

Sept. 2, 1958

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2,849,848

STOPPER-APPLYING MACHINES

Filed Dec. 7, 1953

3 Sheets-Sheet 1

FIG. 1.

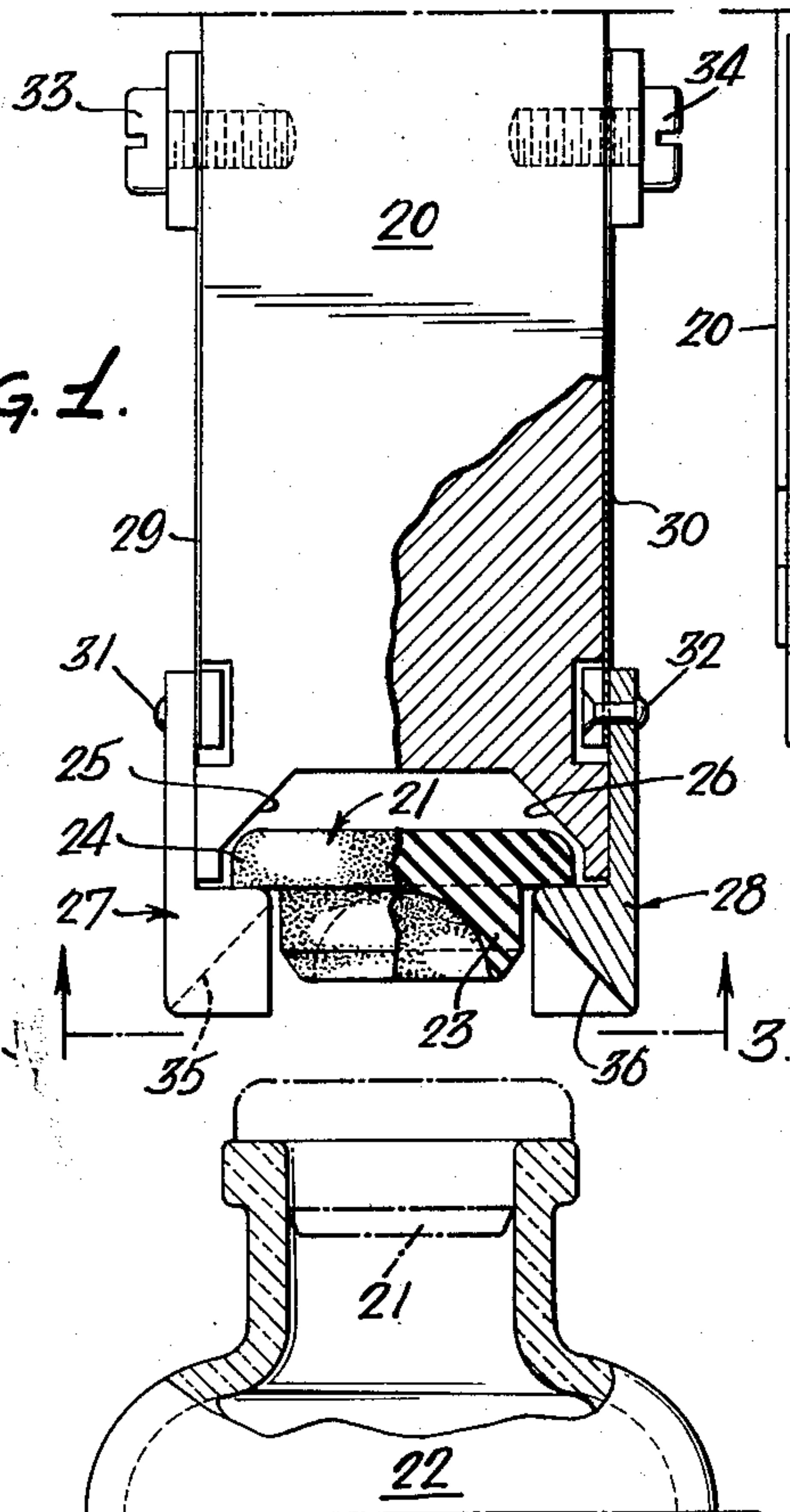


FIG. 2.

