body and end closure between the expanded sealing chuck and the outer support ring of the heat-sealing tool;

FIG. 6 is a cross-sectional view along line 6-6 in FIG. 4;

FIG. 7 is a highly magnified detail view of a portion of FIG. 6 as indicated;

FIG. 8 is a cross-sectional view through the can body and end closure of the completed container after the end closure has been heat-sealed to the can body; and

FIG. 9 is a highly magnified detail view of a portion of FIG. 8 as indicated.

DETAILED DESCRIPTION OF THE INVENTION

The present invention now will be described more fully hereinafter with reference to the accompanying drawings in which some but not all embodiments of the inventions are shown. Indeed, these inventions may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

FIGS. 1, 1A, and 1B depict a heat-sealing tool **20** for use in heating sealing a substantially paper-based end closure to a paperboard can body in accordance with the present invention. The tool **20** includes an outer support ring **22** defining a central opening whose diameter is approximately equal to (or very slightly less than) the sum of the diameter of the paperboard can body and twice the thickness of the end closure, for reasons that will be made apparent below. The inner surface **24** of the support ring defines six longitudinally extending grooves **26** spaced uniformly about the circumference of the inner surface **24**. The inner surface **24** also has a conical or flared portion **24a** (FIG. 3) adjacent the lower end face **28** of the support ring **22** to help guide the can body and end closure into the central opening of the support ring during a heat-sealing operation, as further described below.

The heat-sealing tool **20** further includes an expandable and contractible sealing chuck **30** that consists of six wedge-shaped segments **32** each forming one-sixth (60°) of a 360° disk, such that the six segments **32** collectively form the 360° disk. Each segment

32 has two radially extending side edges **34** that are linear and a radially outer edge **36** that is part-cylindrical (i.e., one-sixth, or 60°, of a cylinder). The segments **32** are sized in outside diameter such that when the segments have their adjacent side edges **34** abutting each other (as in FIG. 1A), the radially outer edges **36** of the segments define a substantially cylindrical surface having an outside diameter that is slightly smaller than the inside diameter of a paperboard can body to be processed by the heat-sealing tool.

The tool **20** includes an arrangement for moving the segments **32** radially outwardly in unison so as to increase the outside diameter of the substantially cylindrical surface that the segments collectively form. In the illustrated tool **20**, this arrangement comprises a longitudinally movable ram **40** connected at its lower end to a cam arrangement (not visible in the drawings) that engages cam surfaces on the segments **32**. The ram **40** passes down the center of a hollow guide tube **42** affixed at its lower end to the support ring **22**. Moving the ram **40** downward relative to the segments **32** causes the cam arrangement to urge the segments **32** radially outwardly. The tool **20** also includes an upper plate **44** rigidly connected by connecting members **46** to the support ring **22**, and has means (not shown) for urging the upper plate **44**, and therefore the support ring **22**, downward independently of the movement of the ram **40**, for reasons that will be made apparent below.

Turning to FIGS. 2 through 5, a heat-sealing operation employing the tool **20** is now described. FIGS. 2 and 3 depict the tool **20** positioned atop an assembly consisting of a paperboard can body **50** and a substantially paper-based end closure **60**. The can body **50** has a cylindrical or tubular form and is open at both ends. The can body **50** is formed substantially of paperboard and includes a heat-sealable material on its inner surface. The heat-sealable material can be part of a gas-impervious liner **52** attached to an inner surface of a tubular wall **54** (FIG. 7) constructed from paperboard wrapped helically or convolutely about an axis of the tube. The end closure **60** can comprise a laminate of multiple layers, including a heat-sealable layer **62** and a paper layer **64** (FIG. 7). The end closure **60** is formed (preferably prior to placing it atop the can body **50**) so that it has a disk-shaped central portion **66**, a cylindrical sealing panel **67** that extends upwardly from the central portion and is sized to fit closely into the top end of the can body **50**, and an outer peripheral portion **68** that extends radially outwardly from the top end of the sealing panel **67** for a distance sufficient to provide enough material to be wiped down the outer surface of the top end of the can body **50**.

As shown in FIG. 3, the heat-sealing tool **20** initially is in a starting position in which the sealing chuck **30** is in its retracted (contracted) state and has its lower surface

closely adjacent or abutting the top surface of the central portion **66** of the end closure. The tool **20** as a whole can be lowered, or the can body **50** and end closure **60** assembly can be raised relative to the tool **20**, to cause the contracted sealing chuck **30** to push the central portion **66** of the end closure down into the top end of the can body **50** until the
5 outer peripheral portion **68** is abutting or nearly abutting the top edge of the can body **50**. In this condition, the support ring **22** of the tool **20** is in a raised position slightly spaced above the top edge of the can body **50** and the outer peripheral portion **68** of the end closure **60** as shown in FIG. 3.

FIGS. 4 and 5 illustrate the next step of the heat-sealing operation. The support
10 ring **22** is moved downward so that the upper end of the can body **50** is received inside the central opening of the support ring, in the radial space between the inner surface **24** of the support ring and the outer surface of the sealing chuck **30**. Substantially concurrently, the ram **40** is moved downward to cause the sealing chuck **30** to be expanded in diameter so that the end closure's sealing panel **67**, the can body **50**, and
15 the outer peripheral portion **68** of the end closure are radially compressed between the expanded chuck **30** and the support ring **22**. The sealing chuck **30** and the support ring **22** are heated sufficiently to cause softening or melting of the heat-sealable materials on the can body **50** and end closure **60**. Specifically, with reference to FIG. 7, the heat-sealable layer **52** on the can body and the heat-sealable layer **62** on the end closure **60**
20 are softened or melted and fuse together (note: layers **52** and **62** are shown with spacing between them in FIG. 7, for clarity of illustration; in reality they are in contact with each other). The heating is then discontinued and the support ring **22** and ram **40** are retracted and the finished can/end closure assembly is removed from the tool **20** to complete the heat-sealing operation. An end closure can be attached to the opposite end of the can
25 body in the same fashion as just described.

The tool **20** produces unique features in the completed can/end closure assembly, which are now described with reference to FIGS. 6 through 9. In particular, because there are circumferential gaps between adjacent segments **32** of the expanded sealing chuck (as best seen in FIG. 1B), the heated segments **32** produce spaced heat seal
30 regions where the heat seal materials on the sealing panel **67** and can body **50** have been heat sealed together. The spaces between those heat seal regions are areas where the sealing panel **67** of the end closure is not heat-sealed to the can body **50**, since the heat-sealable layers **52**, **62** of these components are not heated and fused together in these areas. The result, as seen in FIGS. 7 and 9, is a series of channels **70**
35 between the sealing panel **67** and the can body **50**. These channels **70** act as vents that

can allow excess gas pressure inside the container to be vented to the outside of the container. It should be noted that FIGS. 7 and 9 depict the channels **70** as being open radial spaces, but this is mainly for clarity of illustration. In reality, the sealing panel **67** and can body **50** may contact each other in the region of the channels **70**, but are not
5 sealed or otherwise attached together in the channels **70**, which is what allows excess gas pressure to escape through the channels.

