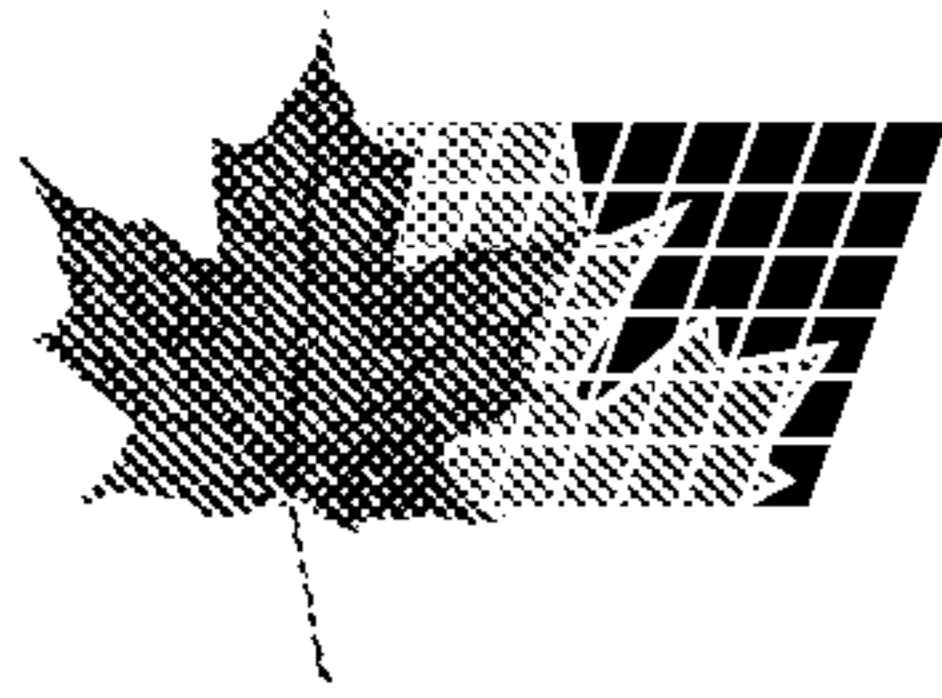




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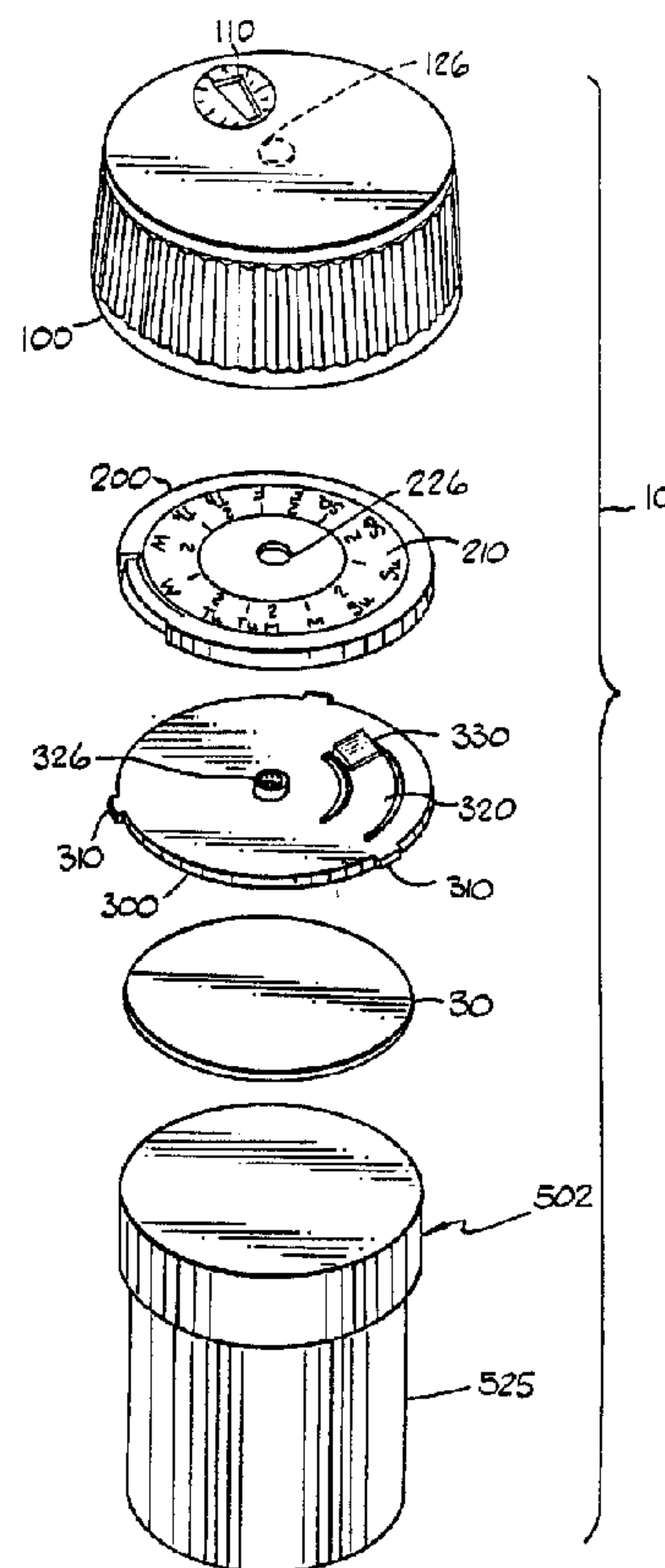
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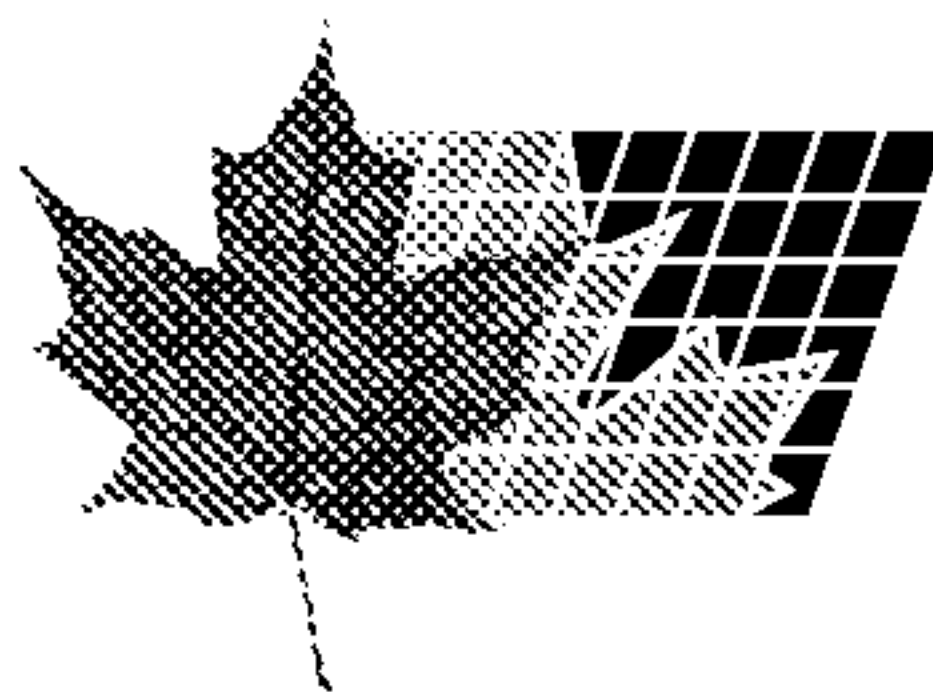
(54) **CAPUCHON INDICATEUR**

(54) **INDICATOR CAP**



(57) Dispositif (10) servant à compter le nombre de fois qu'un récipient a été ouvert ou à indiquer l'occurrence de tout autre événement, dont l'utilité est tout à fait appropriée pour des flacons de médicaments ou autres.

(57) An apparatus (10) for counting the number of times a container has been opened or some other event has occurred, with particular usefulness in medicine bottles and the like. An outer cover portion (100) with a set of



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Une partie de couvercle externe (100) pourvue d'une série de dents (12) supporte un disque indicateur (200) comprenant un cliquet d'engrènement (220), ainsi qu'une autre série de dents (230) et un disque à doigt d'encliquetage (300) comprenant un autre cliquet (320). Les cliquets d'engrènement et les dents associés à une fente (150) servant à mettre en prise le disque d'encliquetage produisent un entraînement à perte de vitesse qui fait tourner le couvercle externe (100) par rapport au disque indicateur (200) chaque fois qu'on ouvre ou ferme le récipient ou lorsque se produit tout autre événement. Plusieurs modes de réalisation de l'invention comprennent un système permettant d'utiliser le couvercle avec des récipients prévus pour ne pas pouvoir être ouverts par des enfants, un système servant à fixer le couvercle sur les récipients, et un système facilitant la fabrication et le montage dudit dispositif.

teeth (12) holds an indicator wheel (200) with an engaging pawl (220) and another set of teeth (230) and a ratchet wheel (300) with another pawl (320). The pawls and teeth in combination with a slot (150) for engaging the ratchet wheel result in a lost motion drive in which the outer cover (100) will turn relative to the indicator wheel (200) each time the container is opened or closed or some other event occurs. Various embodiments of the invention include means for using the cap with child-resistant containers, means for attaching the cap to containers, and means to facilitate the manufacture and assembly of the device.





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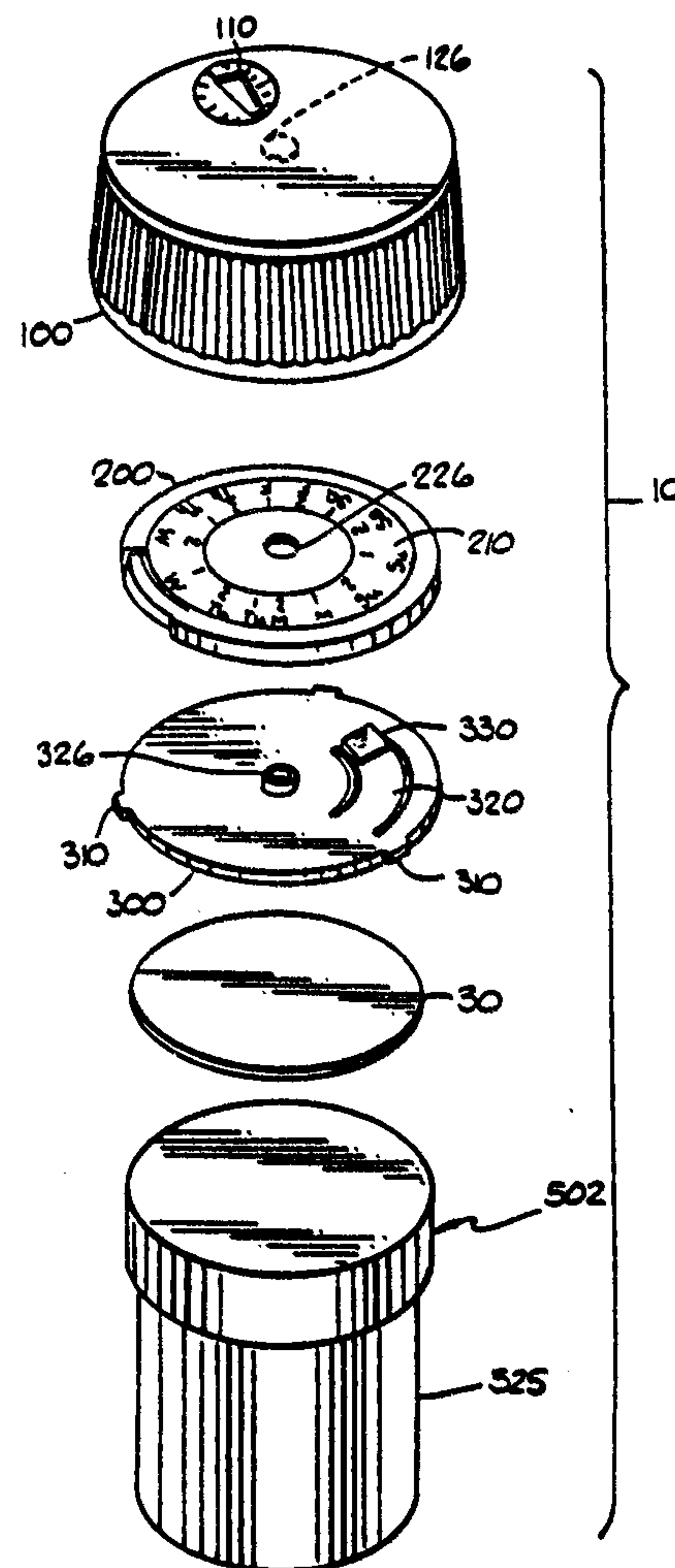
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(54) Title: INDICATOR CAP

(57) Abstract

An apparatus (10) for counting the number of times a container has been opened or some other event has occurred, with particular usefulness in medicine bottles and the like. An outer cover portion (100) with a set of teeth (12) holds an indicator wheel (200) with an engaging pawl (220) and another set of teeth (230) and a ratchet wheel (300) with another pawl (320). The pawls and teeth in combination with a slot (150) for engaging the ratchet wheel result in a lost motion drive in which the outer cover (100) will turn relative to the indicator wheel (200) each time the container is opened or closed or some other event occurs. Various embodiments of the invention include means for using the cap with child-resistant containers, means for attaching the cap to containers, and means to facilitate the manufacture and assembly of the device.



BACKGROUND OF THE INVENTION

The present invention relates to closure members for containers, bottles and the like and, more particularly, to closure members having indicator means to indicate the number of times the container has been opened. The invention can also be used for any other application in which the number of times a given activity is performed must be indicated.

10 In the medical field, medical drugs have a predetermined therapeutic range in which the effects of taking the drug are beneficial. Under-utilization of a drug may endanger the user with the drug's side effects without reaching levels necessary for a therapeutic
15 action. On the other hand, over-utilization may cause side effects or toxicity to a much greater extent than any possible benefit. Thus it is critically important that a patient follow prescribed directions on medications, yet frequently patients forget whether
20 they have taken medication and either omit doses or repeat them.

A considerable number of pill-timing schemes have been used to solve the problem of reminding a patient to take a dose of medicine or reminding him he
25 has already taken the dose. The most used ones involve some scheme of compartmentalization of the necessary medication, such that the pills are placed in compartments that are labeled by day, dose number or time of day, or that are serially numbered. These
30 devices are reasonably satisfactory if a responsible person is available and has the time and patience to fill the compartments properly.

In dispensing pills of a single type, a number of window-containing bottle caps have been invented.
35 Through the window a movable element marked with an index is visible. In only a few devices does the indicating element index in position relative to the window each time the cap is loosened, removed,

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replaced, and re-tightened. Thus, by looking at the index mark displayed through the window, a user can see where in repetitive sequence of dose he or she is.

5 One of the most serious disadvantages of prior art devices of the window indexing type is that there is no warning to the user in case the user does not turn the device far enough during the opening or closing to properly advance the window. Unless the user is alert to the index value before opening and then after closing such devices, the user will be
10 unaware that the window failed to advance to a new index. Most users, especially the elderly who may not understand how the device operates, will not be this alert to the functioning of the device. In addition, most prior art devices fail to provide positive locking in both directions of movement; thus, the index may be moved appropriately when the device is opened or closed, but additional movement is not prevented when the device is moved in the opposite direction. This
15 allows the index to drift, often causing failure or an incorrect reading, particularly after the device has been used over a period of time.

The device of U.S. Patent 4,011,829 issued March 15, 1977 to Wachsmann, et. al., attempts to
25 provide positive locking in both directions, but because of the direction of the tooth designed to prevent movement of the index upon closure, the device may not work reliably, particularly after wearing with use. Also, the device of Wachsmann does not provide
30 space for the ratchet teeth to slide past the engagement teeth when the device is moving in a direction wherein such teeth should disengage, which may cause unreliable operation over a period of time. Another drawback of this device is its inclusion of the
35 "child proofing" feature with the indexing feature,

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which makes the device quite complex. Other features of this device, such as the method of providing the lost motion drive and the requirement of a post in the middle of the elements to hold the device together, also increase its complexity.

The device of U.S. Patent 3,151,599 issued October 6, 1964 to Livingston provides positive locking in both directions, but it does so by means of very closely spaced projections that would be difficult to manufacture economically. Furthermore, this device does not provide space for the projections to move while sliding past each other when not engaged.

The device of U.S. Patent 4,666,051 issued May 19, 1987 to Trick has an indicator wheel with a serrated rim projecting above and below the plane of the wheel. The serrations engage mating serrations in upper and lower elements in order to drive the indicator mechanism. The serrations are rigid and, therefore, tend to wear excessively as they slide past one another.

The device of European Patent Application No. 87100917.2, published July 27, 1987, by Schwab, has a cup-shaped exterior element that engages a frustoconical closure cap. The Schwab device is somewhat complicated in design and manufacture. The device of U.S. Patent 4,220,247 issued September 2, 1980 to Kramer also includes a cup-shaped exterior element which engages an inner element.

Other devices in the art include U.S. Patents 4,511,050 by Nicol; 4,365,722 by Kramer; 4,749,093 by Trick; 4,782,966 by Thackrey; 4,753,189 by Mastman; 4,705,182 by Newel-Lewis; 4,662,520 by Griffen; 4,641,759 by Kelley; 4,634,012 by Kelley; 4,562,933 by Dennis; 4,528,933 by Allen; 4,511,050 by Nicol; 4,548,157 by Hevayan; 4,501,370 by Kelley; 4,489,834 by

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Thackrey; 4,432,300 by Lyss; 4,419,016 by Zoltan;
4,405,045 by Villa-Real; 4,357,192 by Moser; 4,347,804
by Villa-Real; 4,094,408 by Ford; 3,996,879 by Walton;
3,960,713 by Carey; 3,926,326 by Grau; 3,921,568 by
5 Fish; 3,887,099 by Gillman; 3,753,417 by Garby;
3,446,179 by Bender; 3,334,731 by Dale; 2,943,730 by
Tregilgas; 2,939,597 by Greene; 2,587,147 by Guion; and
498,851 by Adsit.

10 It is thus apparent from a review of this art
that there is a need for an improved indicator cap that
provides positive controlled movement of the index on
both opening and closing of the device, while also
providing an indication to the user that the index has
functioned properly each time the device is used.
15 Preferably, the basic design of such a device could
also be used in other applications where it is
necessary to have a record of the number of times a
given event occurs.

20 It is also apparent from a review of this art
that there is a need for an improved indicator cap that
can be used as a child-resistant closure. Preferably,
such a cap would have a minimum of parts, would be
easily manufactured and assembled using standard
injection molding and assembly methods, and could be
25 used with ordinary containers that are not necessarily
specially designed for the cap.

Finally, it is apparent from a review of this
art that the prior art devices are generally designed
for attachment to a container of a particular size.
30 For example, the Wachsmann device is a cap with
indicating features that is designed with threads that
fit onto a particular threaded container. Other
devices may include a skirt portion on the outer shell
of the device that fits over a standard cap of a
35 container so that the standard cap nests inside the

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skirt. Yet other devices may be substantially disk-shaped so that they can be attached directly to the top of a standard cap. The cap is removed from the container by grasping the device and turning it along with the standard cap to which it is attached, thereby advancing the indicator mechanism. In the case of these last two types of devices, the device cannot be used effectively with standard caps that are too large. In the device with the skirt, a large standard cap will not rest into the skirt. In the disk-shaped device that is attached to the top of a standard cap, the device will be too small in relation to the cap to be gripped effectively and, instead, the user will inadvertently grip the standard cap itself so that the indicator mechanism is not advanced.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide an indicator device to indicate the number of times a given event has occurred. Such an invention may have applicability in the control of chemical containers, the development of photographic film and many other areas.

More particularly, it is an object of the present invention to provide an indicator cap for a medication dispensing bottle or the like that provides an indication each time the bottle is opened and then reclosed.

It is another object of this invention to provide a device that has positive control of the index member during both the opening and the closing motions and to require the advancement of the index member by one and only one new index during each complete opening and closing cycle.

Yet another object of the invention is to

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5 provide an audible sound to confirm that the device has been rotated sufficiently to move the index to the next location and to also provide an audible sound when the device has been rotated sufficiently to re-cock the device for the next open-close sequence.

Still another object is to provide space within the device for the locking mechanisms to slide past each other when not engaged to allow such mechanisms to work reliably over a long period of time.

10 Another object of the present invention is to combine functions usually requiring several components into single components to reduce the complexity of the device and provide ease of manufacturability and assembly using standard injection molding and assembly techniques.

15 Another object of the present invention is to provide an indicator assembly that can easily be fitted to an ordinary container without requiring any special modifications to the container itself.

20 Another object is to provide a device with indicator symbols that can be sensed by touch such as raised letters or braille.

25 Another object is to provide a device that can be easily grasped by elderly or impaired patients, as by including grasp-facilitating elements on the device.

Another object is to provide a device which is easily manufactured and assembled with a minimum of parts.

30 It is another object of the present invention to provide a device to enlarge the outer circumference of a disk-shaped indicator mechanism, so that the outer circumference is easier to grasp to advance the indicator mechanism.

35 These and other objects of the present invention are provided by means of an indicator having

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a cup shaped outer cover with a window in the top piece of the outer cover. Underneath the window, and within the body of the device, is an indicator wheel having numbers, days, times or other indicator symbols
5 engraved or printed thereon which are visible through the window to indicate the next time the indicated event occurred (or the last time the indicated event occurred, depending on the chosen protocol for the device). The indicator wheel contains a pawl formed
10 therein or attached thereto that engages a set of teeth formed in the underside of the top piece of the outer cover and which engages the teeth only when the outer cover is turned one direction. This engagement causes the indicator wheel to move to the next index location
15 each time the outer cover is turned in that direction. Underneath the indicator wheel, and attached to the outer cover is a ratchet wheel which contains a pawl formed therein or attached thereto. The pawl engages a set of teeth on the indicator wheel to prevent the
20 indicator wheel from moving with respect to the ratchet when the outer cover is turned in the opposite direction. The pawls on the two wheels, and the teeth formed opposite the pawls are designed such that the indicator wheel moves to a new location upon turning
25 the outer cover in that opposite direction, and is kept in that location when the cap is closed, allowing the window in the top piece to uncover the next indicator symbol as the outer cover is turned in that opposite direction.

30 Both pawls are formed or attached such that space is provided for the pawl to move out of the way when being moved in a direction where the teeth are disengaged. The pawl moves away from the teeth as the teeth slide over the pawl, and as the pawl slides past
35 the edge of a tooth it makes an audible sound as it

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snaps back into place. Thus, the device makes a sound when the outer cover has been turned in one direction a sufficient amount for the indicator wheel to move to the next location, and it also makes a sound when it has been turned in the opposite direction sufficiently to re-cock the mechanism for the next cycle.

To provide for ease of assembly during the manufacturing process, the ratchet wheel is provided with tabs that compress while the ratchet wheel is being placed into the outer cover, and snap into a groove in the outer cover to firmly hold the device together and prevent disassembly. The grooves may have side walls perpendicular to the interior surface of the outer cover depending skirt and the tabs may be flexible to facilitate assembly. Alternatively, for molding reasons, the groove side walls may be at an angle less than perpendicular and the tabs may be substantially rigid in the manner described in more detail below.

The indicator wheel has a circular hole through its middle, one side of which rotatably receives a post in the cap and the other side of which rotatable receives a post in the ratchet wheel. The pair of posts in the cap and ratchet wheel extending into the hole in the indicator wheel, in combination with the depending skirt of the outer cover, help to hold the assembly together as it operates and maintain the outer cover, indicator wheel and ratchet wheel on the same rotational axis.

The indicator is particularly, but not exclusively, useful to indicate dosage schedules on a medicine container. The indicator may be attached to a standard medicine container cap or other cap by means of a ratchet wheel flange attached to the bottom periphery of a depending skirt which snaps over the

bottom rim of the container cap. Alternatively, the indicator may be attached to the standard cap utilizing adhesive means between the ratchet wheel and the cap. In an embodiment which attaches with adhesive, the indicator cap depending skirt may terminate at the bottom of the ratchet wheel, and the ratchet wheel may be attached to the top of the standard cap with an adhesive such as double-sided adhesive tape so that the indicator device is mounted flush with the circumference of the standard cap. The adhesive may also be a *VELCRO brand hook and loop fastener. In yet another embodiment, the indicator itself becomes the closure for the container and replaces a standard cap, by including a skirt depending from the ratchet wheel containing threads or other closure means to engage the container. If the indicator is used with a child resistant cap of the type that includes an outer cap that must be pushed in the axial direction against an inner sealing cap in order to remove the cap, the outer cap may be attached to or integral with the ratchet wheel. If so, then it can be seen that the device would include an outer cover, an indicator wheel, a ratchet wheel attached to or integral with an outer cap, and an inner sealing cap.

The indicator symbols on the indicator wheel may be raised or recessed relative to the indicator wheel top surface and may be in braille, and the window in the outer cover may be rounded, so that the patient can feel the indicator symbols with a thumb or finger.

In one embodiment, the number and configuration of tabs on the ratchet wheel to engage outer cover are optimized such that a single ratchet wheel can be used for a variety of dose schedules in order to maximize assembly flexibility and minimize manufacturing costs. The number and configuration of tabs may also be

*Trade-mark

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optimized such that the indicator wheel can be inserted into the outer cover in multiple orientations without misaligning the window and the indicator symbols.

5 Certain embodiments of the invention include means for viewing an arrow on the standard cap on a container if necessary or for attaching the indicator onto the standard cap in a desired orientation with respect to the arrow. Other embodiments include grasping means on the periphery of the indicator to
10 facilitate the turning of the outer cover.

Another embodiment of the invention uses an outer cover with a hinged snap top. The hinged top allows access to the indicator wheel. Alternatively, the outer cover has a slot. Rather than the indicator
15 wheel having permanent indicator symbols, the indicator wheel is configured to receive a temporary indicator disk with the desired indicator symbols, by accessing the indicator wheel through the hinged top or slot. In this way, a single device can be used for any dosage
20 regimen, by simply choosing the appropriate indicator disk.

In other embodiments, the device contains a mechanism to make the container child-resistant. For example, the device may include an inner sealing cap
25 with threads for attachment to the threaded neck of a container. The inner cap may have a set of notches to mate with tabs on a portion of the device that functions as the indicator, so that an axial force is required to maintain the tabs in engagement with the
30 notches in order to remove the inner sealing cap. Alternatively, the outer cover of the device may have a set of annular groove segments through which tabs or an inner sealing cap travel to rotate the sealing cap, but only if sufficient axial force is applied to overcome a
35 biasing spring.

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In another child-resistant embodiment, the device has an outer shell with lugs or bayonets that mate with bayonets or lugs, respectively, on the container neck. In this embodiment, the "lost motor" drive that enables the outer shell to advance to successive indicator symbols by rotating with respect to the indicator element, is accomplished with the required partial turning of the outer shell to disengage the lugs from the bayonets. Before that turning can be effected, it is necessary to apply an axial force to overcome a bias. In still another embodiment, the lugs or bayonets are on the inner sealing cap rather than on the outer shell.