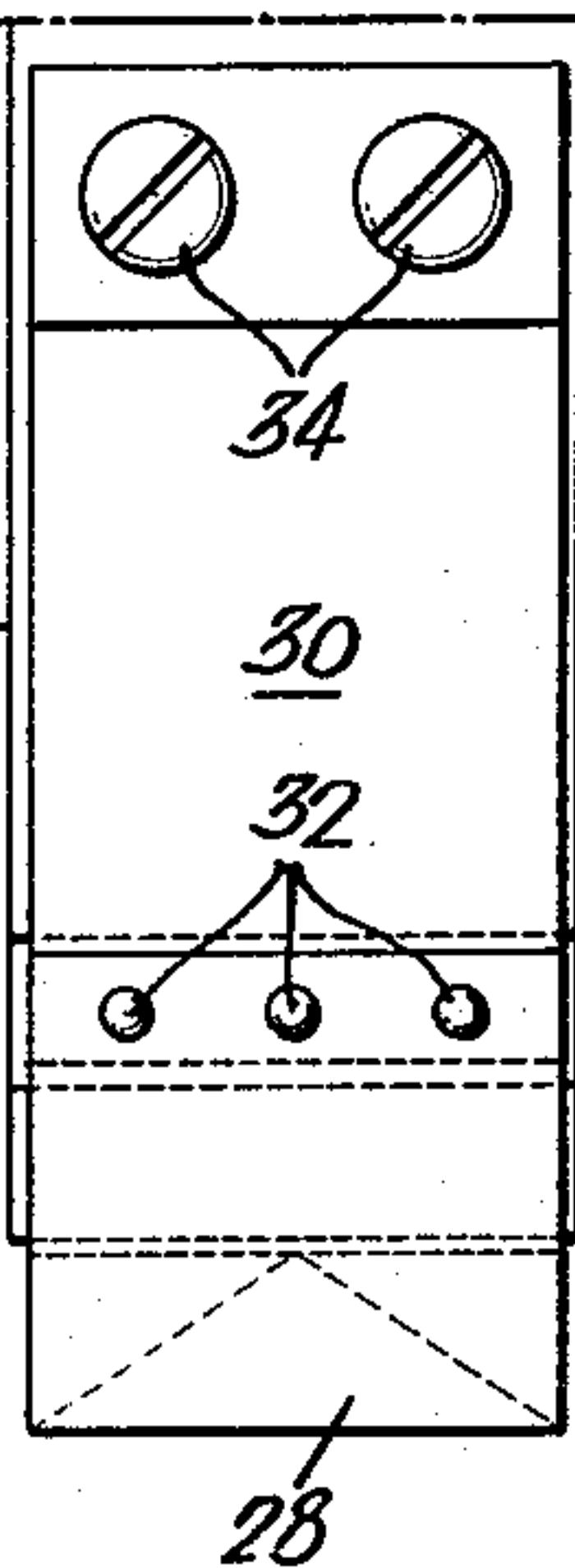


FIG. 3.