This venting action is also aided by similar channels **72** defined between the outer peripheral portion **68** of the end closure and the outer surface of the can body **50**. The channels **72** are formed as a result of the grooves **26** in the inner surface of the support
10 ring **22**, which are aligned with the gaps between sealing chuck segments **32** and allow the outer peripheral portion **68** of the end closure in the regions of the grooves to “flow” outwardly into the grooves. The channels **70** on the inner side of the can body can communicate with the channels **72** on the outer side because the end closure is not sealed to the very top edge of the can body, as best seen in FIG. 5.

15 A container assembled in accordance with the foregoing description can be used for containing a product that off-gases or causes increasing pressure within the container, such as refrigerated dough or roasted coffee. Excess pressure in the container is vented through the channels. The threshold pressure at which venting will occur can be controlled by suitably designing the number and sizes of the gaps between sealing chuck
20 segments **32** and correspondingly the number and sizes of the grooves **26** in the support ring **22**, thereby controlling the number and dimensions of the channels **70**, **72**.

As one non-limiting example, the sealing panel **67** can have a thickness of about .015” to about .020”, and a circumference of about 9.5”. The collective circumferential width of the channels **70** (i.e., the sum of the circumferential widths of all channels) can
25 be about .095” to about 1.5”, or on a percentage basis, about 1% to about 16% of the circumference of the sealing panel. The collective circumferential width more preferably ranges from about 2% to about 10%, and still more preferably about 4% to about 6% of the circumference. As one example, there can be six channels **70** each .060” in circumferential width, for a collective circumferential width of .36”, or 3.8% of the
30 circumference. It will be understood that the circumferential widths of the channels **70** correspond to the circumferential widths of the gaps between sealing segments **32** at the radially outer surface **36** of the sealing chuck **30**, and the circumference of the sealing panel **67** is substantially equal to the circumference of the outer surface **36** of the sealing chuck **30**. Thus, another way of specifying the preferred channel/gap widths is to require
35 that the collective circumferential width of the gaps between segments **32** at the radially

outer surface **36** of the sealing chuck **30** ranges from about 1% to about 16% (more preferably about 2% to about 10%, and still more preferably about 4% to about 6%) of the circumference of the outer surface **36**.

Many modifications and other embodiments of the inventions set forth herein will
5 come to mind to one skilled in the art to which these inventions pertain having the benefit
of the teachings presented in the foregoing descriptions and the associated drawings.
Therefore, it is to be understood that the inventions are not to be limited to the specific
embodiments disclosed and that modifications and other embodiments are intended to be
included within the scope of the appended claims. Although specific terms are employed
10 herein, they are used in a generic and descriptive sense only and not for purposes of
limitation.

WHAT IS CLAIMED IS:

1. A substantially paper-based composite container for an off-gassing product, comprising:

5 a can body comprising a tubular wall constructed from paperboard wrapped about an axis, the can body having opposite ends each defining an opening, the can body further comprising a substantially gas-impervious liner attached to an inner surface of the paperboard of the can body; and

10 a pair of substantially paper-based end closures attached to the opposite ends of the can body, each end closure defining a generally cylindrical sealing panel in contact with a surface of the can body, a heat seal material being disposed on a surface of the sealing panel and a heat seal material being disposed on the surface of the can body contacted by the sealing panel;

the sealing panels of the end closures being attached to the can body by heat seals;

15 the heat seal for at least one of the end closures being discontinuous such that at least one vent channel extends through the heat seal so as to establish fluid communication between an interior of the composite container and the environment outside the composite container, the at least one vent channel being operable to vent excess gas pressure from the interior of the container.

20 2. The substantially paper-based composite container of claim 1, wherein the heat seal having the at least one vent channel is formed by a plurality of separate, spaced heat seal regions where the heat seal materials on the sealing panel and can body have been heat sealed together, thereby forming the at least one vent channel between the spaced heat seal regions.

25 3. The substantially paper-based composite container of claim 2, wherein the spaced heat seal regions are spaced apart in a circumferential direction about the can body, the at least one vent channel extending generally axially of the can body.

4. The substantially paper-based composite container of claim 3, wherein there are a plurality of vent channels circumferentially spaced apart.

30 5. The substantially paper-based composite container of claim 1, wherein the end closures comprise a paperboard layer and a heat-sealable layer providing the heat seal material.

6. A method for assembling a composite container for an off-gassing product, comprising the steps of:

providing a can body comprising a tubular wall constructed from paperboard wrapped about an axis, the can body having opposite ends each defining an opening, the
5 can body further comprising a substantially gas-impervious liner attached to an inner surface of the paperboard of the can body;

providing a pair of substantially paper-based end closures, each end closure defining a generally cylindrical sealing panel, a heat seal material being disposed on a surface of the sealing panel, and a heat seal material being disposed on a corresponding
10 surface of the can body; and

positioning the end closures over the openings at the ends of the can body and attaching the sealing panels of the end closures to the can body by forming heat seals therebetween;

wherein the heat seal for at least one of the end closures is formed to be
15 discontinuous such that at least one vent channel extends through the heat seal so as to establish fluid communication between an interior of the composite container and the environment outside the composite container, the at least one vent channel being operable to vent excess gas pressure from the interior of the container.

7. The method of claim 6, wherein the heat seal having the at least one vent channel
20 is formed by a plurality of separate, spaced sealing elements that are heated so as to heat and soften the heat seal materials on the sealing panel and can body at a plurality of separate, spaced regions, thereby forming the at least one vent channel between the spaced regions.

8. The method of claim 7, wherein the sealing elements are part of an expandable
25 chuck, the heat seal being formed by the steps of:

placing the chuck in an unexpanded condition within the opening at the respective end of the can body, the sealing panel of the end closure being located between the tubular wall of the can body and the chuck;

disposing a support ring about the end of the can body, such that the tubular wall
30 of the can body and the sealing panel of the end closure are disposed between the support ring and the chuck; and

heating the sealing elements of the chuck and expanding the chuck by moving the sealing elements radially outwardly to compress the sealing panel and tubular wall of the can body between the support ring and a radially outer surface of the chuck formed by
35 the sealing elements, wherein expansion of the chuck causes circumferential gaps to

develop between adjacent sealing elements at the radially outer surface, the heated sealing elements causing the heat seal materials on the sealing panel and can body to be softened and to seal together at the spaced regions.

