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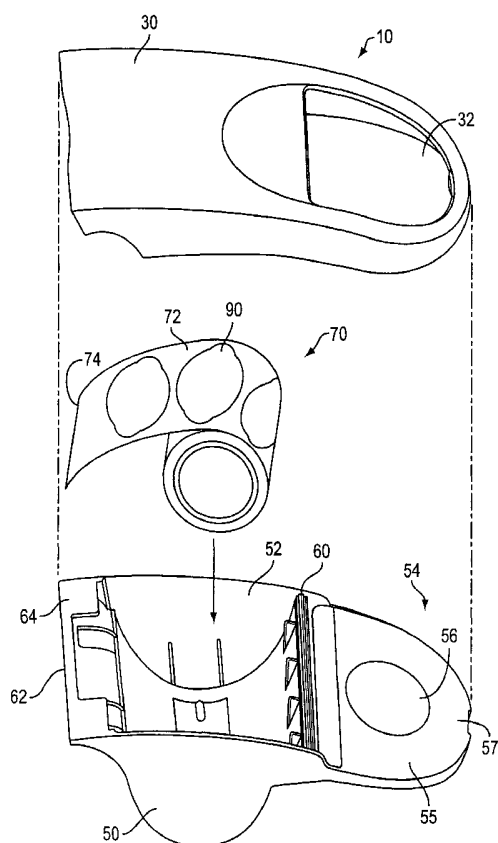
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[Continued on next page]

(54) Title: STETHOSCOPE SHIELD DISPENSER



(57) Abstract: A dispenser for dispensing stethoscope covers (90) stored in a holding chamber (52). The covers (90) are adhesively arranged on a continuous backing (72) and automatically, individually separated from such backing (72) and dispensed into a discharge area (54) as a result of the continuous backing (72) being withdrawn from the dispenser (10). Each cover (90) is dispensed with the adhesive portion (97) facing upward in preparation for attachment to a stethoscope diaphragm (102).



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

STETHOSCOPE SHIELD DISPENSER

FIELD OF THE INVENTION

This invention relates to dispensers in general, and more specifically, to a stethoscope cover dispenser that dispenses an individual cover from a stored plurality
5 of covers such that the dispensed cover is positioned with its adhesive side exposed and facing upward.

BACKGROUND OF THE INVENTION

Hygiene and sanitary conditions are a major concern in the medical field, and in particular in doctor's offices, hospitals and in any area exposed to a variety of
10 germ-infested sick people. In such highly contaminated areas, it is critically important to prevent the transmission of germs, disease and the like. Sometimes, a sanitary environment can mean the difference between life and death, particularly if such environment prevents the spread of fatal diseases. Furthermore, it is commonly understood that the increased use of sanitary and hygienic conditions in highly
15 civilized countries is directly responsible for an increase in the life span of its inhabitants, as compared with many third-world countries where the life span is depressingly low.

Thus, it is always favorable to minimize direct or indirect contact between infectious people. With respect to medical facilities, this is often accomplished
20 through the use of sterile equipment and instruments. Examples of such equipment include disposable tongue depressors, plastic-wrapped thermometers, sterilized and autoclaved metal instruments, disposable hypodermic needles and the like. In a perfect world, and without regard to hazardous waste buildup or waste buildup in general, all medical instruments would be disposable and used only once per patient.

However, with the advent of sterilization, instruments may be used safely on a variety of people with a negligible risk of disease transmission between uses.

Certain instruments that are used with great frequency are not particularly suited for sterilization between patients. A stethoscope, which is normally worn
5 around the neck at all times, is a perfect example. In the normal course of a day, a medical professional in a hospital may use a stethoscope on up to one hundred patients, if not more. A doctor in private practice may see half as many patients in the same time period. In any event, it is rare to see a doctor or the like sterilize the head of a stethoscope between uses.

10 The prior art is replete with disposable shields or covers designed to impart sterility to the head and/or diaphragm of a stethoscope. For example, U.S. Patent 4,871,046 to Turner discloses a disposable, plastic envelope that encompasses the entire head portion of a stethoscope. U.S. Patent 5,448,025 to Stark et al. discloses a disposable, adhesive cover that completely covers the diaphragm and adheres to the
15 surrounding rim of a stethoscope head, while U.S. Patents 5,424,495 and 5,528,004 and 5,686,706, all to Wurzbarger, disclose another disposable, adhesive cover that adheres to the entirety of a stethoscope diaphragm.

In each of the above-mentioned references, an apparatus is also provided for dispensing individual shields or covers, usually from a roll or stack. However, in each
20 case the medical professional must handle the shield during affixation onto the head of a stethoscope. This is particularly true with rolls of covers that are adhesively applied to a continuous backing as shown and described in the Stark et al. '025 reference, which covers must be peeled off the backing and hand-applied to the stethoscope.

While medical professionals try to limit the transmission of germs or bodily matter from patient to patient through hand-washing and the use of rubber gloves, no system is perfect and germs are likely to persist at any contact location. Even a medical professional wearing gloves is likely to contact a germ-bearing surface, such as a writing instrument or a patient's chart that might have been previously handled by someone not wearing gloves or concerned with sterility.

The case of stethoscope shields or covers is no different, and it is highly desirable if such covers could be applied to the stethoscope head without any contact or bodily intervention from a medical professional and in a quick and efficient manner. Again, this is particularly true in the case of adhesively backed covers, which must be peeled off a non-adhesive backing using one's fingers.

Thus, there is a need for a stethoscope shield dispenser that encourages sterility and hygiene with respect to contact between the stethoscope and a dispensed shield. There is also a need for a stethoscope shield dispenser that is easy to use and that enables quick application of a shield to a stethoscope head. In particular, there is a need for a dispenser that is preferably suited to dispense adhesively-backed stethoscope shields with the adhesive portion of the dispensed shield being exposed in preparation for direct contact with the head of a stethoscope. Such needs, among others, are fulfilled by the dispenser of the present invention.

20

OBJECTS OF THE INVENTION

It is an object of the present invention, therefore, to provide a dispenser for use with stethoscope shields that dispenses shields in a sterile fashion.

It is a further object of the present invention to provide a dispenser for use with stethoscope shields that prevents direct contact between the user of the dispenser and the shields dispensed.

It is a further object of the present invention to provide a dispenser that houses
5 a plurality of shields and individually dispenses such shields for direct contact by a stethoscope head.

It is a further object of the present invention to provide a dispenser that dispenses individual shields from a roll of shields adhesively applied to a continuous backing.

10 It is a further object of the present invention to provide a dispenser that dispenses individual shields from a roll of shields adhesively applied to a continuous backing, such that the individual shield is dispensed with its adhesive side exposed in preparation for contact by a stethoscope head.

It is a further object of the present invention to provide a dispenser that
15 controllably guides a dispensed shield into a position that is readily capable of direct attachment to a stethoscope head.

It is a further object of the present invention to provide a dispenser that is easy to operate and easy to manufacture.

It is a further object of the present invention to provide a dispenser that enables
20 the quick application of a sanitary shield to the head of a stethoscope.

Still other objects and advantages of the invention will become clear upon review of the following detailed description in conjunction with the appended drawings.

SUMMARY OF THE INVENTION

A dispenser for dispensing stethoscope covers stored in a holding chamber. The covers are adhesively arranged on a continuous backing and are automatically, individually separated from such backing and dispensed into a discharge area as a
5 result of the continuous backing being withdrawn around a separating means from the dispenser, which separating means causes the covers to detach from the continuous backing. Each cover is dispensed into a discharge area with the adhesive portion facing upward in preparation for direct attachment to a stethoscope diaphragm.

BRIEF DESCRIPTION OF THE DRAWINGS

10 FIG. 1 is an exploded view of a dispenser in accordance with the teachings of the present invention.

FIG. 2 illustrates application of a stethoscope to a shield that has been ejected onto a discharge area of the dispenser of the present invention.

FIG. 3A is an exploded side view of the dispenser with the lower housing
15 partially cutaway illustrating a shield roll advancing through the dispenser in preparation for the dispensing of an individual shield from such roll.

