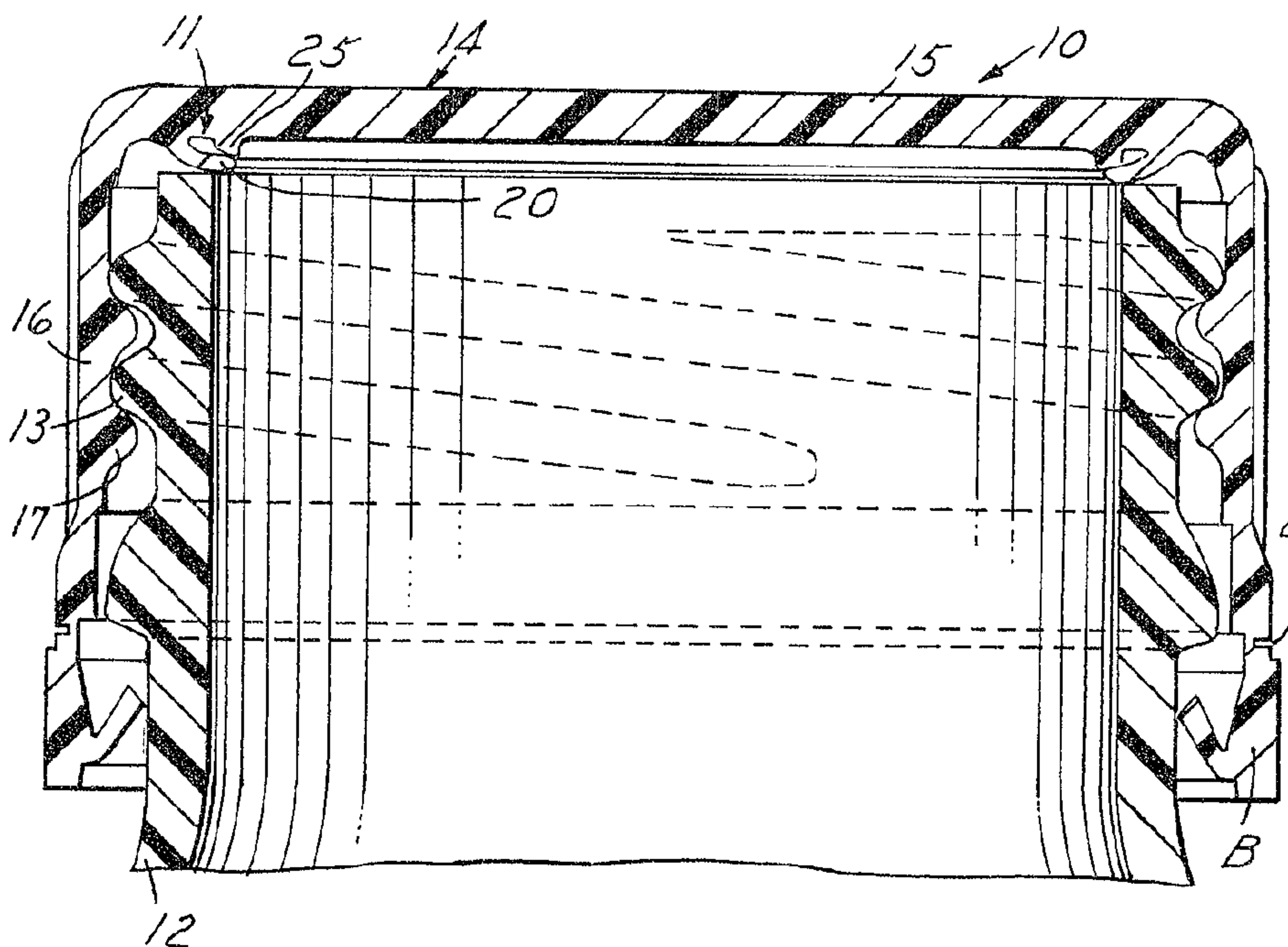




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 (54) Title: PLASTIC CONTAINER PACKAGE WITH LINERLESS SEALING CLOSURE SYSTEM



(57) Abrégé/Abstract:

A plastic container closure package with a linerless sealing closure system comprising a plastic container having a threaded finish for receiving a closure having a base wall and an internal skirt with complementary threads on the skirt. The plastic container is made by a process wherein a tube of molten plastic is inflated and blown to form the container and thereafter the tube is trimmed to form the sealing surface of the finish of the container. The closure includes an annular flange that extends downwardly from the underside of the base wall of the closure and radially inwardly of the closure for engagement with the container. The annular flange includes a smooth continuous frustoconical surface that faces the finish of the container and engages the inner edge at the juncture of the top surface and inside surface of the finish of the container. An annular stop extends axially from the underside of the base wall of the closure to limit the flexing of the annular flange. The width of the flange is such that the free end thereof normally extends beyond the inner edge of the finish into sealing this engagement intermediate the free edge and the end of the flange.

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**PLASTIC CONTAINER PACKAGE WITH
LINERLESS SEALING CLOSURE SYSTEM**

Abstract of the Disclosure

5 A plastic container closure package with a linerless
sealing closure system comprising a plastic container having a
threaded finish for receiving a closure having a base wall and
an internal skirt with complementary threads on the skirt. The
plastic container is made by a process wherein a tube of molten
plastic is inflated and blown to form the container and thereafter
the tube is trimmed to form the sealing surface of the finish
of the container. The closure includes an annular flange that
10 extends downwardly from the underside of the base wall of the
closure and radially inwardly of the closure for engagement
with the container. The annular flange includes a smooth
continuous frustoconical surface that faces the finish of the
container and engages the inner edge at the juncture of the top
15 surface and inside surface of the finish of the container. An
annular stop extends axially from the underside of the base
wall of the closure to limit the flexing of the annular flange.
The width of the flange is such that the free end thereof
normally extends beyond the inner edge of the finish into sealing
20 this engagement intermediate the free edge and the end of the
flange.

