



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.12.2002 Bulletin 2002/51

(51) Int Cl.7: **B65D 47/10**

(21) Application number: **02254152.8**

(22) Date of filing: **13.06.2002**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
 MC NL PT SE TR**
 Designated Extension States:
AL LT LV MK RO SI

- **Glover, Stephen**
 Doncaster, South Yorkshire, DN5 8LD (GB)
- **Stephenson, Timothy**
 Doncaster, South Yorkshire DN11 0FF (GB)

(30) Priority: **13.06.2001 GB 0114410**

(74) Representative:
McLeish, Nicholas Alistair Maxwell
Boult Wade Tennant
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT (GB)

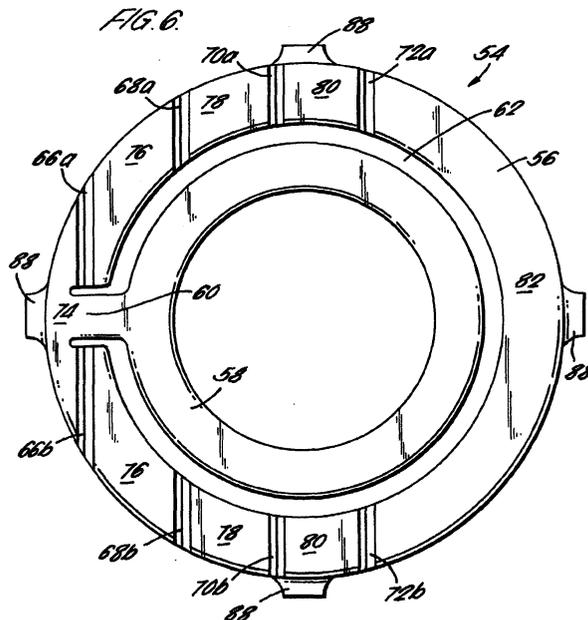
(71) Applicant: **Portola Packaging Limited**
Doncaster, South Yorkshire DN4 5NT (GB)

(72) Inventors:
 • **Mavin, Gerry**
Ashington, Northumberland NE63 8QX (GB)

(54) **Pull-tab**

(57) There is described a pull-tab for use in removing a membrane adhered to a container (32). The container (32) defines an opening (40) having a periphery and the membrane overlies the opening (40) and is adhered to the periphery so as to prevent access to the contents of the container (32) via the opening (40) prior to the removal of the membrane. The pull-tab (54) comprises a peripheral portion having a shape correspond-

ing to at least a part of the periphery of the opening (40) and is joined to the membrane in a region approximate that part. A tab portion (58) is joined to the peripheral portion (56). The peripheral portion (56) comprises means (66,68,70,72) to restrict a pulling force applied to the tab portion (58) from being substantially transmitted to all but a sector of the peripheral portion until such time as the membrane approximate that sector has been pulled away from the container (32).



Description

[0001] The present invention relates to a pull-tab for use in releasing a membrane adhered to a container, the container defining an opening having a periphery and the membrane overlying the opening and being adhered to the periphery so as to prevent access to the contents of the container via the opening prior to the release of the membrane. The present invention also relates to a pull-tab in combination with such a membrane and to a pull-tab and membrane in combination with such a container.

[0002] It is known to package goods in plastics containers in which the plastics container is provided with an opening which is overlain by a plastics cap or other closure to provide resealable access to the contents of the container via the opening. It is also known to provide such a cap or closure with a foil liner which covers the opening and which is at least initially adhered to the container. The provision of such a liner serves not only to retain the freshness of the product packaged within the container but also serves to provide the consumer with evidence as to whether the container has been subject to unauthorised tampering since, under such circumstances, the foil liner will either no longer be adhered to the container or else will be compromised in some other way.

[0003] Typically, as shown in Figure 1, the foil liner 10 comprises a metallic substrate 12 which is coated on each of its opposing surfaces with a respective layer of adhesive 14, 16. Each of the layers of adhesive 14, 16 in turn adhere the metallic substrate 12 to a respective layer of polyethylene material 18, 20. One of the layers of polyethylene material 18 is also bonded to a form layer 22 which provides a non-stick coating to one side of the foil liner 10.

[0004] The foil liner is adhered to the container by placing it over the opening with the form layer uppermost and holding it in close contact with the rim. The foil liner is then exposed to a time varying magnetic field which gives rise to eddy currents within the electrically conductive metallic substrate 12 and the generation of heat. This heat in turn melts the respective polyethylene layers 18 and 20 and bonds the foil liner to the container.

[0005] In order to first gain access to the contents of the container the foil liner must be removed and discarded. To this end it is known to provide the liner with a tab 24 which is not adhered to the container and which projects outwardly away from the underlying opening as shown in Figure 1. In order to remove the foil liner it is intended that the consumer pull the tab in such a way as to overcome the bond between the foil liner and the container. However, such tabs are small and typically difficult to grasp, particularly for the elderly and those with limited dexterity, and as a result it has not always been possible to remove the foil liner in an easy and reliable manner.

[0006] In an attempt to overcome the difficulties as-

sociated with the tab arrangement shown in Figure 1, foil liners have also been designed of the type shown in Figure 2 which present a semi-circular pull-tab of increased surface area and which are consequently easier to grasp. The foil liners are stamped from a web of material shown in Figure 3 which, as before, comprises a metallic substrate 12 sandwiched between two layers of adhesive 14 and 16 and, outside that, two layers of polyethylene material 18 and 20. One of the layers of polyethylene material 18 is again provided with a form layer 22 and it is here that the foil liner of Figure 2 differs from that of Figure 1. The form layer 22 comprises a laminate of two layers, the first of which 22a is adhered to the layer of polyethylene material 18 and the second of which 22b is adhered to the first layer 22a but only at opposite edge portions of the web 26a and 26b. In a central portion of the web 28 the second layer 22b is not adhered to the first layer 22a. Thus, by stamping out foil liners in such a way that approximately half the liner intersects the central portion of the web 28 and the other half intersects one of the two edge portions 26a or 26b it is possible to produce the liner shown in Figure 2 and which comprises a semi-circular pull-tab 24 comprising the non-adhered portion of the second form layer 22b.

[0007] Although this foil liner overcomes some of the difficulties of the much smaller tab arrangement shown in Figure 1, both suffer from the disadvantage that it is possible for a consumer to exert a pulling force on the tab in a direction which is by no means an efficient one if they are attempting to remove the foil from the container opening. This, again, can lead to a perceived unreliability and a lack of consumer confidence when it comes to the initial removal of the foil liner.