FIG. 3B is the dispenser of FIG. 3A illustrating a shield being automatically separated from the roll.

FIG. 3C is the dispenser of FIG. 3A illustrating a shield fully dispensed from
20 the continuous backing.

FIG. 4 illustrates a mounting plate for mounting the dispenser of the invention to a surface.

FIG. 5 illustrates the mounting of a dispenser of the invention to a vertical wall surface.

FIG. 6 is a top view of the dispenser of the invention showing a finger cutout on the upper housing that exposes a cutting edge.

FIGS. 7-8 illustrate alternative embodiments of a body contact surface, i.e., transparent or opaque or the like, of shields usable with the dispenser of the present invention.

FIG. 9 illustrates the opposite, adhesive surface of a shield usable with the dispenser of the present invention.

FIGS. 10A-10C are three-dimensional illustrations of a shield of the invention as also shown in FIGS. 3A-3C being dispensed from a continuous backing.

FIG. 10D illustrates a dispensed shield of the invention retained in the discharge area between the upper and lower housings of the dispenser of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following detailed description is of the best mode or modes of the invention presently contemplated. Such description is not intended to be understood in a limiting sense, but to be an example of the invention presented solely for illustration thereof, and by reference to which in connection with the following description and the accompanying drawings one skilled in the art may be advised of the advantages and construction of the invention. In the various views of the drawings, like reference characters designate like or similar parts.

FIG. 1 is an exploded view of a dispenser 10 in accordance with the teachings of the present invention. Dispenser 10 comprises an upper housing 30 and a lower housing 50 capable of being snapped or otherwise joined together. A chamber or storage area 52 provided in the lower housing 50 is adapted to receive a plurality of

stethoscope shields 90. For purposes of explanation, such plurality will be illustrated in roll form 70 with the individual shields 90 being adhesively attached to a preferably continuous backing 72. It will, however, be understood by one skilled in the art that a plurality of shields may be dispensed from other than a roll, such as a stack or the like.

5 Each shield 90 preferably has a transparent front surface 93 (FIG. 7) or an opaque front surface 95 (FIG. 8), and an adhesive back surface 97 (FIG. 9) for attachment to the backing 72 (FIG. 1). The shield front surfaces are intended for contact with a patient, while the adhesive rear surfaces are intended for adhesive contact with the head of a stethoscope 100 (see FIG. 2). Each surface could also be
10 provided with logos, trademarks or other decorative printing that may designate the shield manufacture or use location. As shown in FIGS. 7-9, each shield 90 may be further provided with a central portion 92 and opposing edge portions 94 and 96, which edge portions will be described in detail later.

Returning to FIG. 1, upper housing 30 is provided with a cutout or window 32
15 through which is exposed a discharge area 54 provided on said lower housing 50 when said upper and lower housings are joined together. The discharge area 54 is adapted to receive an individually dispensed shield 90 (see FIGS. 2 and 10D) from the roll of shields 70 in preparation for direct contact by, and attachment to, a stethoscope 100 (see FIG. 2). The shield 90 is preferably dispensed with its adhesive side 97 exposed
20 (see FIGS. 2 and 10A-D). Discharge area 54 is provided with a discharge area surface 55 and a raised attachment projection 56 that assists with the adhesive attachment of the dispensed shield 90 to the diaphragm 102 and rim 104 of a stethoscope 100. Thus, since the diaphragm 102 of a stethoscope 100 tends to be recessed with respect to the outer rim 104, the raised projection 56 assures that application of a stethoscope head

100 to the adhesive side 97 of a shield 90 would result in the adhesive attachment of the shield 90 to both the diaphragm 102 and rim portion 104 of the stethoscope 100. Of course, the dispenser 10 of the present invention may be used even if a stethoscope is not equipped with a depressed diaphragm.

5 Lower housing 50 further comprises a separating member 60, around which the continuous backing 72 of the roll 70 of labels is wrapped, and an exit aperture 62 through which the continuous backing 72 extends. Thus, as shown in FIGS. 3A-3C, a pathway for the backing 72 is defined between the chamber 52 and exit aperture 62 preferably around the separating member 60. The exit aperture 60 is preferably
10 formed in the body of the lower housing 50 as shown, although an exit aperture could also be defined between top surface 64 (FIG. 1) and the upper housing 30 when the upper and lower housings 30, 50 are engaged together (FIG. 2) to form the dispenser
10.

Operation of the dispenser 10 is clearly illustrated in FIGS. 3A-3C and FIGS.
15 10A-10D. First, as shown in FIG. 1 with the upper housing 30 separated from the lower housing 50, a roll 70 of shields 90 is placed in the chamber 52 of the lower housing 50. The chamber 52 illustrated in the figures is configured and dimensioned to accommodate a plurality of shields 90 in roll form. However, it will be understood that such chamber 52 may be dimensioned to accommodate shield pluralities of other
20 configurations as well, such as a stack and the like.

After the roll 70 is placed in the chamber 52, as shown in FIGS. 3A and 10A, an initial or leading portion of a backing sheet 72, preferably without shields 90 attached thereto, is threaded through the dispenser 10 such that the sheet 72 extends around the separator member 60 and through the exit aperture 62. After threading the

sheet 72 through the dispenser 10, the upper housing 30 is preferably attached to the lower housing 50 as shown in FIG. 2. For purposes of illustration, however, the operation of the dispenser 10 as depicted in FIGS. 3A-3C and FIGS. 10A-10D is shown with the upper housing 30 separated from the lower housing 50, although during operation the housings will preferably be attached together.

As shown in FIGS. 3A-3C and FIGS. 10A-10D, covers 90 are dispensed from the dispenser 10 by pulling on the free end 74 of the backing sheet 72. Pulling on the backing sheet 72 is usually accompanied by firmly gripping or otherwise holding the upper housing 30 of the dispenser 10 while the dispenser is situated on a planar surface or the like, such that a pull on the backing sheet does not translate into a rearward movement of the dispenser. If the dispenser 10 were mounted to a substantially horizontal surface, then it would not be necessary to grip either upper or lower housing 30,50 during operation of the dispenser. Of course, the dispenser 10 could also be held completely by a medical professional, either by gripping the upper housing 30, lower housing 50, or both.

As shown in FIGS. 3A and 10A, passage of the continuous backing 72 around the separator 60 causes a single shield 90 to peel off and detach from the continuous backing 72 and enter the discharge area 54, such that the shield 90 extends into the area 54 with its adhesive side 97 (FIG. 9) facing upward and its non-adhesive side 93,95 (FIGS. 7 and 8) facing the surface 55 of the discharge area 54. The shield 90 detaches from the backing 72 in a direction that is tangential to the initial movement of the backing 72 up and around the separator member 60. The adjacent positioning of the separator member 60 with respect to the discharge area 54 and the manner in which the continuous backing 72 is withdrawn from the dispenser 10 through the exit

aperture 62 results in the movement of the shield 90 toward the discharge area 54 and away from the exit aperture 62. In other words, in the embodiments shown in FIGS. 3A-3C and FIGS. 10A-10C, pulling of the continuous backing 72 in one direction causes a shield 90 to be dispensed in the opposite direction. In alternative 5 embodiments not shown, the pathway of the continuous backing may be defined such that the shield 90 is discharged in a direction that is perpendicular or at an angle to the withdrawal of the backing 72 through the exit aperture 62.

As illustrated in FIGS. 3B-3C and FIGS. 10B-10C, a continued pull on the free end 74 of the continuous backing 72 causes the shield to progress farther into the 10 discharge area 54. As shown in FIG. 10D, the dispensed shield 90 is guided into the discharge area 54 by grooves 66, 68 defined between the engagement of the upper 30 and lower housing 50 on either side of the discharge area 54. Such grooves 66, 68 preferably narrow, i.e., the engagement between the upper and lower housings 30, 50 tightens or becomes closer, toward the end 57 of the discharge area surface 55 in order 15 to better retain the edges 94,96 (see also FIGS. 7-9) of the shield 90. Of course, while such grooves 66,68 are formed between the upper and lower housings as shown, separate grooves can be fashioned into either the upper housing 30 or the lower housing 50 in order to accommodate the edges 94,96 and achieve the desired guiding and retaining function. Furthermore, each shield 90 is dispensed in a substantially flat 20 orientation with the adhesive side 97 of the shield 90 exposed or facing upward as shown.