This invention relates to a plastic container package including a linerless sealing closure system.

Background and Summary of the Invention

5 When plastic containers are utilized to retain liquids such as oil or water, it has been found that it is necessary that the closure utilized with the container have a separate
10 liner in order to provide an adequate seal. The problem of sealing is made even more complex where the plastic container is made by closing molds about a tube of molten plastic material and blowing the tube followed by thereafter cutting and trimming
15 the portion of the tube that has been blown into a finish to provide a sealing surface on the upper end of the finish. The trimming process often results in variation in the plane of the finish at circumferentially spaced points along the sealing surface as well as non-uniformity in a radial direction. The
20 trimming process can result in variations in height circumferentially of the finish, known as "trim slant". The trimming can also result in the top surface being inclined rather than being perpendicular to the longitudinal axis of the container. In addition, in such a molding process wherein the tube is extruded variations in diameter of the finish can occur circumferentially known as ovality. Each of these conditions can result in failure of the seal so that it has thought to be necessary to utilize a sealing liner in the closure. Sealing

on such a container is also made more difficult due to variations or imperfections in the seam produced adjacent the juncture of the closed molds.

5 Various patents have been proposed including flanges extending radially outwardly and inwardly as shown in United States patents 3,053,406, 3,067,900, 3,255,909, 3,393,818, 3,802,590, 4,069,937, 4,196,818, 4,220,250, 4,398,645, 4,422,947, 4,450,973, 4,598,835, 4,739,893 and 4,872,304.

10 As far as the present inventor is aware, none of these patents has been directed to the problems of the present invention or resulted in a satisfactory package for liquids.

15 Among the objectives of the present invention are to provide a package for a plastic container made by the aforementioned process which does not require a separate liner and utilizes a linerless sealing closure system which will compensate for any unevenness and out-of-round top surfaces on the finish of the container; and which container package will be capable of packaging oil, water or similar fluids.

20 In accordance with the invention a plastic container closure package with a linerless sealing closure system comprising a plastic container having a threaded finish for receiving a closure having a base wall and an internal skirt with complementary threads on the skirt. The plastic container is made by a process wherein a tube of molten plastic is inflated and blown to form the container and thereafter the tube is

25

trimmed to form the sealing surface of the finish of the
container. The closure includes an annular flange that extends
downwardly from the underside of the base wall of the closure
and radially inwardly of the closure for engagement with the
5 sealing surface on the container. The annular flange includes
a smooth continuous frustoconical surface that faces the finish
of the container and engages the inner edge at the juncture of
the top surface and inside surface of the finish of the container.
An annular stop extends axially from the underside of the base
10 wall of the closure to limit the flexing of the annular flange.
The width of the flange is such that the free end thereof
normally extends beyond the inner edge of the finish surface
into sealing engagement intermediate the free edge and the end
of the flange.

Description of the Drawings

FIG. 1 is a fragmentary sectional view on an enlarged scale of a container package embodying the invention;

5 FIG. 2 is a fragmentary sectional view on an enlarged scale of a portion of the package shown in FIG. 1;

FIG. 3 is a fragmentary sectional view of a portion of the closure before application to the container;

10 FIGS. 4, 5 and 6 are fragmentary sectional views of closure packages which show the manner in which the closure compensates for variations in height and non-perpendicular surfaces on the finish of the container.

FIG. 7 is a view similar to FIG. 2 of a modified form of closure that can be used in the container package.

Description

In accordance with the invention, a plastic container closure package 10 with a linerless sealing closure system comprising a plastic container 12 having an external threaded finish 13 for receiving a plastic closure 14 which has a base wall 15 and an integral skirt 16 with complementary threads 17 on the skirt 16.

The plastic container 12 is made by a process wherein a tube of molten plastic is extruded, blow molds are closed over the tube and the tube is blown to form the container. Thereafter the tube finish or neck of the container is trimmed to form the sealing surface of the finish of the container. The trimming process can result in variations in height circumferentially of the finish, known as "trim slant". The trimming can also result in the top surface being inclined rather than being perpendicular to the longitudinal axis of the container. In addition, in such a molding process wherein the tube is extruded variations in diameter of the finish can occur circumferentially known as ovality. Each of these conditions can result in failure of the seal so that it has thought to be necessary to utilize a sealing liner in the closure. Sealing on such a container is also made more difficult due to variations or imperfections in the seam produced adjacent the juncture of the closed molds.

The trimmed container is intended to provide a top surface 18 which is perpendicular to the longitudinal axis of the container 12.

5 The closure 14 includes an annular flange 20 that extends downwardly from the underside of the base wall 15 of the closure 14 and radially inwardly of the closure 14 for engagement with the container 12. The annular flange 20 includes a smooth continuous frustoconical surface 21 that faces the finish 13 of the container 12 and is designed to engage the inner edge 22 at the juncture of the top surface 18 and inner surface 23 of the finish 13. The flange 20 includes a free annular edge 24 that is rounded at least at portion facing the finish 13. The width of the flange 20 is such that the free edge 24 thereof normally extends beyond the top surface 18 into sealing engagement intermediate the free edge 24 and the other end of the flange 20 extending from the underside of the base wall 15. The flange 20 has its greatest thickness adjacent the base wall 15 and tapers and converges toward the free edge 24. An annular stop 25 extends axially from the underside of the base wall 15 of the closure 14 to limit the flexing of the annular flange 20.

The container and closure are preferably made of high density polyethylene but may also be made of other plastics such as other polyethylenes or polypropylenes.

The closure 14 also preferably includes a tamper indicating band B connected to the skirt 16 along a weakended line L, such as shown in United States application Serial No. 07/386,391 filed July 27, 1989.