[0008] In US Patent No. 4,815,618 there is described a tamper indicating dispenser closure in which a membrane, in the form of a foil seal, overlies and is adhered to the perimeter of an opening in a container. However, rather than having an upper non-stick layer, the form layer of the previous arrangements is omitted and replaced by a plastics disc which is of slightly smaller surface area than the opening overlain by the membrane and which is adhered to the membrane at the same time as the membrane is adhered to the container. A pull-ring is attached to the disc and is arranged so that a pulling force applied to the pull-ring by a consumer is transmitted to an edge of the circular disc irrespective of the direction in which the consumer pulls on the pull-ring provided that that direction is generally away from the membrane. Because the edge of the disc is close to the edge of the membrane, the pulling force is said to ensure that substantially all of the membrane is removed. Nevertheless, it will be noted that the pulling force exerted by the consumer must be sufficient to simultaneously overcome the bond created between the membrane and the container at all points around the perimeter of the opening, a task which may be sufficient to defeat the attempts of certain consumers. Thus there still remains a need for a reliable means for removing foil liners and the like

which does not prevent their use by the elderly or the infirm or consumers with reduced dexterity.

[0009] According to a first aspect of the present invention there is provided a pull-tab for use in removing a membrane adhered to a container, the container defining an opening having a periphery and the membrane overlying the opening and being adhered to said periphery so as to prevent access to the contents of the container via said opening prior to the removal of the membrane, the pull-tab comprising a peripheral portion having a shape corresponding to at least part of the periphery of said opening and being joined to the membrane in a region approximate said part and a tab portion joined to the peripheral portion, the peripheral portion comprising means to restrict a pulling force applied to the tab portion from being substantially transmitted to all but a first sector of the peripheral portion until such time as the membrane approximate said first sector has been pulled away from the container.

[0010] According to a second aspect of the present invention there is provided a closure assembly in combination with a container, the container defining an opening having a periphery and the closure assembly comprising a membrane and a pull-tab, the pull-tab being as described above.

[0011] A number of embodiments of the present invention will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a cross-sectional view of a foil liner of the prior art;

Figure 2 is a perspective view of another foil liner of the prior art;

Figure 3 is a cross-sectional view of a web from which the foil liner of Figure 2 is stamped;

Figure 4 is an exploded view of the components of a closure assembly in accordance with a first embodiment of the present invention;

Figure 5 is an enlarged cross-sectional view of a metallic foil of the closure assembly of Figure 4;

Figure 6 is a plan view of a pull-tab of the closure assembly of Figure 4;

Figure 7 is a plan view of a pull-tab in accordance with a second embodiment of the present invention;

Figure 8 is an cross-sectional view of a pull-tab in accordance with a third embodiment of the present invention;

Figure 9 is an enlarged cross-sectional view of a line of weakness extending through a peripheral portion of a pull-tab in accordance with a fourth embodiment of the present invention; and

Figure 10 is an enlarged cross-sectional view of a line of weakness extending through a peripheral portion of a pull-tab in accordance with a fifth embodiment of the present invention.

[0012] Referring to Figure 4 there is shown a neck 30 of a container 32. The remainder of the container 32 has

not been shown as its body shape may take any suitable form and may, for example, be of square, rectangular or circular cross-section and may have an integral handle formed as part of the body shape.

[0013] The neck 30 is provided on an external surface with engagement means 34 with which to engage complementary engagement means (not shown) provided on a cap 36. In the example shown, the engagement means 34 comprise a helical thread configuration but other engagement means may also be provided. At an upper end, the neck 30 terminates in a rim 38 which in turn defines an opening 40. It is via this opening 40 that access is gained to the contents of the container 32 and through which the contents of the container are dispensed.

[0014] A circular disc known as a metallic foil 42 rests on rim 38 so as to overlie and close opening 40. As shown in more detail in Figure 5, the metallic foil 42 comprises an electrically conductive substrate 44 which is coated on each of its opposed surfaces with a respective layer of adhesive 46 and 48. Each of the adhesive layers 46 and 48 serve to bond the electrically conductive substrate 44 to a respective layer of polyethylene material 50 or 52. The result is a laminate structure with the electrically conductive substrate 44 sandwiched between two layers of polyethylene material 50 and 52.

[0015] A moulded plastics pull-tab 54 rests on an upper surface of the metallic foil 42 and is shown in plan view in Figure 6. The pull-tab comprises an annular peripheral portion 56 and, in the example shown, an annular tab portion 58 which is joined to the peripheral portion 56 by a tongue 60. The peripheral portion 56 is sized so as to overlie the rim 38 of the container 32 and accordingly has an external diameter substantially the same as that of the rim. The internal diameter of the peripheral portion 56 is substantially the same or slightly smaller than the diameter of the opening 40.

[0016] The tab portion 58 is sized so as to be as large as possible while at the same time capable of being received within the peripheral portion 56. Thus the external diameter of the tab portion 58 is slightly smaller than the internal diameter of the peripheral portion 56 thereby defining a near annular space 62 between the two in plan view. The internal diameter of the tab portion 58 is selected so as to allow the insertion of a finger of a user.

[0017] In order to further facilitate this process, the pull-tab is moulded so that in its natural or relaxed state the tab portion 58 and tongue 60 occupy a plane that subtends an acute angle to that occupied by the peripheral portion 56. As a result, at a position opposite the tongue 60, the tab portion 58 is raised in height with respect to the peripheral portion 56 by a distance 64 and this enables the tab portion 58 to be grasped more easily and reliably by a user. Nevertheless, the tab portion 58 is joined to the peripheral portion 56 in a manner which is sufficiently flexible so that, when constrained, the tab portion 58 can occupy substantially the same plane as the peripheral portion 56 and sufficiently resilient to en-

able the tab portion 58 to return to its natural or relaxed state once that constraint has been removed.

[0018] In contrast to the tab portion 58, the peripheral portion 56 is provided with a plurality of lines of weakness which extend in a direction generally transverse to the tongue 60. In the embodiment shown, the lines of weakness take the form of a series of mutually spaced parallel grooves 66-72 which serve to divide the peripheral portion 56 into a number of sectors 74-82. In this regard it will be noted that grooves 66a and 66b are co-linear and so in what follows will be referred to simply as groove 66. The same is also true of grooves 68a and 68b which will henceforth be referred to simply as groove 68 and is also true of grooves 70a and 70b which will henceforth be referred to as groove 70. Grooves 72a and 72b will henceforth be referred to simply as groove 72.