In accordance with the present invention, there is provided an indicator device for mounting to a closure for a container, to indicate the opening or closing of the container, comprising: (a) an outer cover comprising a top piece with an indicator window therein and a depending skirt extending axially downward from the top piece; (b) a retainer rotatably attached to the outer cover whereby the outer cover can rotate a predetermined number of degrees before causing rotation of the retainer; (c) an indicator device mount for mounting the indicator device to said closure; (d) an indicator wheel disposed between said outer cover top piece and said retainer, having indicating symbols visible through the indicator window; (e) a rotation mechanism engaging said indicator wheel to said outer cover for causing rotation of the indicator wheel with the outer cover upon rotation of the outer cover in a first direction; and (f) an antirotation mechanism engaging said retainer to said indicator wheel for preventing rotation of the indicator wheel with outer cover upon rotation of the outer cover in a second direction opposite said first direction.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 shows an exploded perspective view of the invention together with a container and standard container cap.

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Fig. 2 shows an exploded perspective view of the three major elements of the invention as seen from the bottom.

Fig. 3 shows a partial sectional view of one embodiment of the means for attaching the invention to an
5 ordinary container cap.

Fig. 4 shows a partial sectional view along line 4-4 of Fig. 3.

Fig. 5 shows a partial sectional view of an embodiment of the invention which includes container sealing
10 means.

Fig. 6 shows an embodiment of the invention for mounting flush to an ordinary container cap.

Fig. 7 shows a sectional view along line 7-7 of Fig. 6.

15 Fig. 8 shows an elevational view of another embodiment of the invention.

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Fig. 9 shows an elevational view of another embodiment of the invention.

Fig. 10 shows an exploded perspective view of another embodiment of the invention.

5 Fig. 11 is an exploded perspective view showing another embodiment of the present invention along with the neck of a container to which the invention can be attached.

10 Fig. 12 shows a detail of the annular grooves in the outer cover, taken along line 12-12 of Fig. 11.

Fig. 13 shows a detail of the top of the indicator wheel, taken along line 13-13 of Fig. 11.

Fig. 14 shows a detail of the ratchet wheel tabs, taken along line 14-14 of Fig. 11.

15 Fig. 15 shows a detail of the lugs and notches of the ratchet wheel and sealing cover of Fig. 11.

Fig. 16 is an exploded perspective view showing another embodiment of the present invention.

Fig. 16A shows a detail of the tabs of Fig. 16.

20 Fig. 17 is an exploded perspective view showing another embodiment of the present invention along with the neck of a container to which the invention can be attached.

25 Fig. 18 is an exploded perspective view showing another embodiment of the present invention.

Fig. 19 is an exploded perspective view showing another embodiment of the present invention.

Fig. 20 is a partial perspective view of the indicator symbol window cover.

30 Fig. 21 is a partial perspective view of another embodiment of an indicator symbol window cover.

Fig. 22 is a partial perspective view of another embodiment of an indicator symbol window cover.

35 Fig. 23 is a partial perspective view of another embodiment of an indicator symbol window cover.

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Fig. 24 shows a perspective view of an adaptor portion of the present invention.

5 Fig. 25 shows a sectional view of the invention attached to a disk-shaped indicating device which is attached to a container cap.

Fig. 26 shows a perspective view of the invention attached to a disk-shaped indicator device which is attached to a container cap.

10 Fig. 27 shows a perspective view, with a partial cut-away of another embodiment of the invention.

Fig. 28 is a sectional view, taken along line 28-28 of Fig. 27.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

15 One embodiment of the invention is primarily comprised of three parts: the outer cover, the indicator wheel, and the ratchet wheel. In addition, one embodiment of the invention uses an adhesive or other means to affix the ratchet wheel to the standard
20 cap of a medicine dispenser, bottle or the like, and another embodiment uses an inner sealing cap for a child resistant application.

As explained above, the device may be used anywhere it is necessary to keep a record of the number
25 of times an event has occurred. The device has particular applicability to medicine containers and, for ease of explanation, will be described primarily in that application. As a user opens the medicine container the outer cover of the device is generally
30 twisted in a counterclockwise direction looking down on the cap. The initial twisting motion does not turn the sealing cap to open the bottle, but instead, through a ratchet pawl and gear teeth, turns the indicator wheel to advance it to the next index location. Although the
35 indicator wheel has advanced, the next index location

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is not yet visible in the window because the outer cover turned with the indicator wheel. When the outer cover reaches a predetermined angle with respect to the ratchet wheel, and therefore the sealing cap of the bottle since the two are attached, the sealing cap begins to turn and eventually the two caps are removed from the bottle. The user then takes the prescribed dosage of medication and places the two caps back on the bottle. Then the user turns the caps clockwise to begin tightening the seal with the bottle. When the sealing cap reaches its limit and is tight, the outer cover continues to turn. A pawl on the ratchet wheel meshes with teeth on the indicator wheel to hold the indicator wheel in place while the outer cover turns to expose the next index location through the window.

As the outer cover is loosened, the pawl on the ratchet wheel slides over the teeth on the indicator wheel because it has room to flex away from these teeth. As the pawl passes over the next tooth, the spring action of the pawl snaps it over the edge of the tooth causing a snapping or clicking sound. Likewise as the cap is being closed, the pawl on the indicator wheel slides over the teeth on the outer cover and makes a click as it passes over the edge of a tooth. Therefore, a click is heard by the user when the indicator wheel has advanced to the next index location, and a second click is heard when closing the cap as the mechanism is re-cocked for the next cycle. Both pawls are designed with sufficient space behind them to allow them to move out of the way of the teeth, giving long term reliability, and they are designed to spring back into place after passing a tooth, which causes the audible sound that informs the user that the mechanism is working correctly.

Referring now to Fig. 1, the cap 10 is

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comprised of an outer cover 100 which fits over an indicator wheel 200. A ratchet wheel 300 fits inside the outer cover 100 and is held into the outer cover 100 by flexible tab projections 310. The indicator wheel 200 is contained between the ratchet wheel 300 and the outer cover 100. The indicator wheel is not attached to either the outer cover or the ratchet wheel, but floats between the two as its pawl engages the teeth of the outer cover and its teeth engage the pawl of the ratchet wheel. In order to stabilize the assembly and to reduce frictional drag between the outer cover skirt and the perimeter of the indicator wheel as it floats, and to help reduce any bowing in the wheels in the molding process, the indicator wheel 200 has a central hole 226. The central hole 226 receives an axially-extending post 326 in the center of the upper side of the ratchet wheel 300 and an axially-extending post 126 in the center of the lower side of the outer cover 100.

As a user grasps the outside of the outer cover 100 to turn the cap, the rotary motion is transferred to the ratchet wheel 300 through projections 310 and to the sealing cap 502 to turn the sealing cap 502 and remove it from the bottle 525. A window 110 in the outer cover 100 is used to view indicator symbols 210 located on the indicator wheel 200. Window 110 is only wide enough for one set of the indicator symbols 210 to be visible at any time.

Fig. 2 is a perspective view of the indicator cap 10 shown from the bottom to better illustrate the two ratchet systems employed in the device to achieve optimum operation. Gear teeth 120 are formed in the bottom side on the outer cover 100 in a manner that allows them to mesh with the pawl 220, located on the indicator wheel 200, when the outer cover 100 is

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rotated in the direction of arrow 130. Rotation in the direction of arrow 130 is counterclockwise to a user looking down on the cap, although it appears clockwise in this view looking upward. A counterclockwise rotation is the normal movement for removing a cap, and as the outer cover 100 is rotated this way, the pawl 220 engages the teeth 120 which causes the indicator wheel to rotate in the direction of arrow 130.

Tabs 310 on the ratchet wheel 300 are designed to fit into slots 140 on the outer cover 100 and lock into groove 150. Since the slot 140 and the groove 150 are wider than the projections 310, a lost motion drive is formed whereby outer cover 100 can turn through a predetermined number of degrees relative to the ratchet wheel before projections 310 are encountered by the sidewalls 160 of slot 140. Once the projections 310 make contact with the sidewall 160 of the slot 140, the ratchet wheel 300 will begin to turn which will then turn the sealing cap 502. The number of degrees the outer cover 100 is allowed to turn is determined by the width of slots 140 and tabs 310, and would generally correspond with the number of degrees between the indicator symbols 210 (Fig. 1) on the indicator wheel 200. For clarity in the Figures, the device is depicted with three flexible tabs and slots but, as explained below, the device could actually have two, four or any other desired number of tabs and slots.

Figs. 1 and 2 should be viewed together to best illustrate replacing the cap 502 on the bottle 525. When the indicator cap 10 is replaced on the bottle 525, the cap 10 is turned in a direction opposite arrow 130 (that is, clockwise as viewed from the top of the cap). Until the sealing cap 502 is tight on the bottle 525, sealing cap 502, ratchet wheel 300 and outer cover 100 will turn in unison. Once the sealing cap 502 is

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5 tight on bottle 525, the sealing cap 502 will cease to
turn. However, because of the lost motion drive formed
by the projections 310 on the ratchet wheel 300, the
slots 140, and the grooves 150 in the outer cover 100,
the outer cover 100 will continue to turn in the
direction opposite arrow 130. Friction between the
outer cover 100 and the indicator wheel 200 will
attempt to turn the indicator wheel 200 along with the
outer cover 100. However, the tooth 330 on the pawl
10 320 of the ratchet wheel 300 will engage teeth 230 on
the indicator wheel 200 to prevent the indicator wheel
200 from turning. Since the indicator wheel 200 was
turned in the direction of arrow 130 when the cap was
opened, and since the indicator wheel 200 is prevented
15 from turning in the opposite direction upon closure,
the indicator symbols 210 will advance one position in
the window 110.

The number of indicator symbols that can be
placed on the indicator wheel 200 is determined by the
20 width of slots 140 and tabs 310 as well as the number
of teeth 120 in the outer cover 100 and the number of
teeth 230 in the indicator wheel 200. Of course, the
width of the window 110 should correspond to the width
of one index mark. The indicator symbols shown in Fig.
25 1 consist of M1, M2, Tu1 . . . Sa2, Su1, Su2, and
correspond to medication to be taken twice a day for
one week. Other index marks could be used depending on
the dosage of the medication. The index marks may be
molded into or printed onto the indicator wheel 200 or
30 printed on a label which is then attached to the
indicator wheel 200. Preferably, the indicator symbols
are arranged with the day symbol and times per day one
on top of the other as shown in Fig. 1.

Fig. 1 and Fig. 2 show the window 110 as an
35 opening with a generally trapezoidal bottom and

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5 circular top and with a bevelled edge 140. A window of that configuration can be used in combination with raised or recessed indicator symbols or braille indicator symbols. In this way the patient can discern the indicator symbols in the dark and sight-impaired patients can discern the indicator symbols.

10 The teeth 230 and the pawl 220 of the indicator wheel can be seen in Fig. 2. A tooth 240 extends above the top surface of the indicator wheel 200 to engage the teeth 120 of the outer cover 100. The pawl 220 is formed into the indicator wheel 200. However, the pawl 220 is not as thick as the indicator wheel, a space 250 being left below the pawl 220. This space 250 allows the tooth 240 of the pawl 220 to flex below the upper surface of the indicator wheel 200 when the teeth 120 of the outer cover 100 are moving in a direction which will not engage the tooth 240, that is, when the outer cover is moving in a direction opposite the arrow 130 of Fig. 2. This movement occurs when the cap is being tightened on the bottle. As the outer cover is tightened, one of the teeth 120 will depress the tooth 240 which will depress the pawl 220. By forming the indicator wheel 200 out of a resilient material, such as plastic, the pawl 220 will have a spring effect which will bias the pawl 220 and the tooth 240 toward the outer cover 100. As the trailing edge of one of the teeth 120 passes over the pawl, the pawl will spring back into place. This movement results in an audible snap or click which is loud enough to be heard by the person operating the cap. Thus the person knows that the mechanism has been re-cocked for the next cycle.

35 The ratchet wheel 300, with a pawl 320 having a tooth 330 can be seen in Fig. 1 and Fig. 2. The tooth 330 is designed to engage the teeth 230 of the

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indicator wheel 200 when the cap is being closed. This engagement prevents the indicator wheel 200 from moving with respect to the ratchet wheel 300, which allows the outer cover 100 to move the window 110 over the next index mark. When the cap is being opened, the teeth 230 of the indicator wheel 200 and the tooth 330 of the ratchet wheel 300 are not engaged and function in a manner similar to the teeth 120 of the outer cover 100 and the pawl 220 of the indicator wheel. That is, the pawl 320 is formed in such a way that space is left below the pawl so that one of the teeth 230 can depress the pawl 320 when the cap is being opened. As the trailing edge of one of the teeth 230 passes over the tooth 330, the pawl 320 springs back to its normal position causing an audible snap or click which can be heard by the person opening the cap. This snap or click alerts the user that the indicator wheel has advanced to the next index mark.

Thus the combination of the pawl 320 and the teeth 230 as well as the pawl 220 and teeth 120 give the user an audible indication that the indicator wheel has advanced one index mark on opening, and that the mechanism has been re-cocked for the next cycle when the cap is closed.

The tabs 310 of the ratchet wheel 300 are designed to pass through the slots 140 of the outer cover 100 and lock into grooves 150. Furthermore, the tabs 310 may be designed with a space between the tab and the body of the ratchet wheel that allows the tabs 310 to compress as they are being inserted into the outer cover 100 during assembly. When the tabs 310 are inserted far enough into slots 140 to reach the grooves 150, the projections snap into the grooves 150 to lock the ratchet wheel 300 in place. Because of this arrangement, the cap 10 is easy to assemble and does

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not easily come apart.

5 The grooves 150 may be configured so that the
groove walls toward the bottom of the outer cover are
at an angle less than perpendicular to the interior
surface of the depending skirt. Although this may
result in a slightly less secure assembly, it
facilitates the injection molding of the outer cover,
because a less expensive bump-off mold can be used
without lifters, sliders or collapsible elements.
10 Also, the tabs may be designed without any space
between the tab and the body of the ratchet wheel 300,
so that they are substantially inflexible. However,
the ratchet wheel and outer cover are still deformable
enough to allow the ratchet wheel to be inserted into
15 the outer cover to allow the tabs to lock into the
grooves.

 It should be appreciated that the angular
position of the outer cover 100 in relation to the
indicator wheel 200 is important. That angular
20 relationship must be such that when the outer cover 100
is turned one way relative to the ratchet wheel 300 the
tabs 310 are stopped by the end of the slotted grooves
140 just after the pawl 220 of the indicator wheel 200
snaps over a tooth of the teeth 120 on the interior of
25 the outer cover. Also, when the outer cover 100 is
turned the other way relative to the ratchet wheel 300
the tabs 310 are stopped by the other end of the
slotted grooves 140 just after the pawl 320 of the
ratchet wheel 300 snaps over a tooth of the teeth 230
30 of the indicator wheel 200. Otherwise, the indicator
wheel would turn too far relative to the outer cover
when turned in one direction and not far enough when
turned in the other direction. The result would be a
misalignment between the window 110 and the indicator
35 symbols 210. This misalignment would occur if the

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position of the grooves 150 relative to the set of
outer cover teeth 120 is not uniform on all grooves.
If that position is not uniform, then there would be
alignment if the tabs 310 are inserted into the grooves
5 140 in a correct position, but there would be
misalignment if the tabs 310 are inserted into the
grooves 140 in an incorrect position.

One way to avoid inserting the tabs 310 into
the grooves 140 in an incorrect position is to include
10 positioning marks on both the outer cap and the ratchet
wheel to allow the assembler to determine the correct
position. Another way is to position the flexible tabs
310 and the slots 140 in a nonuniform spacing around
the circumference of the ratchet wheel and the skirt of
15 the outer cover, so that the ratchet wheel will fit
into the outer cover in only a single position. A
disadvantage of the first approach is that it requires
some care in the assembly of the device. Also, it is
difficult to implement that approach in automated
20 assembly processes. A disadvantage of the second
approach is that it may necessitate a different ratchet
wheel for each different set of symbols on the
indicator wheels.

Another way to avoid inserting the tabs 310
25 into the grooves 140 in an incorrect position is to
design the device so that all grooves are oriented
uniformly with respect to the outer cover teeth 120.
In this way, there can be no incorrect position of the
indicator wheel, because all grooves are identically
30 oriently with respect to the outer cover teeth 120 and,
therefore, with respect to the indicator wheel 200 and
indicator symbols 210. It should be apparent that this
is possible only if the number of outer cover teeth 120
is evenly divisible by the number of grooves 140. If
35 so, then each groove will have the same orientation

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with respect to the nearby outer cover teeth 120. For example, there may be twelve outer cover teeth 120 (and, therefore, twelve positions of the indicator wheel) and either three or four grooves 140, since
5 twelve is evenly divisible by both three and four. Alternatively, there may be twenty-one outer cover teeth and three grooves, fourteen outer cover teeth and two grooves or seven grooves, and so on.

It may be particularly useful to have seven
10 grooves 140, since there are seven days in a week. The seven grooved outer cover and corresponding seven tabbed ratchet wheel could then be used with seven, fourteen, twenty-one or twenty-eight teeth and the ratchet wheel could still be inserted into the outer
15 cover in any position without risking a misalignment.

The invention can be attached to a container in one of several ways. An adhesive strip such as double-sided tape 30 may be attached to the lower surface of the ratchet wheel 300 as shown in Fig. 1. The adhesive
20 strip then is adhered to the top of the ordinary cap of a container. This method of attachment is exceptionally simple. It is also flexible in that the device can attach to any ordinary container cap that will fit into the hollow of the outer cover skirt.

Another method for attachment is the snap-on arrangement shown in Fig. 3 and Fig. 4. In this arrangement, the ratchet wheel 300 includes a depending skirt 334 extending axially downward. The lower rim of the depending skirt includes a flange 336 extending
30 radially inward. The flange 336 engages the lower lip of the skirt of an ordinary cap 502, thereby securing the device to the ordinary cap. The inner surface of the ratchet wheel depending skirt 334 may include irregularities such as axially extending ribs 338 to
35 engage mating ribs 504 on the ordinary cap, thereby

5 providing an additional resistance to any sliding of the ratchet wheel skirt in relation to the ordinary cap. The snap-on flange 336 may also be disengagable from the ordinary cap 502, so that the device can be removed when the medicine is exhausted.

10 In another arrangement for attaching the device to a container, the device is integral with the closure means, as shown in Fig. 5. In this arrangement, a skirt 352 depending from the ratchet wheel 300 includes attachment means on its inner surface. The attachment means directly engage mating attachment means on the container, and may be threads 354, as shown in Fig. 5 or may be lugs and bayonets. The arrangement may be child-resistant by requiring the user to exert an axial force against the cap to overcome a bias in the cap while turning the cap at the same time. If the device is to be used with a child resistant cap of the two-piece push and turn type, then the ratchet wheel may be either attached to or integral with the outer portion of the two-pieces.

20 Another embodiment with another means for attaching the device to an ordinary cap 502 is shown in Fig. 6 and Fig. 7. In this embodiment, the cap includes the ratchet wheel 300 and indicator wheel 200 as in the other embodiments. However, the depending skirt of the outer cover 150 terminates at the ratchet wheel 300. The device can be attached to the top of any ordinary cap with a double-sided adhesive pad or other adhesive means. It will be apparent that this configuration can also be used in a wide variety of applications not involving caps or containers. For example, the device could be attached to a refrigerator to indicate the number of times it is opened by instructing each person accessing the refrigerator to advance the device each time the door is opened, and so

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on.

The outer cover 150 shown in Figs. 6 and 7 also has a set of knobs 152 or other protrusions or grasp-facilitating elements spaced around its circumference.

5 The knobs 152 help the user to grasp the outer cover 150 effectively. By eliminating the depending skirt, the device is more compact and streamlined, which may be a factor in aesthetics or in marketing.

Another embodiment is shown in Fig. 8 and Fig.
10 9. This embodiment is designed for use with caps and containers that are made child-resistant by the use of a pair of arrows on the cap and container that must be aligned in order to remove the cap. As shown in Fig. 8, the depending skirt of the outer cover 100 includes
15 a cut-out 160. This cutout 160 allows the user to see the arrow 512 on the cap, so that the user can align it with the arrow 514 on the container. Alternatively, as shown in Fig. 9 the skirt on the outer cover 100 may itself include an arrow 170, so that the user can align
20 the arrow on the outer cover 100 with the arrow 512 on the cap and then simply align the outer cover arrow 170 with the container arrow 514 without regard to the concealed arrow 512 on the cap.

Yet another embodiment is shown in Fig. 10.
25 The embodiment of Fig. 10 includes an outer cover 710 with a depending skirt 711 and a top 712 which hinges open from the depending skirt through a hinge portion 714 or is otherwise removably attached to the depending skirt. The outer cover 710 with the top 712 and hinge
30 portion 714 can be made from a resilient injected plastic. The top 712 is snapped onto the top of the depending skirt 711 by means of one or more projections 718 which extend from the bottom of the top 712 and engage mating holes 720 in the top of the depending
35 skirt 711. The projections 718 are preferably knobs

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that snap onto the mating holes 720 to form a friction fit holding the top 712 in place.

5 The indicator wheel 730 of this embodiment includes a pair of tabs 732 extending upward from the upper surface of the indicator wheel. The indicator wheel 730 receives a paper or thin film indicator wheel disk 738 which is printed with the desired dosage regimen. The indicator wheel disk 738 has a pair of retaining holes 734 which mate with the projections 718 to hold the indicator wheel disk 738 from turning with respect to the indicator wheel 730.

10 The indicator wheel disk 738 may be printed with any desired dosage information. If the ratchet and pawls are configured to provide fourteen indicator wheel positions, then it can be seen that the device will be easily usable with any of several indicator wheel disks 738. For example, the device could be used with the following indicator wheel disks:

- 20 (a) a disk with once a day dosage for a fourteen day period;
- (b) a disk with twice a day dosages for a six day period;
- (c) a disk with three times a day dosages for a four day period, with two blank positions;
- 25 (d) a disk with four times a day dosages for a three day period, with two blank positions;
- (e) a disk with seven times a day dosages for a two day period;
- 30

It will be apparent that such a device may use a disk with any other number of dosages per day up to and including fourteen, by including a number of blank positions equal to fourteen minus the number of dosages

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per day times the number of days provided. The blank positions may include an arrow pointing in the direction of outer cover rotation, thereby instructing the user to advance to the next position.

5 Another preferred embodiment of the invention 810 is shown in Fig. 11. This preferred embodiment includes an outer cover 812, an indicator wheel 814, a ratchet wheel 816 and an inner cover 818. The outer cover includes a top circular portion 820 with a window 822 and a depending skirt 824. The lower surface of the top circular portion 820 has a set of teeth 826.

10 The inner surface of the depending skirt 824 has a set of grooves 828 (three in the embodiment shown), as better seen in Fig. 12. The grooves 828 are in the annular direction around a portion of the depending skirt inner surface, and include a deep groove portion 830 and a shallow groove portion 832 connected by a ramp 834 which may be perpendicular to the two groove portions or may be sloped relative to the two groove portions. The function of the grooves is to receive the ratchet wheel tabs as described in some detail below.

15 The window 822 in the circular top portion 820 of the outer cover 812 may be trapezoidal in shape as shown in Fig. 11 or, alternatively, may be circular in shape or may be circular on its upper edge and sloped to trapezoidal on its lower edge. In the later alternative especially, the window can be used with an indicator wheel having raised or recessed alpha-numeric symbols or braille symbols so that the user can sense the symbols with his finger even though his vision may be physiologically or environmentally impaired.

20 The indicator wheel 814 includes a circular top portion 842 containing a set of indicator symbols 844 to indicate a day of the week and a dose number of that

25

30

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day. For example, the symbols may be Su1, Su2, M1, M2, etc. as shown in Fig. 13 to indicate a dosage schedule of two per day. Alternatively, of course, the indicator symbols may be 1, 2, 3, 1, 2, 3, etc. to indicate a dosage schedule of three per day, or Su, M, Tu, etc. to indicate a dosage schedule of one per day, and so on.

5 The total number of indicator symbols 844 on the indicator wheel 814 should be evenly divisible into the total number of teeth 826 in the outer cover 812. Otherwise, the indicator symbols will not advance one at a time past the outer cover window 822 as the device is operated unless the indicator wheel has some blanks in place of indicator symbols. Preferably, the number of indicator symbols 844 together with the number of any blanks that may be necessary is exactly equal to the number of outer cover teeth 826.

10 In the region of the outer perimeter of the indicator wheel 814 is a ratchet 850 which is spaced apart from the body of the indicator wheel by a space 852 underneath it, an annular slot 854 on the radially inner side of it, and a leading edge slot 856 adjacent the leading edge of it. The ratchet is flexibly connected to the indicator wheel by only the trailing edge 858. This flexible connection along with the slots 854 and 856 and space 852 allow the ratchet to flex as it passes over the outer cover teeth 826 of the outer cover 812.

20 The bottom surface of the indicator wheel 814 includes a set of indicator wheel teeth 860. The number of indicator wheel teeth involves the same considerations as the number of outer cover teeth, as discussed above, and preferably is exactly equal to the total of the number of indicator symbols and the number of blanks on the upper circular portion of the

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indicator wheel. The bottom surface of the indicator wheel 814 also preferably has an axially extending center hole 861 to receive the hub of the ratchet wheel in the manner described below.

5 The ratchet wheel 816 includes a circular upper portion 862 and a circumferential edge 863. The center of the circular upper portion 862 has an axially extending center hub 864 which mates with the center hole 861 of the indicator wheel. Around the outer
10 circumference of the circular upper portion 862 is a set of tabs 865 extending radially outward. As better seen in Fig. 14, the tabs 865 have a sloping ramp 866 and a locking edge 867 at the lower end of the sloping ramp 866. The tabs 865 engage the grooves 828 in the
15 inner surface of the depending skirt 824 of the outer cover 812 and, therefore, are numbered and configured to align therewith so that the ratchet wheel can be attached to the outer cover by the tabs and grooves while still allowing a predetermined amount of rotation
20 of one relative to the other by sliding the tabs annularly through the grooves.

 The ratchet wheel also includes a ratchet wheel pawl 868 flexibly attached to the circular upper
25 portion 862. The pawl 868 rests in and is attached to one end of a rectangular cutout in the circular upper portion to allow it to flex up and down as it rides over the indicator wheel teeth 860 on the bottom of the indicator wheel 814.

30 Another element of the ratchet wheel 816 is a set of lugs 869 extending downward from the lower surface and radially inward from the depending skirt 863. The lugs 869 occupy a space at the joining of the circular upper portion 862 (on its lower side) and the circumferential edge 863 (on its inner side) and are
35 numbered and configured to mate with the notches on the

upper surface of the sealing cover as described below.

The sealing cover 818 includes a circular upper portion 870 and a depending skirt 871. The circular upper portion 870 has a set of notches 872 numbered and configured to mate with the lugs 869 on the ratchet wheel 816 and are better shown in Fig. 15. The purpose of the lugs and notches are to engage the ratchet wheel with the sealing cover upon the application of an axial force pushing the two together when the device is turned in the direction to unscrew it from the container. The lugs and notches are configured such that no axial force (other than that provided by gravity) is required to engage them when the device is turned in the direction to screw it onto the container. It can be appreciated that the exact number and configuration of the lugs and notches is not critical so long as they effectively engage one another upon the application of an axial force within the easy capability of an adult, and they disengage upon the release of such force. Lug and notch arrangements such as this are well-known in the field of child-resistant closures, and need not be described in any more detail here. The inner surface of the depending skirt 871 of the sealing cover 818 has threads 873 to mate with threads 874 on the outer surface of the neck of the container 875.