5 The closure system forming part of package will accommodate for unevenness and out-of-round conditions.

10 For example ie as shown in FIG. 4, the level or axial distance between one side of the container top surface as at 18a and differs from the other side 18b, known as trim slant, the differential flexing along the periphery of the flange 20 accommodates for the variation in height of the top surface 18. As shown in FIG. 5, if the top surface 18c is cut so that it is inclined on one side so that it tapers downwardly and axially
15 inwardly, the flange 20 will also accommodate such situations or variation.

20 If as shown in FIG. 6, the top surface 18d is tapered in the opposite direction from that shown in FIG. 5, the annular flange 20 will also provide a proper seal. If there is a variation in out-of-round condition of the finish, the ability of the flange 20 to engage at various portions along its width will accommodate and provide the satisfactory seal under those conditions.

25 It has been found that in tests as represented by the following, the plastic container package with linerless sealing

closure system effectively seals the package where the contents are, for example, liquids such as motor oil or water and the like.

In the form shown in FIG. 7, the flange 20a has a partial rounded free edge 24a facing the finish 13 to facilitate manufacture.

It can thus be seen that the container package effectively compensates for trim slant, non-perpendicularity of the top surface of the finish and ovality of the finish. In addition since the sealing is designed to occur at the inner edge of the juncture of the top surface and inside surface of the finish, the problems of sealing at the seam of the container are obviated. Furthermore since the seal is at the inner edge of the finish, the liquid is kept from the seal area.

The container package will provide a satisfactory seal even though the container can vary from the ideal as indicated in the following representative measurement of diameters, ovality and trim slant of 32oz high density polyethylene bottles from different cavities made by the extrusion, blow and trim process heretofore described:

| A <u>Diameter</u> | | | B <u>Ovality</u> | | <u>Trim Slant</u> |
|----------------------|-------------|----------------|---------------------|----------------|-------------------|
| <u>Min./Max</u> | <u>aver</u> | <u>ovality</u> | <u>aver</u> | <u>ovality</u> | |
| .971/.991 | .981 | .020" | 1.099 | .016" | .018" |
| .966/.986 | .976 | .020 | 1.095 | .014 | .016 |
| .967/.990 | .979 | .023 | 1.096 | .020 | .020 |
| .971/.986 | .979 | .015 | 1.097 | .012 | .021 |
| .975/.990 | .983 | .015 | 1.098 | .015 | .020 |
| .970/.988 | .979 | .018 | 1.094 | .018 | .020 |
| .970/.979 | .975 | .009 | 1.092 | .010 | .020 |
| .965/.978 | .972 | .013 | 1.090 | .012 | .020 |
| .964/.978 | .971 | .014 | 1.091 | .016 | .022 |
| .954/.980 | .967 | .026 | 1.087 | .018 | .015 |
| .967/.981 | .974 | .014 | 1.093 | .015 | .019 |
| .961/.981 | .971 | .020 | 1.094 | .016 | .016 |
| .960/.980 | .970 | .020 | 1.094 | .017 | .028 |
| .959/.984 | .972 | .025 | 1.094 | .023 | .026 |
| .958/.983 | .971 | .025 | 1.094 | .019 | .028 |
| .955/.968 | .962 | .013 | 1.089 | .010 | .027 |
| .961/.977 | .969 | .016 | 1.092 | .011 | .016 |
| .960/.972 | .966 | .012 | 1.092 | .011 | .021 |

5 Tests performed on container packages with motor oil utilizing prior art closures with a liner as a standard or contest and container packages for oil embodying the invention show no leakage within 24 hours or one week when case containing such packages were inverted and stand on pallets under warehouse conditions.

10 It can thus be seen that there has been provided a package for a plastic container made by the aforementioned process which does not require a separate liner and utilizes a linerless sealing closure system which will compensate for any

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unevenness and out-of-round top surfaces on the finish of the container; and which container package will be capable of packaging oil, water or similar fluids.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A plastic closure adapted for use with a plastic
5 container and closure package for liquids with a linerless
sealing closure system wherein the plastic container of the
package has a threaded finish for receiving said closure,
and the threaded finish has an upper end axially above the
10 thread with a substantially flat top surface, an outer
surface and an inner surface, the outer surface and inner
surface each intersecting the top surface to respectively
define therewith an outer edge and an inner edge, and
wherein the threaded finish may have at least one variation
15 comprising at least one of a variation in height
circumferentially of the top surface of said threaded
finish; a variation in inclination of the top surface of
said threaded finish; a variation in out-of round; a
variation in ovality of said threaded finish, and a
20 variation in a mold seam produced adjacent a juncture
formed by closed molds used in making the container;

said plastic closure comprising a base wall and a
peripheral skirt with a thread on the skirt adapted for
threadably engaging the container thread, said closure base
wall having an underside,

25 said closure including a single integral annular
flexible and resilient flange that extends downwardly from
the underside of the base wall of the closure and radially
inwardly of the closure, and a continuous annular stop that
extends axially from the underside of the base wall,