[0019] As can be seen from Figure 4, each of the grooves 66-72 is of V-shaped cross-section and is defined, in the case of groove 66, by mutually inclined surfaces 84 and 86.

[0020] In addition the pull-tab 54 is provided with a plurality of circumferentially spaced flanges 88 which project radially outwardly from the peripheral portion 56.

[0021] A cap 36 is also provided and comprises a circular top 90 which merges at a radially outer edge with a depending annular skirt 92. The annular skirt 92 is sized so as to fit over the neck 30 and, as stated previously, is provided on its inner surface with complimentary engagement means (not shown) for repeated and releasable engagement with the engagement means 34 provided on the container 32.

[0022] In order to assemble the components shown in Figure 4, the pull-tab 54 and metallic foil 42 are first received within the annular skirt 92 of the cap 36 with the pull-tab closest to the underside of the top 90. The purpose of the radially outwardly projecting flanges 88 provided on the peripheral portion 56 is to engage the inner surface of the annular skirt 92 above the complimentary engagement means and so retain the pull-tab 54 within the cap 36. Similar elements may also be provided on the metallic foil 42 to ensure that it too is retained within the cap 36. Alternatively, the metallic foil 42 may simply be formed oversize with an external diameter that is sufficient to retain the metallic foil within the annular skirt 92 above the complimentary engagement means.

[0023] Once the container 32 has been filled with the desired contents, the cap 36, together with the metallic foil 42 and the pull-tab 54, is offered up to the neck 30. Depending on the nature of the respective engagement means provided on the container and cap, the cap 36 is then pushed, rotated or otherwise applied to the neck 30 until such time as the metallic foil 42 is pressed against the rim 38 of the opening 40 and the peripheral portion 56 of the pull-tab 54 is pressed against the metallic foil 42. In this condition the assembled cap and neck are exposed to a time varying magnetic field which

gives rise to eddy currents within the electrically conductive substrate 44 and the generation of heat. This heat in turn melts the respective polyethylene layers 50 and 52 and bonds the metallic foil both to the rim 38 of the container 32 and also to the peripheral portion 56 of the pull-tab 54. In so doing the bonding components, comprising the respective layers of adhesive 46 and 48 and the respective layers of polyethylene material 50 and 52, are selected so as to ensure that a permanent bond is established between the metallic foil 42 and the peripheral portion 56 of the pull-tab 54 while a weaker, peelable bond is established between the metallic foil and the container 32. At the same time and in contrast to the peripheral portion 56, the tab portion 58 is not bonded to the metallic foil 42, either because it is not held in intimate contact with the metallic foil by virtue of its tendency to occupy a different plane from that of the peripheral portion or else, in an alternative embodiment, because the metallic foil 42 is provided on its upper surface with a non-stick form layer which underlies the tab portion 58 but not the peripheral portion 56.

[0024] In use the metallic foil 42 serves to maintain the freshness of the product packaged within the container and serves to provide the consumer with an indication that the container has not been subject to unauthorised tampering. Nevertheless, in order to dispense the contents of the container, the metallic foil must first be removed and discarded. This is achieved by unscrewing or otherwise disengaging the cap 36 from the container 32 so as to expose the pull-tab 54. The user then inserts a finger through the central aperture of the tab portion 58. In so doing the user is helped by the resilience of the pull-tab 54 which, once the cap 36 has been removed, is sufficient to cause the tab portion 58 to return to its natural or relaxed state in which it projects upwardly from the peripheral portion 56 and away from the metallic foil 42. The user then pulls on the pull-tab and, irrespective of the direction in which that pulling force is applied, the pulling force is nonetheless transmitted by the tongue 60 to the peripheral portion 56. However, rather than the pulling force being dissipated around the circumference of the peripheral portion 56 in an attempt to simultaneously overcome the bond between the metallic foil 42 and the container 32 at all points around the rim 38, because of the grooves 66-72, the pulling force applied by the user and transmitted by the tongue 60 is applied substantially only in the first sector 74 bounded by groove 66. As a result, in order to begin to peel the metallic foil 42 away from the rim 38 it is necessary only for the pulling force applied by the user to be sufficient to overcome the bond between the metallic foil 42 and the container 32 over the much smaller surface area of the first sector 74. Only once the metallic foil underlying this sector has been pulled away does the peripheral portion 56 hinge about groove 66, bringing mutually inclined surfaces 84 and 86 into abutting relationship so that the pulling force applied by the user is then transmitted to the second sector 76 bounded by

grooves 66 and 68. Again, because the pulling force applied by the user is restricted to overcoming the bond between the metallic foil 42 and the container 32 only in the region defined by the second sector, the pulling force need not be nearly so great as if it were attempting to overcome the strength of the same bond at all points around the rim. Thus, as the process repeats, a very much reduced pulling force is sufficient to overcome the bond between the metallic foil 42 and the container 32 in each of a succession of sectors before that pulling force is transmitted to the next adjacent sector. As a result the metallic foil 42 may be easily and reliably peeled away from the rim 38 and subsequently discarded together with the pull-tab 54.

[0025] With the removal of the metallic foil 42, the opening 40 is exposed and the contents of the container may be dispensed as desired. Should it be necessary to re-close the container 32, the cap 36 may simply be presented to the neck 30 and applied as necessary depending upon the nature of the engagement means 34. The cap 36 may be disengaged and reapplied to the container 32 as many times as necessary.

[0026] Although the peripheral portion 56 of the pull-tab 54 has been described as annular it will be apparent that the peripheral portion could have any shape although it is preferable that the shape correspond, at least approximately, to that of the periphery of the underlying opening 40. Nevertheless, the peripheral portion 56 of the pull-tab 54 may have a shape selected from the list comprising circular, elliptical, oval, triangular, square, rectangular, pentagonal and hexagonal.

[0027] Likewise, although the peripheral portion 56 has been described as having a shape corresponding to the periphery of the opening in its entirety (in other words that the peripheral portion has a shape which, like the rim 38, is closed), it will also be apparent that the peripheral portion may have a shape corresponding to only a part of the periphery of the opening. For example, where the opening is circular and is surrounded by an annular rim as in the example shown in Figure 4, the peripheral portion 56 of the pull-tab 54 may simply comprise a part annular shape as shown, for example, in Figure 7. Such an arrangement would still permit the metallic foil 42 to be pulled away from the underlying rim 38 using a significantly reduced pulling force.