Although the embodiment shown has teeth on the lower surface of the indicator wheel and a mating pawl on the upper surface of the ratchet wheel, the arrangement could also be reversed so that the pawl is on the lower surface of the indicator wheel and the teeth are on the upper surface of the ratchet wheel. Similarly, the teeth on the outer cover and the pawl on the indicator wheel could be reversed so that the pawl is on the outer cover and the teeth are on the

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indicator wheel, and the grooves on the outer cover and tabs on the ratchet wheel could be reversed so that the grooves are on the ratchet wheel and the tabs are on the outer cover. Finally, the direction of the teeth and pawls may be reversed, so that the indicator wheel advances when the device is closed rather than when it is opened. The possibility of reversing the elements in these ways applies to all of the embodiments described herein. Whether the elements should be reversed or not may depend on molding and assembly considerations. Also, the mating pawls may include a plurality of pawls or even an entire set of pawls such as a circumferential row of teeth. Alternatively, the teeth with which the pawls mate may be replaced by holes or other depressions or other means for engagement.

In operation, the preferred embodiment 810 of Figs. 11-15 can be attached to the container 875 by placing it onto the top of the container and turning it in a clockwise direction (or counterclockwise direction if the threads were left-handed). The turning of the outer cover 812 is translated into a turning of the indicator wheel 814 by the outer cover teeth 826 engaging the indicator wheel pawl 850.

The turning of the indicator wheel 814 is translated into a turning of the ratchet wheel 816 by the outer cover grooves 828 engaging the ratchet wheel tabs 865. First, however, the outer cover 812 must be turned sufficiently so that the wall of the outer cover grooves 828 contacts the ratchet wheel tabs 865. Until the outer cover is turned that necessary amount, the tabs slide through the grooves, and the rotating indicator wheel slides over the stationary ratchet wheel. The sliding of the indicator wheel over the ratchet wheel causes the ratchet wheel pawl 868 to

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slide over the indicator wheel teeth 860, causing an audible click when the pawl snaps over a tooth to confirm the proper operation of the device.

5 Once the outer cover is turned sufficiently so
that the ratchet wheel tabs are against the end wall of
the outer cover grooves, the ratchet wheel begins to
turn. The turning of the ratchet wheel is translated
into a turning of the sealing cover 818 by the ratchet
wheel lugs 869 engaging the sealing cover notches 872.
10 As the sealing cover 818 turns relative to the
container 875, the sealing cover threads engage the
container threads to close and seal the container.

15 To remove the device 810 from the container, it
is turned in the opposite direction relative to the
container while an axial force is applied urging the
outer cover 812 toward the container 875 in order to
engage the ratchet wheel lugs 869 with the sealing
cover notches 872. The initial turning of the outer
cover 812 will not be translated into a turning of the
20 sealing cover 818, however. Instead, the indicator
wheel 814 will remain stationary as an outer cover
tooth 826 slides over the indicator wheel pawl 850.
This sliding will advance the outer cover window 822 to
a new indicator symbol, thereby recording that the
25 device has been opened. As the window advances one
full indicator symbol, the indicator wheel pawl 850
will pass over one complete outer cover tooth 826 and,
when it does, the pawl will snap over the edge of the
tooth. This results in an audible click confirming the
30 proper window advancement.

35 Also stationary during the initial turning of
the outer cover 812 is the ratchet wheel 816. This is
because the ratchet wheel tabs 865 slide through the
outercover grooves 828. At the same time, the ratchet
wheel pawl 868 engages the indicator wheel teeth 860 to

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prevent any movement between the indicator wheel and ratchet wheel.

When the ratchet wheel tabs 865 finally have slid through the outer cover grooves 828 so that the tabs are against an end wall of the grooves, the groove end wall applies a force against the tabs so that the ratchet wheel 816 begins to turn with the outer cover 812. This turning of the ratchet wheel 816 translates into a turning of the sealing cover 818, provided that the necessary axial force is applied to maintain the engagement between the ratchet wheel lugs 869 and sealing cover notches 872. The sealing cover threads 873 then unscrew from the container threads 874 to allow the device 810 to be removed from the container. The device is at that time in a proper configuration to be put back onto the container, with the indicator wheel tabs 865 at one end of the outer cover grooves 828.

Another preferred embodiment of the invention 876 is shown in Fig. 16. That embodiment includes an outer cover 877, an indicator wheel 878 and a ratchet cover 879. The outer cover 877 has a set of outer cover teeth 880 and an indicator symbol window 881 in the manner of the four-piece threaded version described above, and will not be further described here. The outer cover 877 also includes an annular raceway 882 extending around the radially inner surface of a depending skirt 883. A set of teeth to permit only one-way travel, as explained below, are on the raceway surface. Alternatively, the device may include other means to limit the travel to one direction, such as a set of teeth and pawl on the outer surface of the ratchet cover skirt and inner surface of the outer cover skirt. The raceway 882 has a set of engaging grooves 885 extending upward from the raceway and in

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one circumferential direction. The raceway 882 and grooves 885 receive a set of tabs on the ratchet cover 879 as described in more detail below. The inner surface of the top of the outer cover may include an axially extending hub 886 that mates with a hole in the indicator wheel in the manner described below.

The indicator wheel 878 has a central hole 887 which mates with the axially extending hub 886 on the inner surface of the top of the outer cover 877 to help maintain the indicator wheel and outer cover coaxial. The top of the indicator wheel 878 has a ratchet pawl 888 which engages the outer cover teeth 880. The bottom surface of the pawl has a recessed flat 881 to allow the pawl some space to flex as it passes over the teeth. The pawl is spaced apart from the body of the indicator wheel in the radial direction by a slot and is flexibly attached to the indicator wheel at its base in the same manner as the indicator wheel 814 of the four-piece threaded version described above. The bottom surface of the indicator wheel has a set of indicator wheel teeth 889 around the periphery which engage pawls on the ratchet wheel in the manner described below.

The ratchet cover 879 has a circular upper portion 890 and a depending skirt portion 891. The top surface of the circular upper portion 890 has a spring means 892 to apply an axial force urging the indicator cover 878 and outer cover 877 apart from the ratchet wheel 879 so that an axial compressive force is necessary to overcome such force to engage the tabs of the ratchet cover in the engaging grooves of the outer cover in the manner described below. In the preferred embodiment, the spring 892 is a diaphragm that is thinned and raised relative to the indicator wheel itself. The diaphragm is made from the same resilient

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plastic material as the rest of the indicator wheel, and serves to bias the outer cover 877 away from the indicator wheel 878 and container 895. This biasing away of the outer cover must be overcome by application of an axial force in order to engage the ratchet wheel lugs 893 with the outer cover engaging grooves 885, thereby achieving a resistance to opening by a child, in the manner described below. Alternatively, the outer cover may be biased away from the container by constructing the ratchet cover pawls 894 so that they extend upwardly to a point where they must be flexed downward in order to assemble the device. Other methods for biasing the outer cover away from the container will be apparent to those skilled in the art, such as leaf springs or resilient compressible liners, and each of these may be used on each embodiment described herein that uses biasing means.

The upper portion 890 of the ratchet cover 879 also has at least one (two in the embodiment shown) pawl 894 protruding upwardly to engage the indicator wheel teeth 889. The pawl covers a cutout in the upper portion and is slightly smaller than the cutout so that the pawl can flex at its base where it attaches to the upper portion into the cutout as it passes over the indicator wheel teeth 889. As in the case of the other embodiments, the teeth 889 and pawl 894 may be reversed, so that the pawl is on the indicator wheel and the teeth are on the ratchet wheel.

On the radially outer surface of the depending skirt 891 of the ratchet cover 879, at the upper edge thereof where it meets the top surface of the upper portion 890, are a set of radially extending tabs 893. The tabs 893 are configured with a radially outer surface. Various configurations are possible for the tabs, as shown in Fig. 16A. In each of the

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configurations of Fig. 16A, the radially outer edge 896 is rounded to nest into the rounded radially outer surface of the annular raceway 882 and engaging grooves 885. In all the embodiments, the trailing edge 897 is planar and substantially parallel to the radially outer edge 896, so that the trailing outer edge 897 engages the one-way teeth in the raceway 882. In the top embodiment shown in Fig. 16A, the tabs are generally rectangular with the exception of the rounded radially outer edge 896, and the leading edge 898 is substantially parallel to the trailing edge 897 that is planar and approximately perpendicular to the radially outer edge 896. In the second embodiment shown in Fig. 16A, the tabs have a beveled and rounded leading edge 898 and a planar trailing edge 897. The beveled leading edge 898 assists in the tab 893 sliding into the engaging grooves 885. In the third embodiment shown in Fig. 16A, the leading edge 898 is a beveled plane that cuts the tab 893 so that the top of the leading edge slopes rearwardly as one travels radially outward, and the radially outer edge of the leading edge slopes downwardly as one travels toward the trailing edge. This results in an angular point 899 where the top of the leading edge meets the radially outer edge of the leading edge, which catches the engaging grooves 885 as the tabs 893 are engaged therein. In the last embodiment shown in Fig. 16A, the leading edge 898 is rounded and partially bevelled to assist in the tab 893 engaging the engaging grooves 885 while still preserving some strength in the tab.

The tabs 893 attach the ratchet cover 879 to the outer cover 877 by being pressed into the annular raceway 882 of the outer cover 877, and they ride in that annular raceway and in the adjacent engaging grooves 885. The radially inner surface of the

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depending skirt 891 has a set of threads 900. The threads 900 engage mating threads 901 on the neck of a container 895.

The number of tabs 893 is preferably seven.

5 That is because the number of index symbols on the indicator wheel (and, therefore, the number of teeth on the outer cover and indicator wheel) is usually seven (for one dose on each of the seven days of the week) or an integral multiple of seven (for more than one dose

10 on each of the seven days of the week). If the number of tabs and engaging grooves is not seven or an integral multiple of seven, then the angular position of the tabs and engaging grooves relative to the indicator symbols will vary depending on which engaging

15 grooves engage which tabs. While one position will result in correct alignment, the other positions may result in a misalignment where the indicator window misaligns with the indicator symbols. Other number of tabs and engaging grooves may be preferred for dosage

20 schedules that are not multiples of seven. For example, a twelve indicator symbol indicator wheel (as in three doses a day for four days, four doses a day for three days or two doses a day for six days) would use three or four sets of tabs and engaging grooves.

25 The key is that the number of indicator symbols be an integral multiple of the number of pairs of tabs and slots.

In operation, the preferred embodiment of Fig. 16 can be attached to the container 895 by placing it

30 onto the top of the container and turning it in a clockwise direction (or counterclockwise if the threads are left-handed). The ratchet cover tabs 893 are normally at the terminal end of the outer cover engaging grooves 885 when the device is off the

35 container, so the initial rotation of the outer cover

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causes the tabs to move through the engaging grooves and into the annular raceway while the ratchet cover remains stationary. As this relative rotation occurs between the ratchet cover and the outer cover, the
5 outer cover is causing the indicator wheel to move with it by the engagement of the outer cover teeth 880 with the indicator wheel pawl 888. As the indicator wheel rotating with the outer cover moves relative to the ratchet cover, the ratchet cover pawl 894 passes over
10 the indicator wheel teeth 889. As the pawl 894 snaps over a single tooth 889, it makes an audible click to confirm the proper operation of the device. The circumferential length of the outer cover engaging grooves 885 is such that the ratchet cover pawl 894
15 passes over one and only one tooth before the tabs 893 reach the end of the engaging grooves 885. The engagement of the tabs 893 with the teeth of the annular raceway 882 will then cause the ratchet cover 879 to rotate with the outer cover 877. The rotation
20 of the ratchet cover 879 will cause the ratchet cover threads 300 to thread onto the container threads 901, thereby closing and sealing the container 895.

To remove the device 876 from the container, it is necessary to rotate the outer cover in the opposite
25 direction while applying an axial force to overcome the force exerted by the ratchet wheel spring 892 to cause the tabs 893 to again engage the engaging grooves 885. When the tabs engage the engaging grooves, they pass circumferentially to the terminal end. As the tabs are
30 moving circumferentially to the terminal end of engaging grooves, the outer cover 877 is rotating while the ratchet cover 879 is stationary on the container 895. The stationary ratchet cover 879 holds the indicator wheel 878 stationary as well, by the
35 engagement of the ratchet cover pawl 894 with the

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indicator wheel teeth 889. This results in an angular displacement of the outer cover indicator window 881 relative to the indicator wheel 878, thereby advancing the indicator window to the next indicator symbol. The circumferential length of the engaging grooves is such that the indicator window advances only one symbol before the tabs 893 reach the terminal end of the engaging grooves. Also while the outer cover 877 is rotating relative to the stationary indicator wheel 878, the indicator wheel pawl 888 passes over the outer cover teeth 880. As the pawl snaps over the ledge of a tooth, it makes an audible click to confirm the proper advancement of the indicator window 881 to the next indicator symbol. The tabs 893 are now at the terminal end of the engaging grooves 885 and ready for the next cycle of replacing and again removing the device on the container.

It should be noted that when the ratchet cover tabs 893 are positioned in the outer cover annular raceway 882 the outer cover can rotate only in the counterclockwise direction relative to the ratchet cover. Any attempt to rotate the outer cover in the clockwise direction will cause the ratchet cover tabs axial edges to engage the outer cover annular raceway teeth thereby causing the ratchet cover to rotate clockwise with the outer cover. This arrangement ensures that any attempt to thread the device onto the container will be successful. Otherwise, the user could inadvertently leave the container open while thinking it had been closed.

Another preferred embodiment of the invention is shown in Fig. 17. The invention 902 includes two principal elements: an outer cover 903 and an indicator wheel 904.

The container 905 with which the present

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embodiment is used may be an ordinary container used with a "push-and-turn" type child-resistant closure comprising a bayonet and lug system. Such container and closure systems are well known. Briefly, they typically include a container body 906 having an upper rim 907. Around the exterior surface of the upper portion of the body 906 are a set of bayonet lugs 908, which have a leading edge 909, a notch 910 and a stop 911. The ordinary cap that is used with a container of this type is not shown, but it typically would include a resilient inner surface which springingly seals against the container upper rim 907 and a set of lugs to engage the set of bayonet lugs 908.

In operation, the ordinary cap is turned in one direction (typically clockwise as viewed from the top) so that the cap lugs ride the leading edge 909 of the bayonet lugs 908, thereby drawing the cap downward and compressing the cap resilient inner surface against the container upper rim 907. The cap lugs snap over the bayonet lug leading edges 909 to rest in the bayonet lug notches 910. The stop 911 prevents the cap lugs from advancing any farther. The dimensions of the arrangement are such that the cap has now been drawn sufficiently far downward onto the container, that the cap resilient inner surface is compressed against the container upper rim 907 to seal the container.

To remove the ordinary cap from the container 905, it is necessary to first press the cap toward the container, since otherwise any attempt to rotate the cap in one direction will be resisted by the stop 911 and in the other direction will be resisted by the rear end of the leading edge 909. The lugs of the cap can clear the rear end of the leading edge 909 only if the cap is pressed toward the container 905, so that the resilient inner surface of the cap compresses against

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the container upper rim 907, thereby allowing the cap lugs to drop under the bayonet leading edges 909.

Of course, there is a large number of embodiments of the push-and-turn type child resistant cap, including embodiments with a cap resilient inner surface that is integrated with the cap itself, embodiments where the bayonet lugs 908 of the container include a trailing edge to engage the container lugs so that the container can be child-resistant if the cap is turned one way but not child-resistant if the cap is turned the other way, and other embodiments. Any of these other embodiments could be used with the present invention, so long as they include at a minimum a set of bayonet lugs spaced around the container periphery.

The outer cover 903 of the present invention includes a circular top portion 912 and a depending skirt 913 attached thereto and extending axially downward. The skirt 913 has a set of integrally-formed lugs 914 spaced around the circumference of its inner surface. Each lug 914 extends radially inward from the inner surface of the skirt 913. The dimensions of the lugs 914, including the extent to which they extend radially inward and their width and thickness, is dictated by the dimensions of the bayonet lugs 908 of the container 905. The lugs 914 should enable the skirt 913 to fit over the container upper rim 907, and should ride on the bayonet leading edges 909 and nest into the bayonet notches 910 when the outer cover 903 is engaged onto and turned (clockwise in the embodiment shown) with the respect to the container 905.

The number of outer cover lugs 914 may be the same as the number of container bayonet lugs 908, but also may be different. It is only necessary that enough outer cover lugs and container bayonet lugs are engaged to effectively close and seal the container.

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In most applications, this will be three pairs (each pair being one bayonet and one lug), but applications might exist where two pairs or even one pair is sufficient. On the other hand, if there is a very few number of outer cover lugs and container bayonet lugs, the user will find the device inconvenient because the outer cover must then be rotated through a relatively large angle before the outer cover lugs engage the container bayonet lugs. For this reason, it is desirable to include a relatively large number (such as at least five) of either outer cover lugs or container bayonet lugs. This will ensure that the outer cover lugs will always engage the container bayonet lugs upon a small angular rotation of the outer cover relative to the container. It is important to note that it is not necessary for both the outer cover lugs and the container bayonet lugs to be of this high number. One can be of the minimum number necessary for an effective closure while the other is of the higher number. The excess of one over the other will simply result in one or more unused container bayonet lugs or outer cover lugs each time the device is closed onto the container.

The outer cover 903 includes a set of integrally-formed teeth 915 on the radially outer perimeter of the circular top portion 912 inner surface. As in the threaded embodiments described above, the number of teeth is chosen depending on the dosage schedule desired as depicted by the indicator wheel 904. For example, an indicator wheel depicting seven separate doses (such as one dose a day for seven days) will require an outer cover with seven teeth, an indicator wheel depicting fourteen separate doses (such as two doses a day for seven days or one dose a day for fourteen days) will require an outer cover with fourteen teeth, and so on. The teeth are generally

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5 wedge-shaped elements configured with a ramp and a ledge. All the teeth point in the same direction, either clockwise or counter-clockwise around the outer cap 903. In the circular top portion 912 of the outer cap 903 is an indicator window 916 extending through the top portion, which is similar to the indicator window described in connection with the threaded embodiments.

10 The indicator wheel 904 is a roughly disk-shaped element that nests into the outer cover 903 surrounded by the depending skirt 913. The indicator wheel may have a set of notches (not shown) matching the lugs 914 on the outer cover, so that the indicator wheel can be inserted into the outer cover past the
15 lugs or, alternatively, the elements may configure with some flexibility so that the indicator wheel can snap past the outer cover lugs. In another alternative, the outer cover skirt 913 may be lengthened so that the indicator wheel is positioned above the outer cover
20 lugs and rotatably held in place with an annular bead extending around the inner surface of the skirt. The bead and indicator wheel are sufficiently flexible to allow the indicator wheel to be snapped past the bead. A set of indicator symbols 917 is on the upper surface
25 of the indicator wheel 904 of a size and location such that one indicator symbol at a time is visible through the indicator window 916 in the top portion 912 of the outer cover 903.

30 The indicator wheel 904 includes at least one pawl 918 located on the outer edge of the indicator wheel to engage the teeth 915 in the outer cover 903. The pawl includes a ramp 919 sloped upward from the flat surface of the indicator wheel, a radially curved outer surface 920 following the circumference of the
35 indicator wheel and a lower surface 921 which is raised

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relative to the indicator wheel lower surface in order to leave a space under the pawl. The pawl is connected to the indicator wheel at the base of the pawl ramp 919. It is not connected to the indicator wheel at its radially inner side, there being a slot between the pawl inner side and the indicator wheel. The configuration of the pawl and its attachment to the indicator wheel allow the teeth 915 of the outer cover to flex the pawl downward into the space under the pawl as the teeth pass over the pawl.

In operation, the outer cover 903 and indicator wheel 904 are held together by the outer cover lugs 914 or a snap bead as previously described and can be sold and used as a unit. When attaching the unit of the outer cover 903 and indicator wheel 904 to the container 905, the unit is positioned over the container 905 with the outer cover skirt 913 extending over the container upper rim 907. This causes the indicator wheel 904 lower surface to rest on the container upper rim 907. The outer cover 903 is then pressed toward the container 905, thereby compressing the spring 922 in the indicator wheel 904. At the same time, the unit of the outer cover 903 and indicator wheel 904 is rotated (clockwise in the embodiment shown) so that the outer cover lugs 914 ride down the leading edge 909 of the container bayonet lugs 908. As the outer cover lugs 914 pass the rear of the container bayonet lug leading edges 909, the outer cover lugs 914 snap into the container bayonet lug notches 910. The snapped position maintains sufficient pressure between the lower surface of the indicator wheel 904 and container upper rim 907 to seal the container 905. It can be seen that the outer cover positioned as described on the container cannot be removed by merely rotating the outer cover with respect to the container,

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because the outer cover lugs 914 are held by the container bayonet lugs 908.

5 To remove the outer cover from the container, it is necessary to push the outer cover toward the container against the force of the indicator wheel
10 spring 918, so that the outer cover lugs 914 move lower than the rear part of the container bayonet lug leading edges 909. Then the outer cover can be rotated in a direction to move the outer cover lugs 914 past the
15 container bayonet lug leading edges 909 and thereby disengage them. It can be appreciated from the drawings that the disengagement procedure will cause the outer cover 903 to rotate relative to the indicator wheel 904 as the friction between the lower surface of
20 the indicator wheel and the upper rim 907 of the container tends to hold the indicator wheel in place. This rotation will cause the outer cover teeth 915 to advance past the indicator wheel ratchet 918, thereby advancing a new one of the indicator symbols 917 under
25 the outer cover window 916. At the same time, the indicator wheel pawl 918 moves over an outer cover tooth 915, and the sudden snapping of the pawl past the tooth results in an audible click which confirms the proper advancement of the indicator wheel. It is
30 important that there be sufficient friction between the indicator wheel and the top of the container so that the indicator wheel is initially held stationary on the container and the outer cover is rotated relative to the indicator wheel to advance the indicator window to a new window. That friction can be obtained by
roughening the sliding surfaces if necessary.

In a preferred embodiment, the container bayonet lugs 908 are spaced such that the bayonet lug stop 911 of each bayonet lug 908 serves to stop the
35 outer cover 903 from rotating more than one tooth 915

(which corresponds to one indicator symbol 917) past the indicator wheel ratchet 918. Otherwise, the disengagement process will tend to advance the indicator wheel more than a single indicator symbol, thereby compromising the accurate counting of the device.

Another preferred embodiment is shown in Fig.18. This embodiment 923 includes an outer cover 924, an indicator wheel 925 and a ratchet wheel 926. The outer cover has the same general outside configuration the outer cover of the previously described two-piece bayonet version. On the inside of the depending skirt are a set of annular grooves 927 with the same configuration as the annular grooves 828 shown in Fig. 11 in connection with the four piece threaded version. The indicator wheel 925 has a pawl 928 and set of teeth 929 in the same manner as the indicator wheel 814 shown in Fig. 11 in connection with the four piece threaded version.

The ratchet wheel 926 is unique to this embodiment. It includes an upper surface 929 having at least one upwardly extending pawl 930 (two in the embodiment shown). Each pawl 931 has an upwardly extending ramp 464 and is flexibly attached to the body of the ratchet wheel 926 at its base 932. The pawl when it flexes downward nests into a cavity 933 in the ratchet wheel body 926. Spaced around the periphery of the upper surface 929 of the ratchet wheel 926 are a set of tabs 934. The tabs 934 are similar to the tabs 893 of the ratchet cover 879 in Fig. 16 shown in connection with the three-piece threaded embodiment 876. They include a radially extending portion, the top surface of which is substantially flush with the top surface of the upper surface 929 and two radially extending substantially parallel sides. The radially

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5 outer surface slopes from a smaller radius at the top to a larger radius at the bottom. The number and dimensions of the tabs 470 are such that they can be pressed into the grooves 927 of the outer cover 924 and slide annularly therein.

10 The bottom surface of the ratchet wheel 926 has a disk 925 coaxially attached thereto. The disk is to mate with and seal against the rim of a container (such as the rim 907 of the container 905 in Fig. 17 shown in connection with the two-piece bayonet version) and may have a beveled resilient circumferential sealing edge.

15 The upper surface of either the indicator wheel 925 or ratchet wheel 926 may have a convex diaphragm spring in the manner of the embodiments previously described, in order to bias the outer cover 924 away from the container. Also, the pawls and teeth on the ratchet wheel and indicator wheel may be reversed as described for the other embodiments.

20 In operation, the device 923 is attached to a container (such as the container 905 in Fig. 17 shown in connection with the two-piece bayonet version) by placing it over the container, applying an axial force sufficient to overcome the force of the diaphragm spring and drive the outer cover lugs 936 below the leading edge 909 of the bayonet lugs 908, and then
25 rotating the outer cover 903 in a direction to cause the outer cover lugs 936 to ride past the bayonet lug leading edges 909 and into the bayonet lug notches 910. As this happens, it can be seen that the ratchet wheel
30 926 remains stationary on the container 905 because the ratchet wheel tabs 934 must move from one end to the other through the outer grooves 927. The indicator wheel 925, however is rotating in unison with the outer cover 924 because the outer cover teeth are engaging
35 the indicator wheel pawl 928. Therefore, the rotating

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indicator wheel 925 relative to the stationary ratchet wheel 926 causes the ratchet wheel pawls 930 to pass over the indicator wheel teeth 929. As the pawl 930 snaps over a single tooth 929, it makes an audible click to confirm the proper operation of the system. The bayonet lugs 908 on the container 905 are spaced such that the outer cover 924 can be rotated only enough for the ratchet wheel pawls 930 to pass over a single indicator wheel tooth 929 before the outer cover lugs 936 are stopped by the stop 910 of the bayonet lug 908. It can be appreciated that there must be enough friction between the container and the ratchet wheel to hold the ratchet wheel and indicator wheel stationary in the container as the outer cover is initially rotated, so that the indicator window advances to a new indicator symbol.

To remove the device 923 from the container 905, an axial force is applied to move the outer cover lugs 936 below the bayonet lug leading edges 909, and then the outer cover is rotated in a direction opposite the direction of rotation to attach the device to the container. Initially, the friction of the ratchet wheel 926 against the container rim 907 causes the ratchet wheel to remain stationary. The stationary ratchet wheel 926 holds the indicator wheel 925 stationary by the engagement of the ratchet wheel pawls 930 in the indicator wheel teeth 929. The stationary indicator wheel 925 relative to the rotating outer cover 925 causes the indicator wheel pawl 928 to pass over the outer cover teeth 937. The snapping of the indicator wheel pawl 928 over a single outer cover tooth 937 causes an audible click to confirm the proper operation of the device.

As the outer cover 924 rotates relative to the indicator wheel 925, the outer cover indicator symbol

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5 window 938 advances to a new indicator symbol. The bayonet lugs 908 and outer cover lugs 936 are numbered and spaced such that the outer cover can rotate through the angle necessary for the ratchet wheel tabs to move through the outer cover grooves, (corresponding to a single tooth and single indicator symbol) before the outer cover lug 936 is stopped by the back of the bayonet lug 908 adjoining the bayonet lug 908 from which the outer cover lug 936 was just removed.

10 It can be appreciated that the three-piece bayonet embodiment described above is configured such that an audible click results as the device is securely attached to the container. Another audible click results as the device is removed from the container and
15 the indicator window advances to the next indicator symbol.

Another preferred embodiment 939 is shown in Fig. 19 for use with a bayonet lug container such as the container 905 in Fig. 17 shown in connection with
20 the two-piece bayonet version. The main elements are an outer cover 940, an indicator wheel 941, a ratchet cover 942, and a seal 943 which may or may not be integral with the ratchet cover 942. The outer cover 940 includes a set of outer cover teeth 943, an
25 indicator symbol window 944 and a set of annular grooves 945, all of which are essentially the same as those shown in Fig. 18 in connection with the three-piece bayonet version. However, this embodiment differs from the embodiment shown in Fig. 18 in that
30 this embodiment has no lugs on the outer cover. The indicator wheel 941 is essentially the same as the indicator wheel 925 shown in Fig. 18.