Once the individual shield 90 is fully detached from the continuous backing 72 as shown in FIGS. 2, 3C, 10C, 10D, and held in the discharge area 54 by virtue of the grooves 66,68, a medical professional as shown in FIG. 2 merely has to press the head

100 of a stethoscope against the exposed adhesive side 97 of the dispensed shield 90 to apply the shield 90 to the stethoscope. The discharge area 56, and in particular the opening 32 in the upper housing 30 that helps to define the discharge area 56 when the upper and lower housings 30,50 are joined together, should be appropriately
5 dimensioned to accommodate the head of a stethoscope. A firm pressure against the shield 90 and discharge area surface 55 causes the adhesive side 97 of the shield 90 to adhere to the rim 104 and preferably the diaphragm 102 of the stethoscope head 100, after which the stethoscope can be withdrawn from the dispenser 10 with the shield or cover 90 adhered thereto. The raised portion 56 on the discharge area surface 55
10 facilitates adherence of the central portion of the shield 90 to a recessed stethoscope diaphragm 102 (see FIG. 2). It is therefore important that the shield 90 is dispensed with its adhesive side 97 facing upward and its non-adhesive side 93 facing the discharge area surface 55 so that the shield 90 can be easily removed from the discharge area 54. If the adhesive side 97 were facing toward the discharge area
15 surface 55, the shield 90 would either stick to such surface 55 or it would become necessary to manually remove and adhere the shield 90 to the stethoscope, which would undoubtedly contaminate the shield 90.

Thus, by using the dispenser 10 of the invention, a shield 90 may be completely applied to a stethoscope head 100 without contact of the shield 90 by the
20 hands of a medical professional. After a stethoscope is fitted with a shield 90 and such shield 90 is used to examine a patient, the medical professional can merely remove the shield 90 from the stethoscope and dispose of the shield 90 in accordance with proper sanitary procedures. After an individual shield 90 is dispensed and withdrawn from the dispenser 10, the medical professional merely has to pull on the

continuous backing 72 to dispenser another individual shield 90 located on the roll 70. With the shields 90 disposed on the backing sheet 72 in a spaced apart relationship as shown, individual shields 90 may be dispensed one at a time until the roll 70 is exhausted. As particularly illustrated in FIG. 3C, after an individual shield 90 has
5 been fully detached from the backing sheet 72 and dispensed into the discharge area 54, another shield 90 becomes positioned adjacent the separator member 60 in anticipation of being detached from the backing 72 and dispensed into the empty discharge area 54.

The grooves 66,68 alongside the discharge area 54 are preferred in the
10 dispenser embodiment as illustrated for several reasons. First, because the shields 90 are dispensed from a roll 70, the shields 90 have a tendency to curl upon detachment from the continuous backing 72. Such curling is heightened toward the end of the roll. Curling of a dispensed shield 90 is diminished or restrained by the guided shield edge portions 94,96 extending through the grooves 66,68. The grooves 66,68 also
15 tend to keep the shield 90 centered in the discharge area 54, thereby facilitating application of a stethoscope head 100 by a medical professional. Furthermore, as shown in FIGS. 4-5, if the dispenser 10 were mounted to a wall 112 via a mounting plate 110 and mounting means 115 extending through the bottom 51 of the lower housing 50, the grooves 66,68 would help retain a dispensed shield 90 within the
20 discharge area 54 and prevent such shield 90 from falling away from the discharge area 54.

As noted above, while a roll of shields 90 is illustrated for purposes of explanation, other means of retaining the shields on a continuous backing may be used. For example, a plurality of shields may be adhered to a stack (not shown)

comprised of individual backing sheets separated by bends or perforations, in which case the chamber might have a square or rectangular configuration (not shown). In such a situation, it might not be necessary to employ grooves alongside the discharge area as a retaining means since the shields will not have a tendency to curl upon
5 detachment from the backing sheet. Similarly, if the dispenser is only going to be used on a substantially horizontal surface, such as a table or the like, then it might not even be necessary to equip such stacked shields with edge portions 94,96. Of course, such edge portions would be preferable with any shield configuration, not only for being guided within the discharge area, but also to facilitate removal of the shield
10 from a stethoscope by a medical professional.

Regardless of how shields 90 are disposed on a continuous backing 72, the presence of such backing exiting through the aperture 62 of the dispenser 10 upon dispensing several shields 90 may be significant. At such time, it is usually preferable to cut the backing 72 to a more manageable length. However, as shown in FIG. 6, the
15 dispenser 10 may be provided with a cutting edge 65 on the lower housing 50 to facilitate the downward tearing of the used backing sheet 72 from the dispenser 10. Thus, instead of cutting excess backing 72, which requires the use of an extra cutting tool, it might be expedient to merely tear the excess backing 72 using a straight edge 65. In such a situation, it might be necessary to support the backing 72 during the
20 tearing, since a downward tear on the backing 72 may be accompanied by a withdrawal of the backing from the dispenser and result in an unwanted dispensing of a stethoscope shield through the operation illustrated in FIGS. 3A-3C and FIGS. 10A-10D. Consequently, the backing 72 near the exit aperture 62 can be held in place during tearing of the backing from the dispenser by pinching the upper and lower

housings 30,50 together near the exit aperture 62, or by pressing downward on the backing before the exit aperture 62 through an access opening 34 (FIG. 6) in the upper housing 30.

While the present invention has been described at some length and with some
5 particularity with respect to the several described embodiments, it is not intended that it should be limited to any such particulars or embodiments or any particular embodiment, but it is to be construed with references to the appended claims so as to provide the broadest possible interpretation of such claims in view of the prior art and, therefore, to effectively encompass the intended scope of the invention.

CLAIMS

I claim:

1. A dispenser comprising:
 - a) a chamber adapted to receive a plurality of covers disposed on a continuous backing, each cover having an adhesive portion for removably attaching said cover to said continuous backing,
 - b) a pathway extending from said chamber and terminating in an exit aperture, said pathway adapted for the transmission of said continuous backing through said dispenser and said exit aperture,
 - c) a separating means for causing a cover of said plurality to detach from said continuous backing when said continuous backing is withdrawn through said exit aperture, and
 - d) a discharge area adapted to individually receive a detached cover from said plurality with said adhesive portion being exposed.
2. A dispenser in accordance with claim 1, wherein said discharge area is disposed on one end of said dispenser and said exit aperture is disposed on the opposite end of said dispenser.
3. A dispenser in accordance with claim 1, wherein said separating means is configured to separate a cover of said plurality into said discharge area in a direction opposite said withdrawal of said continuous backing through said exit aperture.
4. A dispenser in accordance with claim 1, wherein said discharge area further comprises an entry and a terminus and a guide means for guiding the movement of said detached cover into said discharge area from said entry to said terminus.

5. A dispenser in accordance with claim 4, wherein said guide means further comprise slots positioned along opposite sides of said discharge area into which portions of said detached cover proceed.

6. A dispenser in accordance with claim 5, wherein said slots are more
5 restrictive at the terminus than at the entry of said discharge area.

7. A dispenser in accordance with claim 1, wherein said discharge area further comprises a discharge surface and a round projection centrally disposed on said discharge surface.

8. A dispenser in accordance with claim 1, further comprising a cutting
10 member disposed near said exit aperture for cutting excess backing extending through said exit aperture.

9. A dispenser in accordance with claim 8, further comprising an access opening disposed near said exit aperture for allowing access to backing that has yet to be withdrawn through said exit aperture.