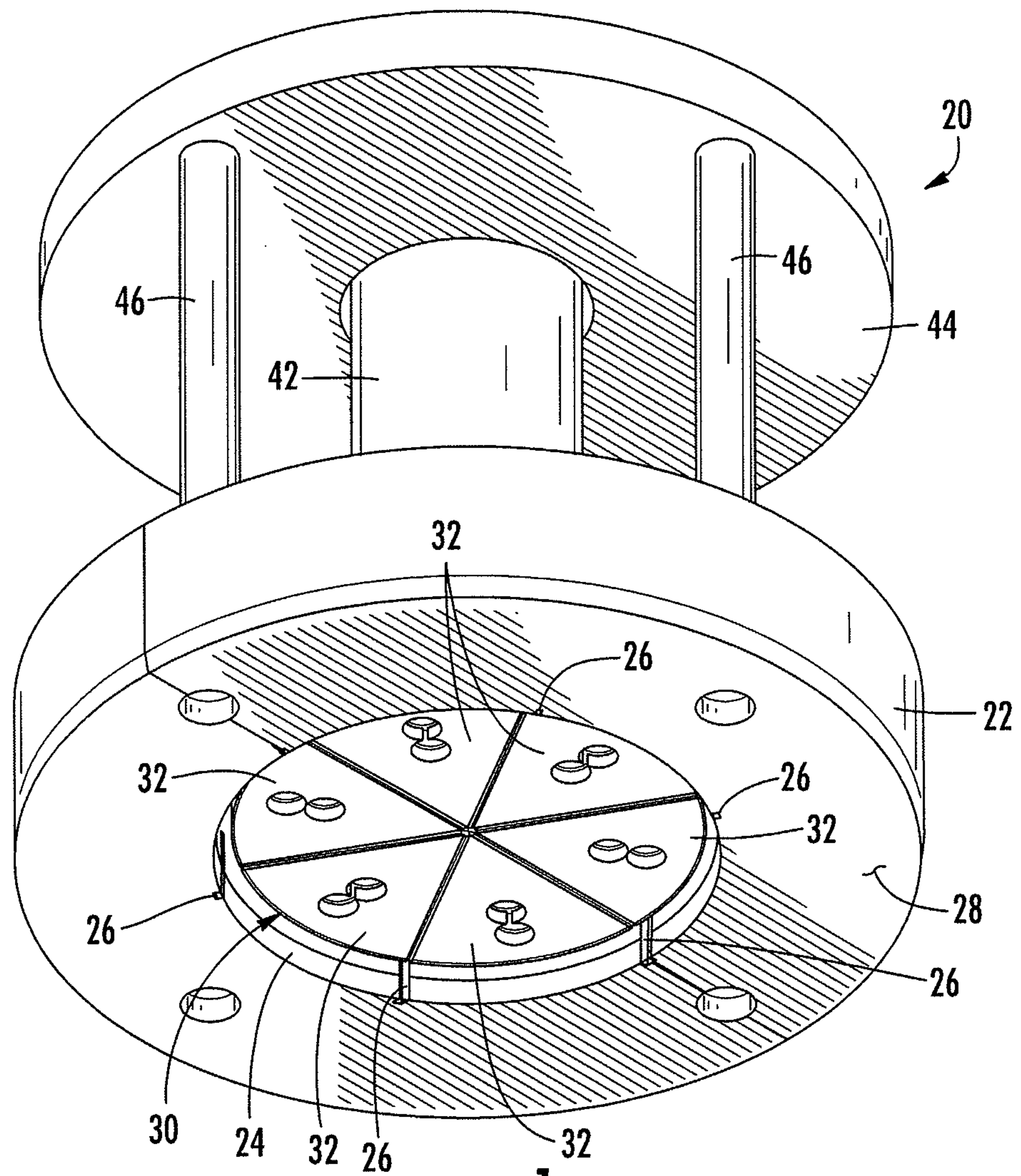
5 9. The method of claim 8, wherein between two and ten sealing elements are moved radially outwardly to compress the sealing panel and tubular wall of the can body between the sealing elements and the support ring, thereby forming the heat seal to have between two and ten spaced regions.

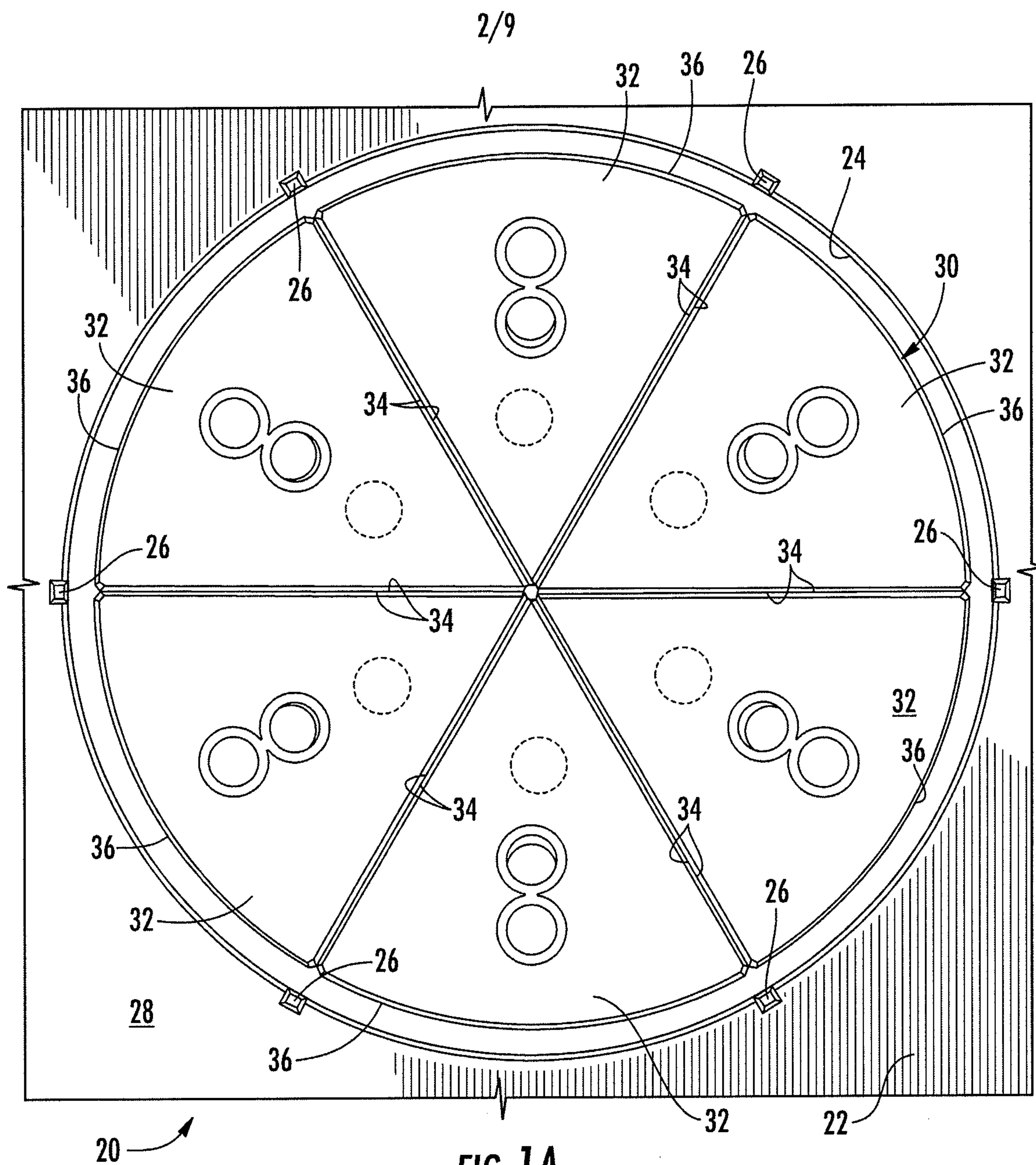
10 10. The method of claim 8, wherein between four and eight sealing elements are moved radially outwardly to compress the sealing panel and tubular wall of the can body between the sealing elements and the support ring, thereby forming the heat seal to have between four and eight spaced regions.