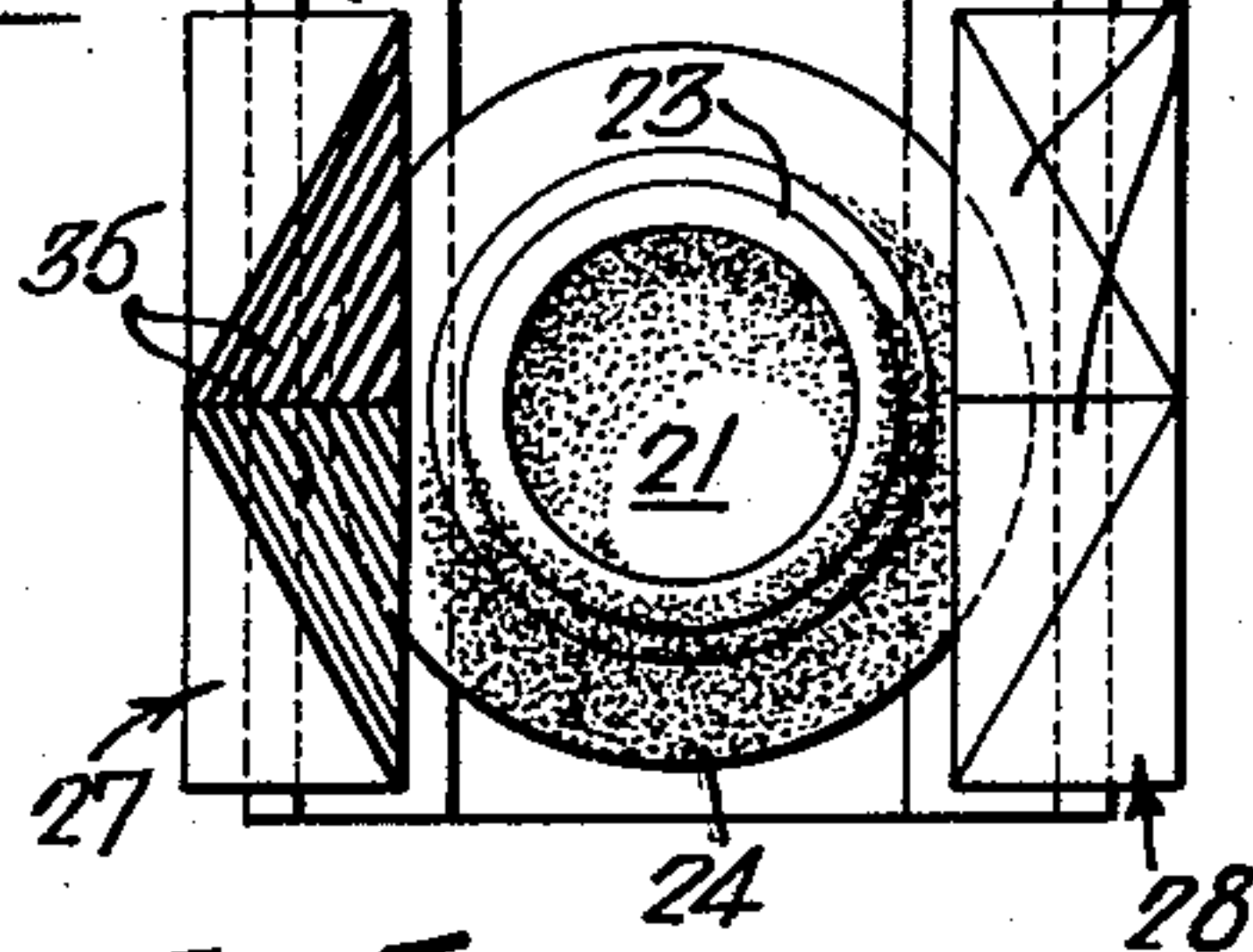


FIG. 5.