10. A dispenser in accordance with claim 1, wherein said separating means is
15 disposed adjacent said discharge area.

11. A dispenser in accordance with claim 10, wherein said separating means forms a bend in said pathway.

12. A dispenser in accordance with claim 1, further comprising a plurality of
20 covers disposed within said chamber.

13. A dispenser in accordance with claim 12, wherein said plurality of covers are arranged in a roll.

14. A dispenser comprising:

a) a chamber,

- b) a plurality of covers disposed in said chamber and removably arranged on a continuous backing,
- c) a pathway extending from said chamber and terminating in an exit aperture, said pathway adapted for the transmission of said
5 continuous backing through said dispenser and said exit aperture,
- d) a separating member for causing a cover of said plurality to detach from said continuous backing when said continuous backing is withdrawn through said pathway and exit aperture, and
- e) a discharge area adapted to individually receive a detached cover
10 from said plurality with said adhesive portion being upwardly exposed.

15 15. A dispenser in accordance with claim 14, wherein said discharge area is disposed on one end of said dispenser and said exit aperture is disposed on the opposite end of said dispenser.

- 15 16. A dispenser in accordance with claim 14, wherein said separating member is configured to individually separate a cover of said plurality into said discharge area in a direction opposite said withdrawal of said continuous backing through said exit aperture.

- 20 17. A dispenser in accordance with claim 14, wherein said discharge area further comprises an entry and a terminus and a guide means for guiding the movement of said detached cover into said discharge area in the direction from said entry to said terminus.

18. A dispenser in accordance with claim 14, wherein said discharge area further comprises a discharge surface and a round projection centrally disposed on said discharge surface.

19. A dispenser in accordance with claim 14, further comprising a cutting member disposed near said exit aperture for cutting excess backing extending through said exit aperture.

20. A dispenser in accordance with claim 14, further comprising an upper housing and a lower housing, said chamber and pathway being disposed between said upper and lower housings.