15 11. The method of claim 8, wherein when the chuck is expanded to compress the sealing panel and tubular wall of the can body between the sealing elements and the support ring, a collective circumferential width of the gaps between the sealing elements at the radially outer surface of the chuck ranges from about 1% to about 16% of a circumference of the radially outer surface of the chuck.

20 12. The method of claim 11, wherein when the chuck is expanded the collective circumferential width of the gaps between the sealing elements at the radially outer surface of the chuck ranges from about 2% to about 10% of the circumference of the radially outer surface of the chuck.

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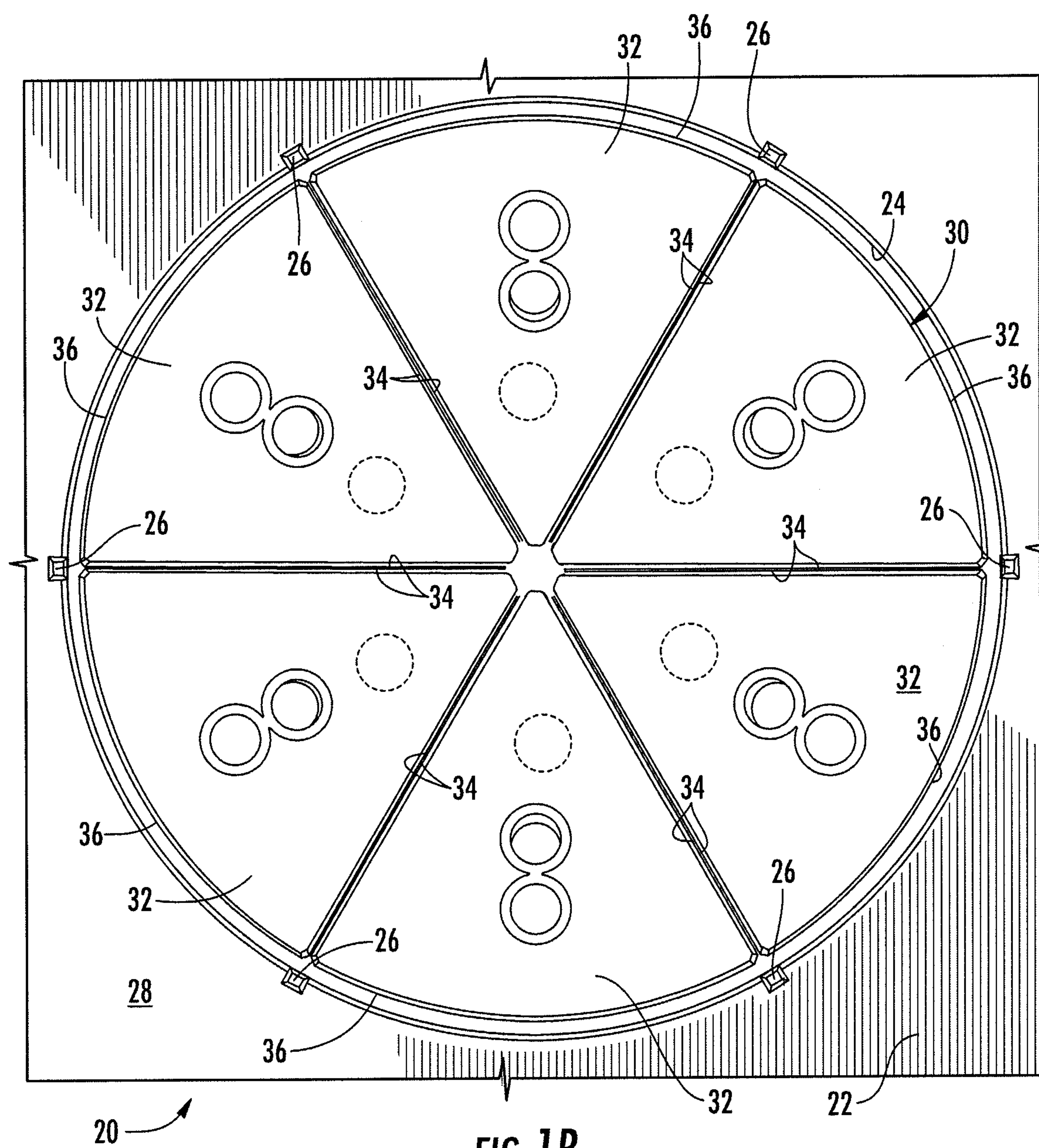


FIG. 1B

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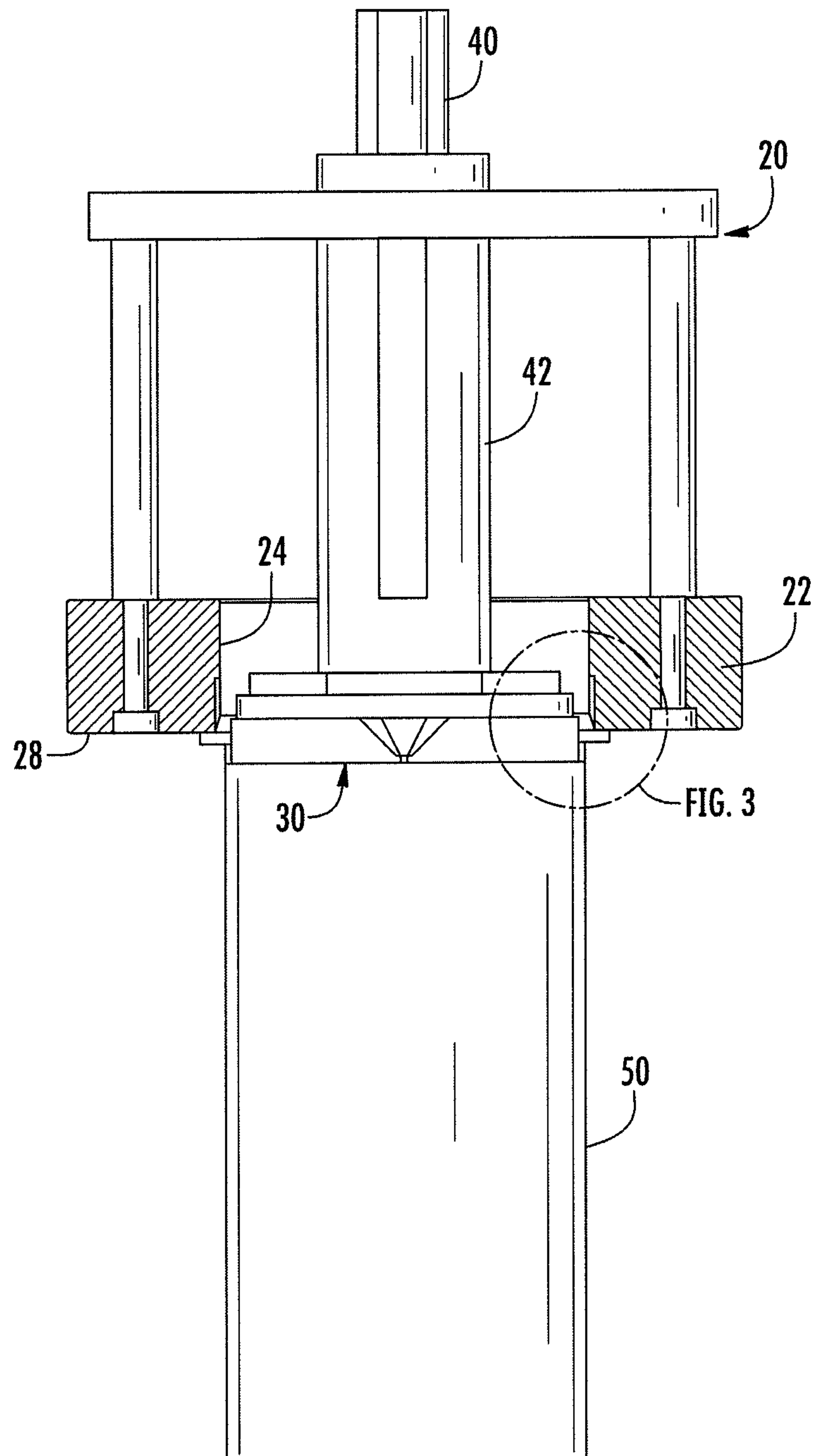