The ratchet cover of this embodiment includes an upper portion 946 with at least one ratchet cover
35 pawl 947 and a set of spaced tabs 948 to engage and

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slide in the annular grooves 945 of the outer cover 940, again all essentially the same as the corresponding elements shown in Fig. 18. The ratchet cover 949 also has an axially depending skirt 949 which is attached to or integral with the top portion 946. The skirt 949 has a set of lugs 950 spaced around its inner surface which are numbered and dimensioned to engage the bayonet lugs 908 of the container 905. The lower surface of the top portion 946 has an annularly extending ring 951 to receive the seal 943. The seal 943 is an ordinary resilient disk that attaches to the ring 540 of the ratchet cover and seals the container 905 upon engagement of the device 939 with the container.

In operation, the device 939 is placed over the container 905, an axial force is applied to overcome the resistive axial force applied by the compression of the seal 943, and the outer cover 940 is rotated in a direction to urge the ratchet wheel lug 950 into engagement with the bayonet lugs 908 of the container 905. Initially, the ratchet wheel 942 and ratchet wheel lugs 950 remain stationary as the ratchet wheel tabs 948 slide through the outer cover grooves 945. During this time, the engagement of the outer cover teeth 943 with the indicator wheel pawl 952 causes the indicator wheel 941 to rotate with the outer cover 940. This rotation by the indicator wheel 941 relative to the ratchet cover 942 causes the ratchet cover pawl 947 to pass over a tooth of the indicator wheel teeth 953, thereby producing an audible click.

When the ratchet cover tabs 948 reach the end of the outer cover grooves 945, then the ratchet cover 942 is forced to rotate with the outer cover 940. This ratchet cover rotation causes the ratchet cover lugs 950 to engage the container bayonet lugs 908 so that

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the lugs become positioned in the bayonet lug notches 910 where rotation is stopped by the bayonet lug stops 911.

5 To remove the device 939 from the container 905, an axial force is again applied to overcome the resistive sealing force of the seal 943, and the outer cover is rotated in the direction opposite the direction for attachment of the device. Initially, the ratchet cover 942 remains stationary as the ratchet
10 cover tabs 948 slide to the other end of the outer cover grooves 945. As that occurs, the engagement of the ratchet cover pawl 947 with the indicator wheel teeth 953 keep the indicator wheel 941 stationary with the ratchet cover 943. This causes a rotation of the
15 outer cover 940 relative to the indicator wheel 914, thereby passing the indicator wheel pawl 952 over an outer cover tooth 943 to cause an audible click and advancing the indicator symbol window 944 to a new indicator symbol. After the ratchet wheel tabs 948
20 reach the end of the outer cover grooves 945, the ratchet cover 943 is forced to rotate with the outer cover 940, thereby causing the ratchet cover lugs 950 to move past the leading edge 909 of the bayonet lugs 908 so that the device 939 can be removed from the
25 container 905.

It can be seen that this embodiment has the advantage that all the "lost motion" that causes the audible clicks to confirm proper operation and the advancement of the indicator window is dependent solely
30 on the motion of the ratchet wheel tabs through the outer cover grooves, and is not related to the spacing of the bayonet lugs. Therefore, this embodiment has the advantage that it can be used with a standard bayonet lug spacing that has no relation to the number
35 of teeth in the outer cover or indicator wheel or the

number of indicator symbols.

5 Figs. 20-23 show an arrangement for blocking
the window 110 shown in connection with the embodiment
in Fig. 1 or any of the other embodiments herein. The
purpose of such an arrangement is to allow the user of
the device to choose whether or not to use the counting
feature of the device. In the embodiment shown in Fig.
20, the block employs a window cover 955 that is
10 attached to the border of the window 110 with two snap
tabs 956 and 957. The radially outer edge of the cover
955 has an axially extending tab 958. In operation,
the user grasps the tab 958 and breaks the cover 955
free of the window 110 by snapping the snap tabs 956
and 957, thereby exposing the window 110.

15 Figs. 21-23 show several variations on the
window cover. In Fig. 21, the snap tabs of Fig. 20 are
replaced with a flexible hinge 959 at the radially
inner edge of the cover 955. Depending on the design
considerations, the hinge may be constructed to keep
20 the cover attached to the device by flexing upward, or
may be constructed to break so that the cover separates
from the device. In Fig. 22, the cover 955 slides into
the outer cover 12 to reveal the window 110. In Fig.
23, the cover 955 is a removeable adhesive tape with a
25 nonadhesive portion 960 at one side for the user to
grasp to remove the tape to expose the window.

A perspective view and a cross-sectional view
of an adaptor for use with the invention are shown in
Figs. 24 and 25. The invention 961 is a ring-shaped
30 element having an outer circumference 962, an inner
circumference 963, a top 964 and a bottom 965. The
outer circumference may have a set of knobs 966 to
facilitate the grasping of the device. The inner
circumference 963 may have an upper circumferential lip
35 967 extending radially inward from the top of the inner

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circumference which serves as a stop for the indicating mechanism in the manner described below. It may also have a lower circumferential lip 968 extending radially inward from the bottom of the inner circumference which serves as a lock for the indicating mechanism in the manner described below. There may be one or more intermediate circumferential lips 969 extending radially inward at levels intermediate between top and bottom to improve the attachment between the device and the indicator mechanism.

The top of the device may be chamfered in the manner shown in Fig. 25. The chamfer 970 is from the outer circumference 962 downward to the inner circumference 963 and includes the top of the upper circumferential lip 967 that extends radially inward. In this way, the device not only serves to enlarge the effective circumference of the indicator mechanism, but it also increases the effective height of the indicator mechanism. Both these features facilitate the grasping of the combined indicator mechanism and device.

The device may be made of any suitable durable material such as plastic, metal, wood or the like. Preferably, the device is resilient so that it can be deformably attached to the indicator mechanism, and is made of an injectionable thermoplastic.

The invention 961 is shown attached to an indicating device in Figs. 25 and 26. The indicating device 971 includes an outer cover 972 having an indicating window 973 to view indicating symbols on an indicator wheel 974. A retainer wheel 975 is mounted on the outer cover 972 in a manner that allows limited rotation between the outer cover and the retainer wheel. The retainer wheel 975 holds the indicator wheel 974 in place. The retainer wheel 975 has a means for attaching the indicator device 971 to a cap 980

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such as the double-sided adhesive pad 981 that is shown on the bottom of the retainer wheel. The outer cover 972, indicator wheel 974 and retainer wheel 975 include a means for advancing the indicator wheel past the indicator window 973 each time the device is cycled through an opening and closing of the container by rotating the device to remove and replace the cap. Such means may be the tooth and pawl arrangements taught in the embodiments described above, or the arrangements taught in other art such as U.S. Patent No. 4,011,829 by Wachsmann et al. or U.S. Patent No. 3,151,599 by Livingston or others. The present invention may be used in any indicator device in which it is desired to enlarge the effective circumference or height or both. The invention is especially useful in devices that have a rotational mechanism to advance the indicator symbols, and that are to be used on a container cap that is of a larger diameter than the device itself.

The invention 961 is pressed onto the indicating device 971 so that the indicating device 971 deforms the lower and intermediate circumferential lips 968 and 969, respectively, as it slides past them. The upper circumferential lip 967 extends radially inward sufficiently far to function as a stop against the top of the indicator mechanism 971. However, the upper circumferential lip 967 does not extend radially inward so far that it obscures the indicating window 973 or any printed matter on the indicating mechanism 971.

The distance from the top of the lower circumferential lip 968 to the bottom of the upper circumferential lip 967 is preferably approximately the same as the height of the indicating device 971.

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Therefore, as the upper circumferential lip 967 acts as a stop against the indicating device 971 as the invention 961 is pressed over the indicating device, the indicating device snaps past the lower
5 circumferential lip 967 to lock the indicating device and the invention together. When locked together, the fit is sufficiently tight that there is no slippage of one past the other. The tightness of the fit may be enhanced by the inherent friction between the
10 indicating device and the intermediate circumferential lip 969 and by other friction-enhancing elements such as ribs, serrations or surface roughness either the inner circumference 963 or on the indicating mechanism.

In operation, the combined invention 961 and
15 indicator device 971 are attached to a container cap 980. The attachment of the indicator device and the invention to the cap may be any suitable means. In the embodiment shown in Fig. 25, the attachment is accomplished with a double-sided adhesive pad 981, one
20 adhesive side of which is attached to the bottom of the retainer disk of the indicator device and the other adhesive side of which is attached to the top of the cap. It can be appreciated that the attachment of the invention to the indicator device in this manner serves
25 to enlarge the effective diameter and circumference of the indicator device, so that the assembly extends past the periphery of the cap. This facilitates the grasping of the device when the user is removing or replacing the cap, so that the indicator mechanism
30 properly advances. Without the invention, the indicator device would be too small to be grasped firmly and predictably, and the user would instead directly grasp the cap itself, so that the indicator mechanism would not properly advance.

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It can be appreciated that the chamfer 970 between the outside circumference 962 downward to the inside circumference 963, serves to increase the effective height of the indicator device. This
5 increase in effective height provides additional assistance in grasping the device.

It should also be appreciated that the contour of the outer circumference 962 need not be circular. Instead, it may be serrated or grooved or textured, or
10 may have an aesthetic design such as a heart shape or another desired design.

Another embodiment of the device which incorporates a child-resistant function is shown in Figs. 27 and 28. An indicator device 980 is disk-
15 shaped with a set of notches 981 spaced around its top surface. The indicator device functions in the manner previously described. The ring-shaped element 982 has a central hold 983 and an upper flange 984 extending radially into the hole.

20 A lower lip 985 around the bottom of the ring hole prevents the ring from being lifted off the indicator. The axial distance between the flange 984 and lower lip 985 is sufficiently great to allow play between the ring and the indicator to allow the tabs
25 and notches described below to engage and disengage.

The lower surface of the flange 984 has a set of tabs 986 to mate with the notches on the upper surface of the indicator device. Preferably, the tabs and notches are shaped with appropriately sloping walls
30 so that the tabs engage the notches upon rotation of the ring in a clockwise direction to close a container, but the tabs disengage the notches upon rotation of the ring in a counterclockwise direction to uncloset a

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container. An axial force must be applied to urge the
tabs into the grooves upon rotation in a
counterclockwise direction. Since children will
generally not recognize this, the device is thereby
5 child-resistant.

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CLAIMS:

1. An indicator device for mounting to a closure for a container, to indicate the opening or closing of the container, comprising:

5 (a) an outer cover comprising a top piece with an indicator window therein and a depending skirt extending axially downward from the top piece;

(b) a retainer rotatably attached to the outer cover whereby the outer cover can rotate a predetermined number
10 of degrees before causing rotation of the retainer;

(c) an indicator device mount for mounting the indicator device to said closure;

(d) an indicator wheel disposed between said outer cover top piece and said retainer, having indicating
15 symbols visible through the indicator window;

(e) a rotation mechanism engaging said indicator wheel to said outer cover for causing rotation of the indicator wheel with the outer cover upon rotation of the outer cover in a first direction; and

20 (f) an antirotation mechanism engaging said retainer to said indicator wheel for preventing rotation of the indicator wheel with outer cover upon rotation of the outer cover in a second direction opposite said first direction.

2. The indicator device of claim 1 wherein said rotation
25 mechanism comprises:

(a) at least one protrusion on one of said indicator wheel and said outer cover; and

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(b) at least one indentation on the other of said indicator wheel and said outer cover.

3. The indicator device of claim 2 wherein the at least one protrusion is flexible to allow said at least one
5 protrusion to flex out of said at least one indentation when said outer cover is rotated in said second direction.

4. The indicator device of claim 3, wherein said at least one protrusion includes a flexible pawl with one end attached to one of the indicator wheel and the outer cover and
10 an opposite end spaced apart from said one of the indicator wheel and the outer cover, whereby the pawl can flex away from said at least one indentation; and said at least one indentation includes a set of teeth on the other of the indicator wheel and the outer cover arranged for engagement
15 with the said pawl.

5. The indicator device of claim 1 wherein said anti-rotation mechanism comprises:

(a) at least one protrusion on one of said retainer and said indicator wheel; and

20 (b) at least one indentation on the other of said retainer and said indicator wheel.

6. The indicator device of claim 5 wherein the at least one protrusion is flexible to allow said at least one
protrusion to flex out of said at least one indentation when
25 said retainer is rotated in said first direction.

7. The indicator device of claim 6, wherein said at least one protrusion includes a flexible pawl with one end attached to one of the retainer and the indicator wheel and an opposite end spaced apart from said one of the retainer and the
30 indicator wheel, whereby the pawl can flex away from said at

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least one indentation; and said at least one indentation includes a set of teeth on the other of the retainer and the indicator wheel arranged for engagement with said pawl.

8. The indicator device of claim 1 wherein the device
5 produces an audible sound when said outer cover rotates.

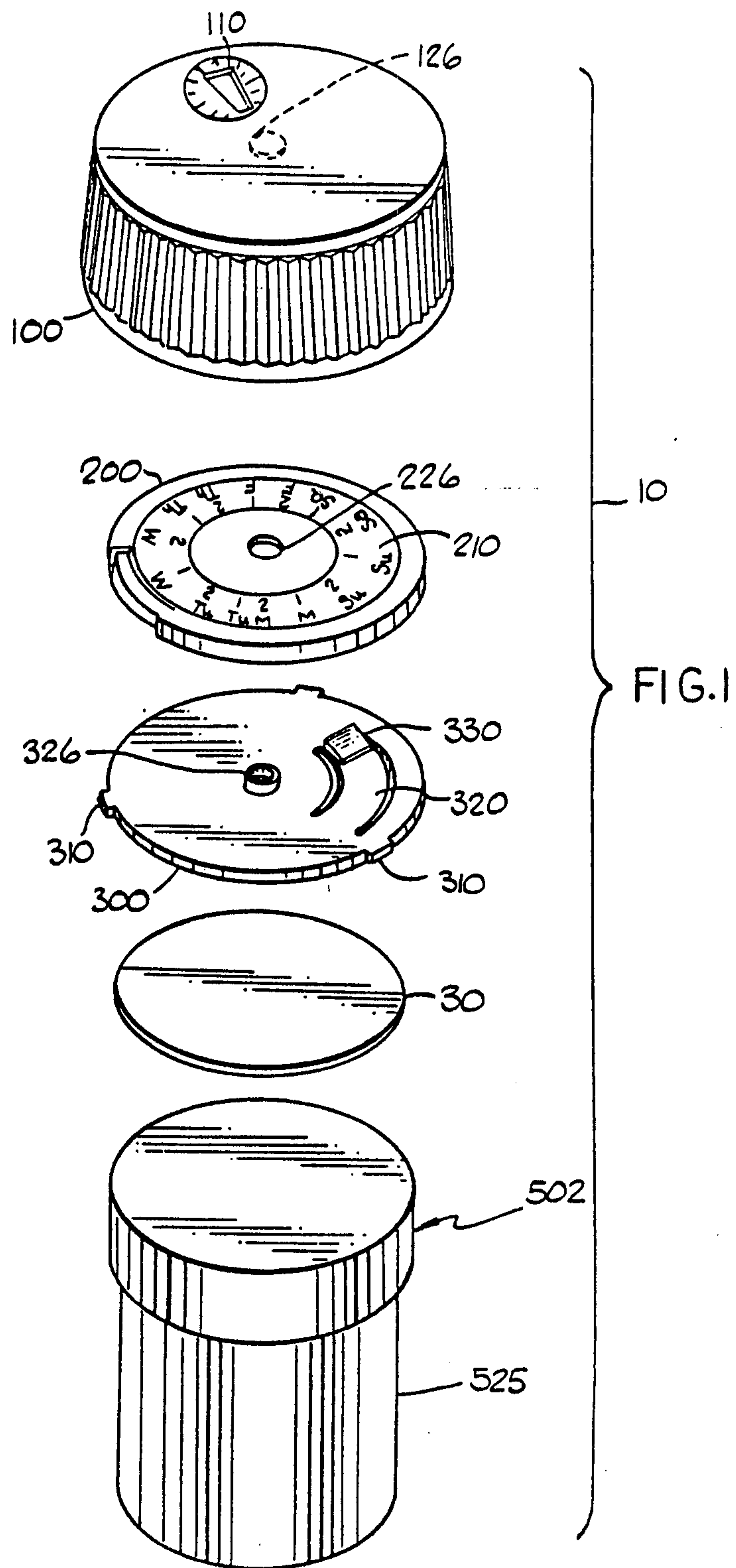
9. The indicator device of claim 8, wherein the audible sound is produced by at least one of said rotation mechanism and antirotation mechanism.

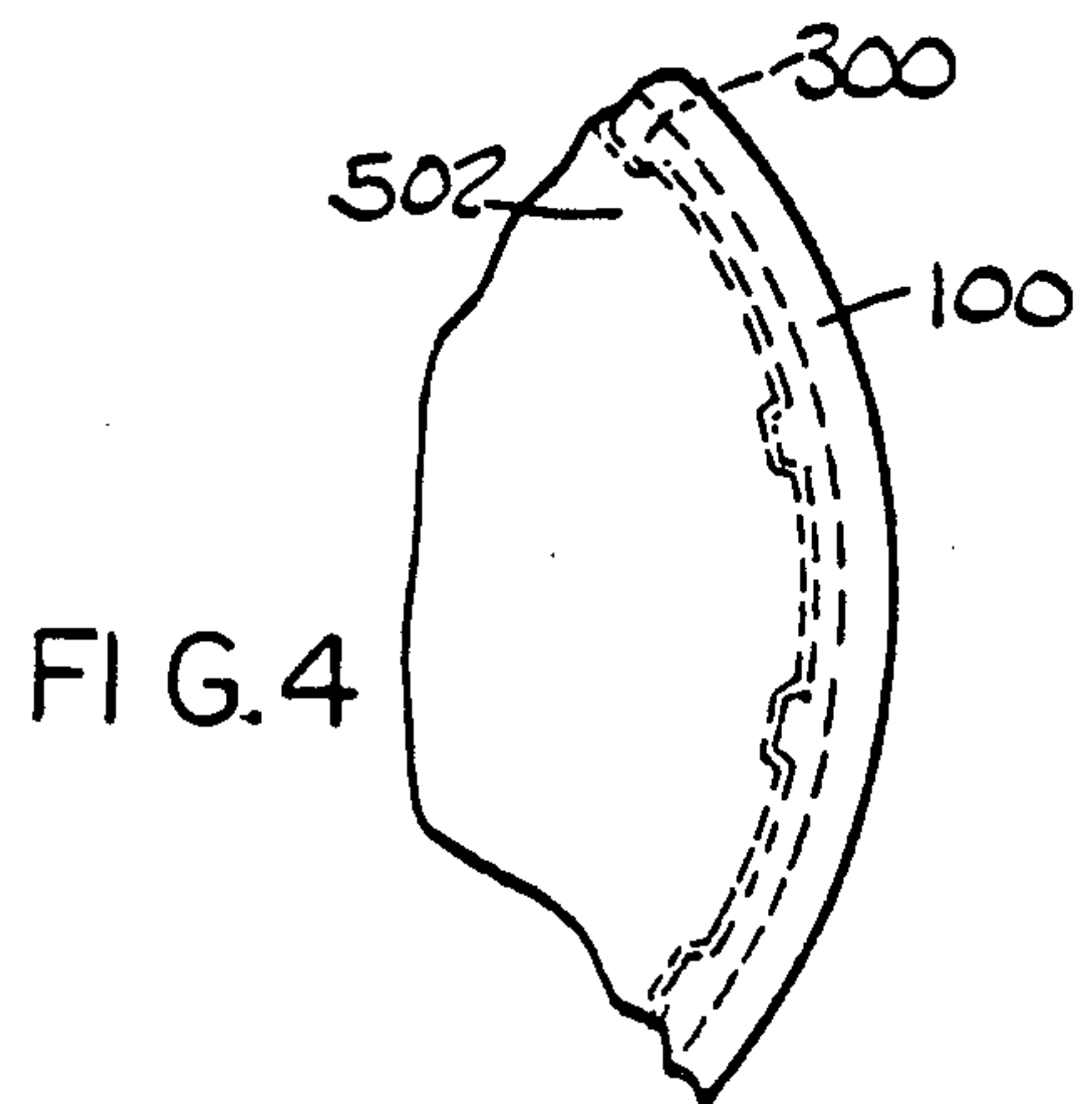
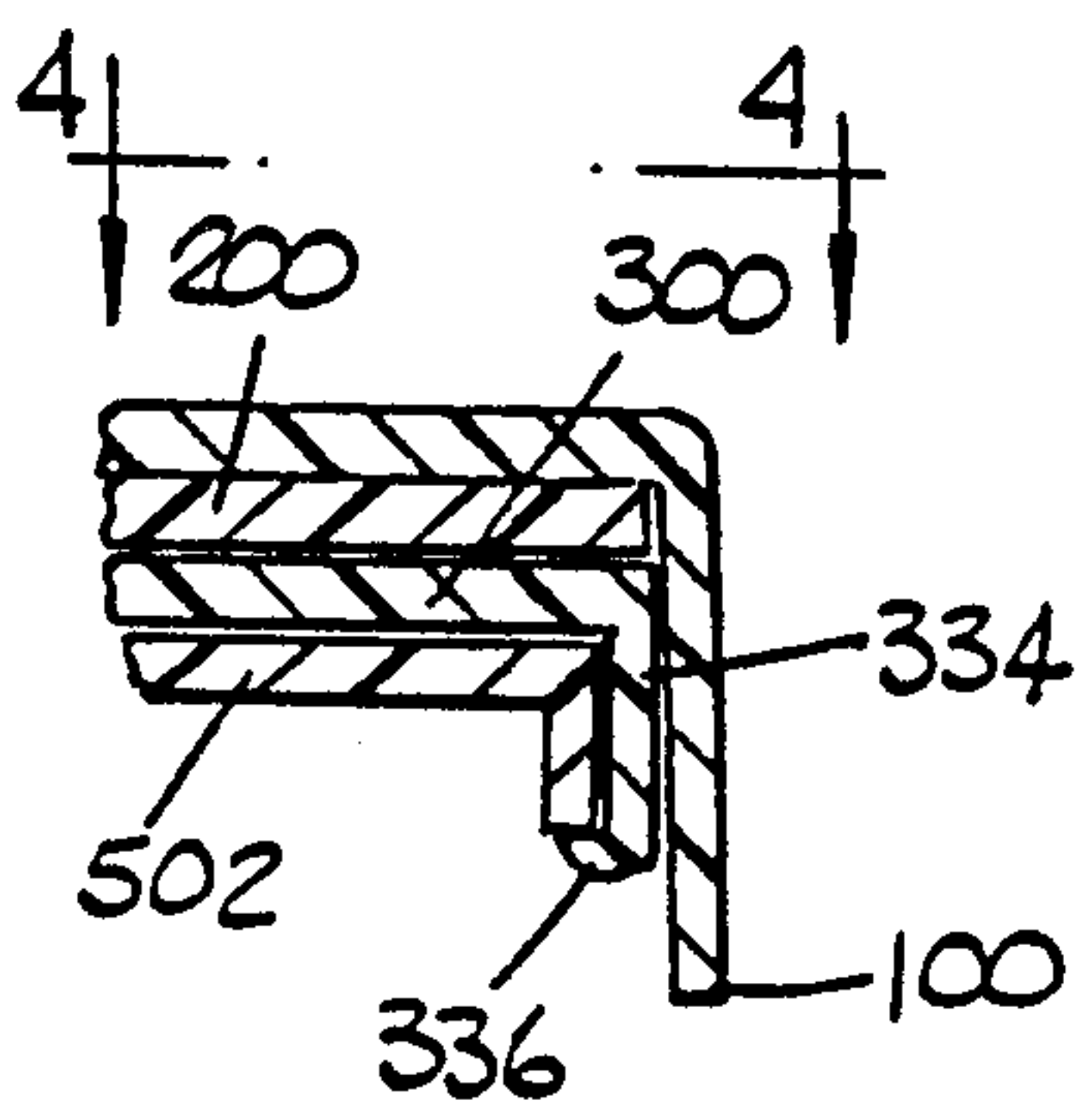
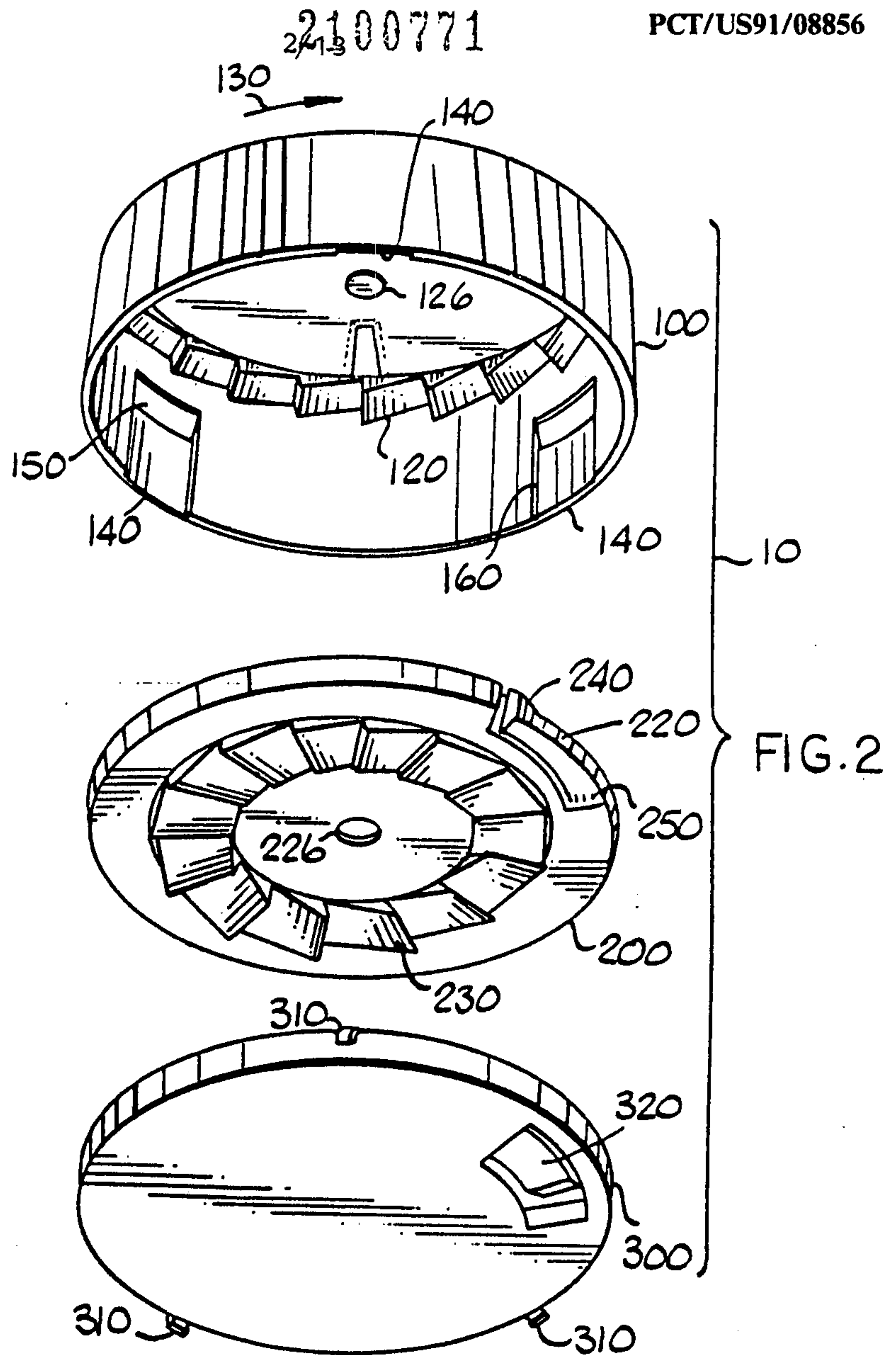
10. The indicator device of claim 8, wherein the audible
10 sound is produced by each of said rotation mechanism and anti-rotation mechanism.