21. A dispenser in accordance with claim 14, wherein said separating member is disposed adjacent said discharge area.

22. A dispenser in accordance with claim 14, wherein said separating member forms a bend in said pathway.

23. A dispenser in accordance with claim 14, wherein said plurality of covers are arranged in a roll.

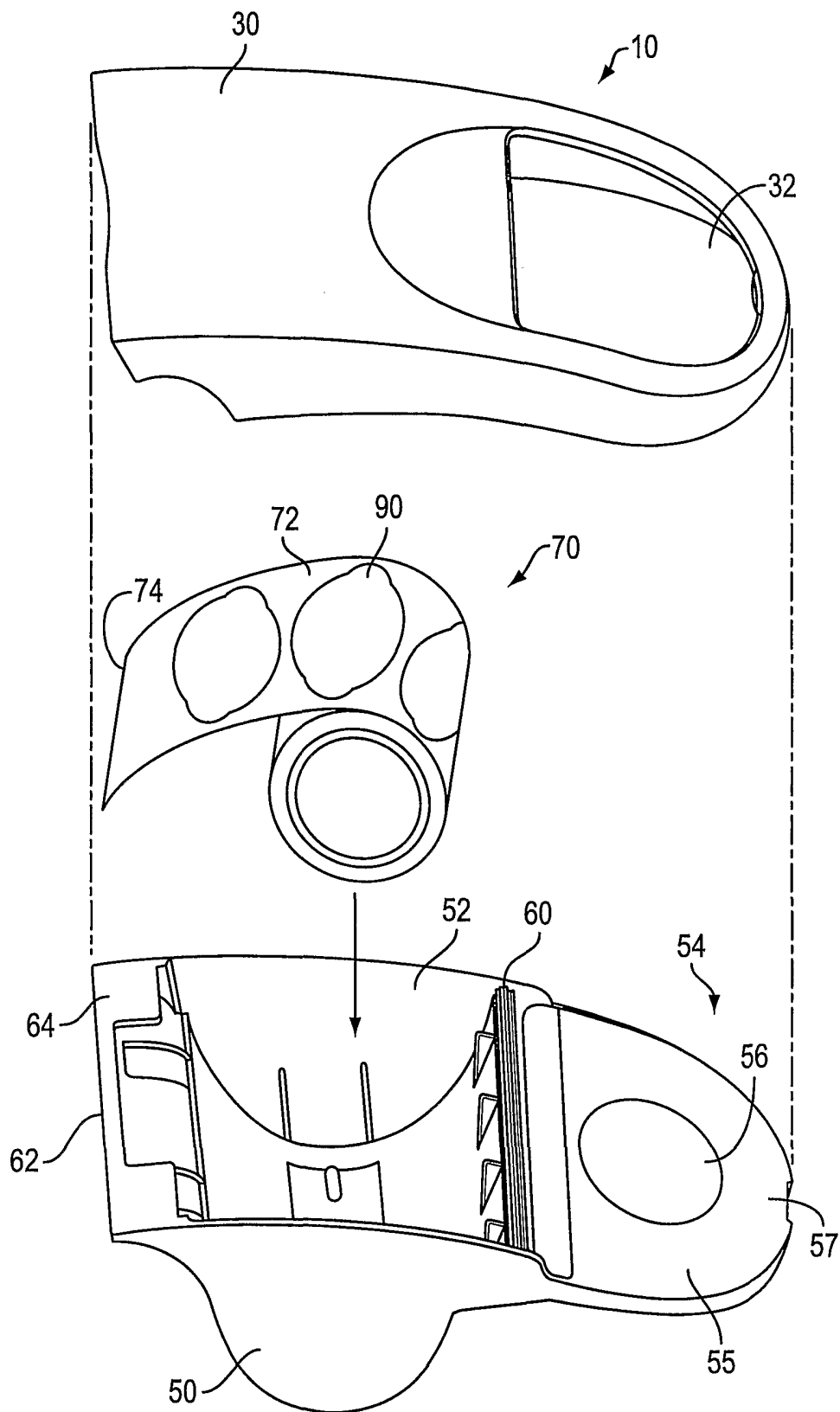


FIG. 1

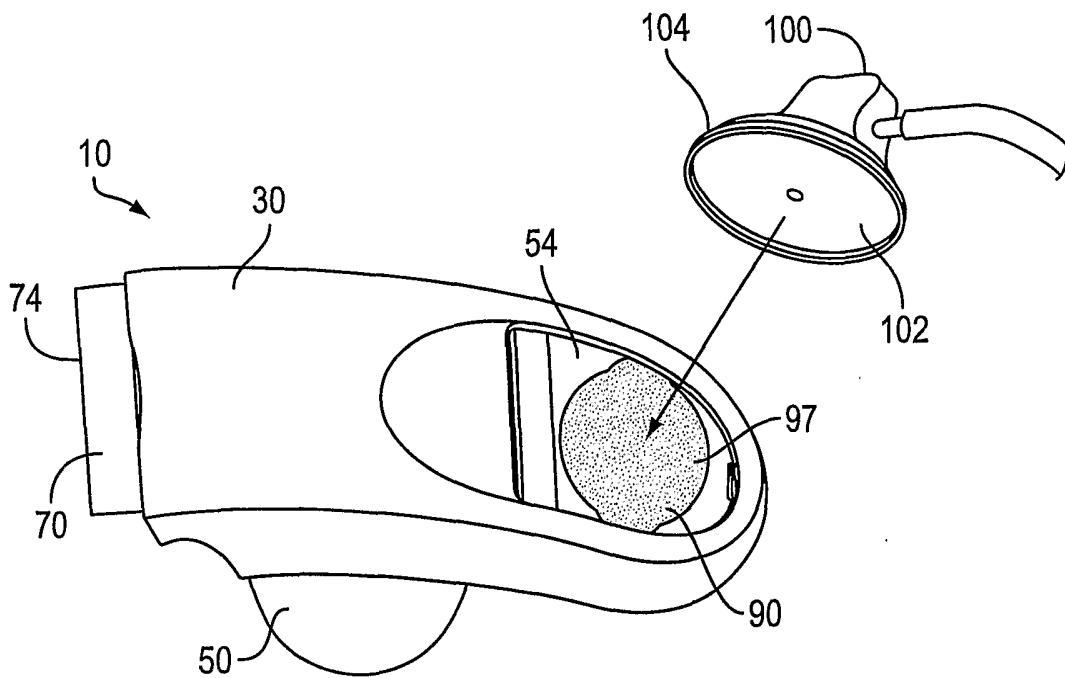