FIG. 2

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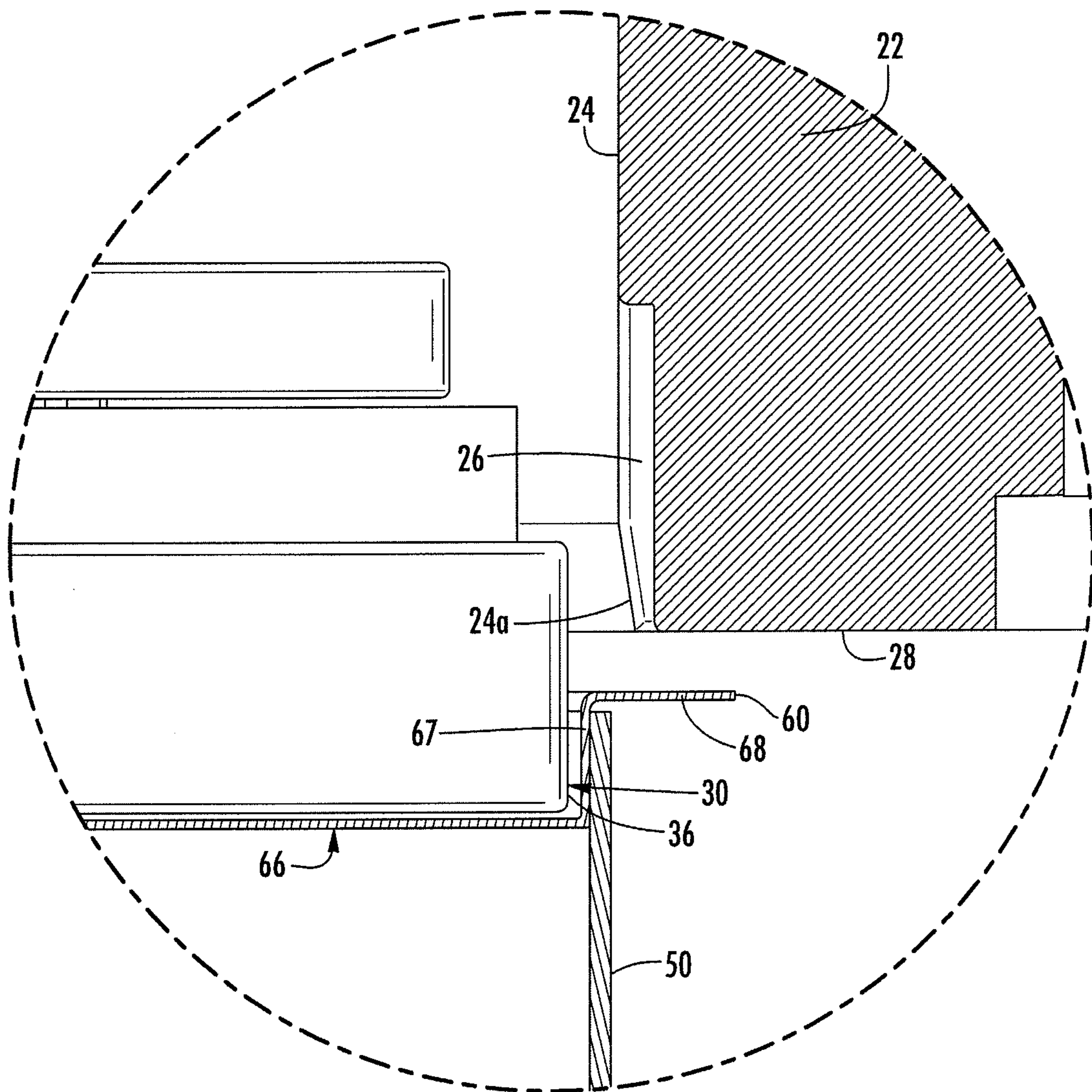


FIG. 3

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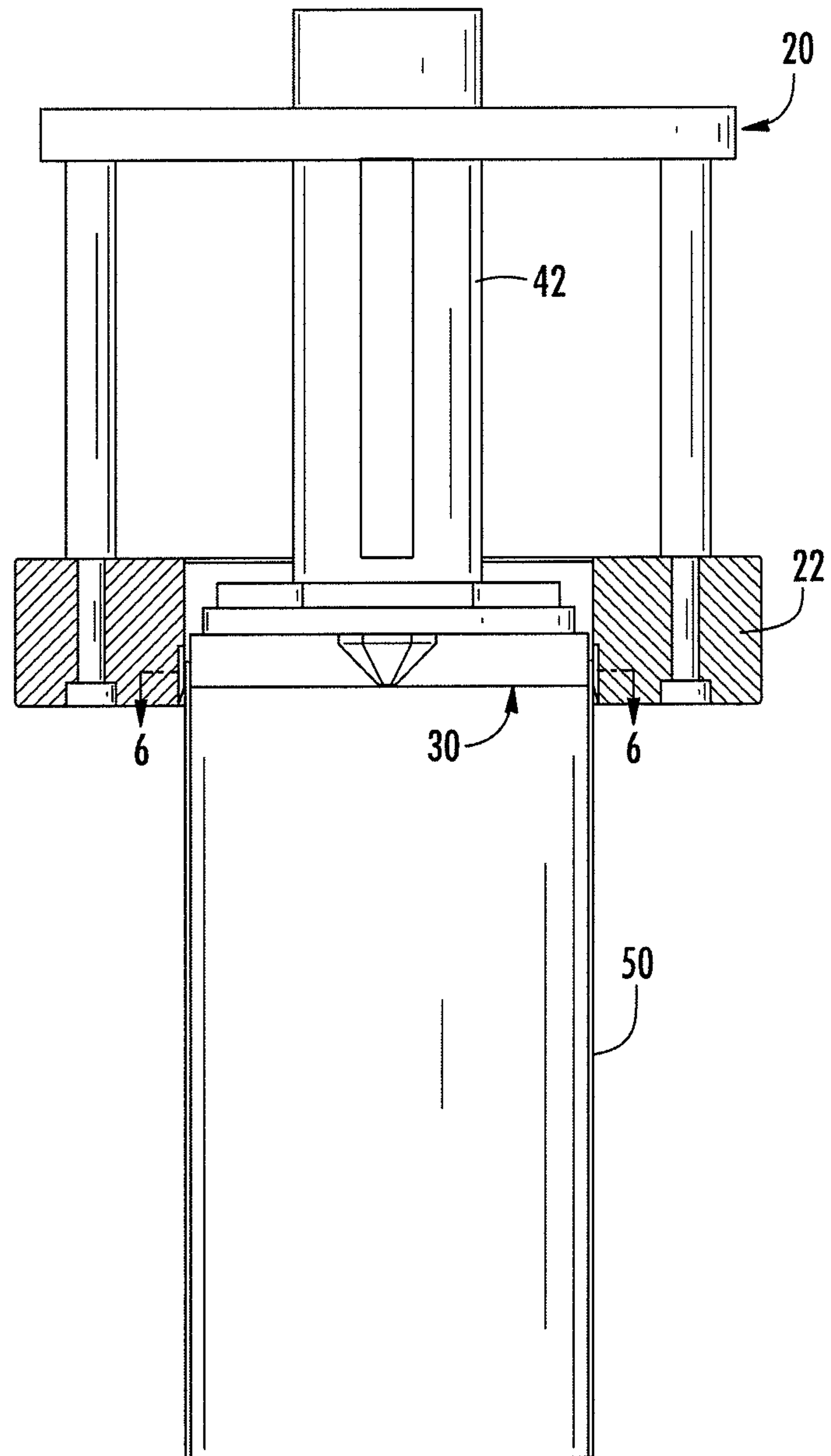