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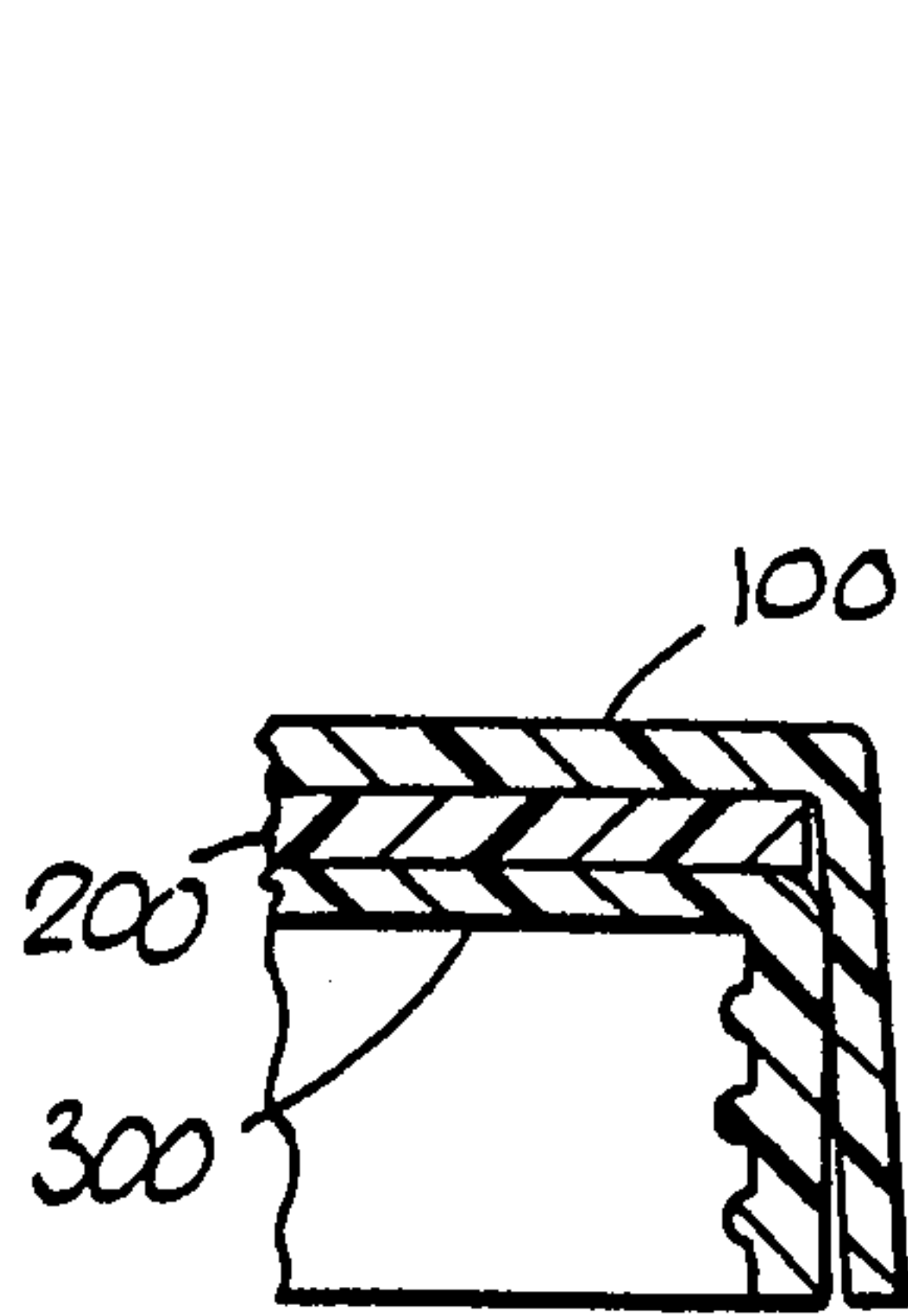