30 said annular flexible flange having a smooth
continuous frustoconical surface adapted to face said
threaded finish and terminating in a free edge, a portion
of said flange adjacent the base wall of the closure being

adapted to overlie the top surface of the threaded finish when said closure is threadably received on the threaded finish and being constructed to be normally out of contact with the base wall and for engaging the inner edge of the threaded finish to provide sealing engagement with such inner edge when the closure is fully applied by threading the closure onto the container, such that the flange is constructed to be free of any contact with the outer edge of the threaded finish at all times wherein a variation in the molding seam may interfere with sealing, and

said flange being adapted to comprise the sole sealing engagement with said upper end of the threaded finish when the closure is fully applied onto the container and adapted to then accommodate any such variations in height and inclination in the top surface of the threaded finish, out-of-round and ovality of the threaded finish, and imperfections in the seam produced in the threaded finish adjacent the juncture of closed molds used in making the container,

the width and position of the flange being such that the free edge thereof is adapted to normally extend beyond the inner edge of the threaded finish and the sealing engagement is normally intermediate the free edge of said flange and said base wall, when the closure is fully applied onto the container, said flange being capable of resiliently flexing intermediate the free edge and the portion adjacent the base wall such that the free edge may move toward the base wall and such that the flange is capable of flexing differentially about the periphery of the flange when fully applied onto the container,

such that if there is a variation in which the height of the top surface of the threaded finish varies circumferentially, the flange is adapted to flex

differentially about the periphery of the flange, and

such that if there is a variation in the top surface of the threaded finish being inclined downwardly and inwardly on one side, the flange is adapted to flex
5 differentially about the periphery of the flange, and

such that if there is a variation in the top surface of the threaded finish being inclined downwardly and outwardly, the flange is adapted to flex differentially about the periphery of the flange, and

10 such that if there is a non-uniformity or variation in a radial direction in the threaded finish such as being out-of-round or having ovality, the flange is adapted to flex differentially to engage the inner edge of the threaded finish at portions of its width, and

15 so that the closure is adapted to effectively sealably accommodate any such variations in height and inclination of the top surface of the threaded finish due to trimming and any such variations in out-of-round or ovality of the threaded finish or imperfections produced adjacent a
20 juncture of closed molds used in making the container.

2. The plastic closure as set forth in claim 1 wherein the free edge of such flange underlies such stop but is constructed to be normally out of engagement with said stop
25 so that said stop provides an end limit to the range of the flexing of said annular flange toward said closure base wall.

3. The plastic closure set forth in claim 2 wherein said
30 flange has its greater width in cross section radially of said closure adjacent the base wall of the closure and has sides converging toward the free edge of said flange.

4. The plastic closure set forth in claim 3 wherein the free edge of said flange is rounded at least along a portion thereof adapted to face the threaded finish.

5 5. The plastic closure set forth in claim 4 wherein the entire free edge of said flange is rounded.

6. The closure set forth in claim 5 wherein said closure and the container are made of high density polyethylene.

10

7. A plastic container and closure package for liquids with a linerless sealing closure system comprising:

a plastic container having a threaded finish for receiving a closure,

15 said threaded finish having a top surface and inner and outer surfaces intersecting said top surface to define an inner edge and an outer edge respectively,

wherein said threaded finish may have variations circumferentially in height and inclination of the top surface of said threaded finish, non-uniformity in a direction radially of the threaded finish such as out-of-roundness or ovality of the threaded finish of the plastic container, and imperfections in a seam produced adjacent a juncture of closed molds used in making the container,

20 a plastic closure having a base wall and a peripheral skirt with complementary threads on the skirt engaging said threaded finish, said base wall having an underside,

said closure including an annular flexible flange that extends downwardly from the underside of the base wall of the closure and radially inwardly of the closure,

30 said annular flexible flange having a smooth continuous frustoconical surface facing said threaded finish and a free edge,

a portion of the flange adjacent the base wall of the closure overlying the top surface of the threaded finish,

said flange normally engaging the inner edge of said threaded finish of said container to provide sealing engagement with said inner edge,

said flange comprising the sole sealing engagement with said threaded finish of said plastic container and accommodating variations in height and inclination in the top surface of said threaded finish, non-uniformity in a direction radially of the threaded finish such as out-of-roundness or ovality of the threaded finish of the plastic container, and imperfections in the seam produced adjacent the juncture of closed molds used in making the container,

the width and position of the flange being such that the free edge thereof normally extends beyond the inner edge of the threaded finish and the sealing engagement is normally intermediate the free edge of said flange and said base wall, said flange being capable of flexing intermediate the free edge and the portion adjacent the base wall such that the free edge may move toward the base wall and such that the flange is capable of flexing differentially about the periphery of the flange

such that if the height of the top surface of the threaded finish varies circumferentially, the flange will flex differently about the periphery of the flange, and

such that if the top surface of the threaded finish is inclined downwardly and inwardly on one side, the flange will flex differentially about the periphery of the flange, and

such that if the top surface of the threaded finish is inclined downwardly and outwardly, the flange will flex differentially about the periphery of the flange, and

such that if the threaded finish is non-uniform in a

direction radially of the threaded finish such as being out-of-round or having ovality, the flange will flex differentially to engage the inner edge of the threaded finish at different portions of its width, and

5 such that the flange is free of any contact with the outer edge of the threaded finish wherein a molding seam may interfere with sealing, and

10 such that the closure effectively accommodates any such variations in height and inclination of the top surface of the threaded finish due to trimming and such variations in out-of-roundness or ovality or other non-uniformity in a direction radially of the threaded finish or imperfections in the seam produced adjacent the juncture of closed molds used in making the container.

15

8. The plastic container package set forth in claim 7 including an annular stop extending axially from the underside of the base wall of the closure, the free edge of the flange underlying the stop but being normally out of engagement with said stop, to limit the flexing of the annular flange.

20

9. The plastic container package set forth in claim 8 wherein said flange has greater cross-sectional thickness adjacent to the base wall of the closure and has sides converging toward the free edge of the flange.

25

10. The plastic container package set forth in claim 7 wherein said free edge of said flange is rounded at least along a portion thereof facing said threaded finish.

30

11. The plastic container package set forth in claim 10 wherein the free edge of said flange is rounded.

12. The container package set forth in claim 7 wherein said container and said closure are made of high density polyethylene.

5

13. The plastic container package set forth in any one of claims 7-12 wherein said plastic container has been made by closing molds about a tube of molten plastic material, blowing the tube to form the container and thereafter cutting and trimming the threaded finish.