[0028] It will also be appreciated that the external dimensions of the peripheral portion 56 may, if so desired, be other than substantially the same as that of the rim 38. In particular, the external dimensions may be greater than that of the rim thereby leading to the possibility of the peripheral portion being joined to the metallic foil at a position outwardly of the periphery of the opening. Conversely, the external dimensions of the peripheral portion may be less than that of the rim leading to the peripheral portion no longer overlying the rim but instead being joined to the metallic foil at a position inwardly of the periphery of the opening. Similarly, the internal dimensions of the peripheral portion 56 may, if so desired,

be substantially less than the opening 40 although this may have implications for the size and the shape of the tab portion 58.

[0029] Likewise, although the tab portion 58 has been described as a pull-ring, it need not necessarily be of annular shape provided that it may be readily gripped by a user. Thus, the tab portion 58 may comprise a tab of any shape, either with or without a central aperture, and may, for example, comprise a T-shape to facilitate easy gripping by a user. Likewise, although the tab portion 58 has been described as being of a size so as to be capable of being received within the peripheral portion 56 so that both the tab portion and the peripheral portion can, when so constrained, occupy substantially the same plane, this need not necessarily be the case. In particular, the tab portion may, if so desired, overlap the peripheral portion. This will, however, have an adverse affect on the overall height of the pull-tab 54 although, depending upon the nature of the cap 36 and the design constraints imposed upon the closure as a whole, this may be an acceptable trade off for a tab of increased surface area.

[0030] It will also be appreciated that although the tab portion 58 has been described as moulded so that in its natural or relaxed state it occupies a plane that subtends an angle to that occupied by the peripheral portion 56, once again this need not necessarily be the case. As shown in Figure 8, the tab portion 58 may alternatively be moulded so as to occupy a plane substantially parallel to that of the peripheral portion 56. Whilst the plane of the tab portion 58 may be coplanar with that of the peripheral portion 56, the tab portion is nevertheless preferably raised with respect to the peripheral portion so as to facilitate the tab portion being grasped more easily and reliably by a user. Of course, the tab portion 58 may be moulded so as to occupy a plurality of planes, one or more of which may be inclined to that occupied by the peripheral portion while others may be parallel to the peripheral portion.

[0031] Although the lines of weakness have been described as grooves, again it will be apparent that this need not be the case. In particular, the lines of weakness may instead comprise webs of material of reduced thickness or a series of apertures, either blind or representing through-holes, always provided, of course, that the lines of weakness are not so weak as to become frangible when a typical pulling force is applied to the pull-tab by a user. Where the lines of weakness are present in the form of grooves, it will be apparent that the grooves may be of any convenient shape and may, for example, be U-shaped or straight sided as shown in Figures 9 and 10.

[0032] Once again, although the lines of weakness have been described as extending parallel to each other, this need not necessarily be the case as the lines of weakness may, in the case of an annular or part annular peripheral portion overlying an annular rim, extend in a generally radial direction. However, it is preferable that

the lines of weakness extend in a direction transverse to the direction in which the pulling force applied to the tab portion is transmitted to the peripheral portion. Most preferably of all the lines of weakness extend in a direction substantially perpendicular to the direction in which a pulling force applied to the tab portion is transmitted to the peripheral portion.

[0033] In the embodiment described with reference to Figures 4 and 5 a plurality of lines of weakness are shown which are equally spaced apart such that the perpendicular distance between groove 66 and groove 68 is substantially the same as that between groove 68 and groove 70 and between groove 70 and groove 72. However, this need not necessarily be the case. In another arrangement the lines of weakness may be arranged so that each of the sectors defined by the lines of weakness are of equal surface area or overlie a bond between the metallic foil and the container which is of equal length. In this way the strength of the bond to be overcome between the metallic foil 42 and the container 32 will be substantially the same for each sector. It will, however, mean that the lines of weakness will be spaced closer together at a side of the peripheral portion close to the tongue 60 and will be spaced further apart in a region spaced 90° from the tongue. In any event, the tongue 60 is preferably joined to the peripheral portion 56 centrally of the first sector.

[0034] Although the pull-tab 54 has been described as comprising a plurality of lines of weakness, it would nevertheless be advantageous if the peripheral portion 56 comprised only a single line of weakness since this would still serve to divide the peripheral portion into two sectors. As a result the pull force that would need to be applied in order to remove the metallic foil would only need to overcome the bond associated with each sector in turn and not both sectors simultaneously. Nevertheless, the peripheral portion preferably comprises a plurality of lines of weakness so that once the metallic foil approximate the first sector has been pulled away, the pulling force applied to the tab portion is directed to a further sector of the peripheral portion having components on either side of the first sector. Similarly, once the metallic foil adhered to the second sector has been released from its engagement with the underlying portion of the rim, the pulling force applied to the tab portion is directed to a third sector which again comprises two components, each adjacent a respective one of the two components of the second sector.

[0035] As previously described, the metallic foil 42 is preferably adhered to both the rim 38 and the peripheral portion 56 by exposure to a time varying magnetic field. However, the partial melting or softening of the two layers of polyethylene material 50 and 52 represents a heat activated bond that may be achieved in other ways. For example, the two layers of polyethylene material 50 and 52 and the two layers of adhesive 46 and 48 used to adhere the layers of polyethylene material to the electrically conductive substrate 44 may all be replaced by

layers of heat activated adhesives applied to either side of the electrically conductive substrate. What is important in this context is that a permanent bond is provided between the metallic foil 42 and the pull-tab 54 while a peelable or removable bond is provided between the metallic foil 42 and the container 32. In any event, the bonding of the metallic foil 42 to both the container 32 and the pull-tab 54 may be activated by alternate means. For example, the bond may be activated by exposing the cap and neck assembly to microwave radiation or to a time varying electric field.

[0036] Once again whilst the opening 40 has been described as closed by a metallic foil 42, the metallic foil 42 may, in principle, be replaced by any suitable membrane and may, for example, comprise a web of plastics material. Under such circumstances, the pull-tab 54 may be formed integrally with the membrane which may, in turn, be provided with a line of weakness extending around the periphery of the underlying opening 40. This line of weakness may either be in the plane of the membrane or else in the cylindrical surface of the neck 30.

[0037] Finally, although the assembly has been described as comprising a cap 36, this is entirely optional as the container may, under certain circumstances, be adequately sealed simply by use of the metallic foil or membrane 42. However, once the metallic foil or membrane has been removed, re-closure of the container would then not be possible.