FIG. 2

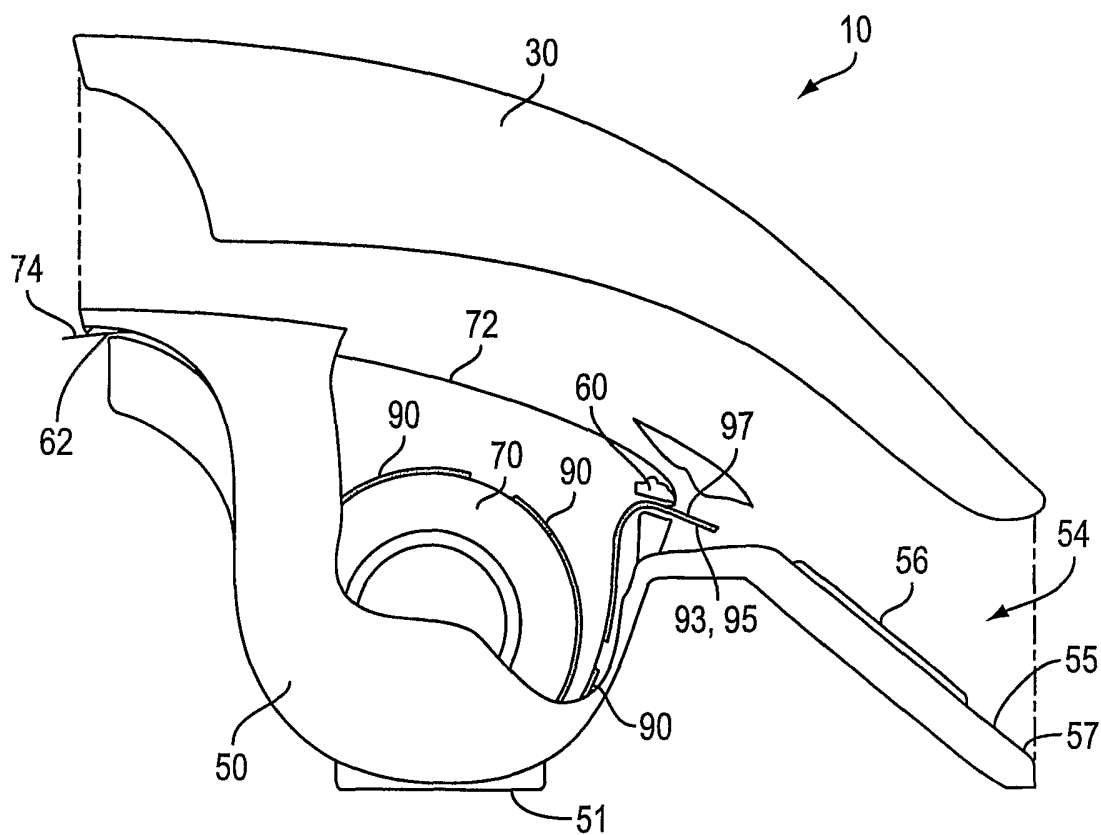


FIG. 3A

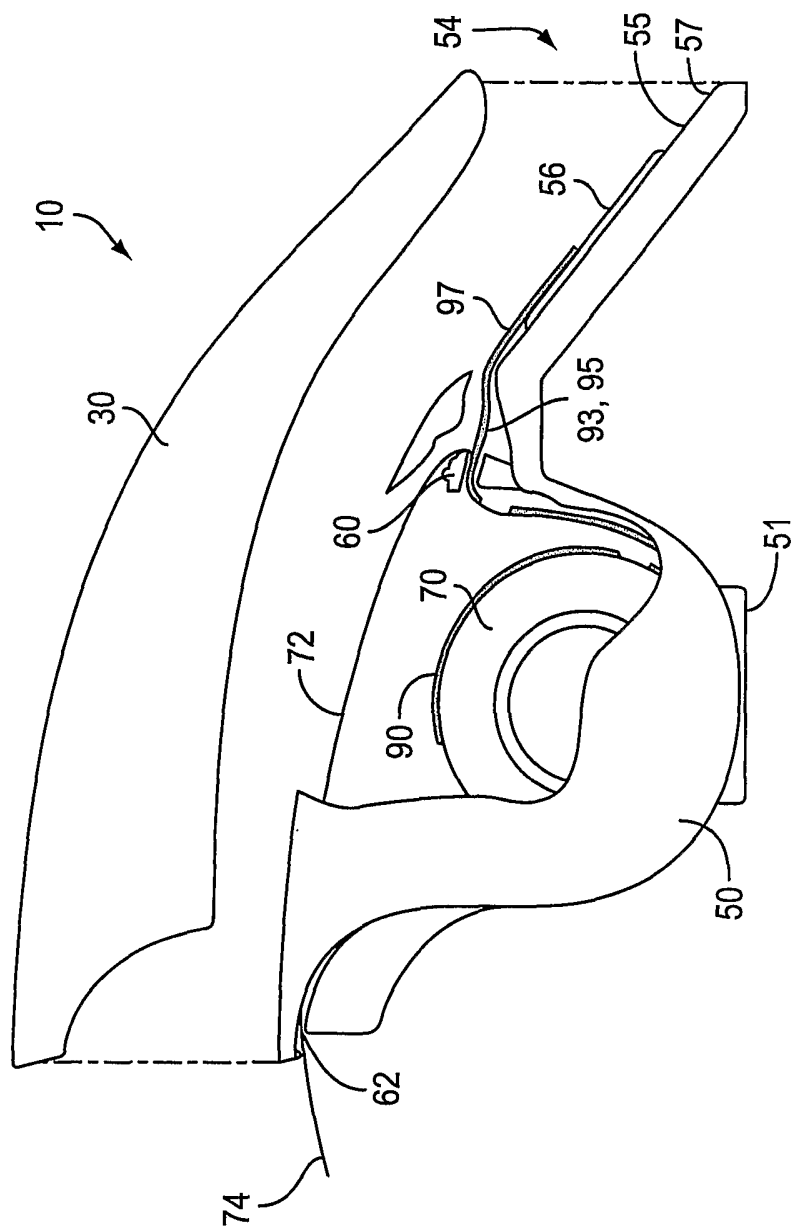


FIG. 3B

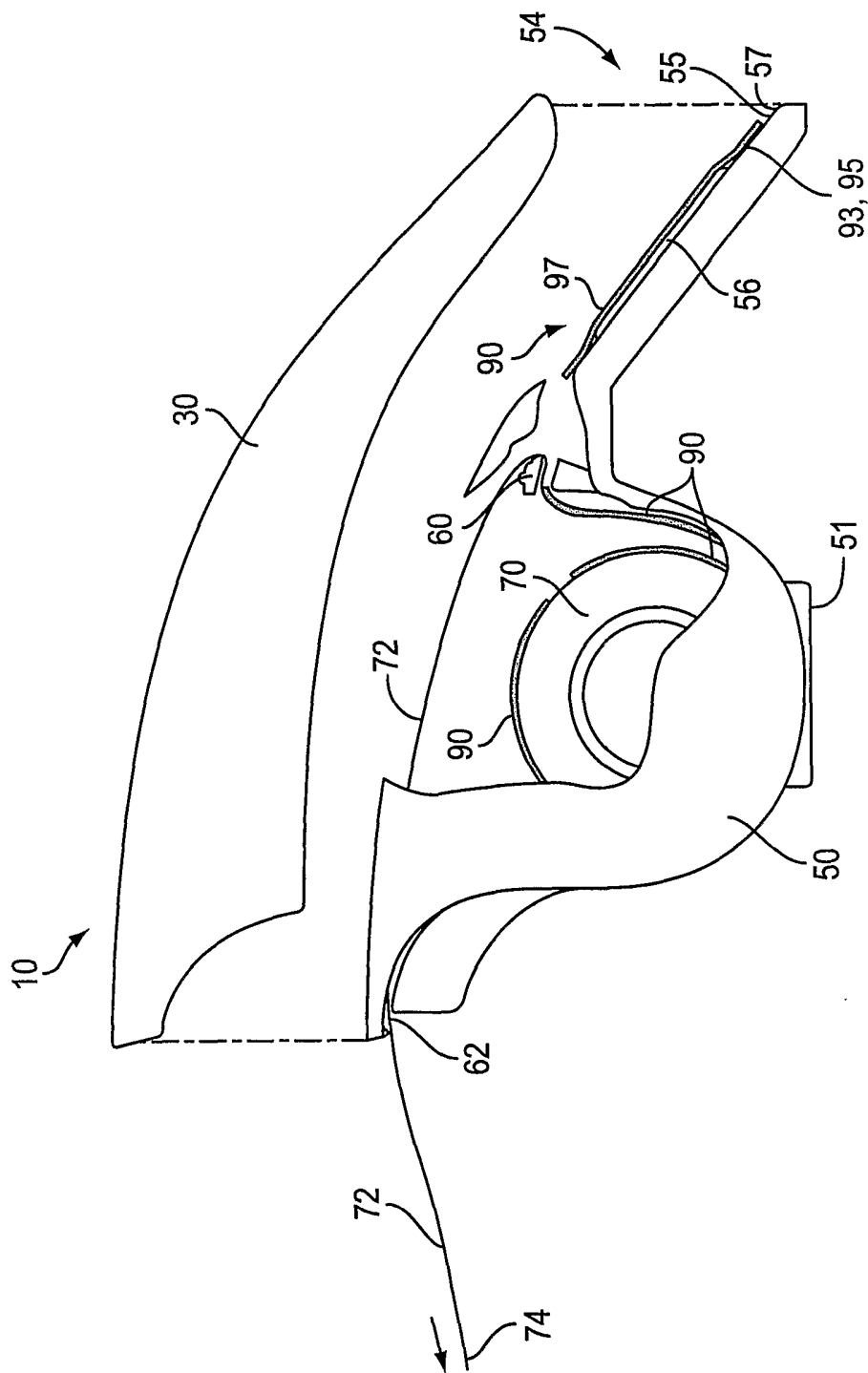


FIG. 3C

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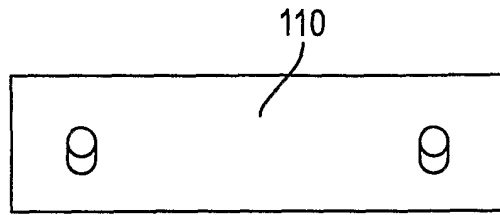


FIG. 4

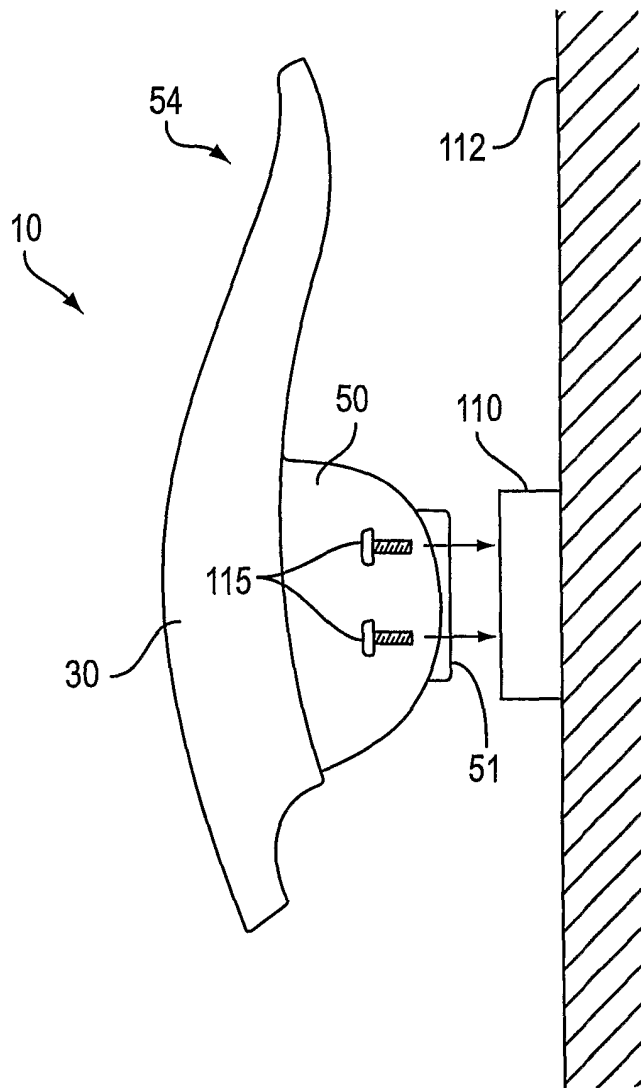


FIG. 5

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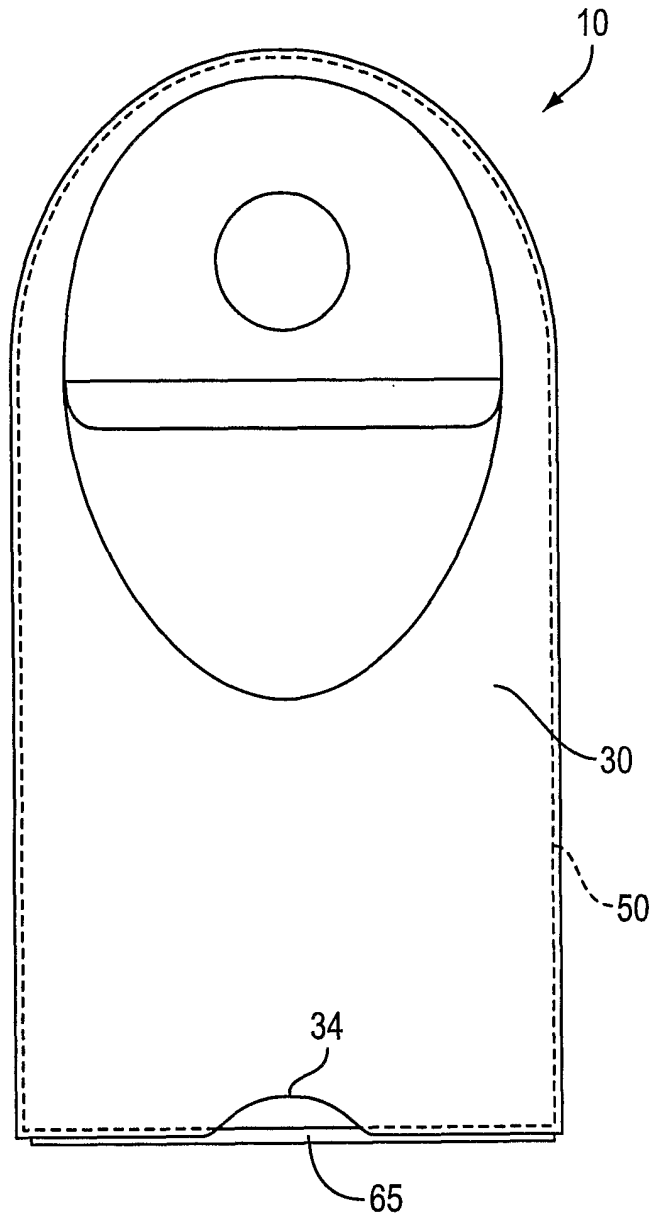