FIG. 4

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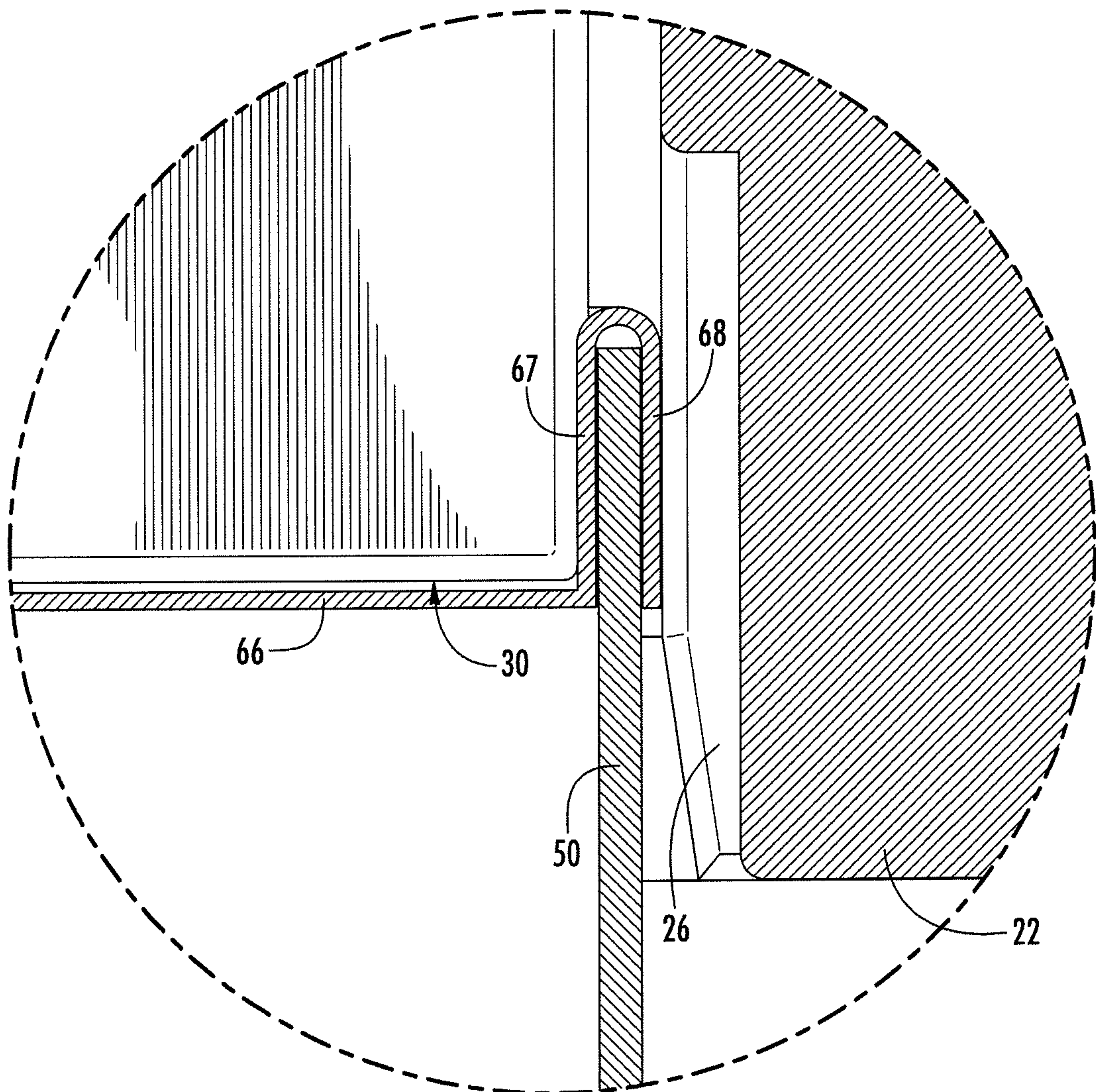