10

FIG. 1

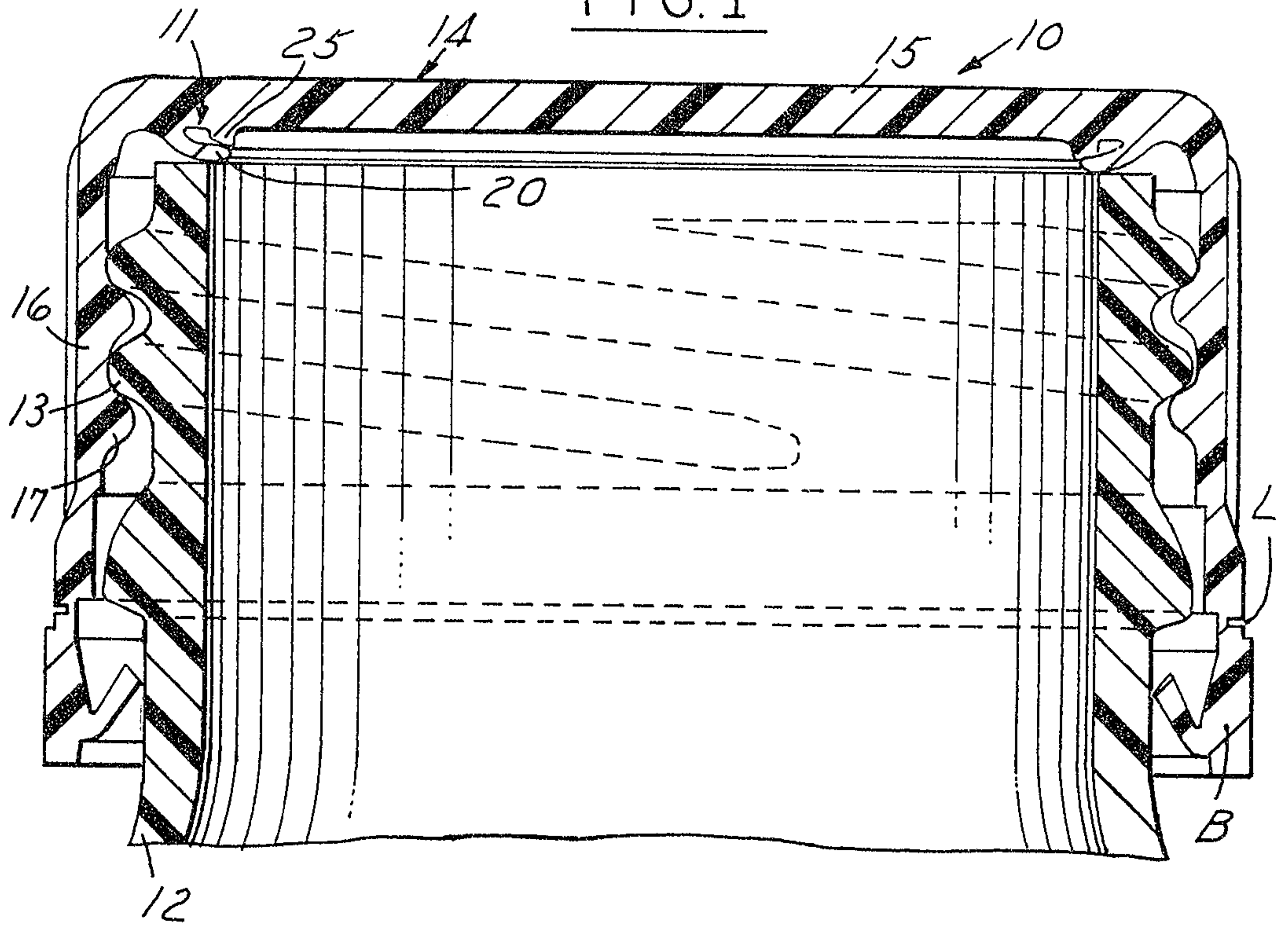


FIG. 2