Claims

1. A pull-tab for use in removing a membrane adhered to a container, the container defining an opening having a periphery and the membrane overlying the opening and being adhered to said periphery so as to prevent access to the contents of the container via said opening prior to the removal of the membrane, the pull-tab comprising
 - a peripheral portion having a shape corresponding to at least a part of the periphery of said opening and being joined to the membrane in a region approximate said part and a tab portion joined to the peripheral portion, the peripheral portion comprising means to restrict a pulling force applied to the tab portion from being substantially transmitted to all but a sector of the peripheral portion until such time as the membrane approximate said sector has been pulled away from the container.
2. A pull-tab in accordance with claim 1 wherein the peripheral portion has a shape selected from the list comprising circular, elliptical, oval, triangular, square, rectangular, pentagonal, hexagonal, arcuate, part-circular, part-elliptical, part-oval, part-triangular, part-square, part-rectangular, part-pentagonal and part-hexagonal.

3. A closure assembly in combination with a container, the container defining an opening having a periphery and the closure assembly comprising a membrane and a pull-tab, the membrane overlying the opening and being adhered to said periphery so as to prevent access to the contents of the container via said opening prior to the removal of the membrane, and the pull-tab comprising a peripheral portion having a shape corresponding to at least a part of the periphery of said opening and being joined to the membrane in a region approximate said part and a tab portion joined to the peripheral portion, the peripheral portion comprising means to restrict a pulling force applied to the tab portion from being substantially transmitted to all but a sector of the peripheral portion until such time as the membrane approximate to said sector has been pulled away from the container.
4. The combination of claim 3 wherein the container defines an opening having a periphery having a shape selected from the list comprising circular, elliptical, oval, triangular, square, rectangular, pentagonal and hexagonal.
5. The invention of any preceding claim wherein the peripheral portion has a shape corresponding to substantially the entire periphery of said opening.
6. The invention of any preceding claim wherein the peripheral portion is adapted so as to at least partially overlie the periphery of the opening.
7. The invention of any of claims 1 to 5 wherein the peripheral portion is adapted so as to be joined to the membrane at a position outwardly of the periphery of the opening.
8. The invention of any of claims 1 to 5 wherein the peripheral portion is adapted so as to be joined to the membrane at a position inwardly of the periphery of the opening.
9. The invention of any preceding claim wherein the tab portion comprises a pull-ring.
10. The invention of any preceding claim wherein the tab portion is sized so as not to overlap the peripheral portion in plan view.
11. The invention of any preceding claim wherein the tab portion is formed integrally with the peripheral portion of plastics material.
12. The invention of any preceding claim wherein, in a natural state, the tab portion occupies a different plane from that occupied by the peripheral portion, said planes being mutually spaced at at least one point on the tab portion.
13. The invention of any preceding claim wherein, in a natural state, the tab portion occupies a plane that subtends an acute angle with a plane occupied by the peripheral portion.
14. The invention of any preceding claim wherein the tab portion is joined to the peripheral portion in a manner which is sufficiently flexible so that, when constrained, the tab portion can occupy substantially the same plane as the peripheral portion and sufficiently resilient to enable the tab portion to return to a natural state once said constraint has been removed in which the tab portion occupies a plane different from that occupied by the peripheral portion.
15. The invention of any preceding claim wherein the means to restrict the pulling force applied to the tab portion from being substantially transmitted to all but a sector of the peripheral portion until such time as the membrane approximate said sector has been pulled away from the container comprises one or more lines of weakness that serve to divide the peripheral portion into a plurality of sectors.
16. The invention of claim 15 wherein said lines of weakness comprise one or more grooves.
17. The invention of claim 16 wherein the grooves have a cross-sectional shape selected from the list comprising V-shaped, U-shaped or straight-sided-channel-shaped.
18. The invention of any of claims 15 to 17 wherein the or each line of weakness extends in a direction transverse to the direction in which a pulling force applied to the tab portion is transmitted to the peripheral portion.
19. The invention of any of claims 15 to 18 wherein the or each line of weakness extends in a direction substantially perpendicular to the direction in which a pulling force applied to the tab portion is transmitted to the peripheral portion.
20. The invention of any of claims 15 to 19 and comprising two or more lines of weakness, each line of weakness extending substantially parallel to the other or others.
21. The invention of any of claims 15 to 20 and comprising two or more lines of weakness wherein each line of weakness is equally spaced apart.
22. The invention of any of claims 15 to 20 and comprising two or more lines of weakness wherein the lines of weakness are spaced so that each of the

sectors defined thereby are of substantially equal peripheral extent.

- 23.** The invention of any of claims 15 to 22 and comprising two or more lines of weakness wherein the lines of weakness are arranged symmetrically about the direction in which a pulling force applied to the tab portion is transmitted to the peripheral portion. 5
- 24.** The invention of any of claims 15 to 23 wherein the tab portion is joined to the peripheral portion centrally of one of said sectors. 10
- 25.** The invention of any of claims 15 to 24 wherein once said membrane approximate a first sector has been pulled away from the container, the pull-tab is adapted to direct the pulling force applied to the tab portion to a second sector of the peripheral portion, the second sector having components adjacent opposite sides of said first sector. 15 20
- 26.** The invention of any of claims 15 to 25 wherein once said membrane approximate a first sector has been pulled away from the container, the pull-tab is adapted to direct the pulling force applied to the tab portion to each of the remaining sectors in succession whilst ensuring that the pulling force is not transmitted to a sector until such time as the membrane approximate all of the preceding sectors has been pulled away from the container. 25 30
- 27.** The invention of any preceding claim wherein the peripheral portion is joined to the membrane by a permanent bond and the membrane is adhered to said periphery by a weaker, peelable bond. 35
- 28.** The invention of any preceding claim wherein the membrane comprises an electrically conductive material and is adhered to the periphery of the opening by a heat activated bond. 40
- 29.** The invention of claim 28 wherein the heat activated bond is activated by exposing the membrane to one of a list comprising microwave radiation, a time varying magnetic field and a time varying electric field. 45
- 30.** The invention of any preceding claim wherein the membrane comprises a metallic foil. 50
- 31.** The invention of any of claims 1 to 26 wherein the membrane is formed of plastics material and is formed integrally with the peripheral portion.
- 32.** The invention of claim 31 wherein a line of weakness is provided extending around the periphery of the opening. 55
- 33.** The invention of any of claims 3 to 32 wherein the closure assembly additionally comprises a cap for repeated and releasable engagement with the container and which, when engaged with the container, overlies the opening and, prior to the removal of the membrane, also overlies both the membrane and the pull-tab.
- 34.** The invention of claim 33 wherein the pull-tab is provided with one or more outwardly directed flanges for engagement with an inner surface of the cap.