FIG. 6

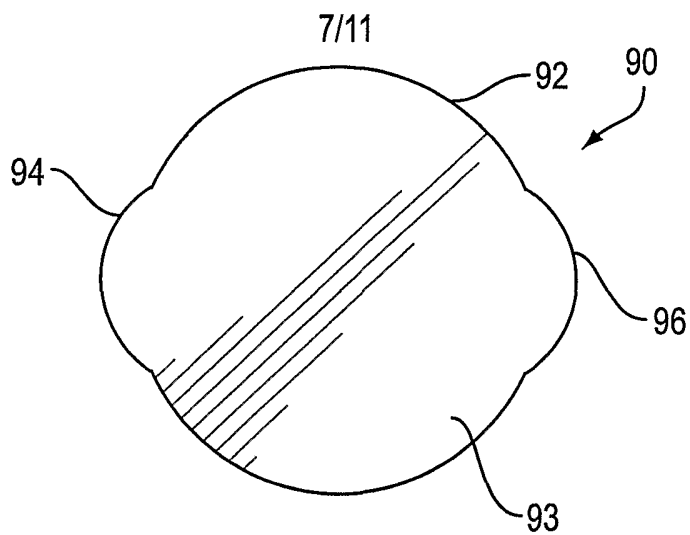


FIG. 7

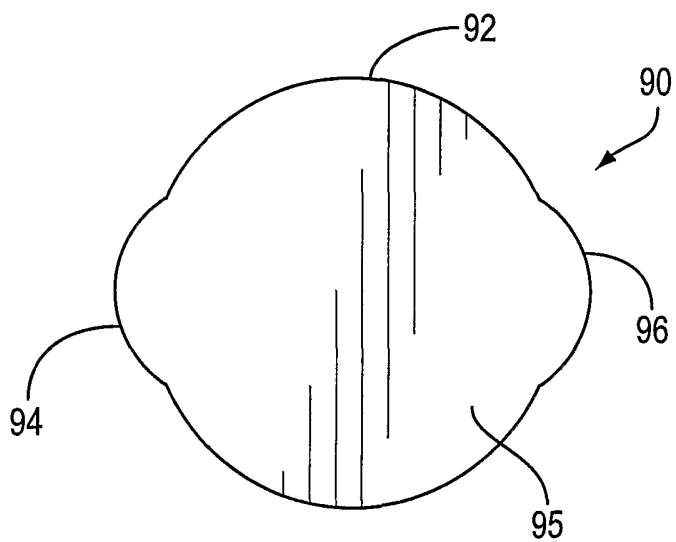


FIG. 8

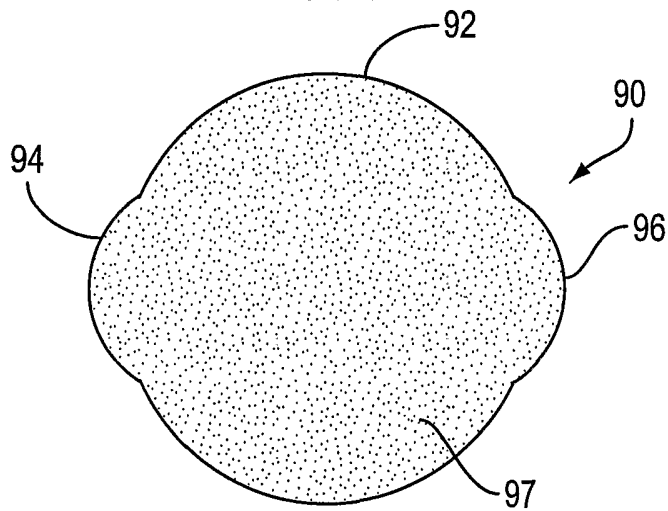


FIG. 9

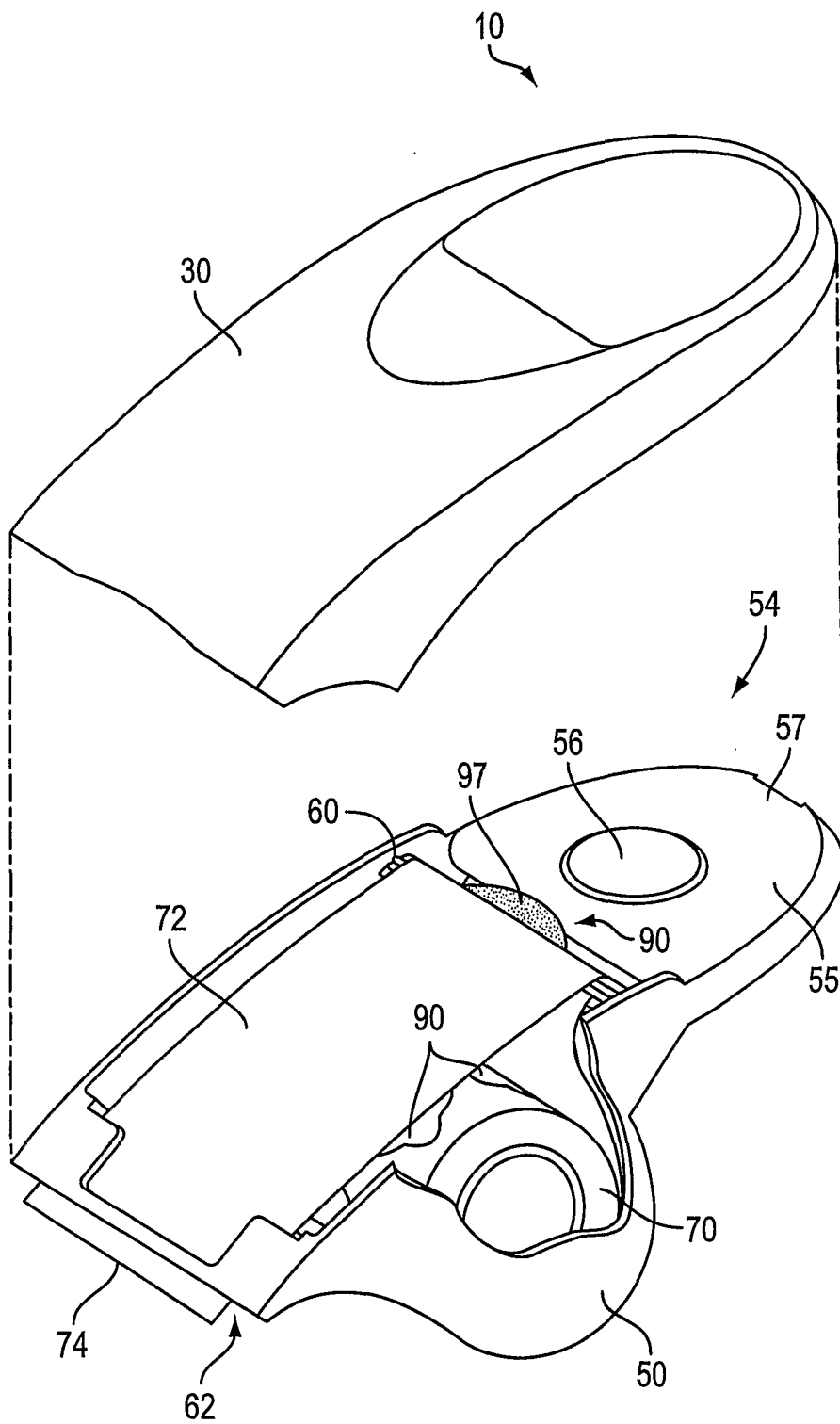


FIG. 10A

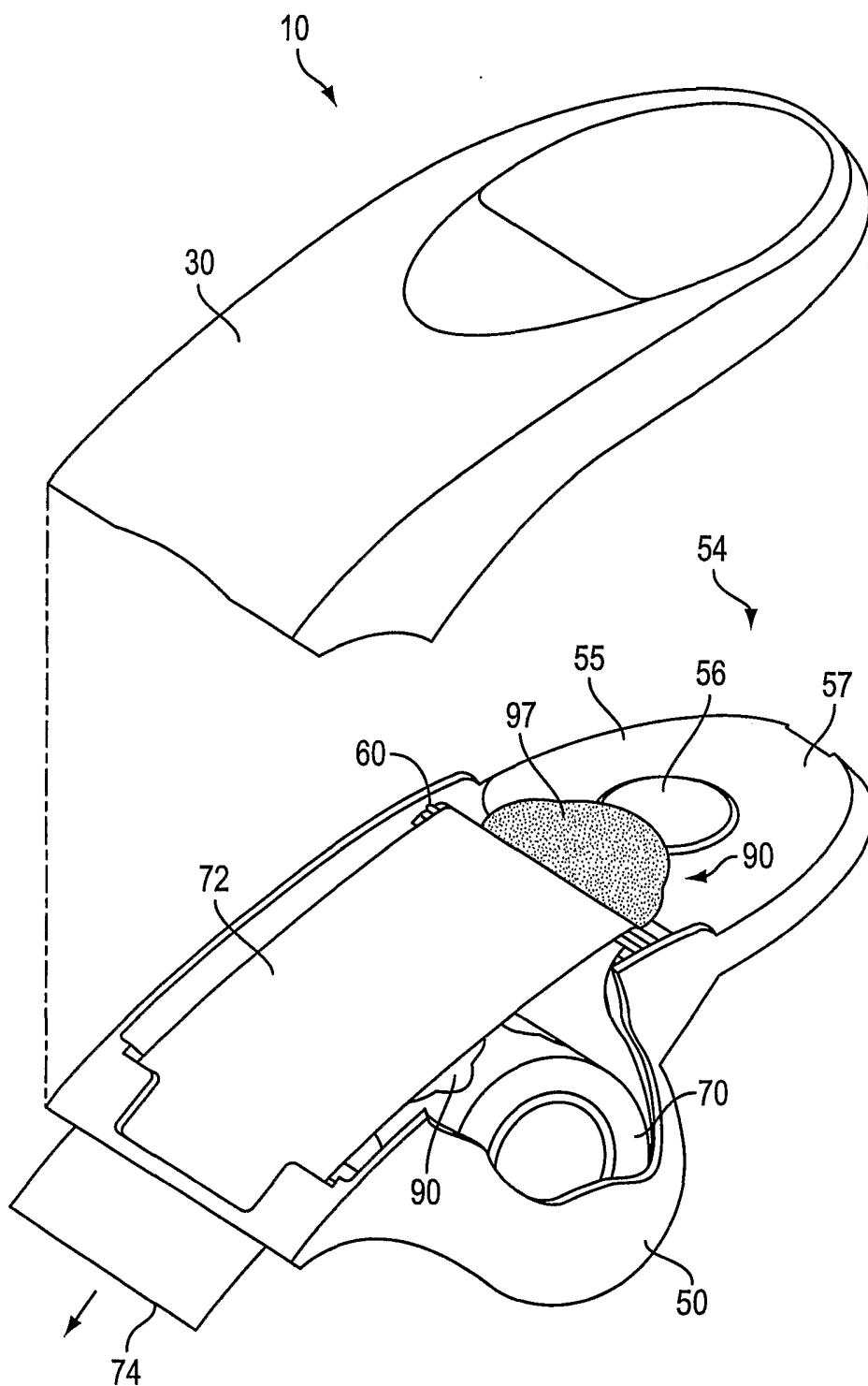


FIG. 10B

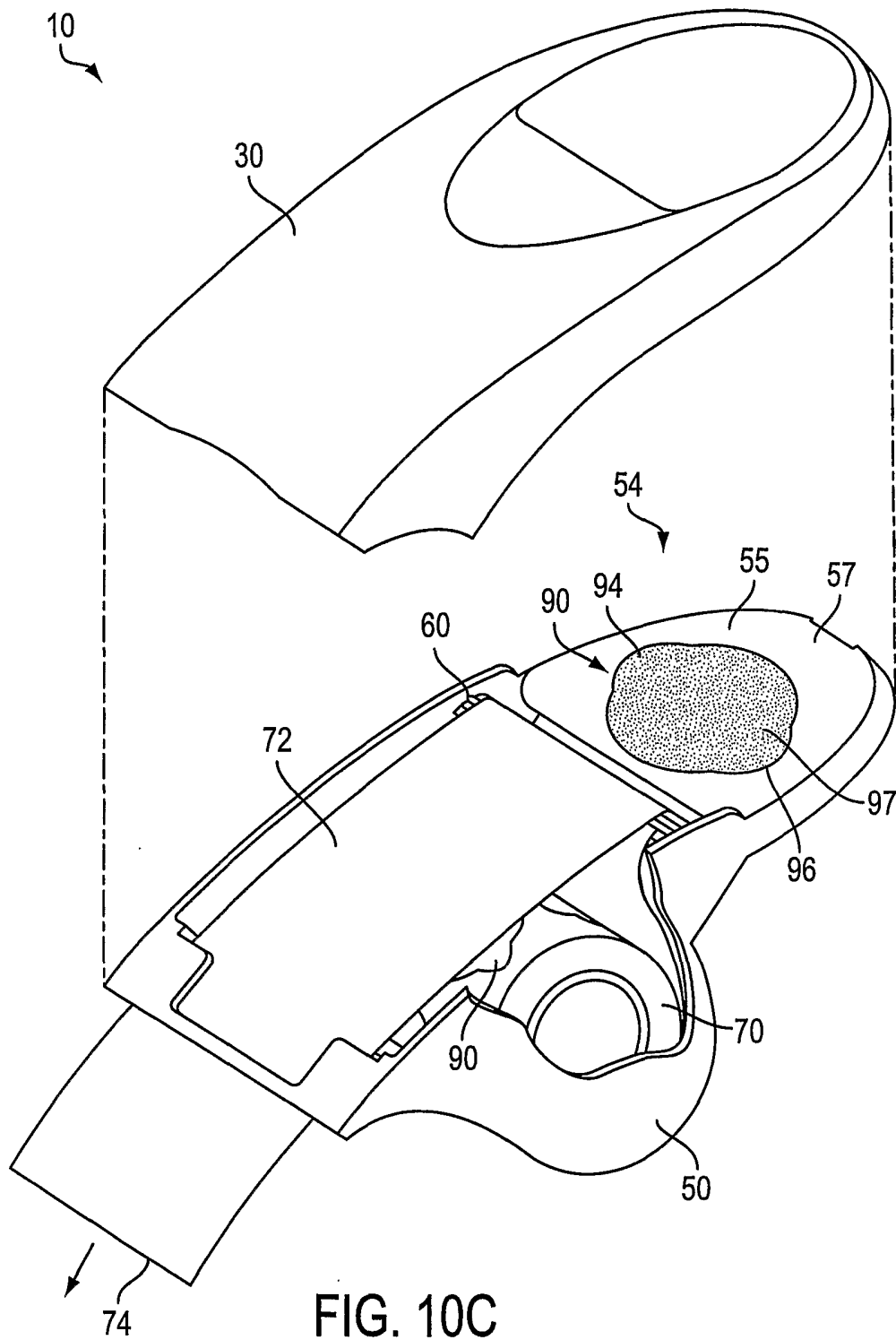


FIG. 10C

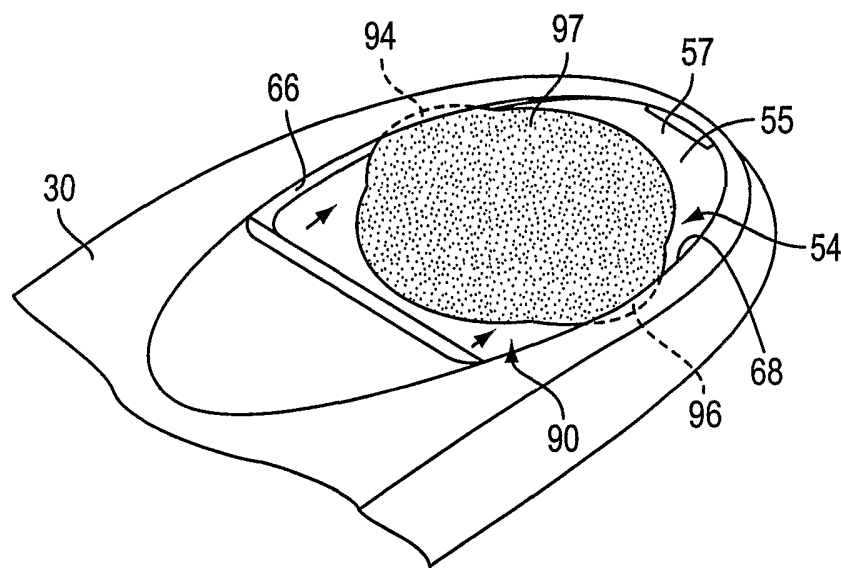


FIG. 10D

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/10920

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) :B65H 1/00

US CL :221/33,45

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 221/33,45, 48, 63 ; 600/528

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,564,431 (SEWARD) 15 October 1996 (15.10.96), See the entire document.	1-23

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 06 JUNE 2001	Date of mailing of the international search report 26 JUL 2001
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