FIG. 5

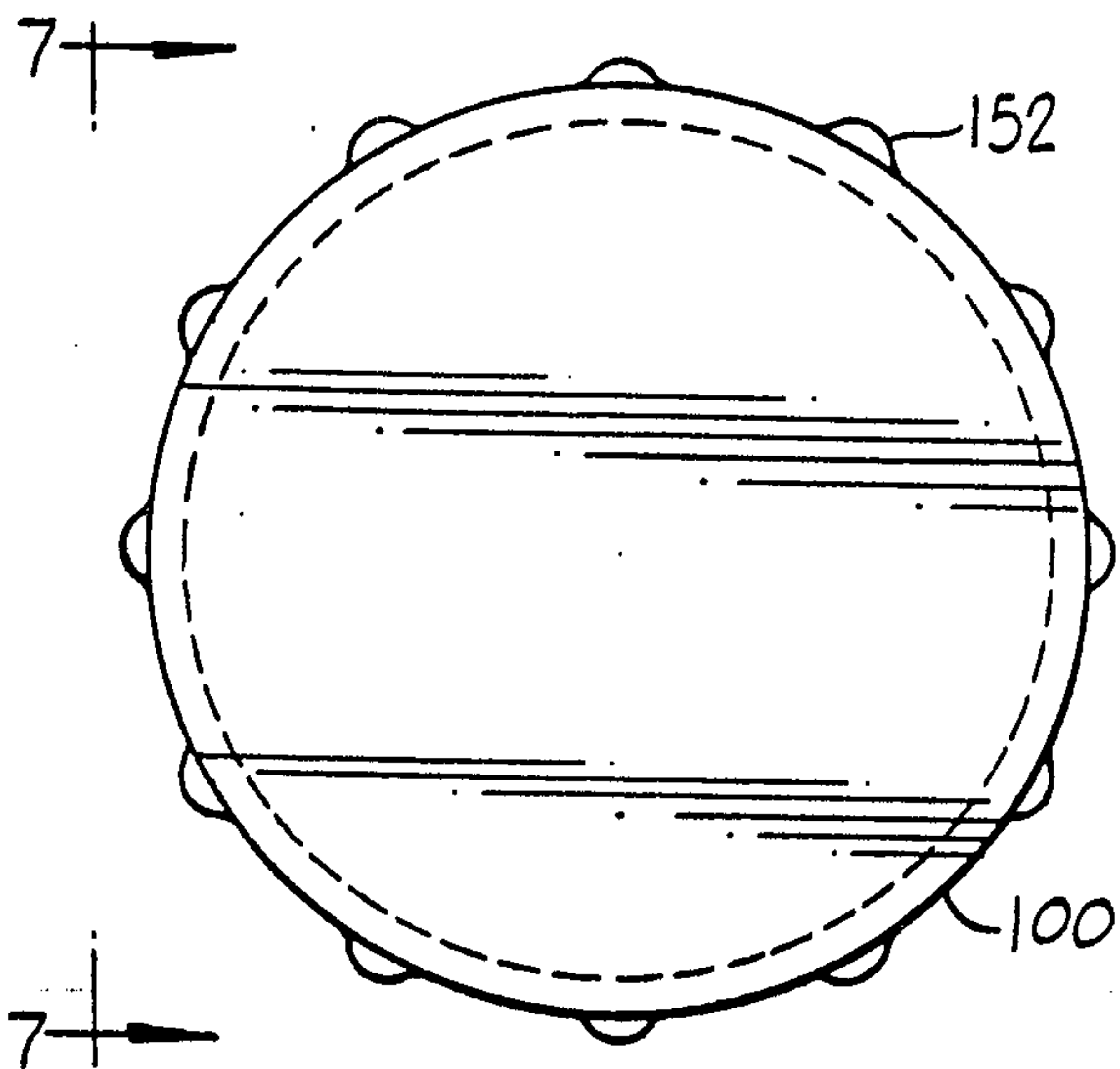


FIG. 6

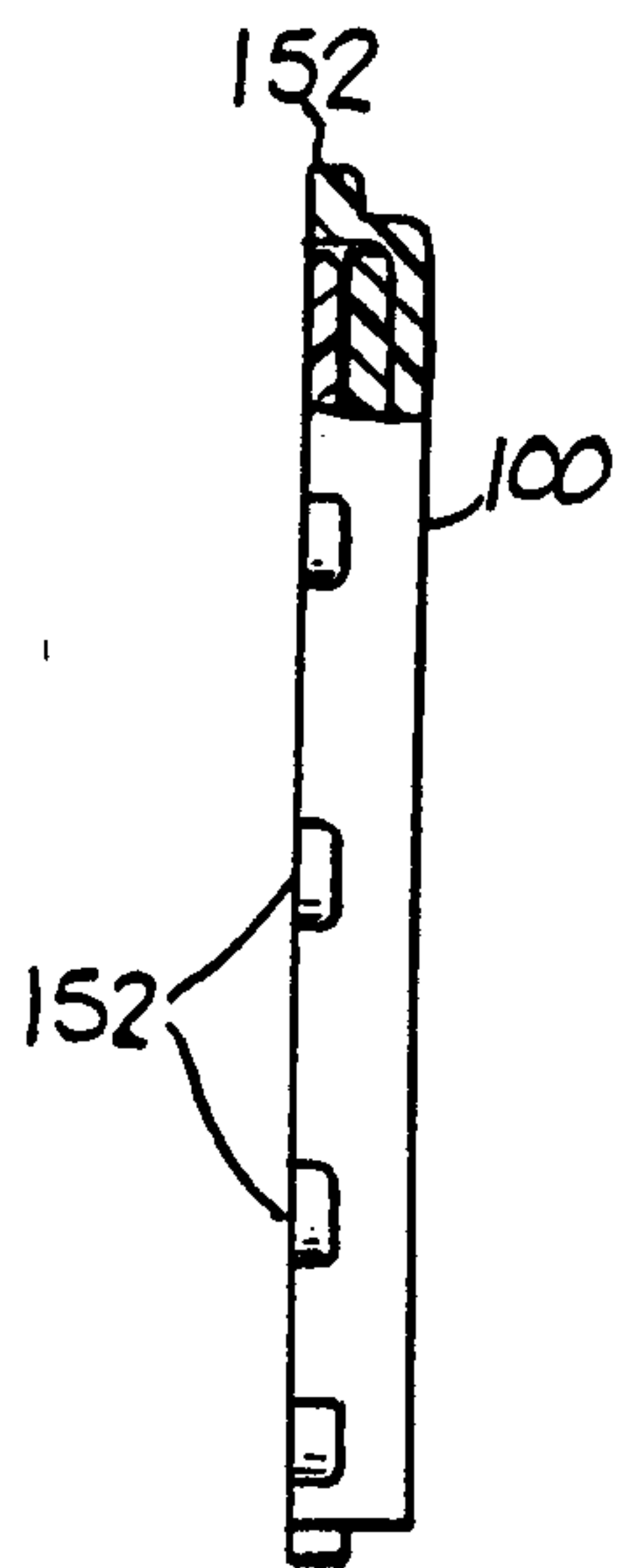


FIG. 7

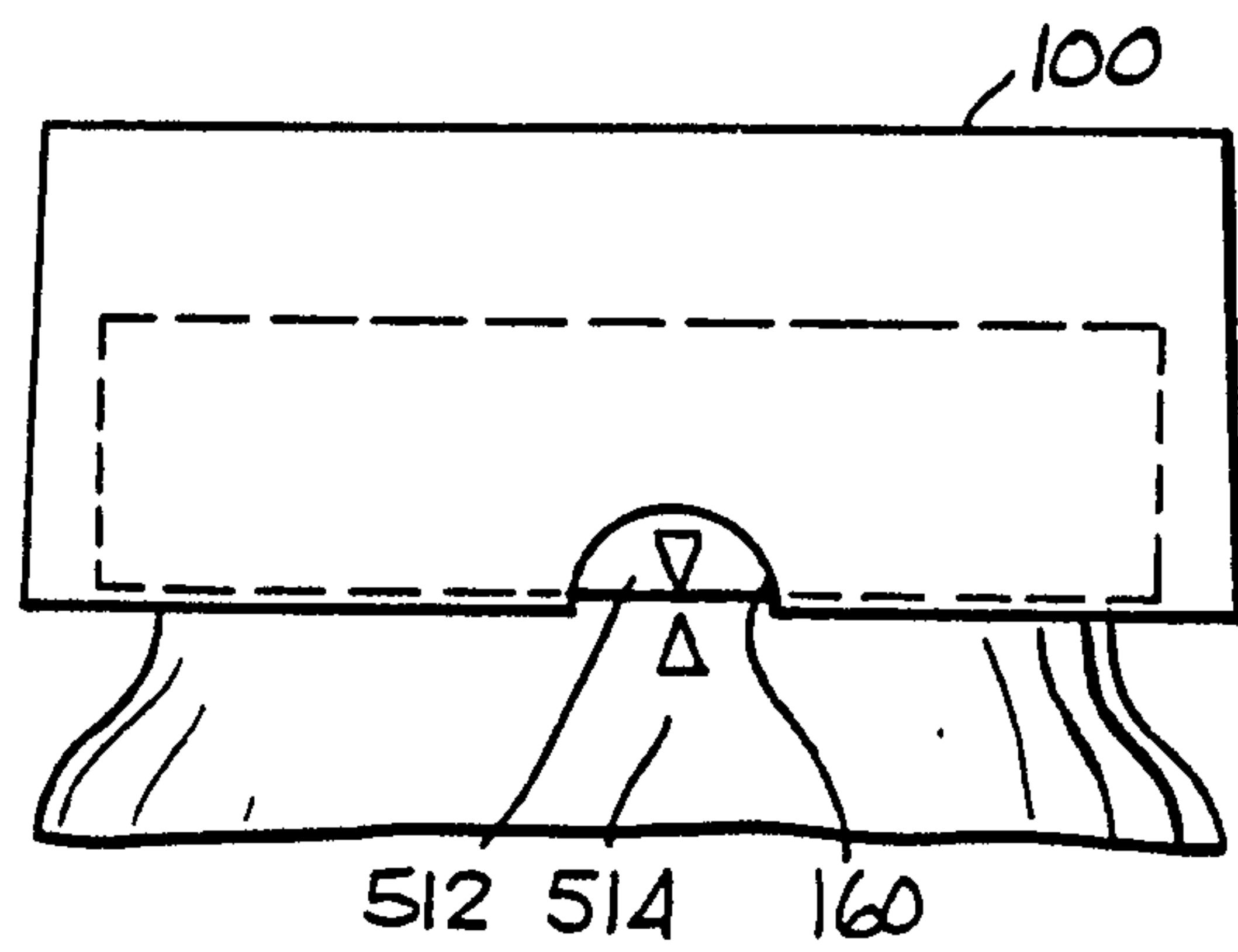


FIG. 8

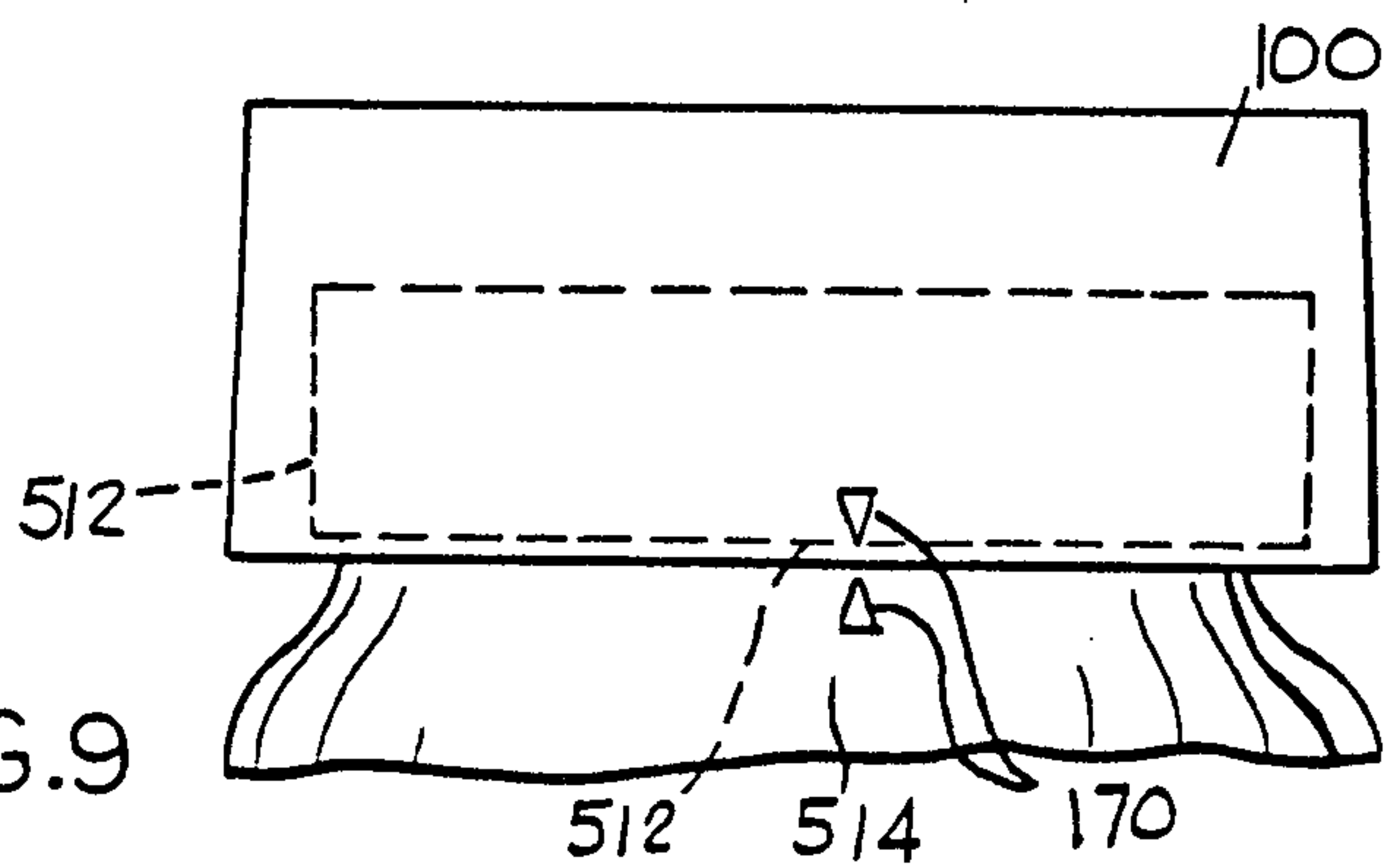


FIG. 9

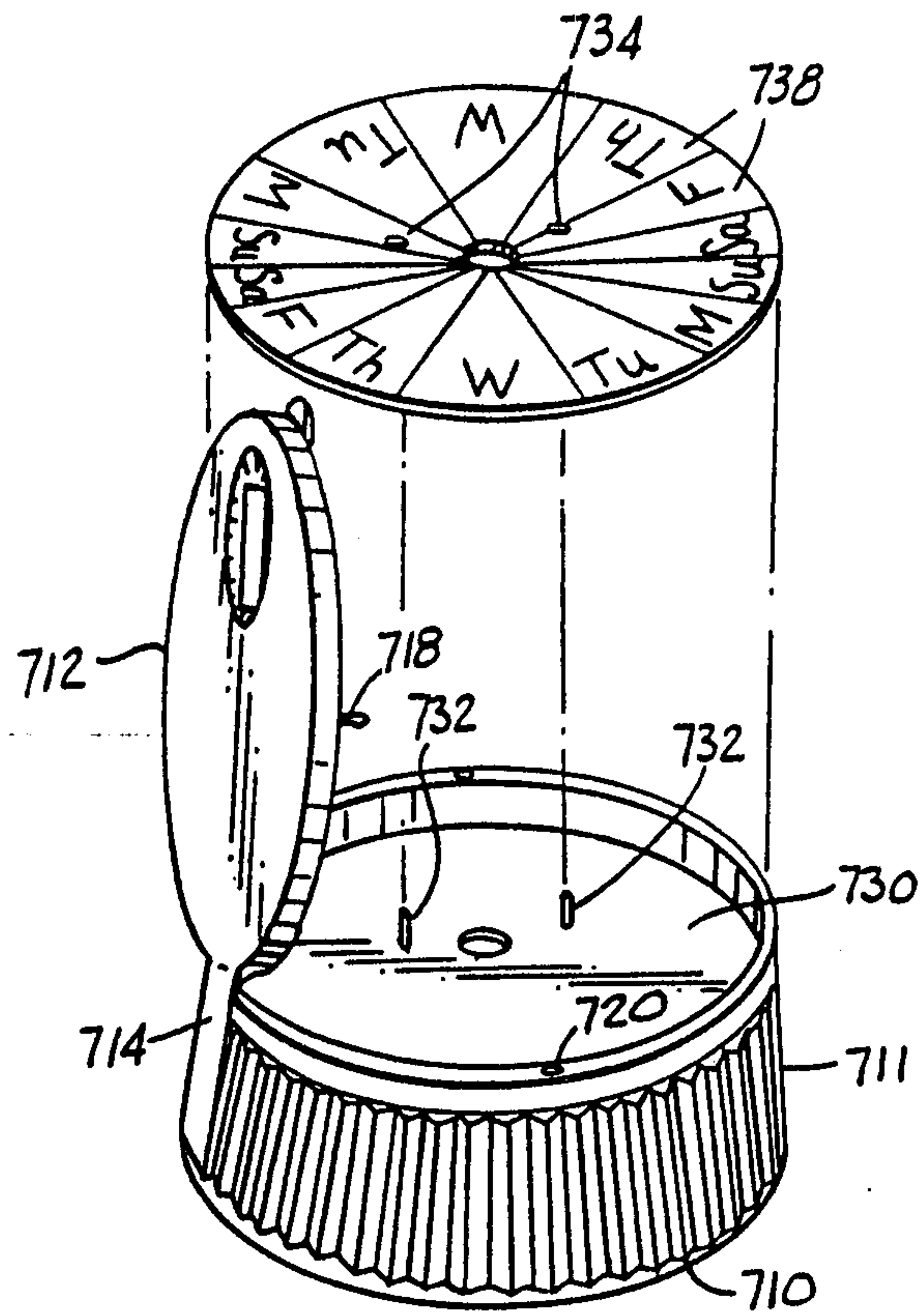


FIG. 10

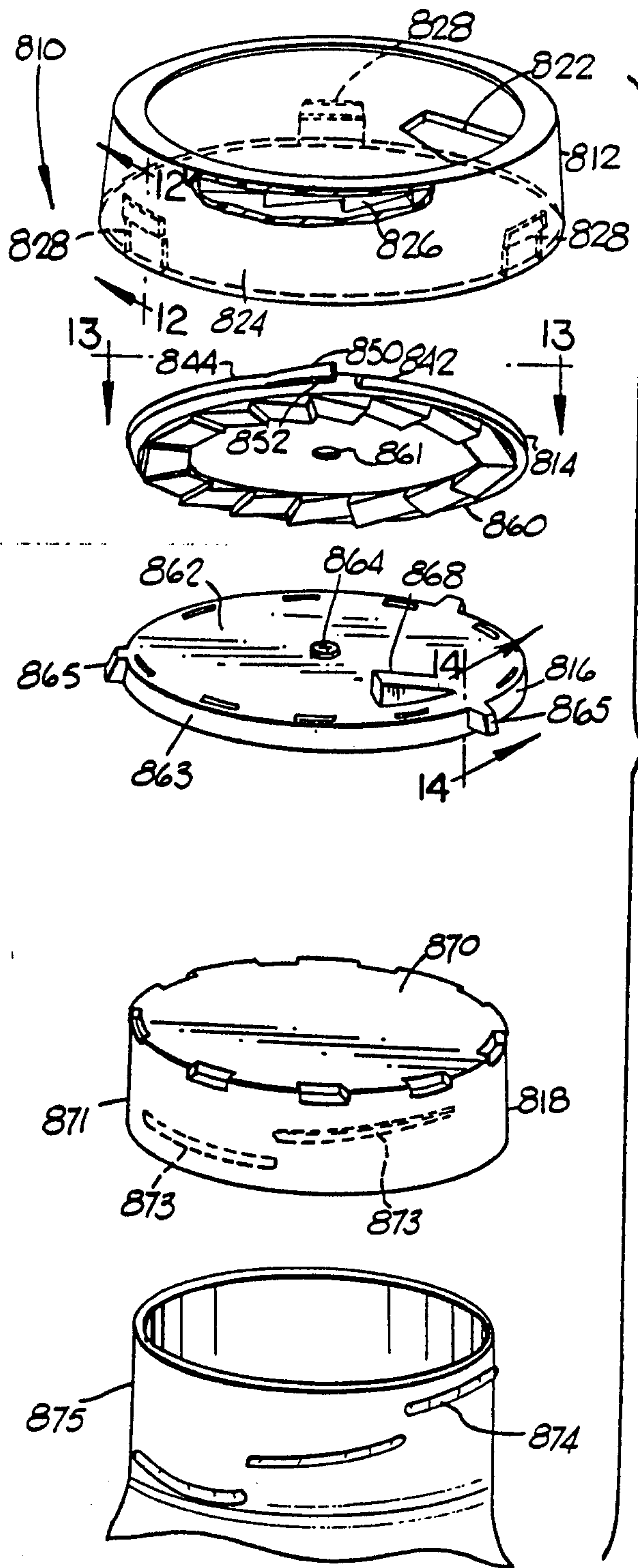


FIG. 11

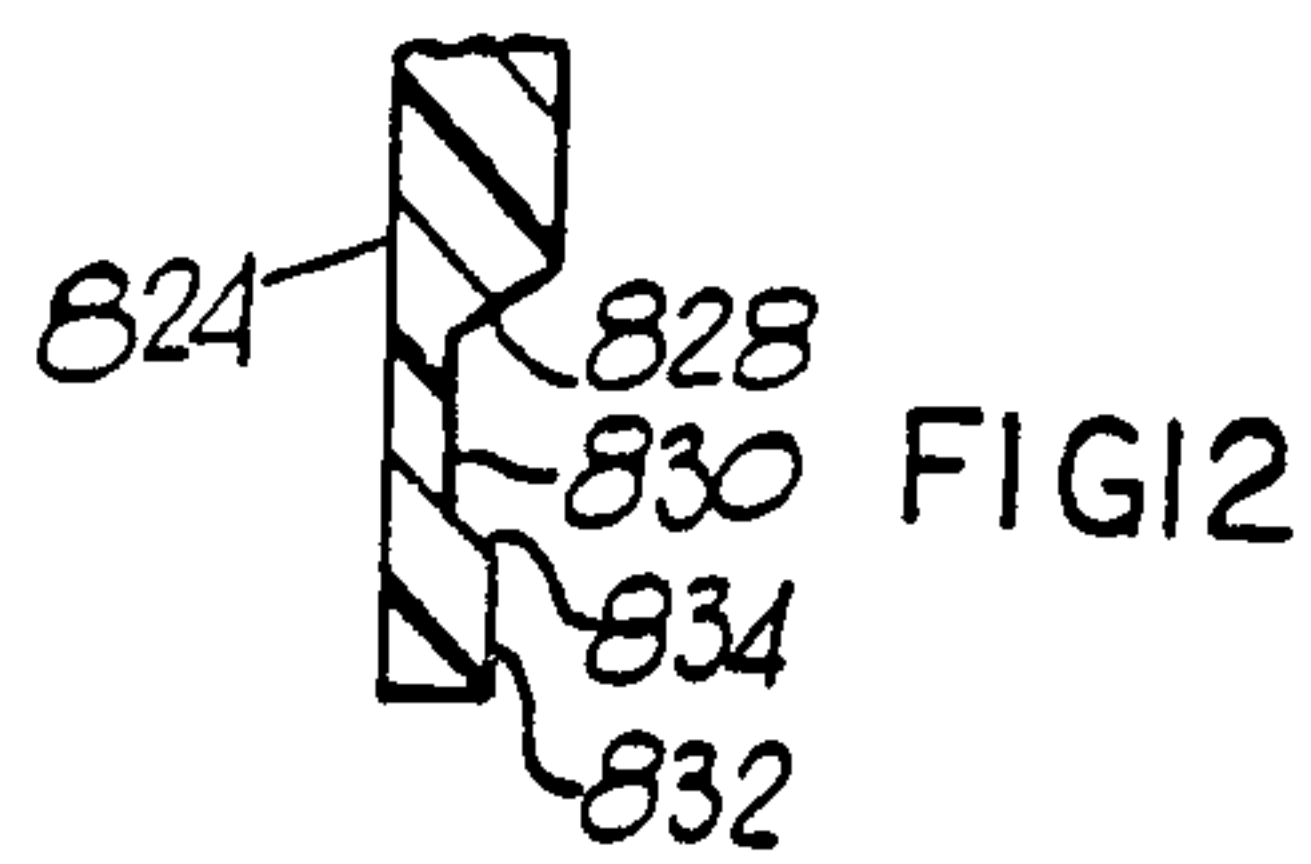


FIG. 12

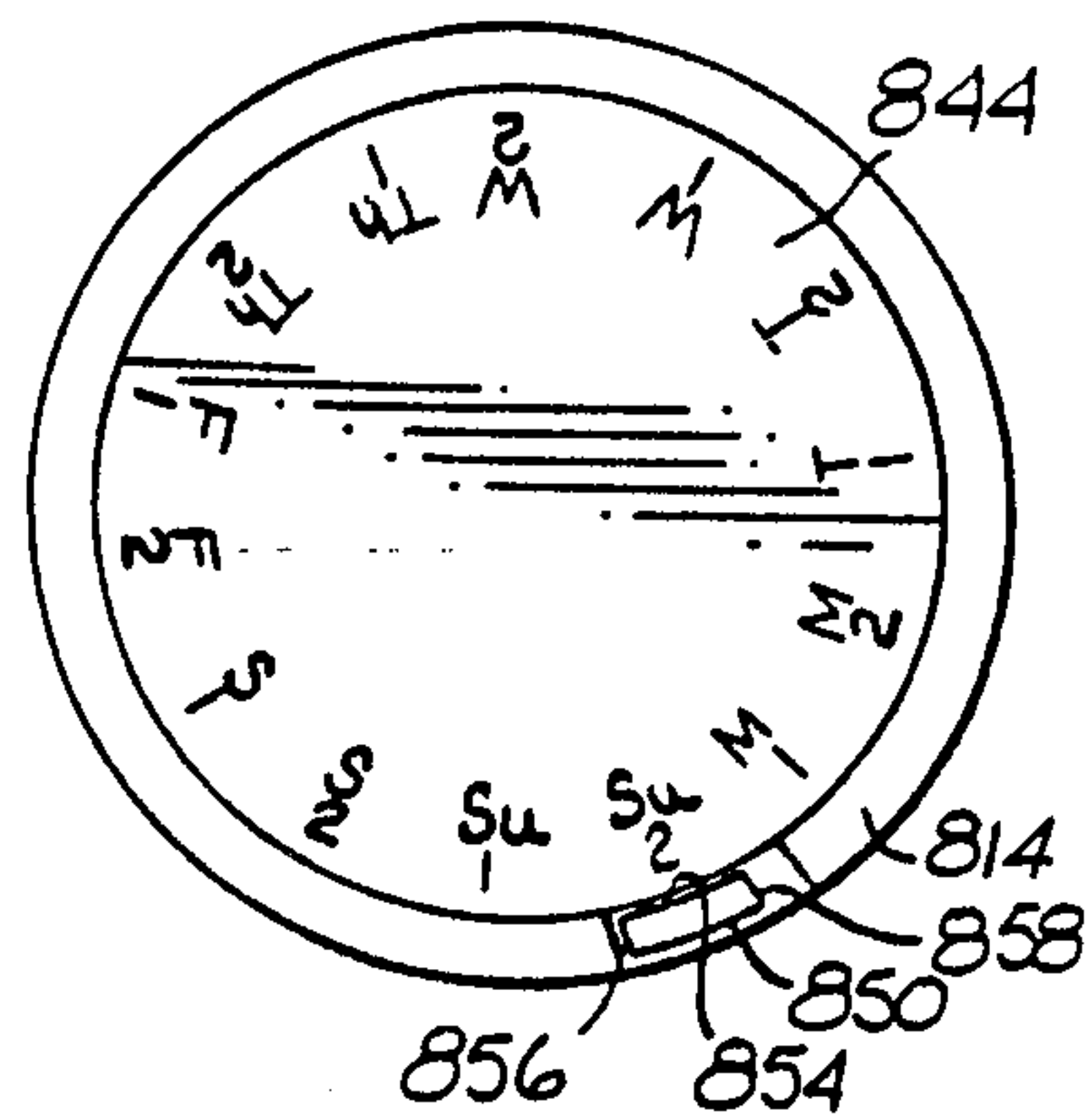


FIG. 13

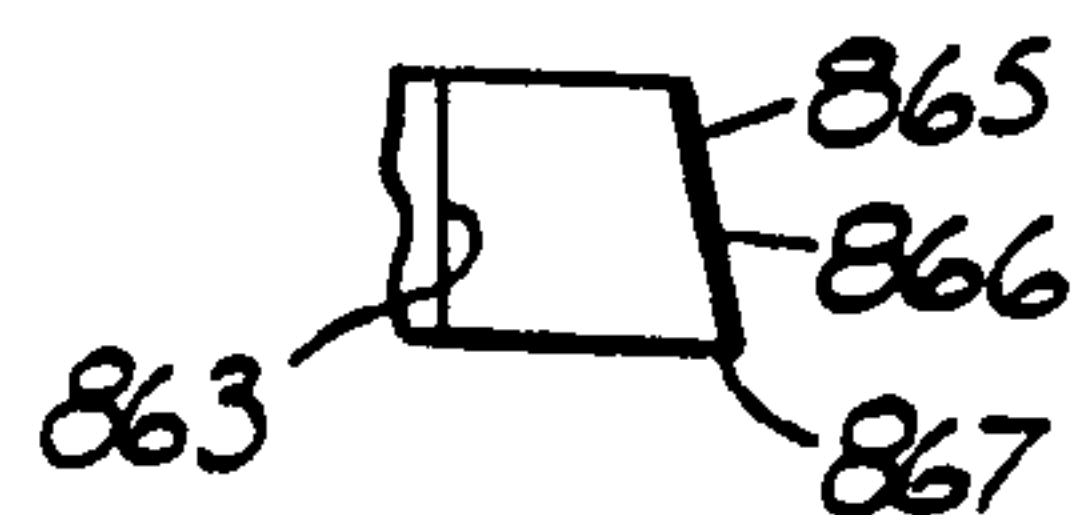


FIG. 14

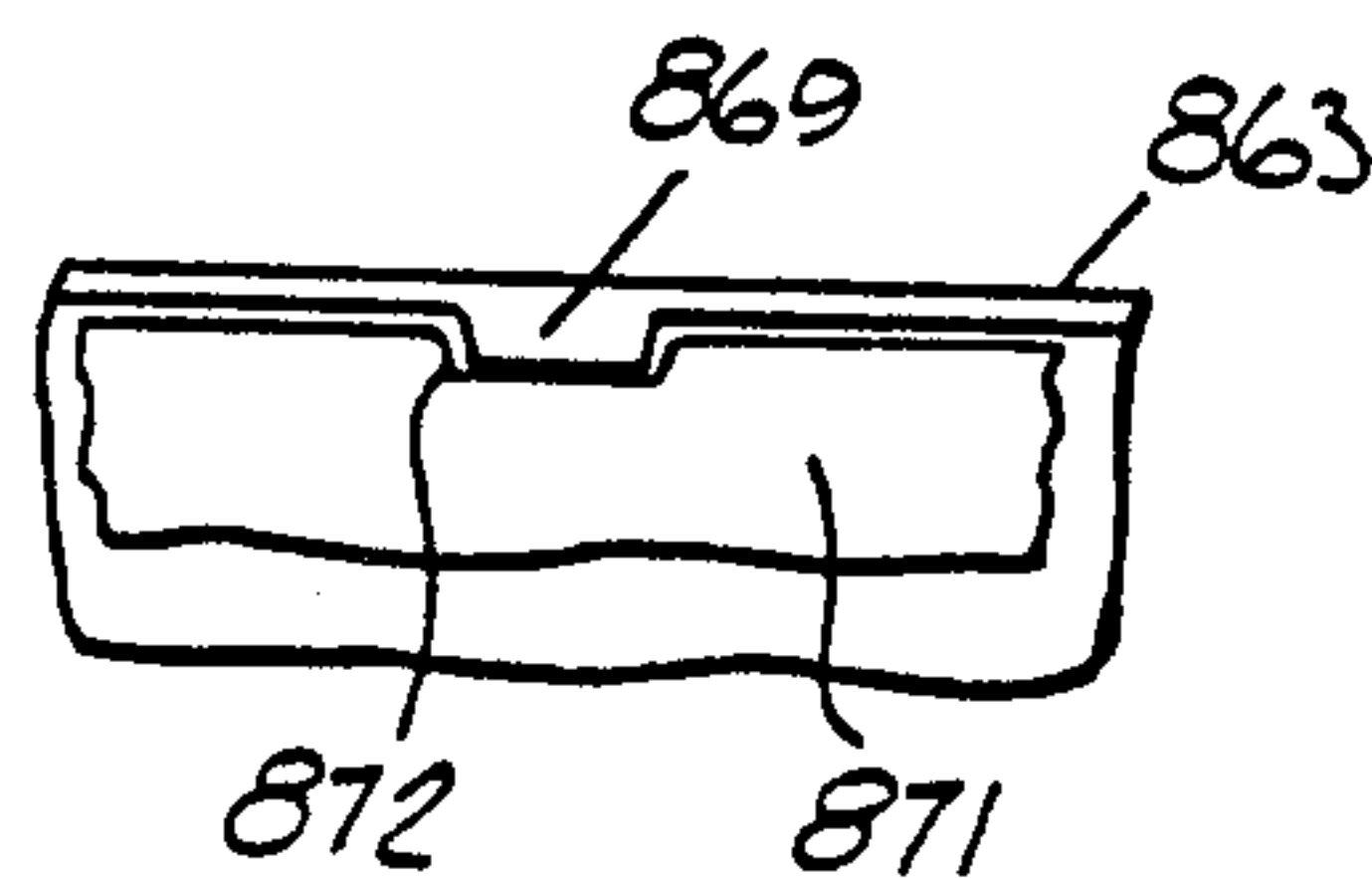


FIG. 15

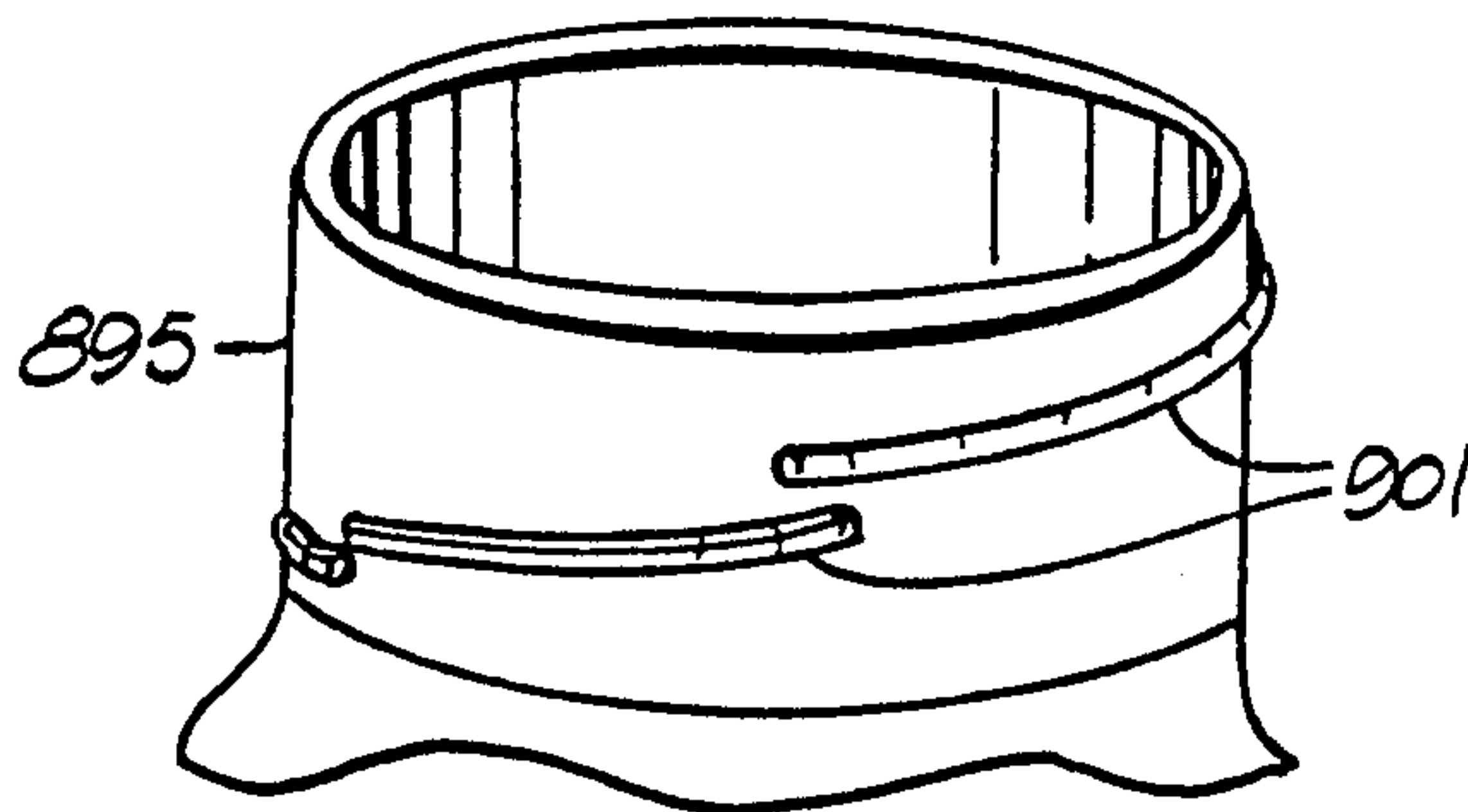
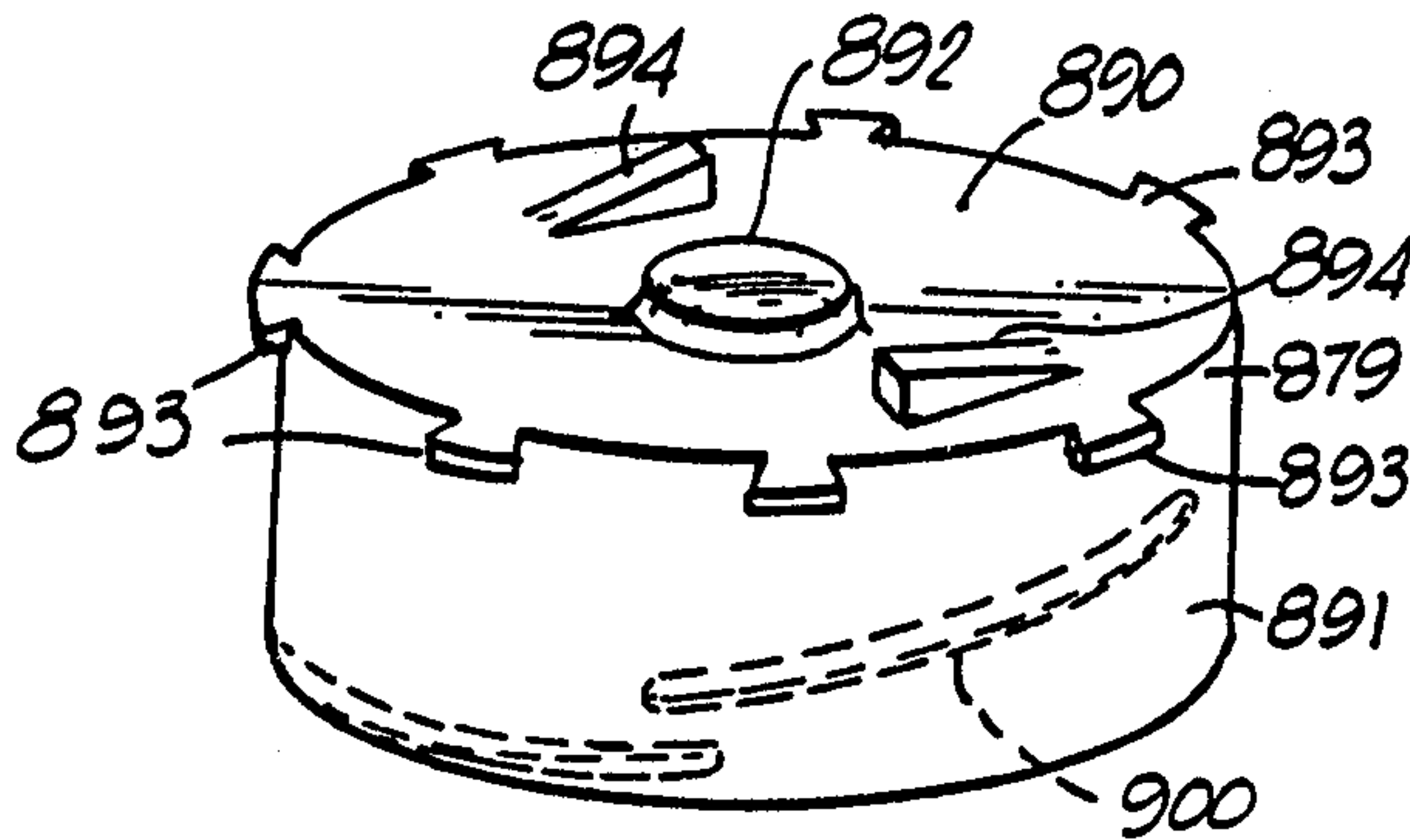
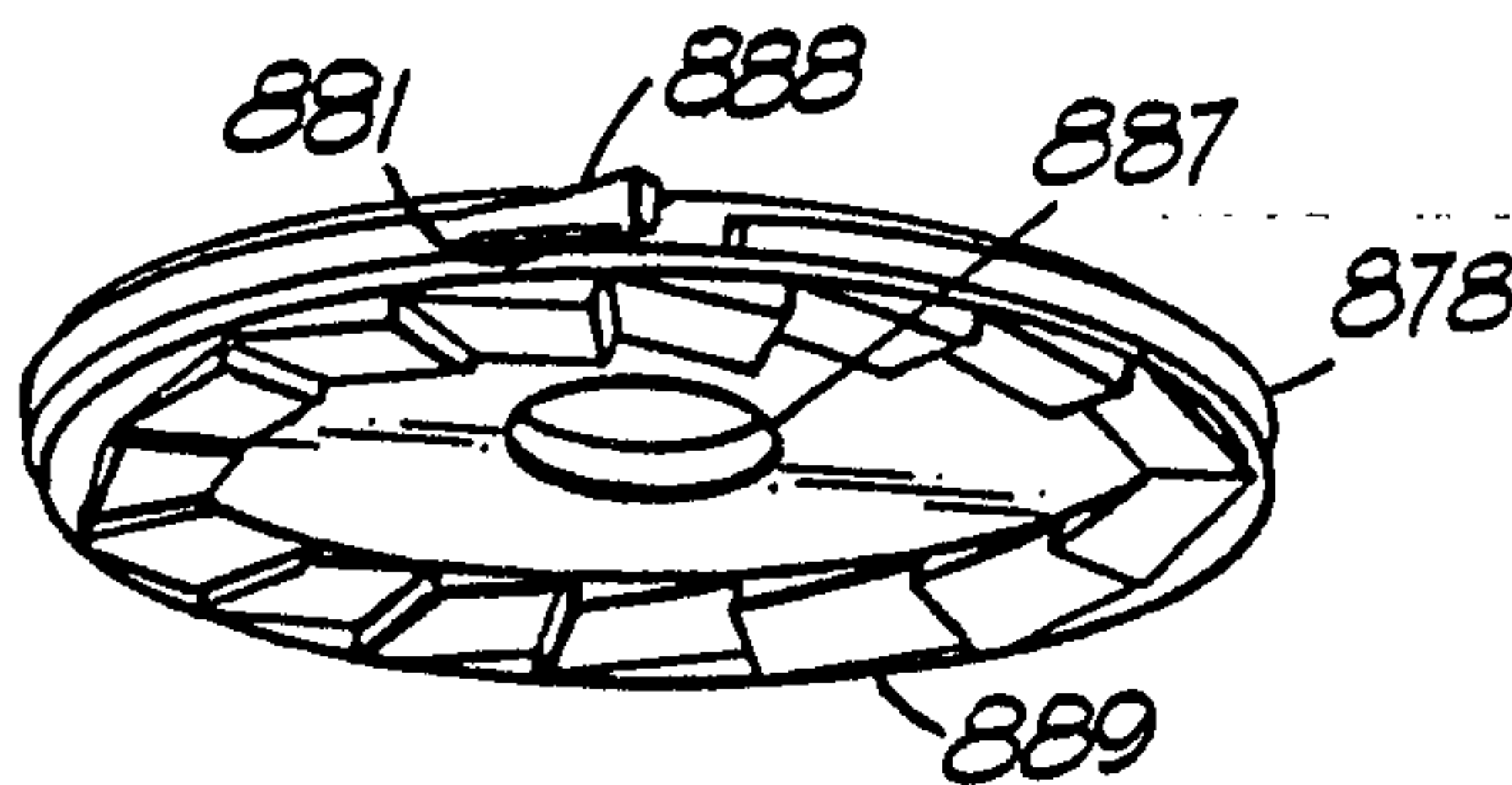
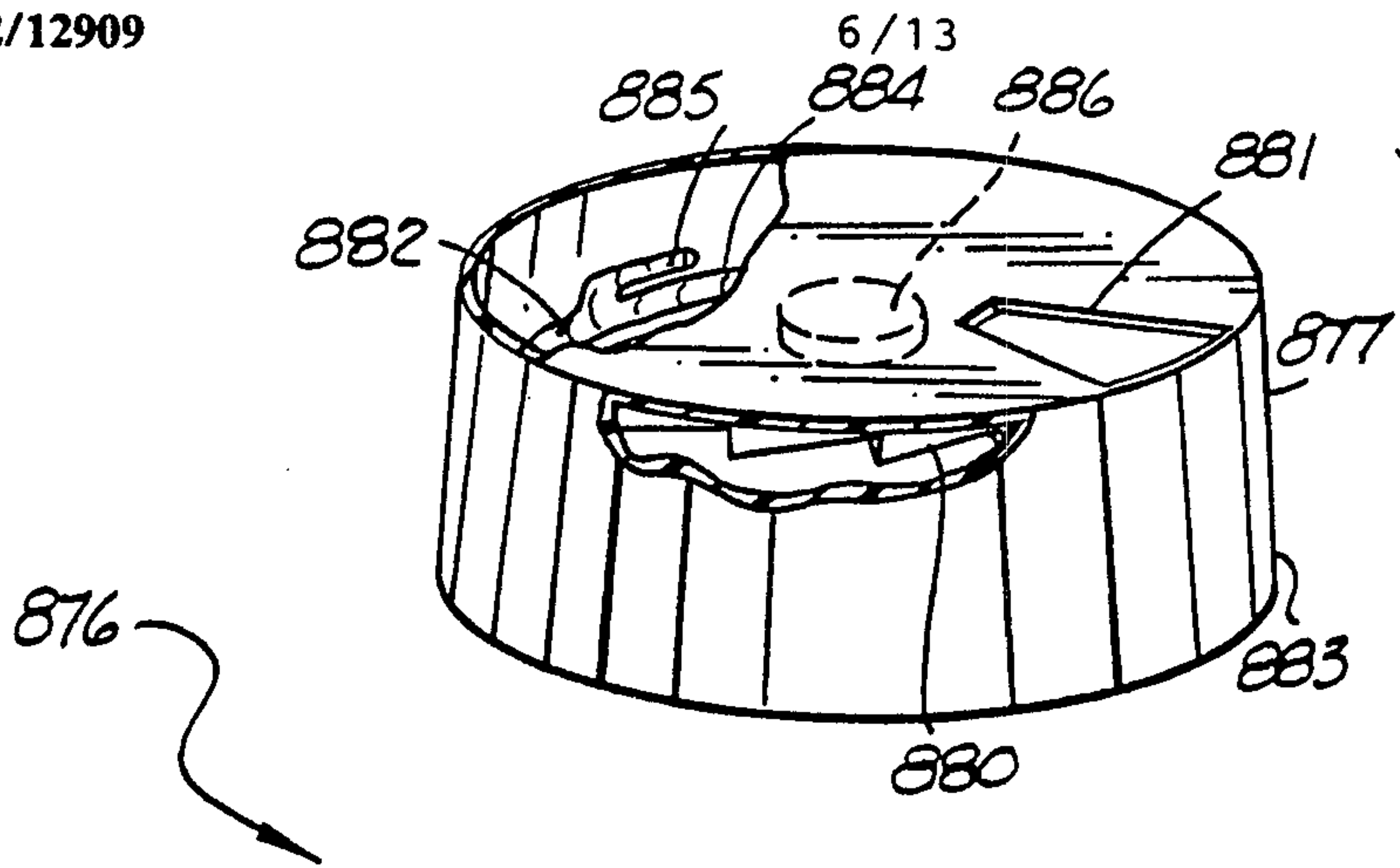
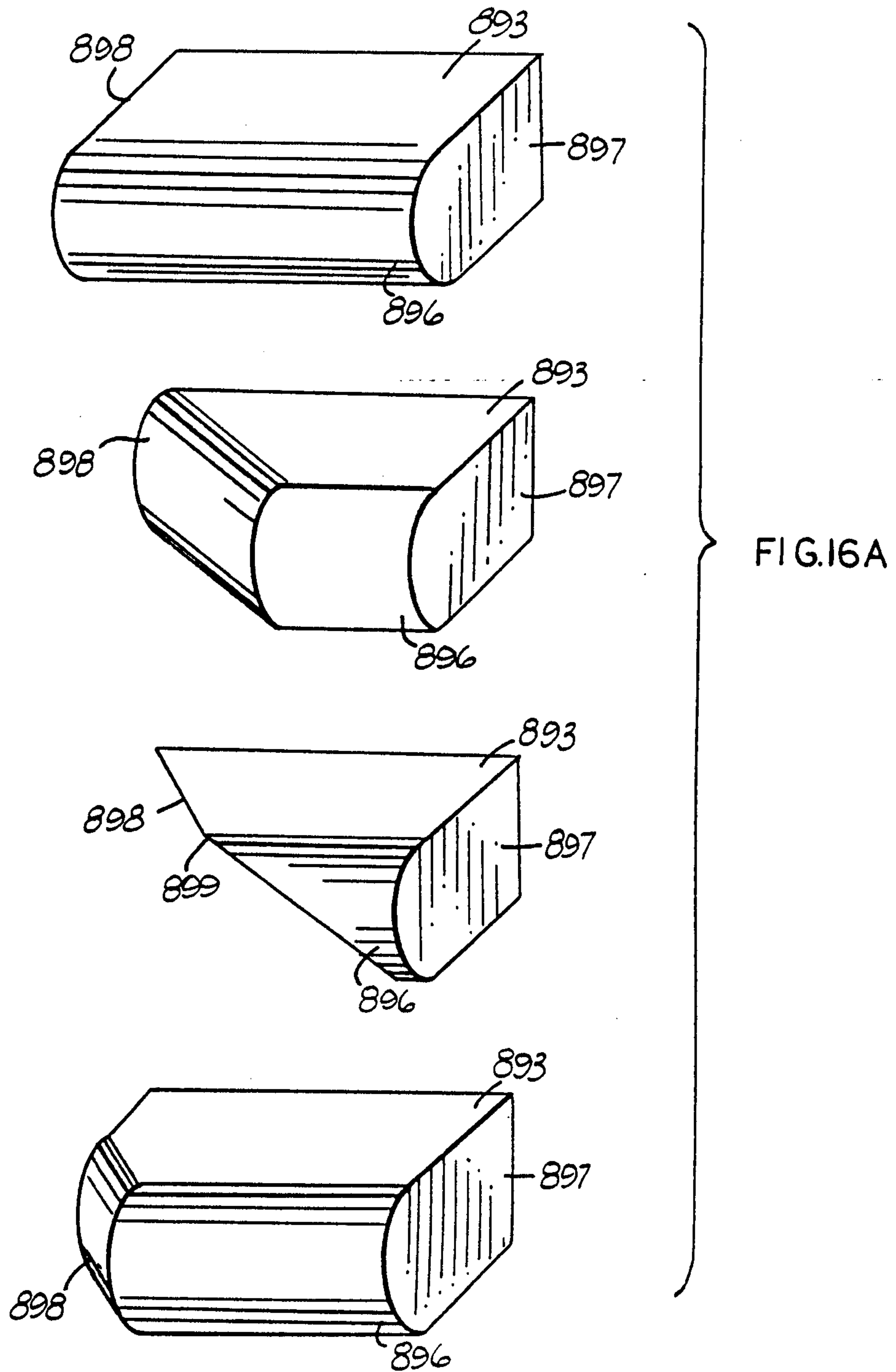
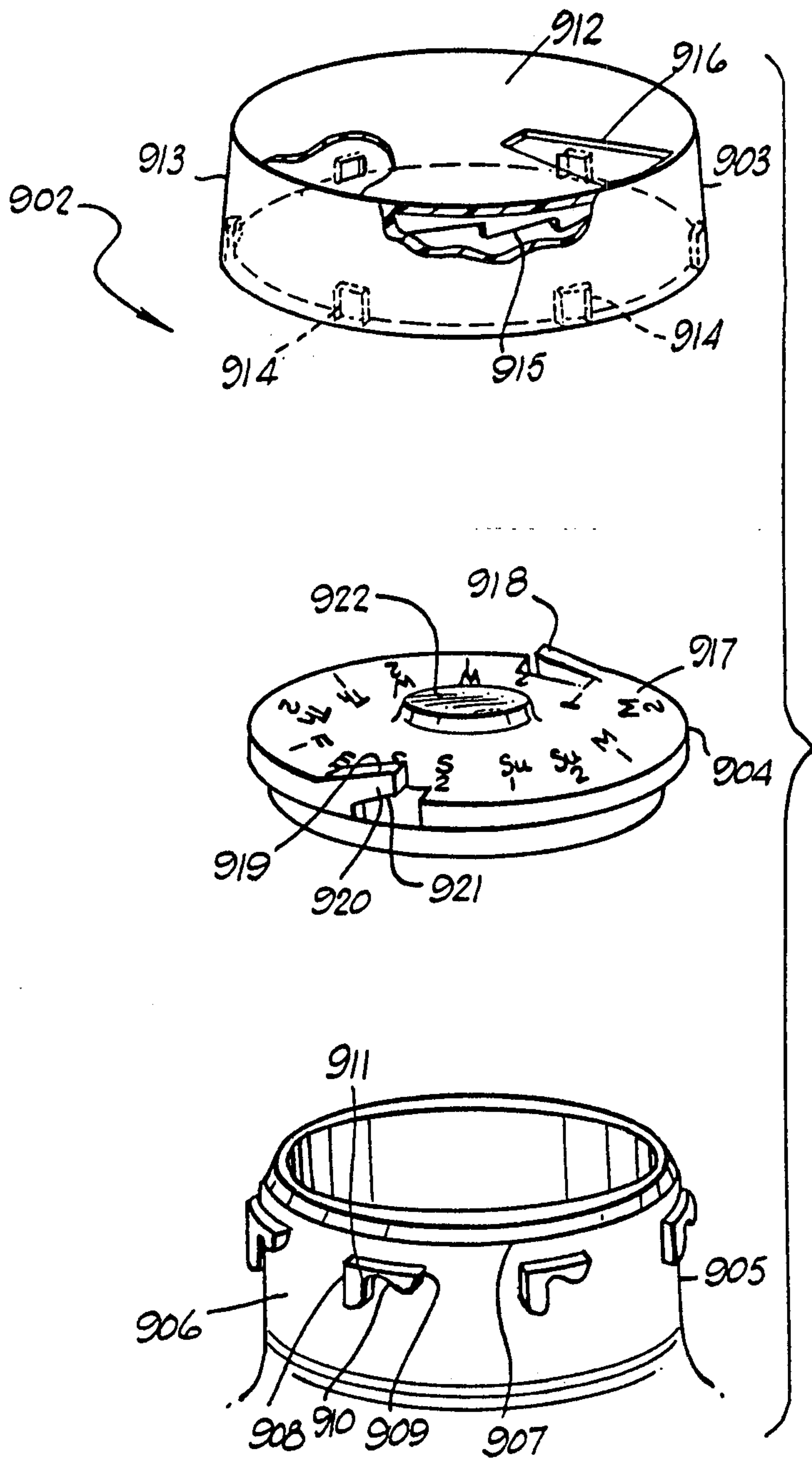
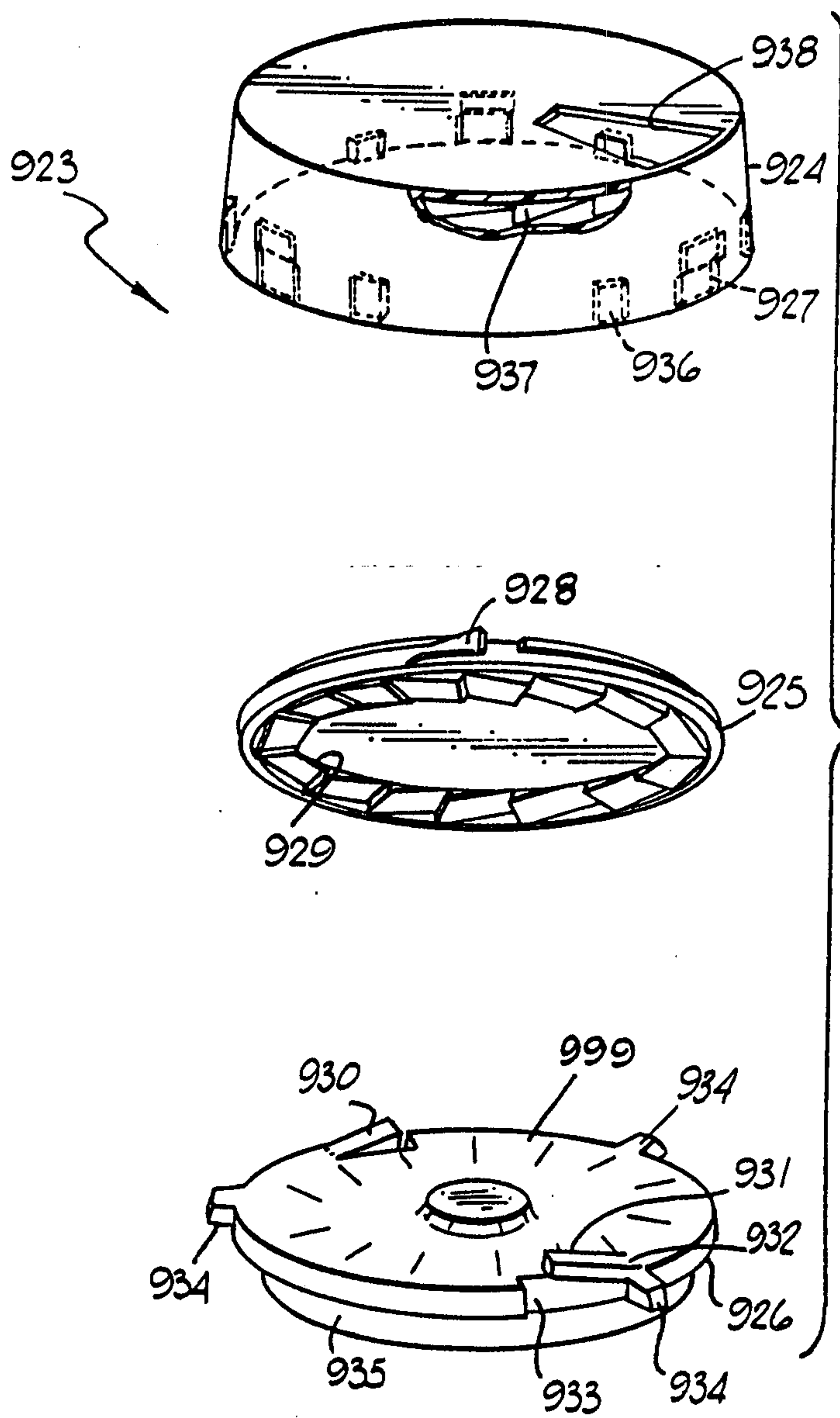