FIG. 1.

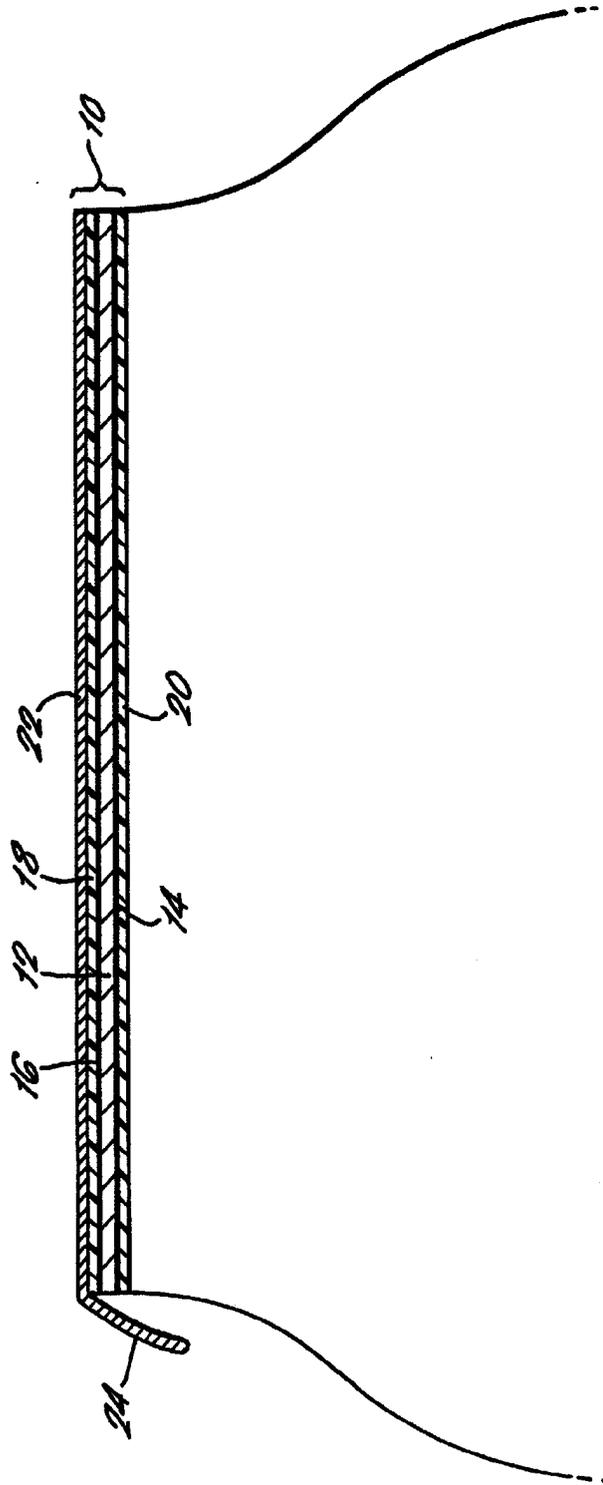


FIG. 2.

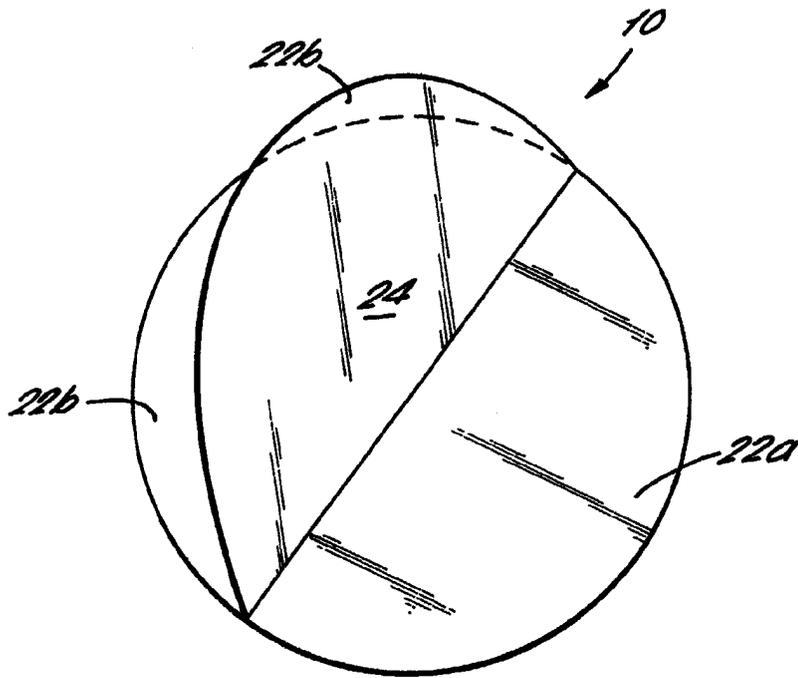


FIG. 3.