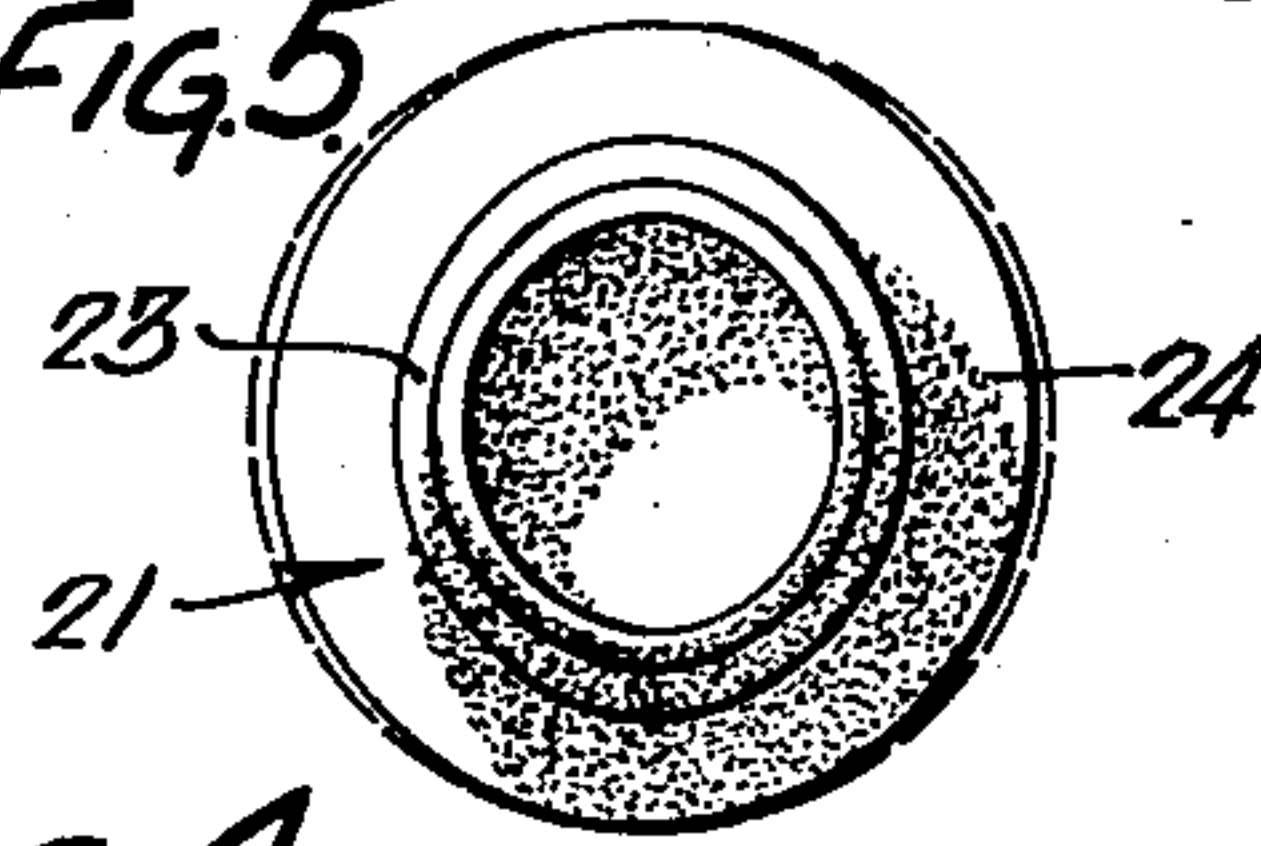


FIG. 4.