FIG.16







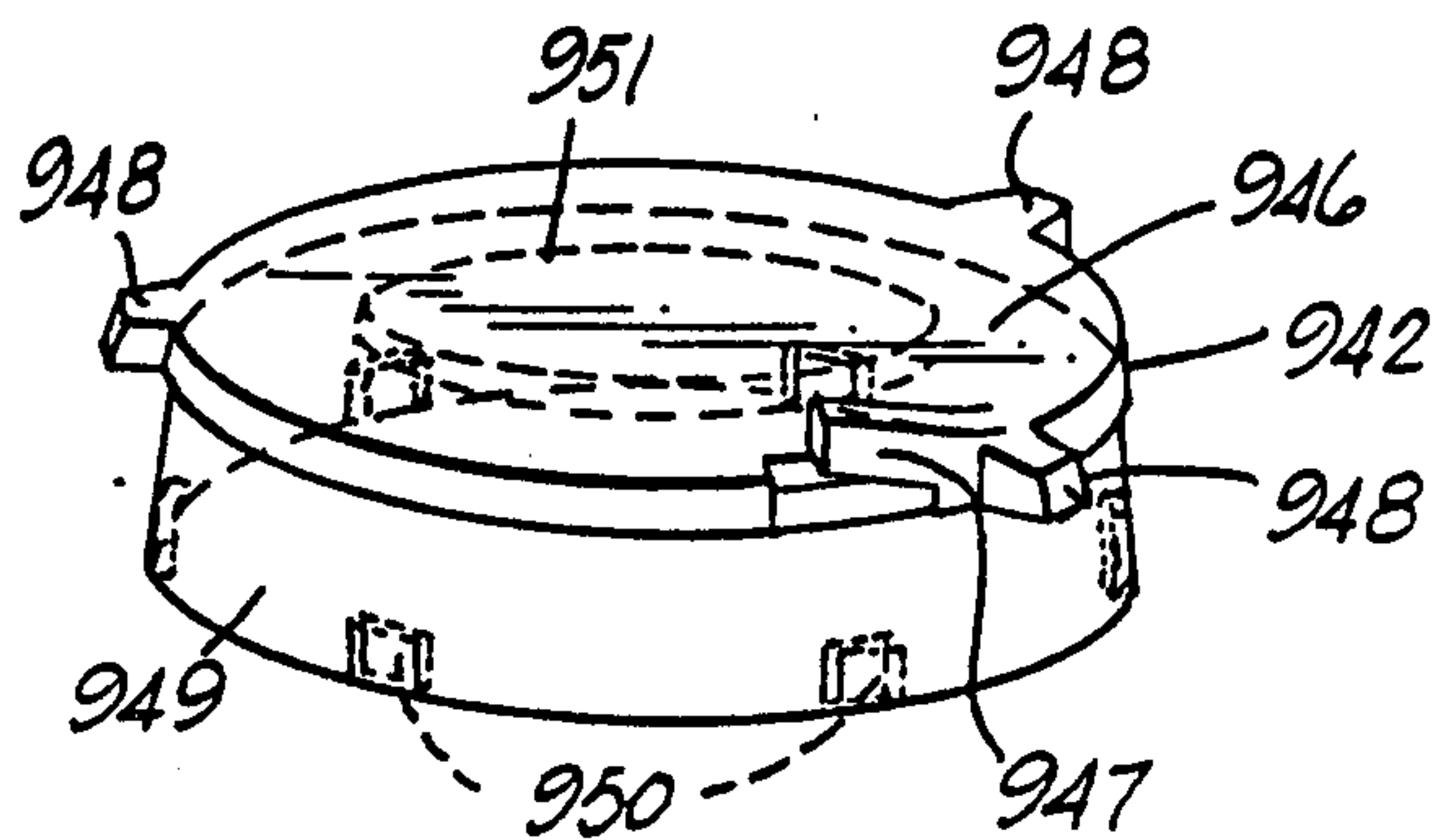
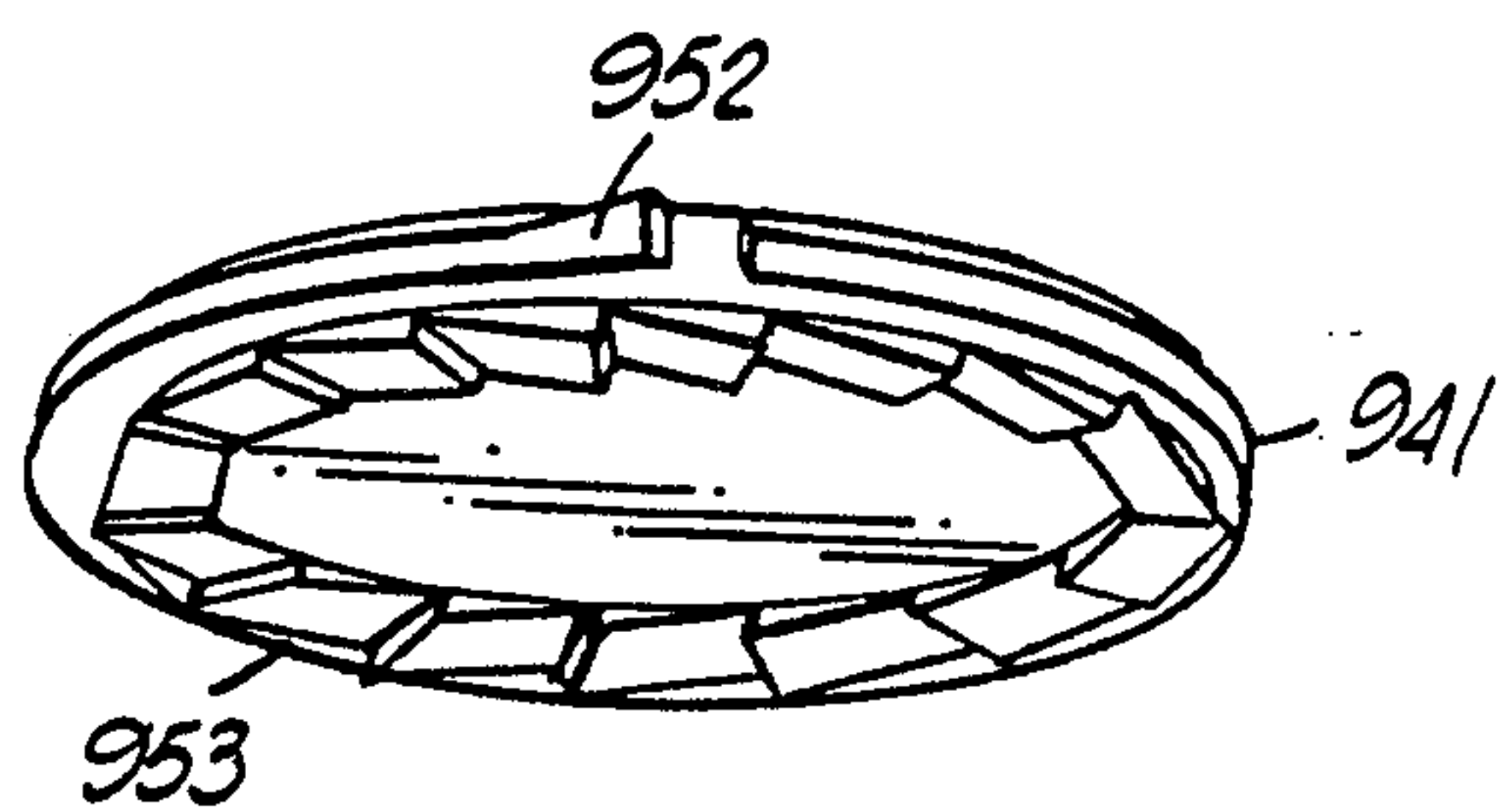
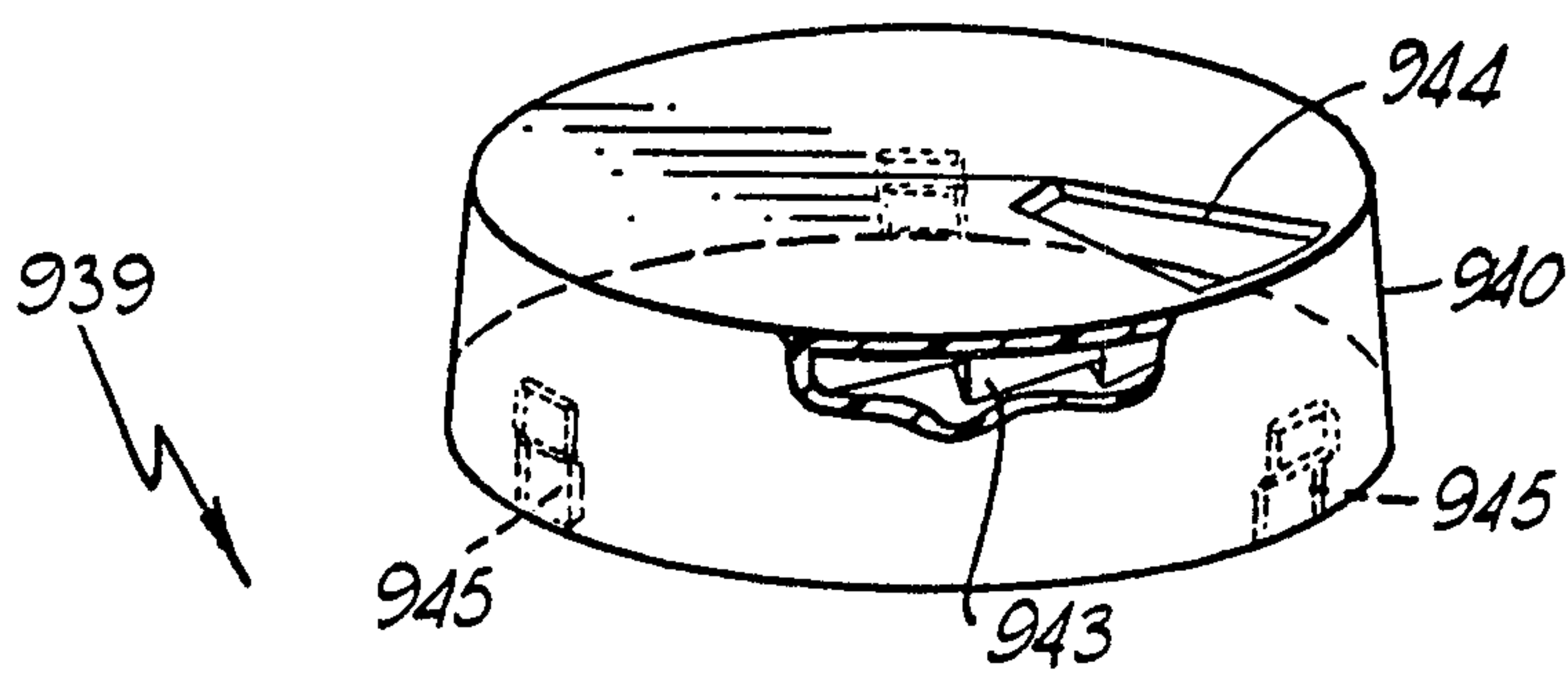