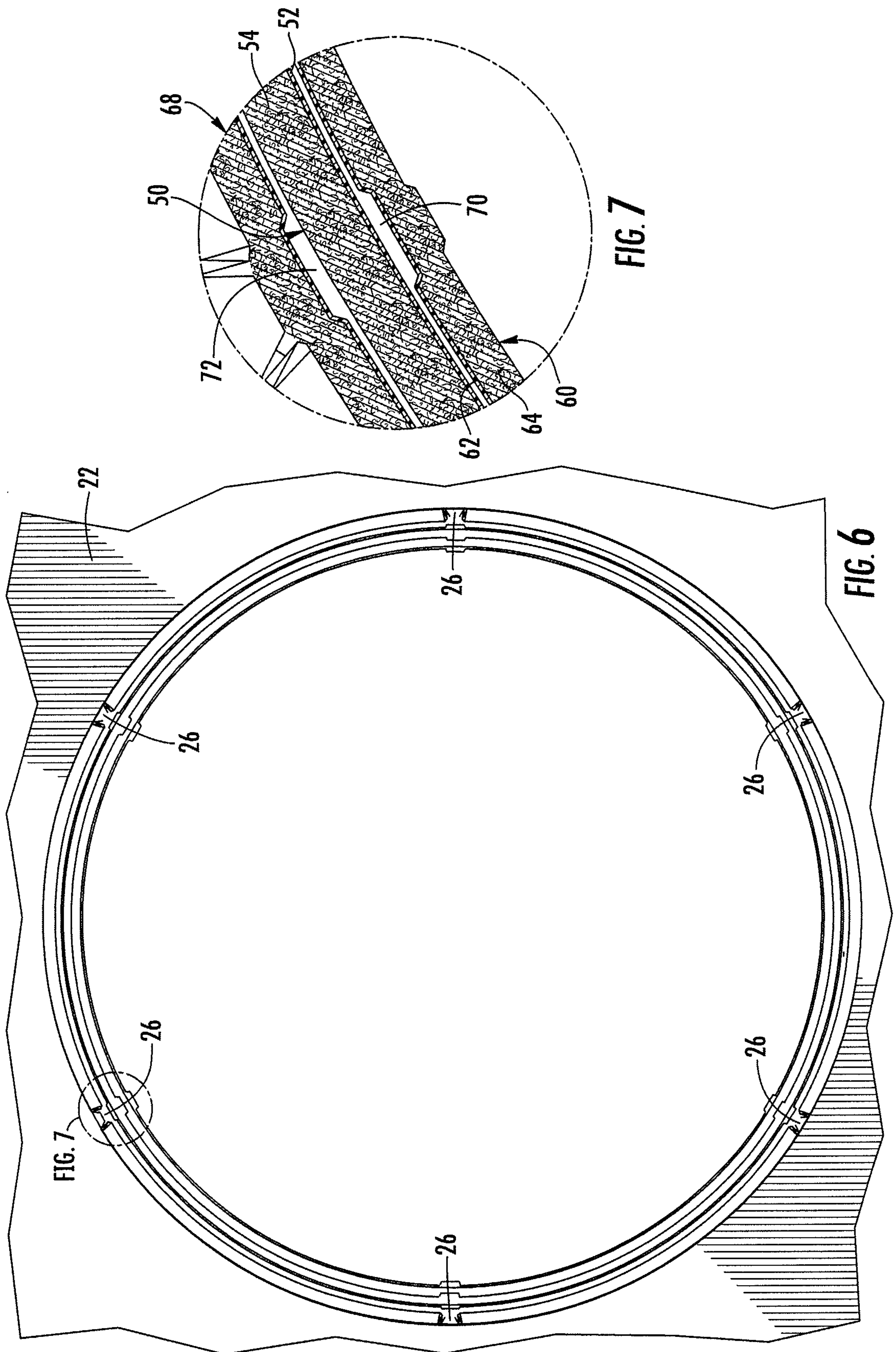
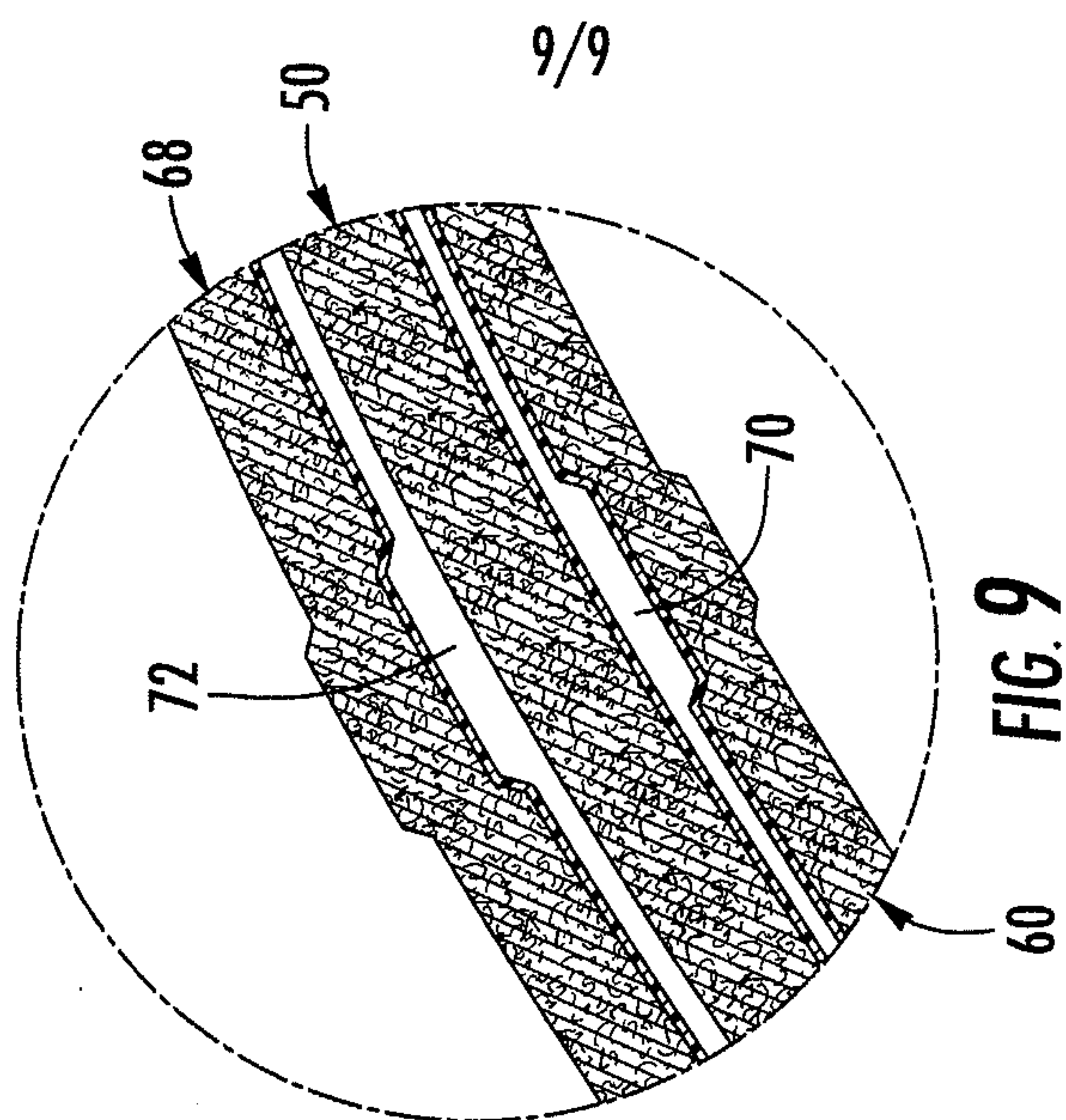
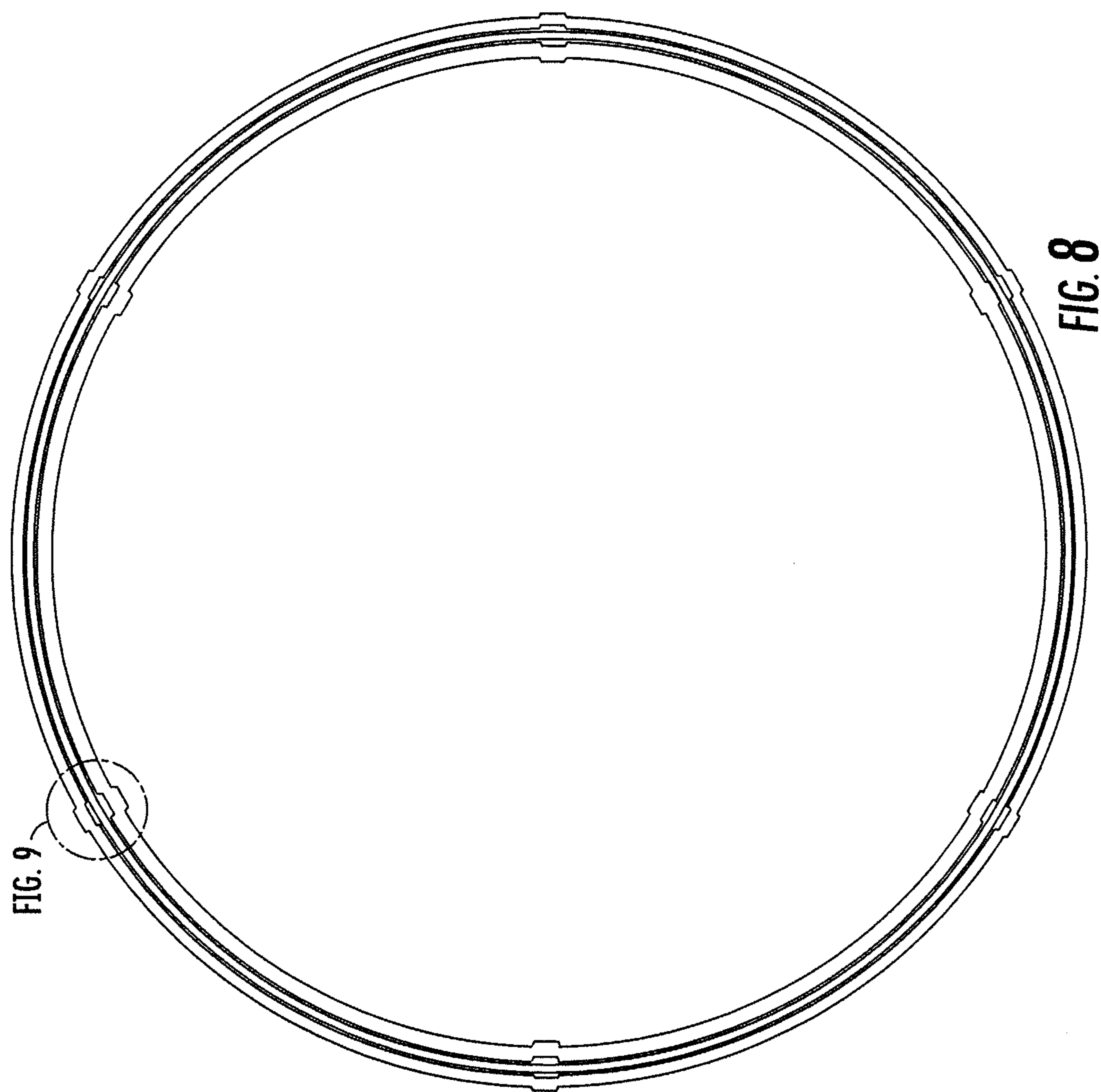