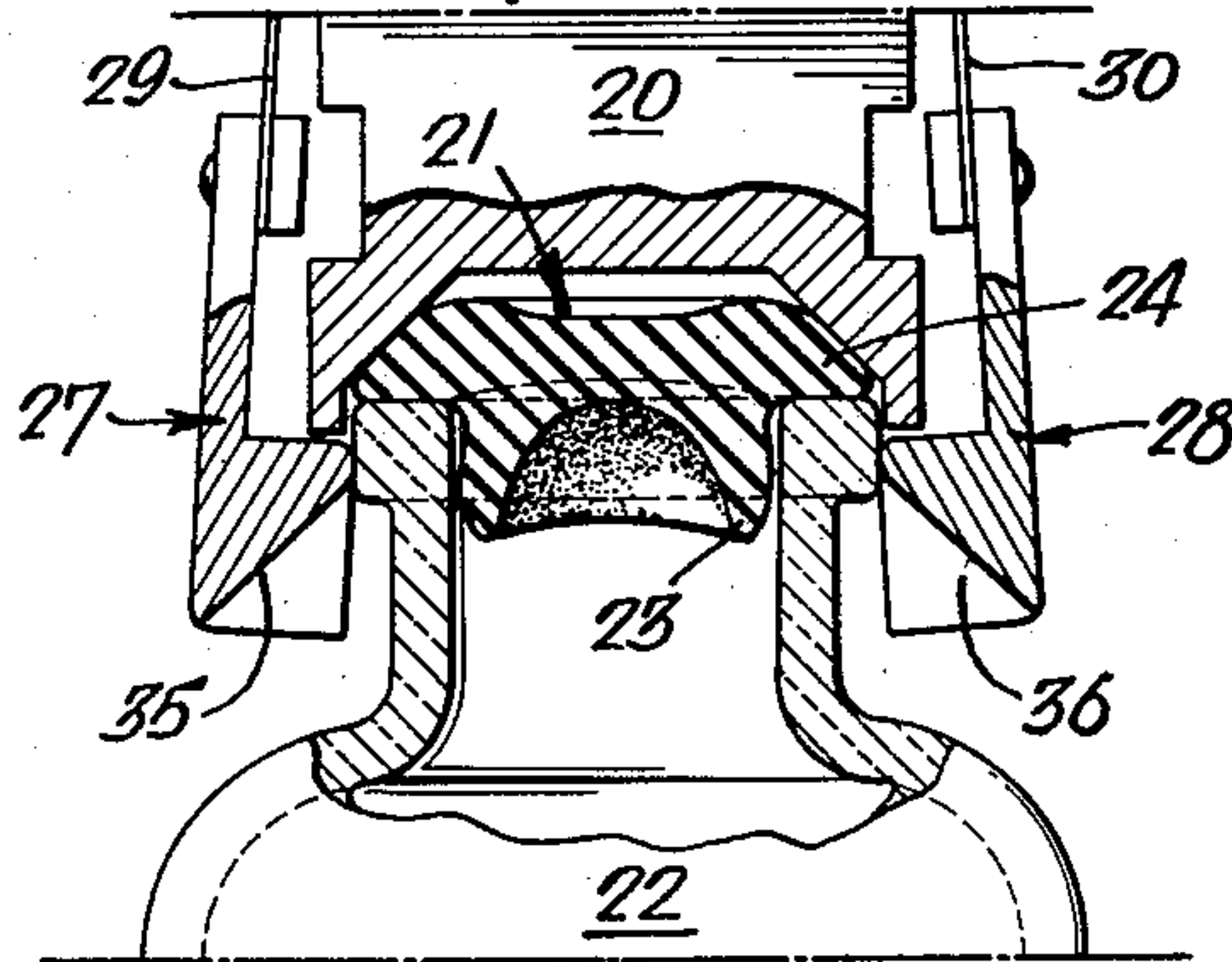


FIG. 8.

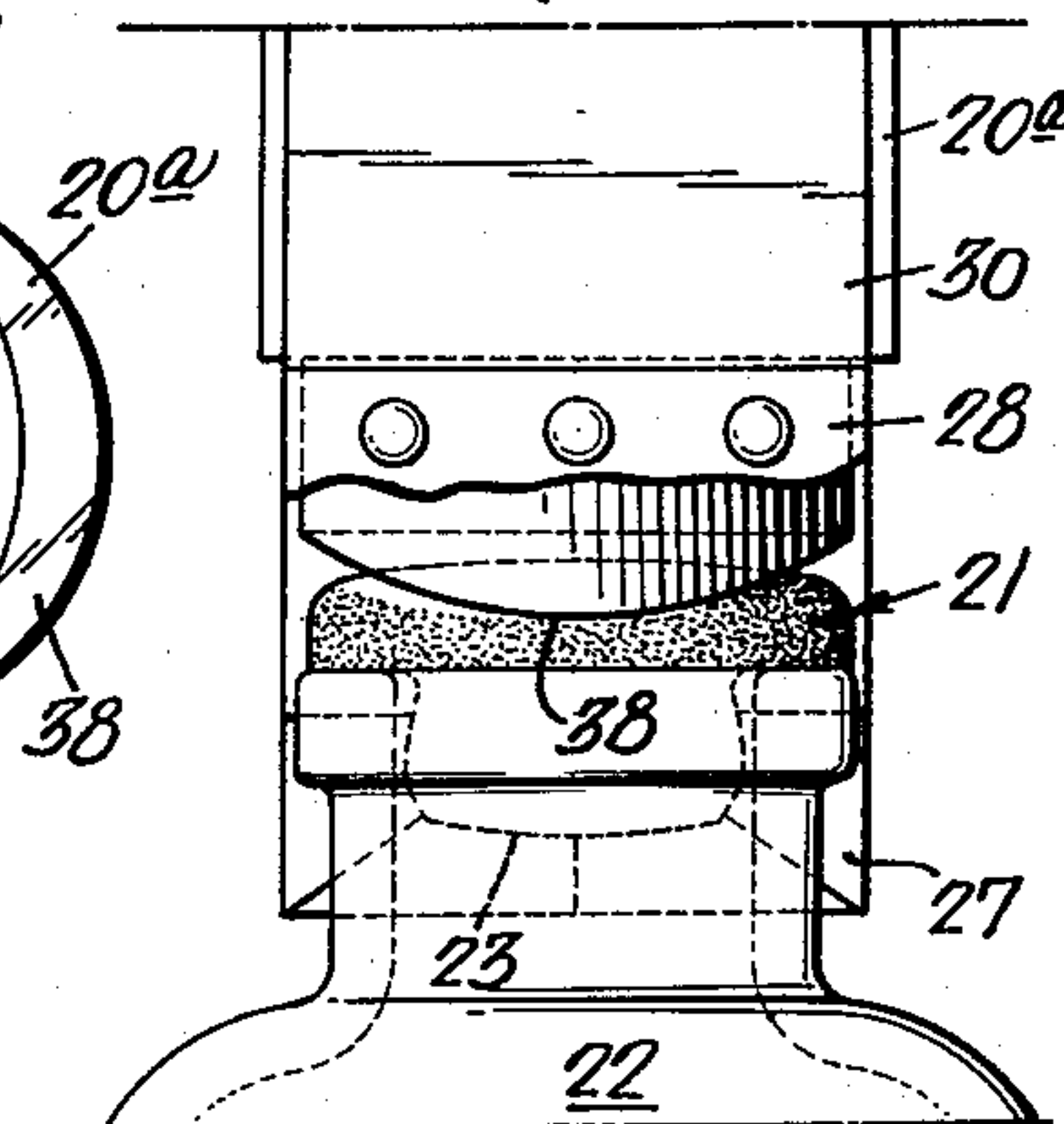


FIG. 6.