FIG.19

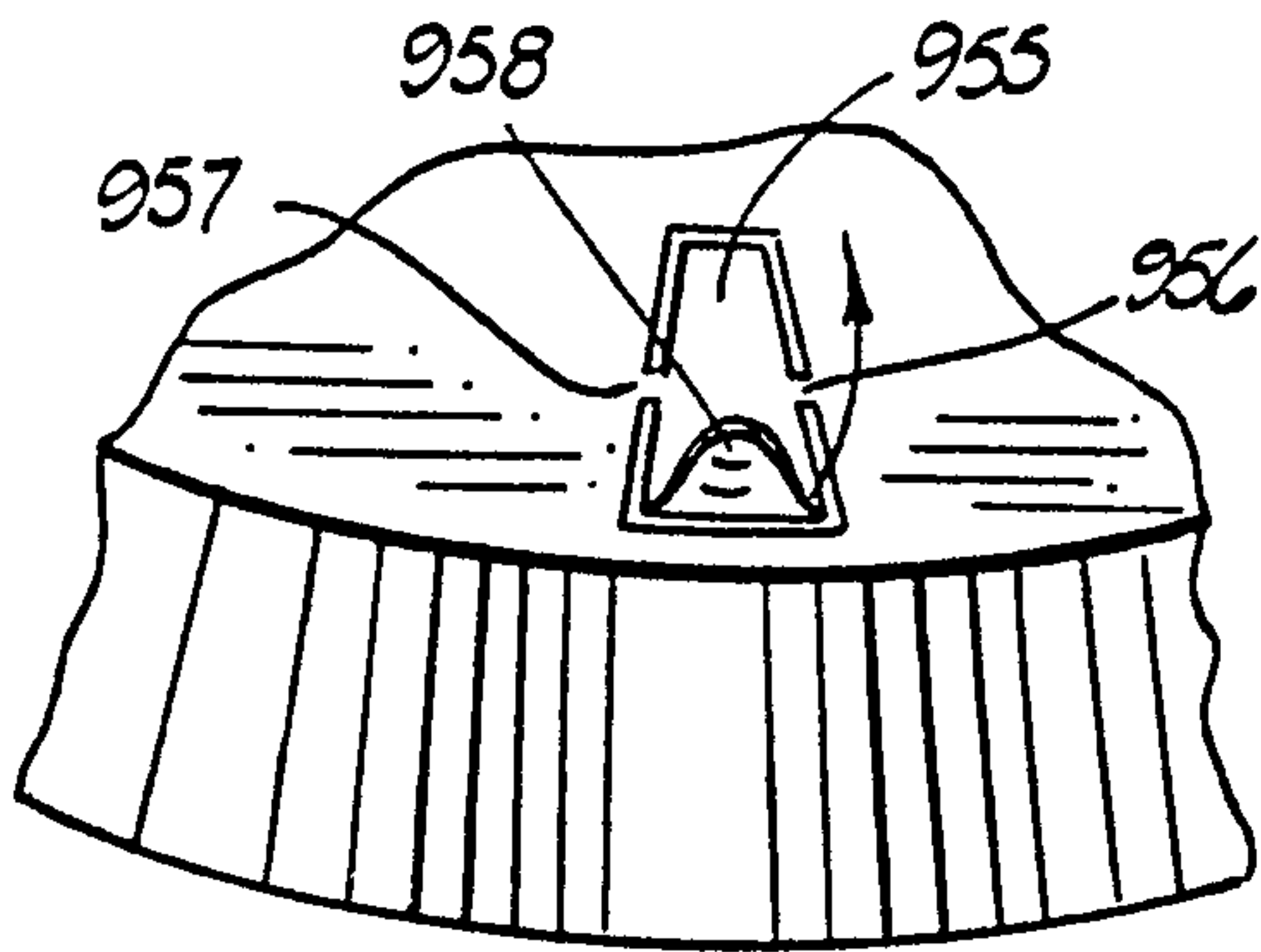


FIG. 20

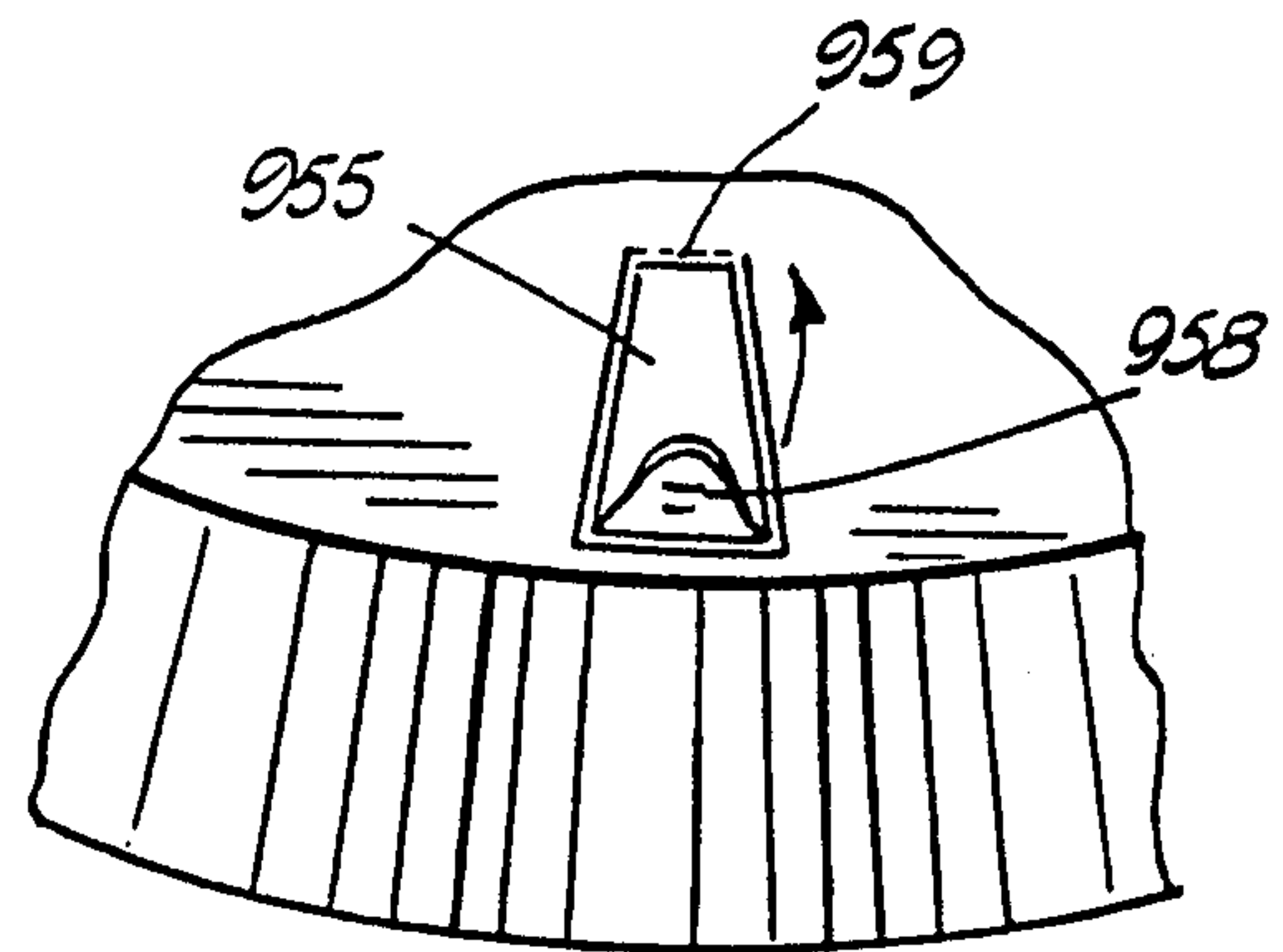


FIG. 21

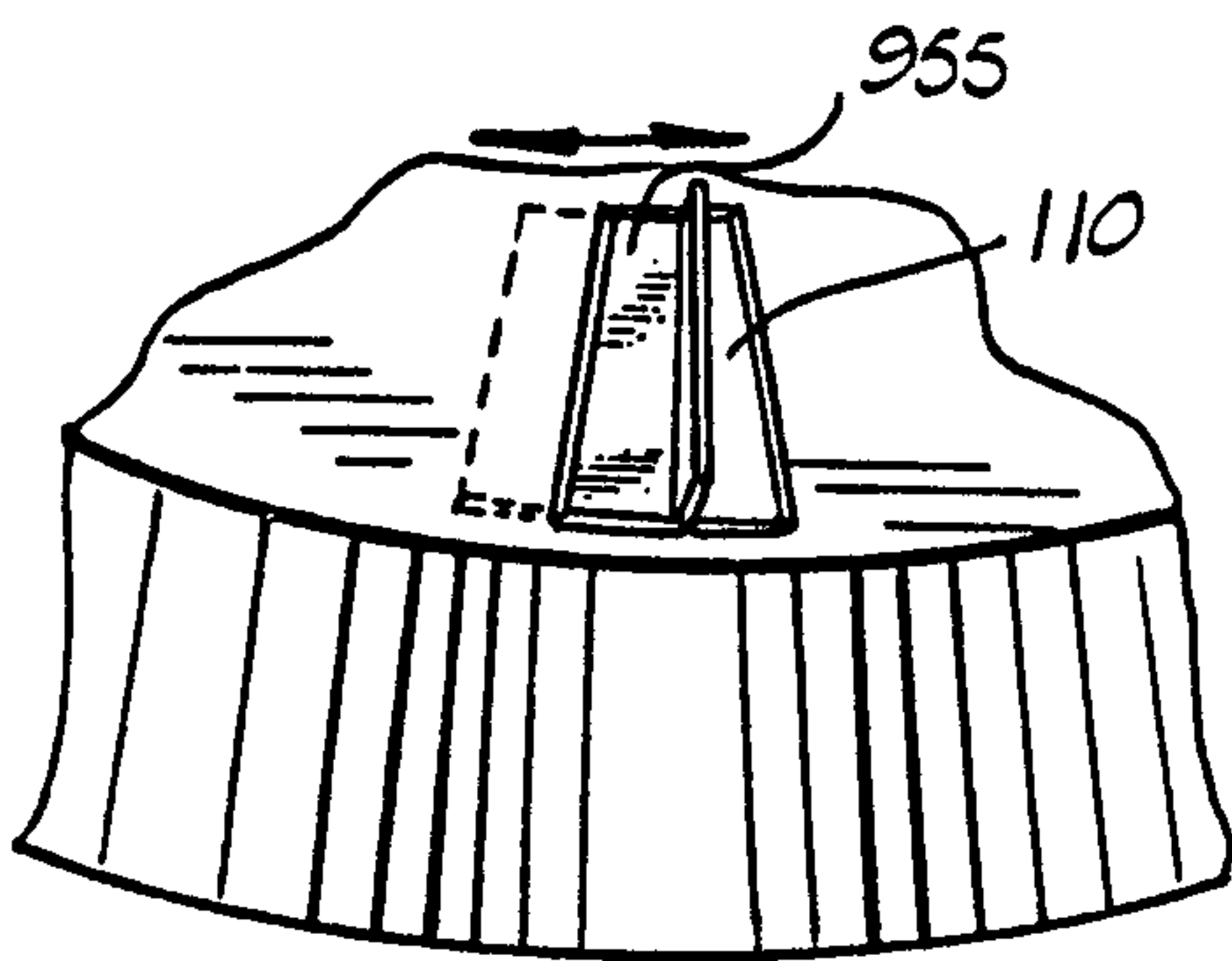


FIG. 22

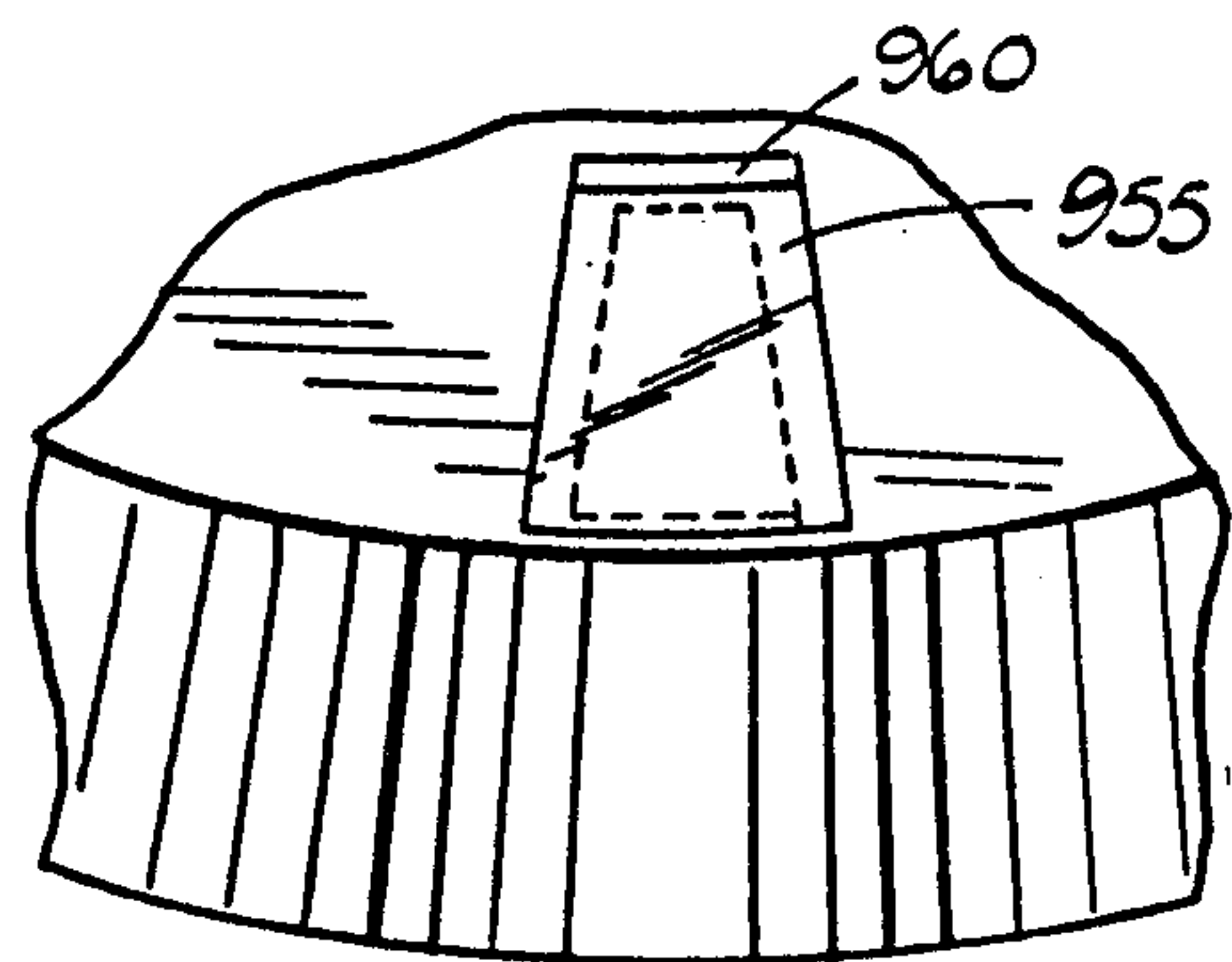


FIG. 23

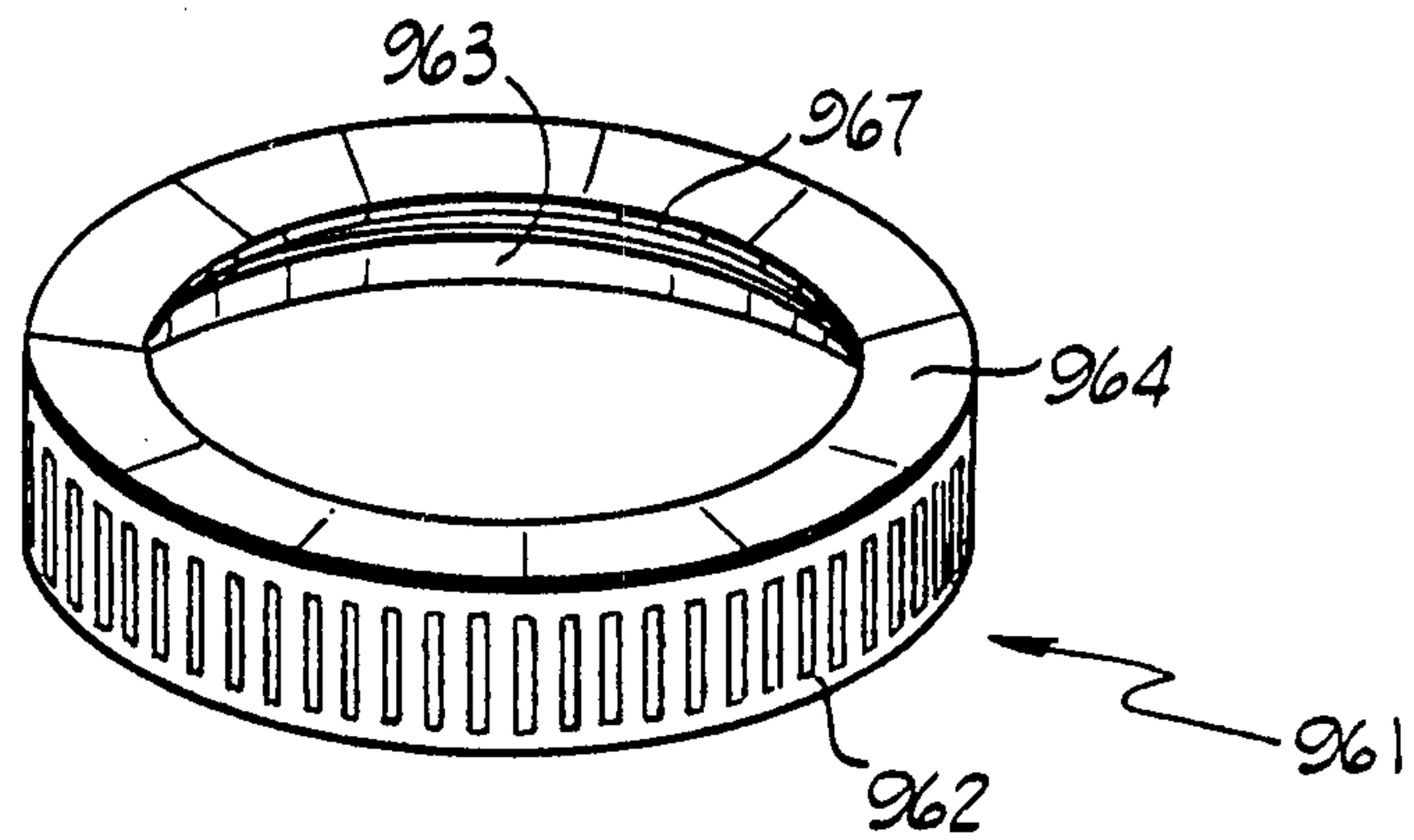


FIG. 24

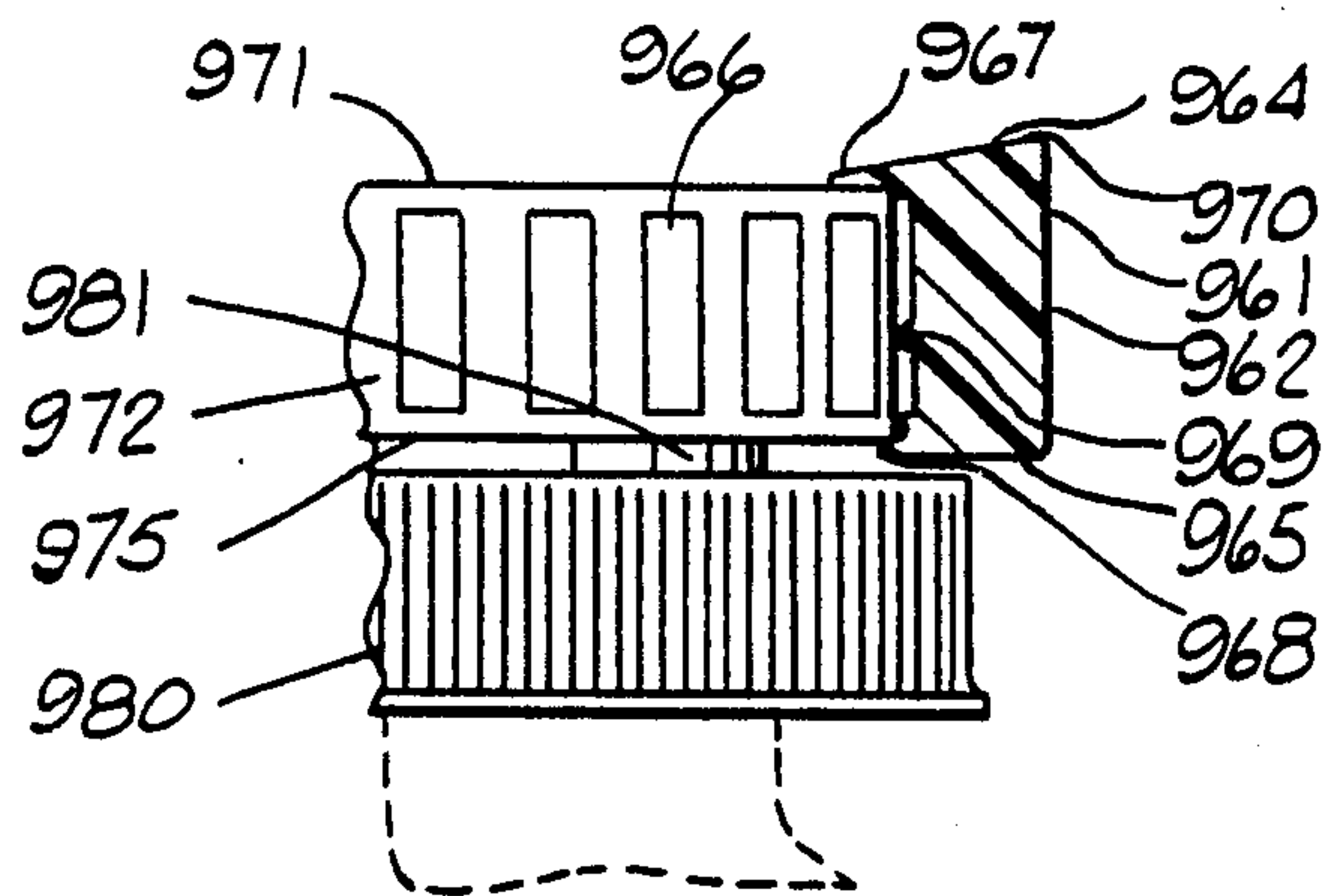


FIG. 25

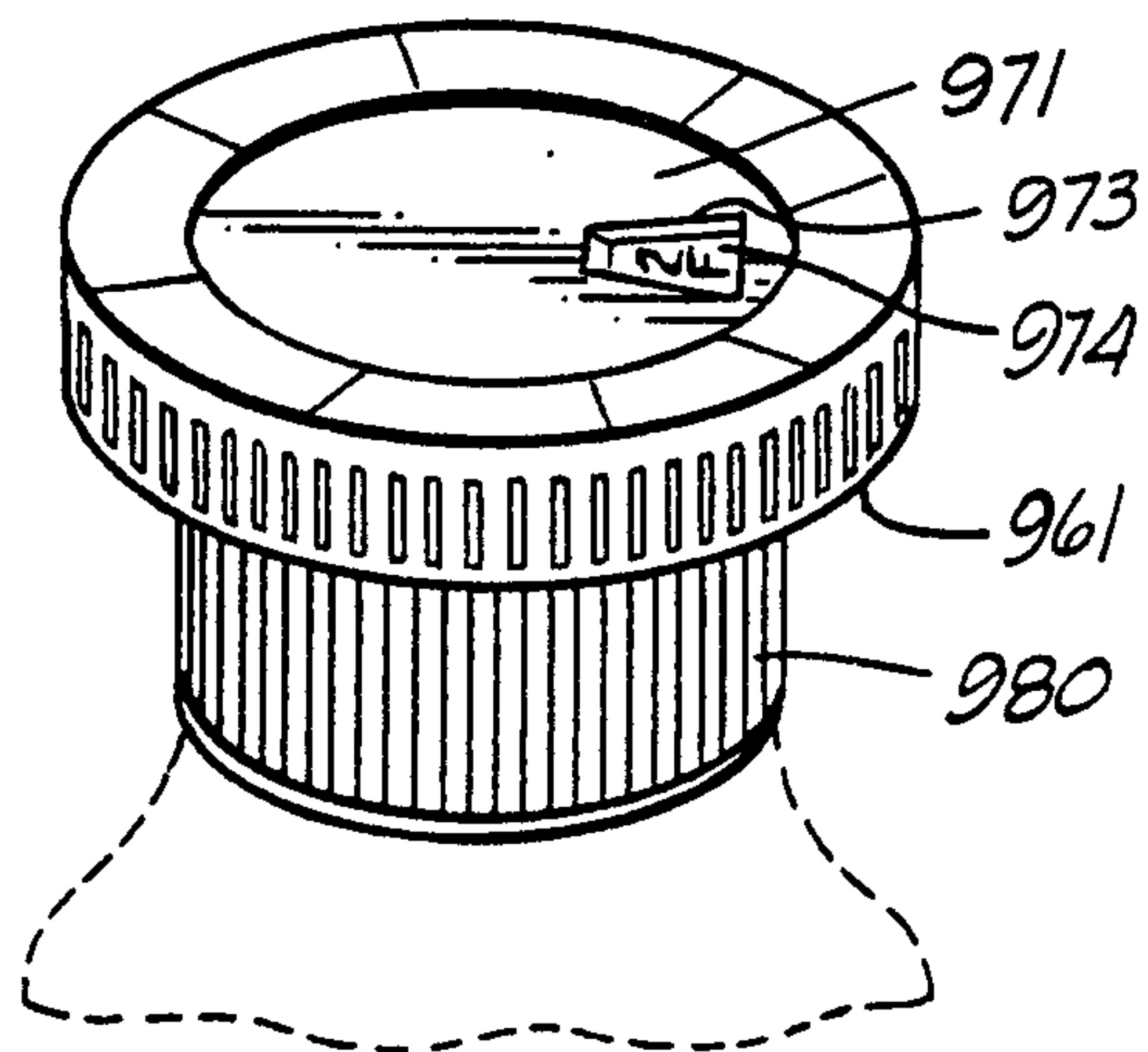


FIG. 26

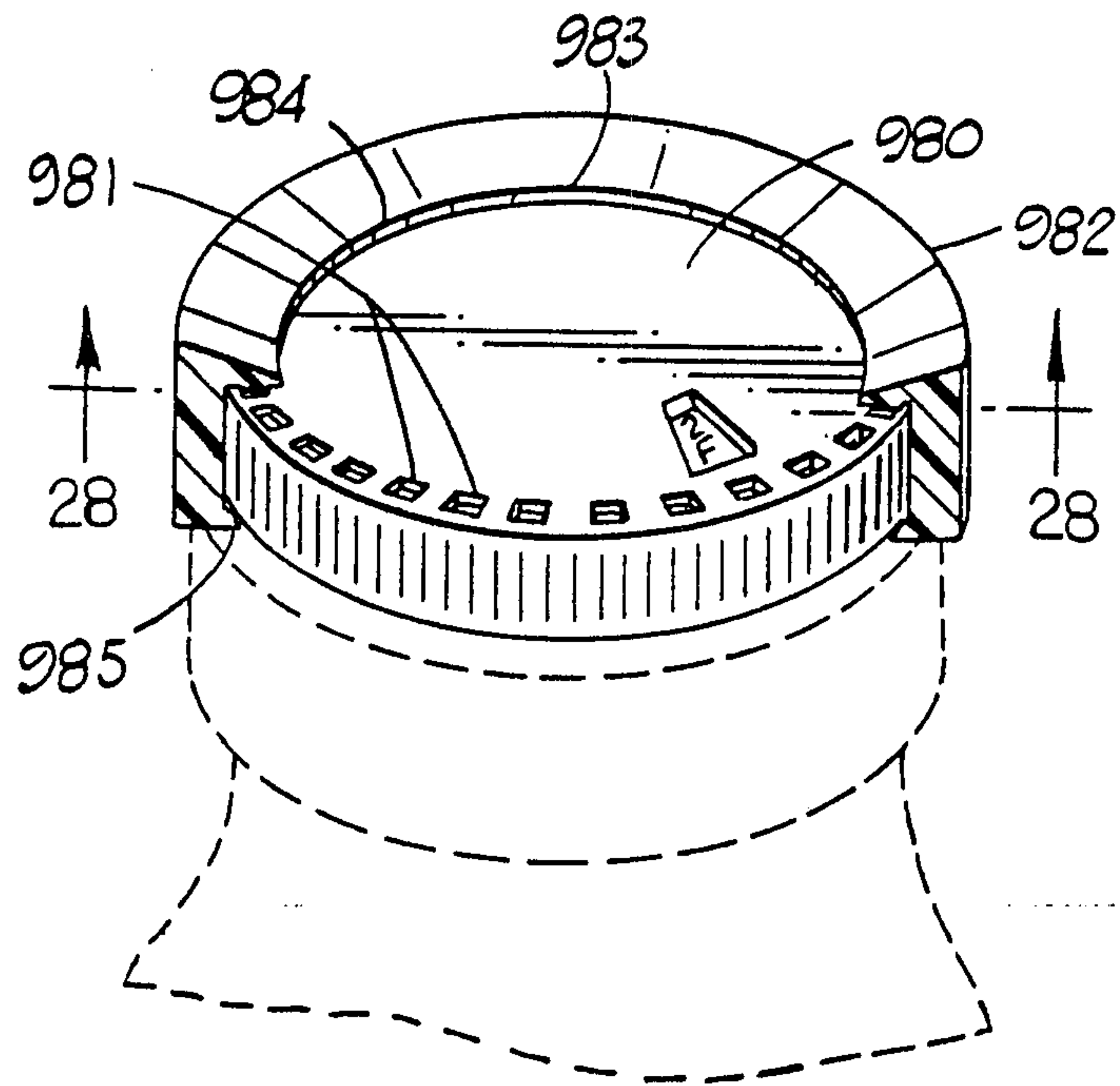


FIG. 27

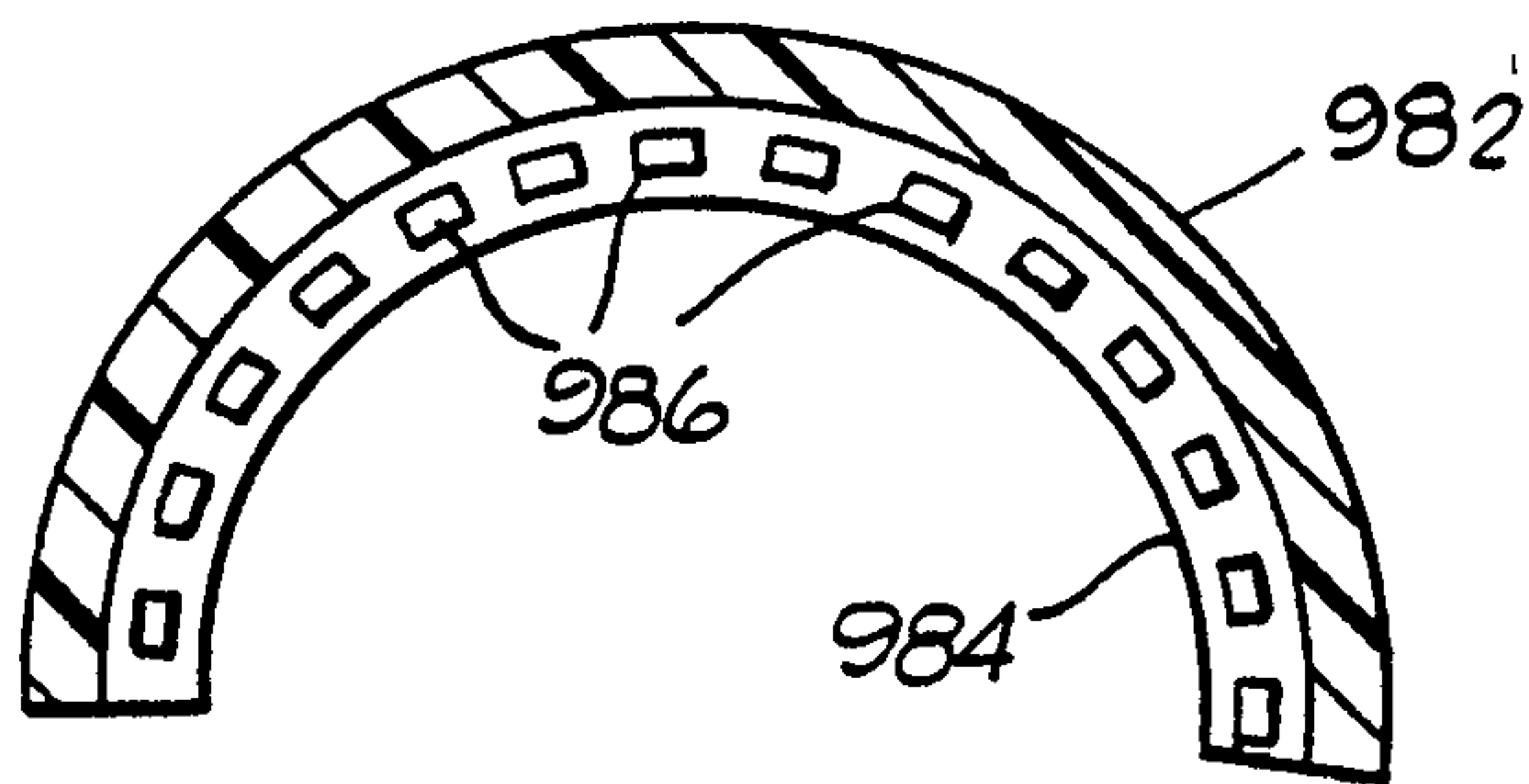


FIG. 28