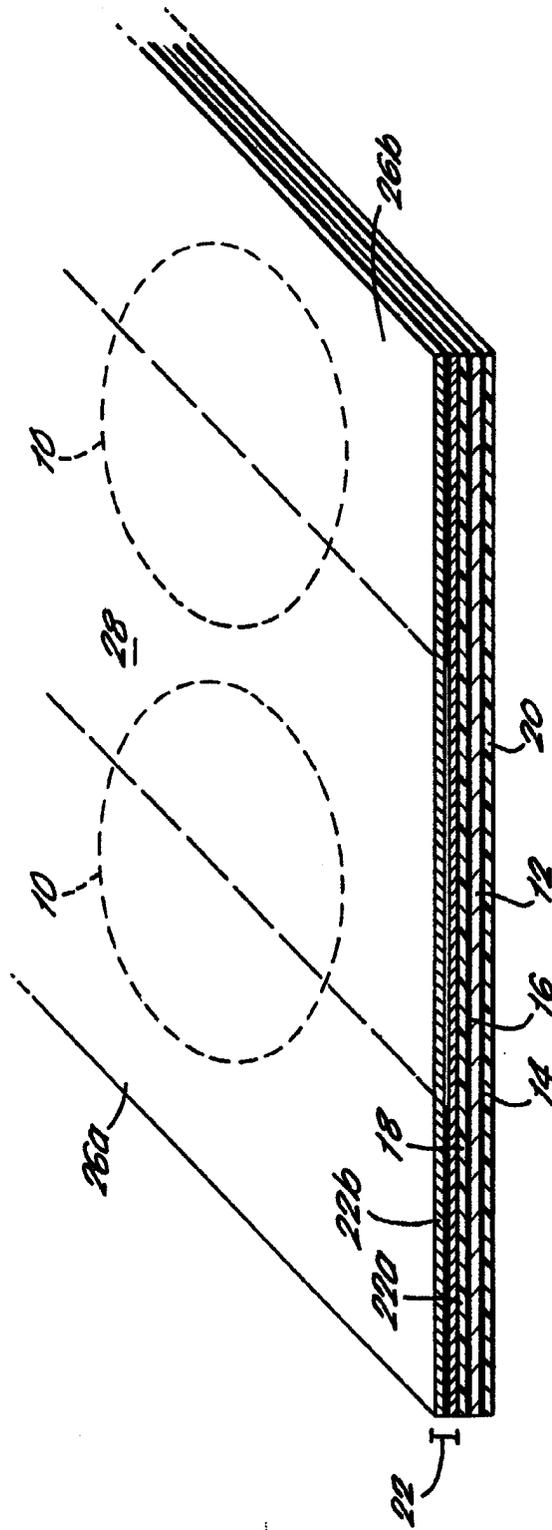


FIG. 4.

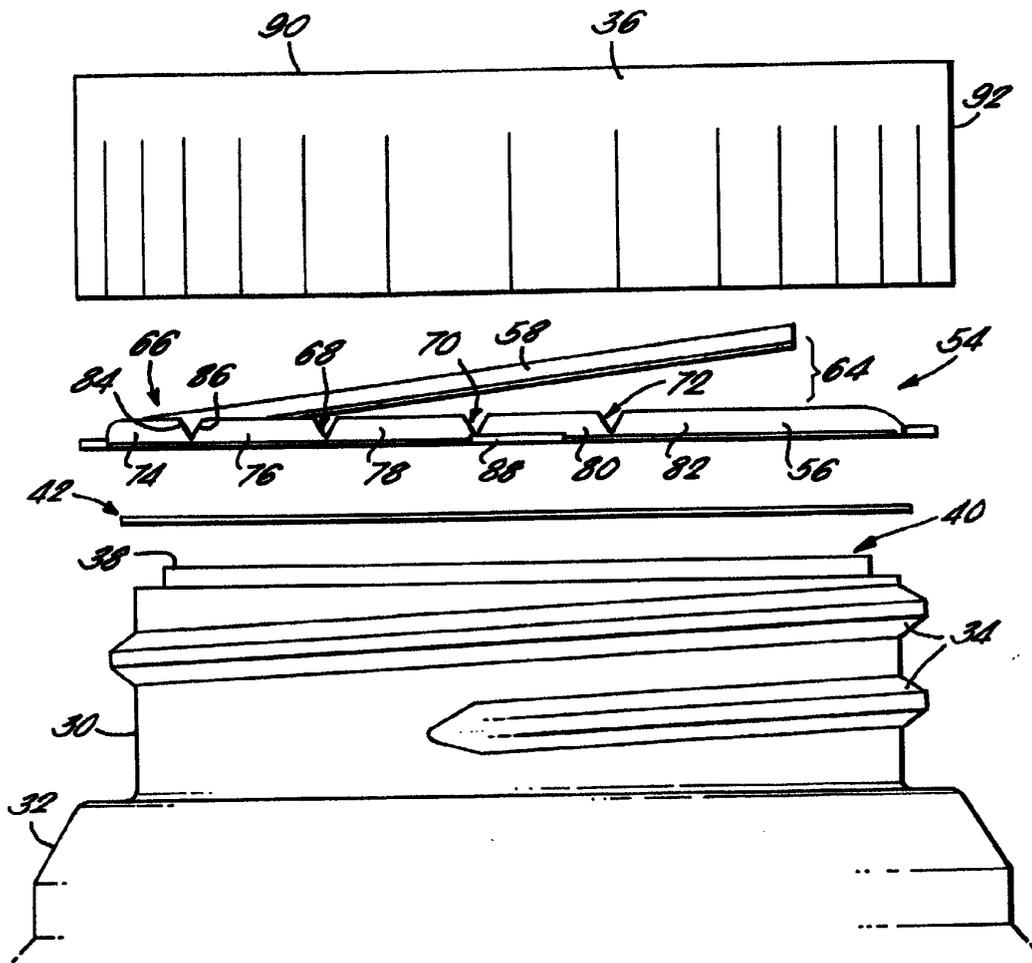


FIG. 5.