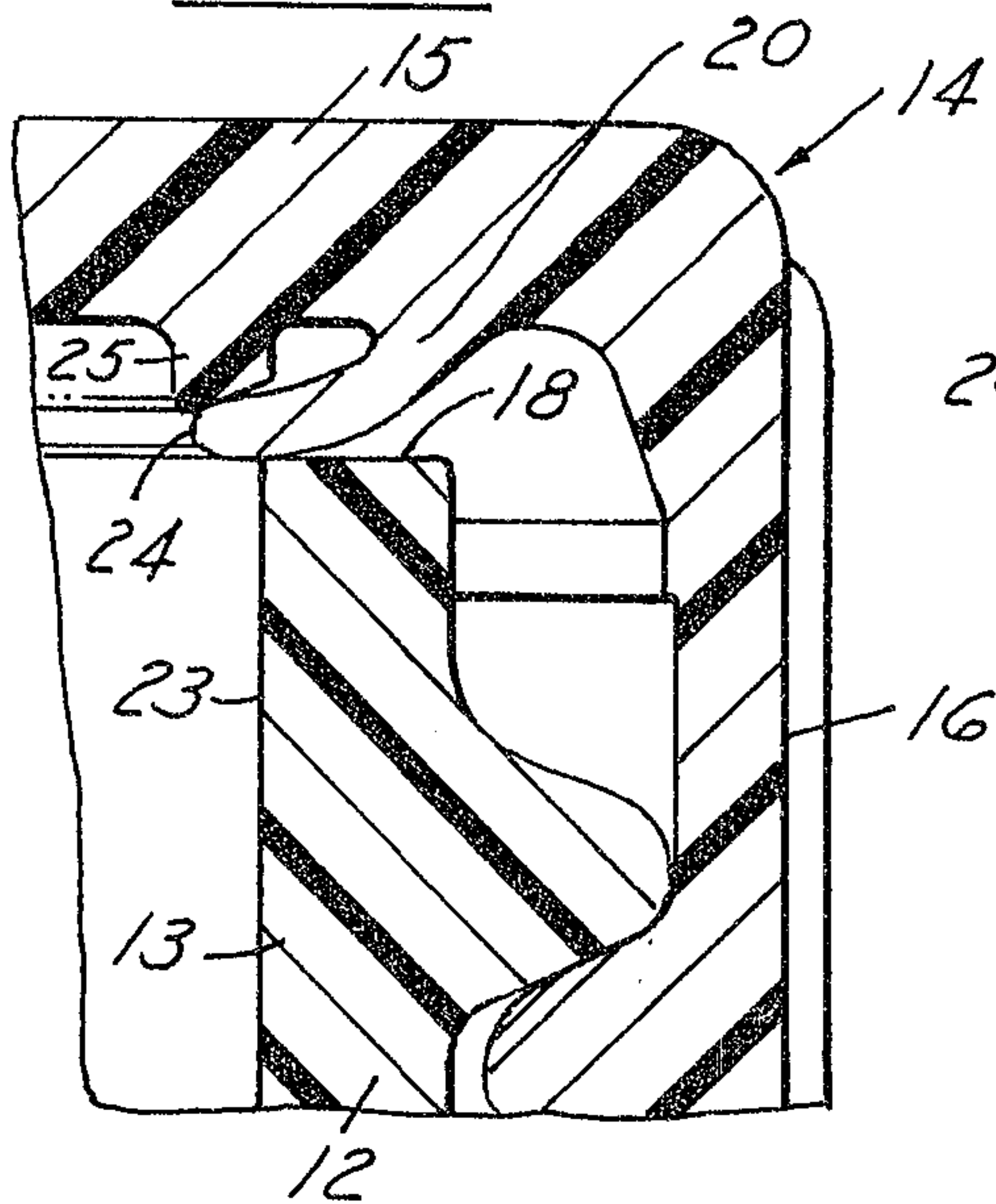


FIG. 3

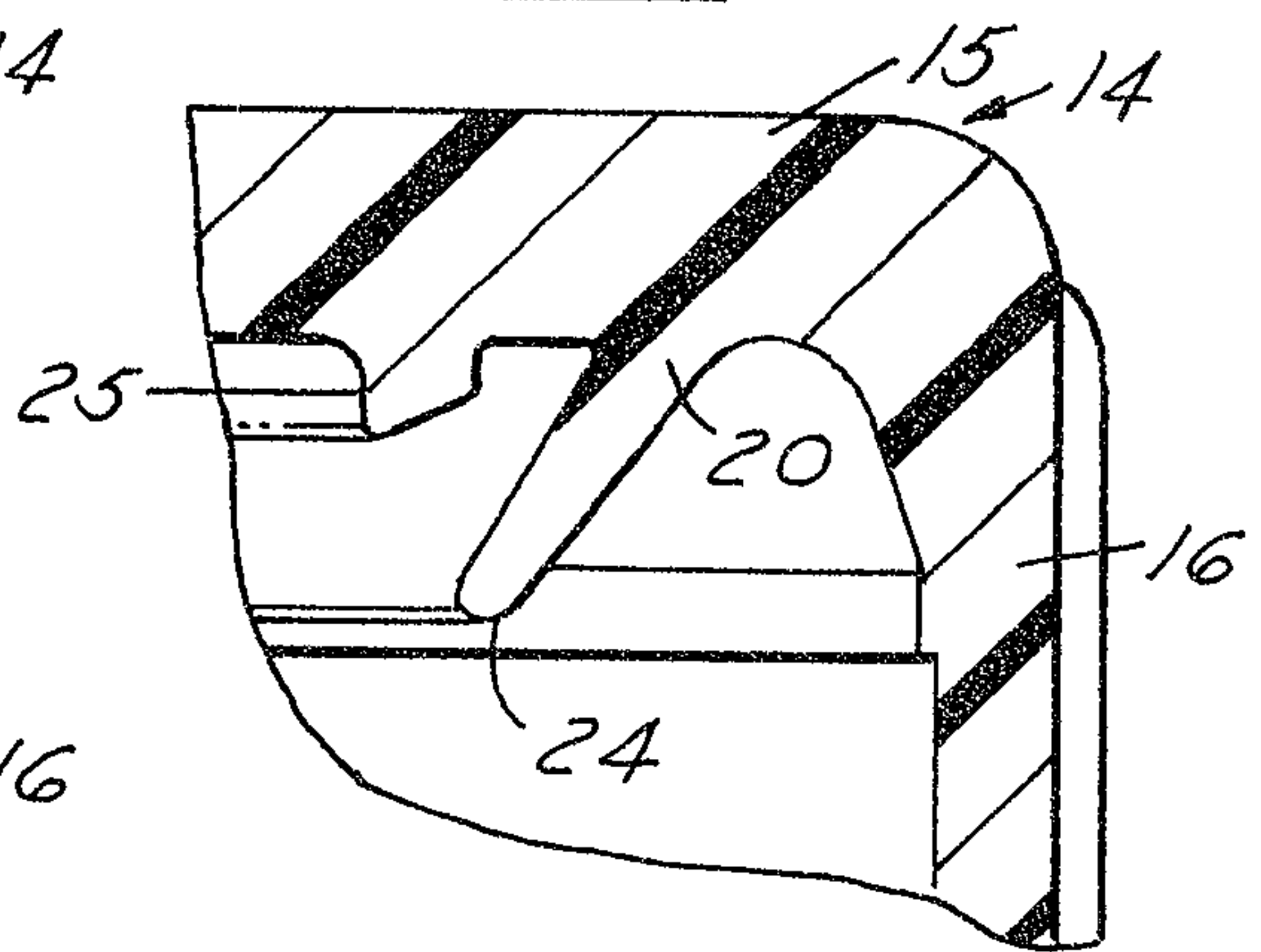