FIG. 5

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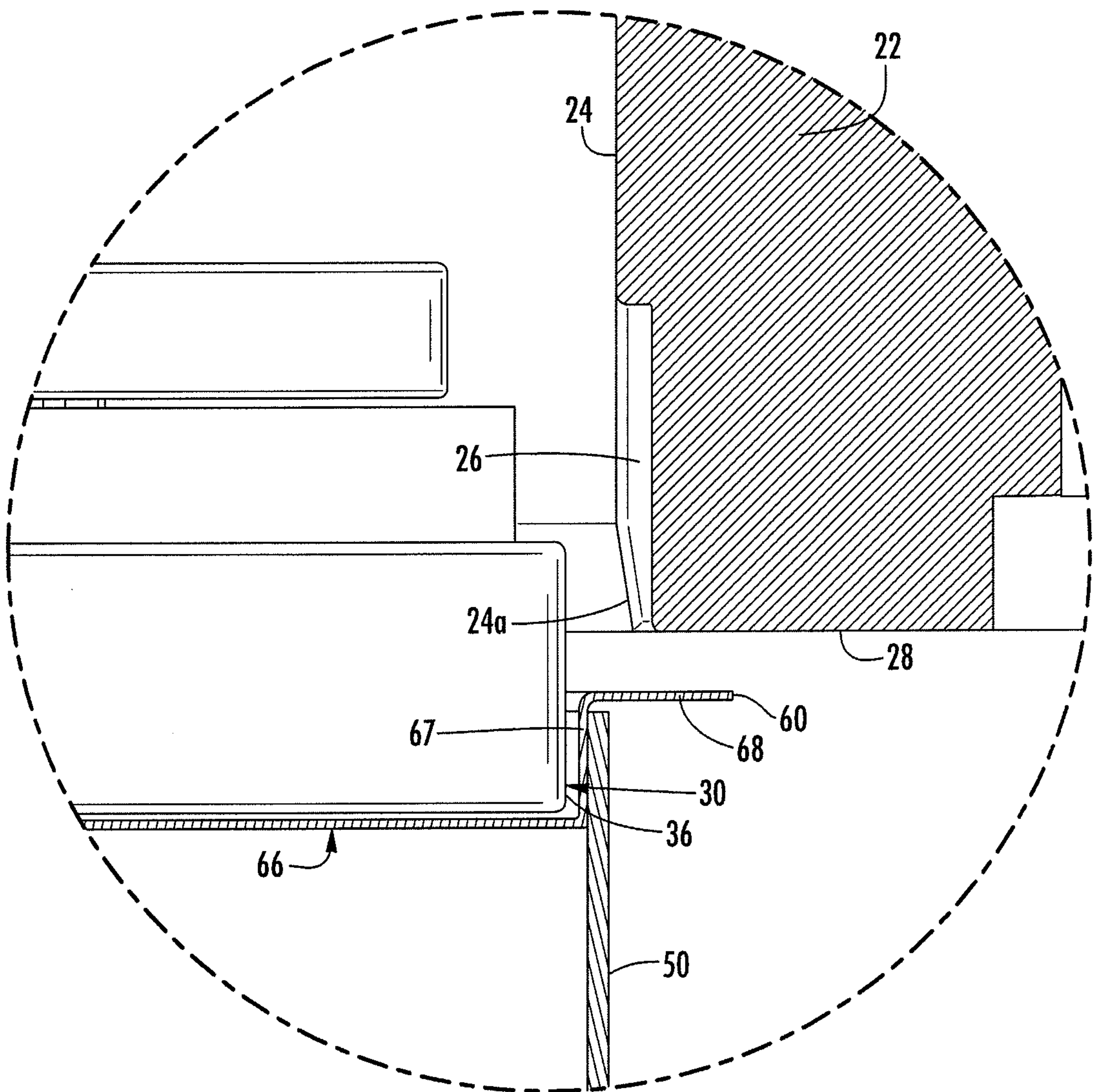


FIG. 3