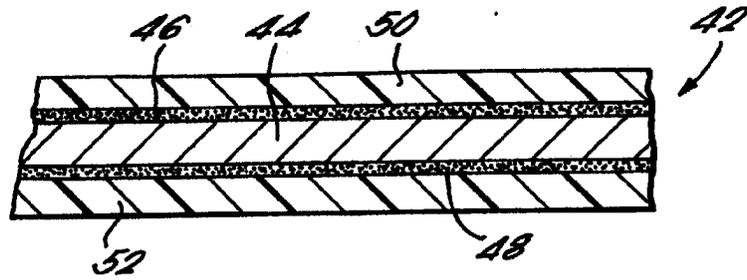
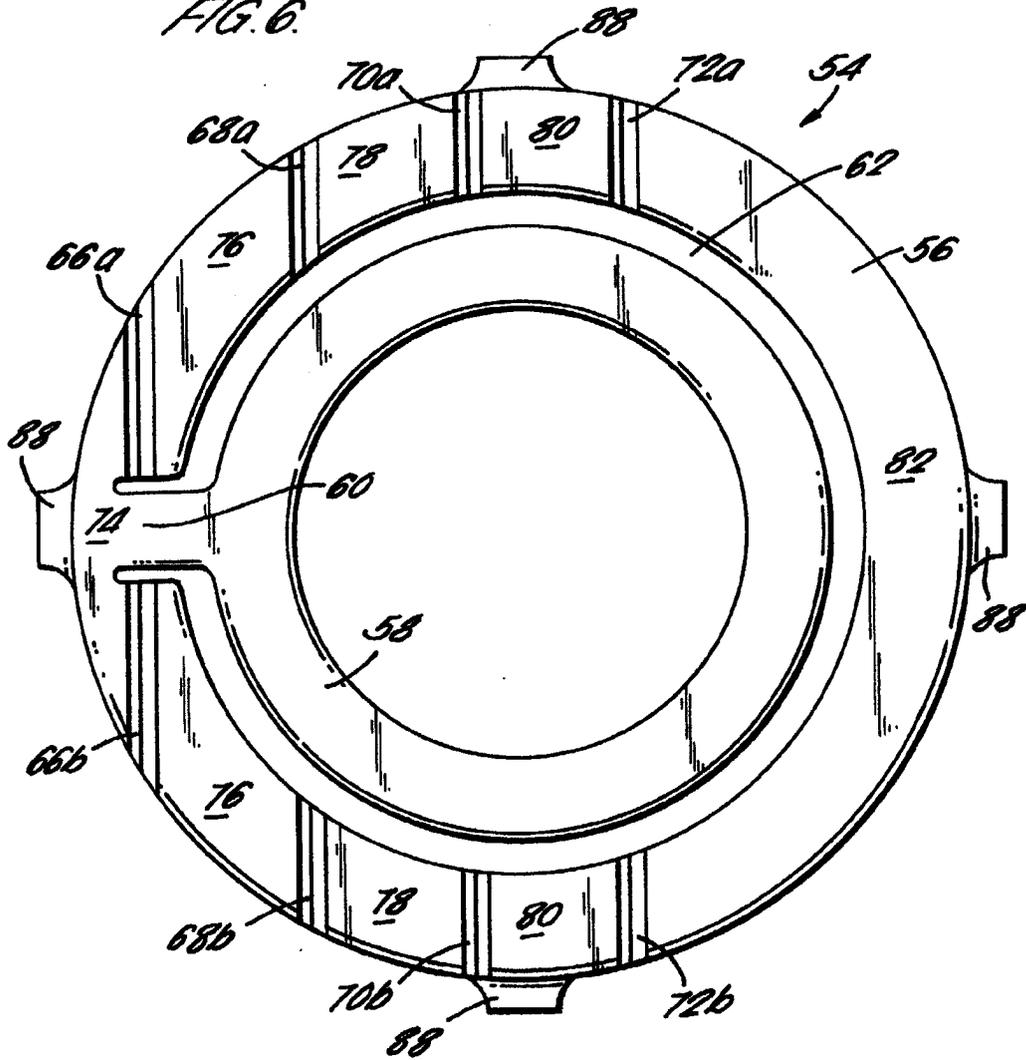


FIG. 6.



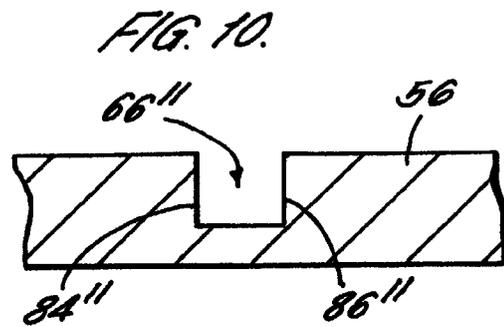
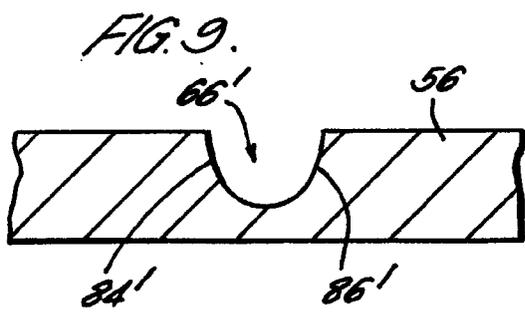
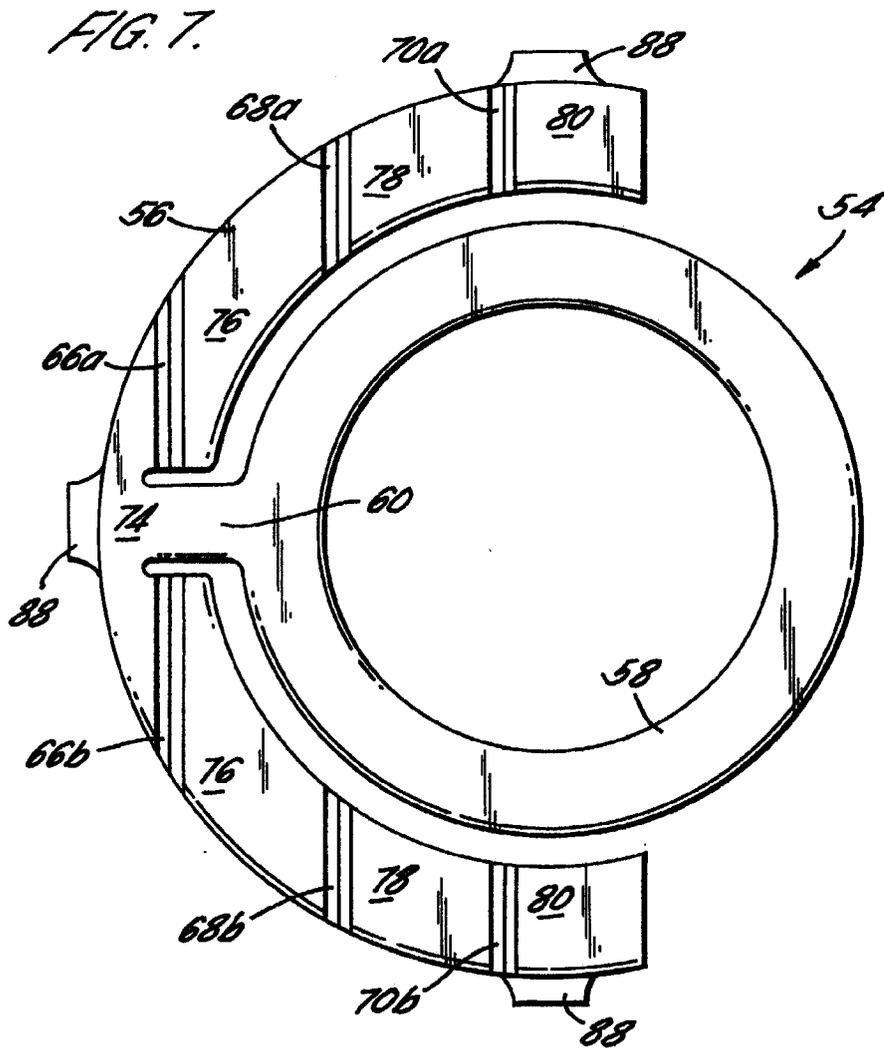


FIG. 8.