FIG. 4

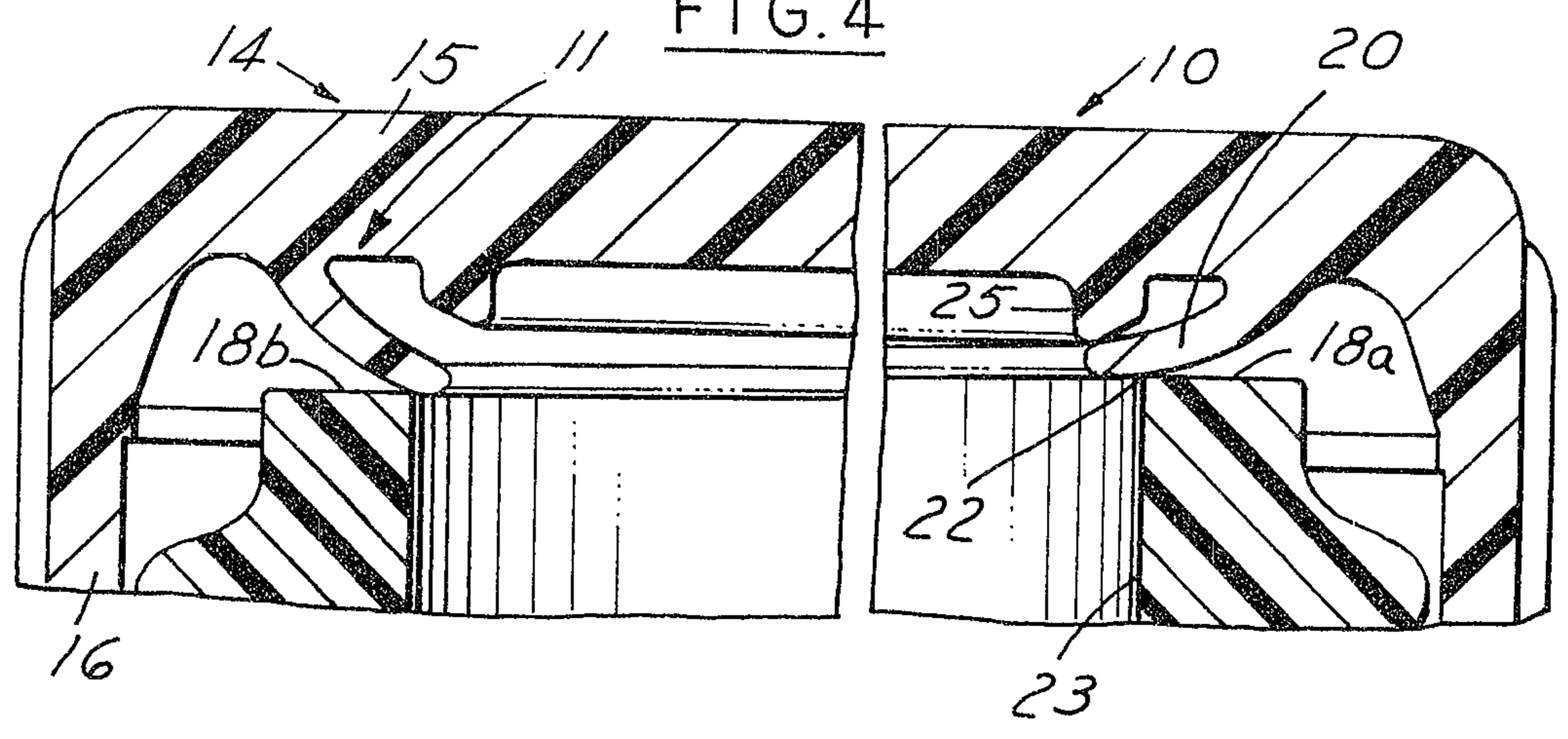


FIG. 5

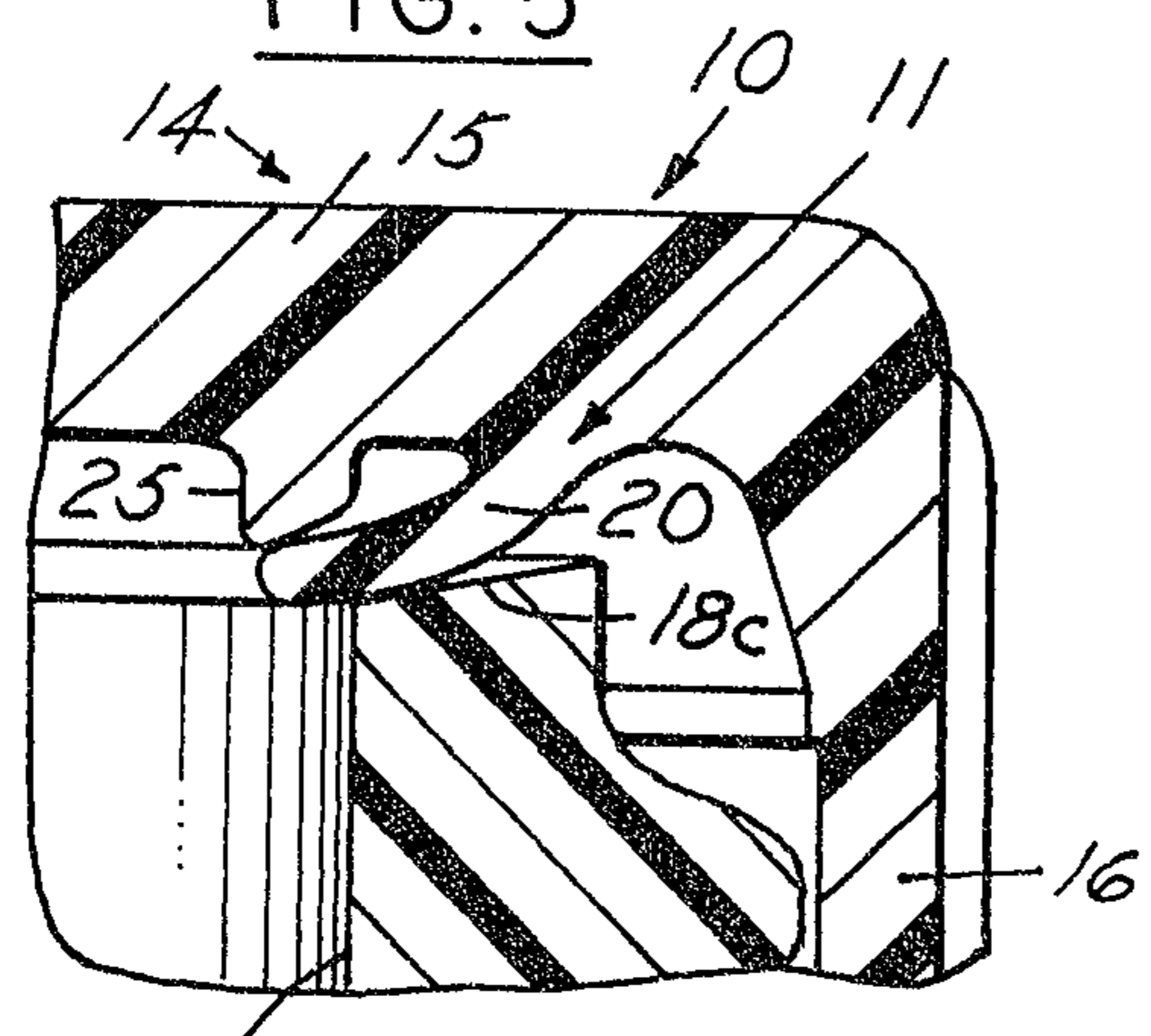


FIG. 6

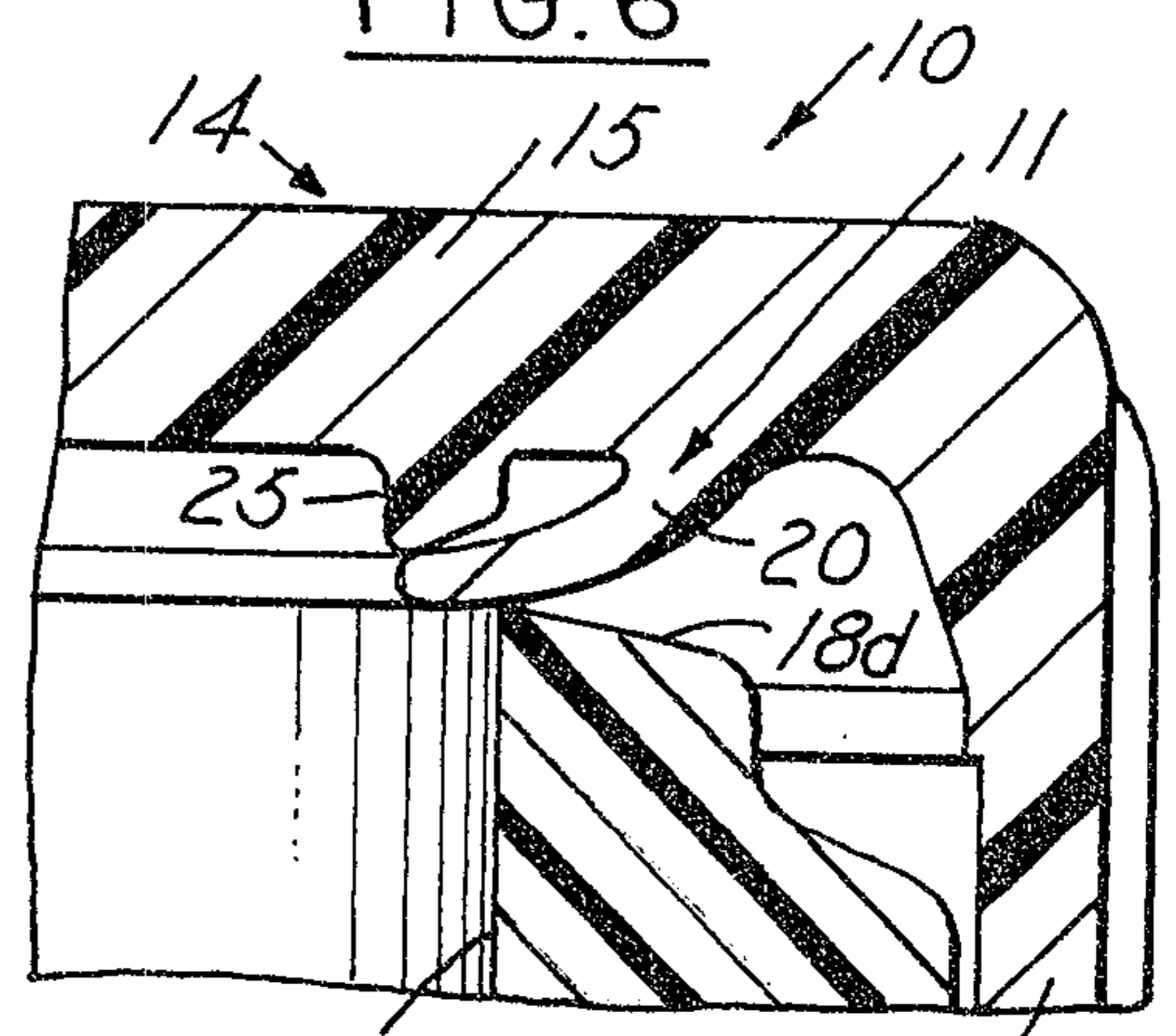


FIG. 7