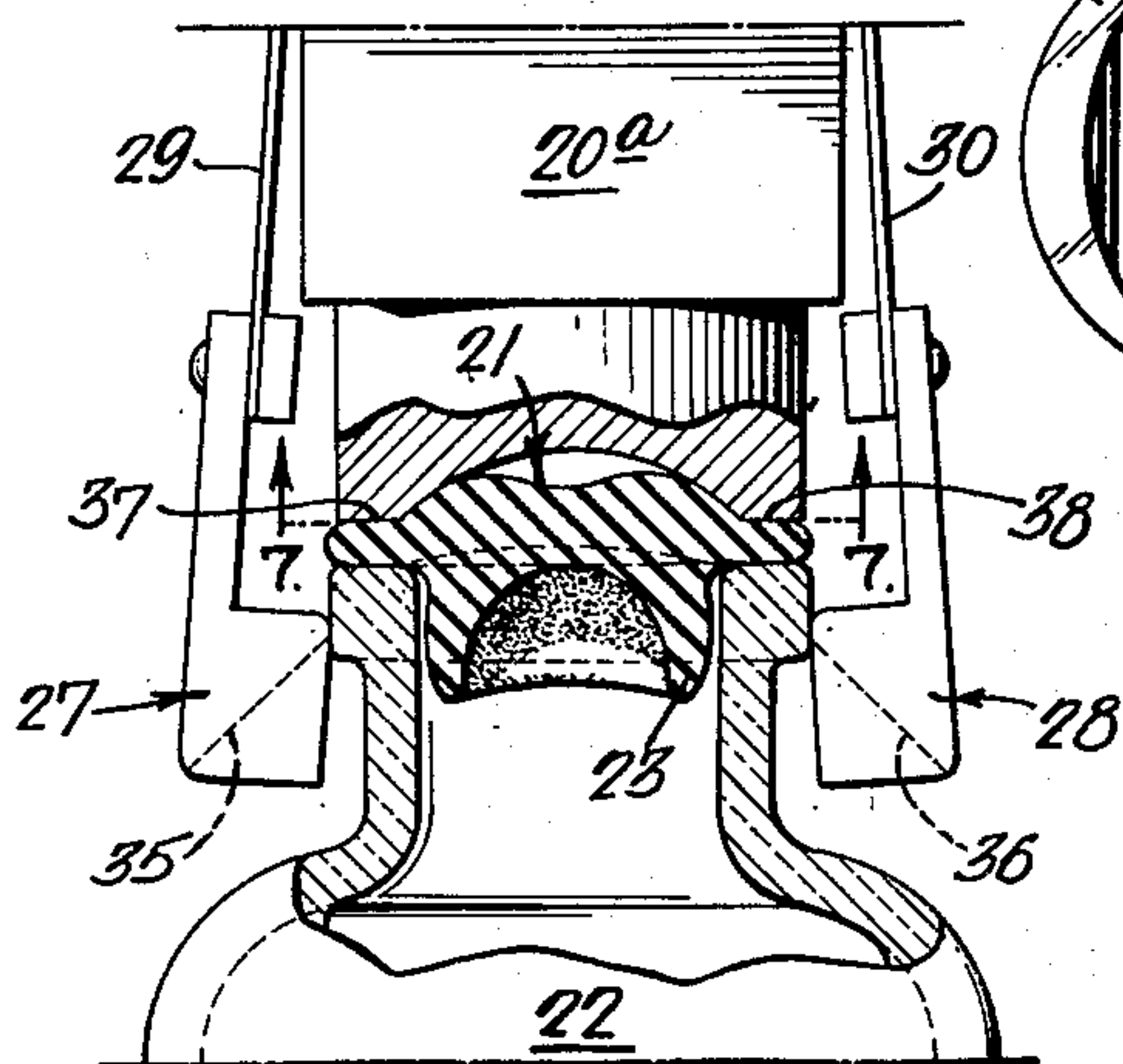
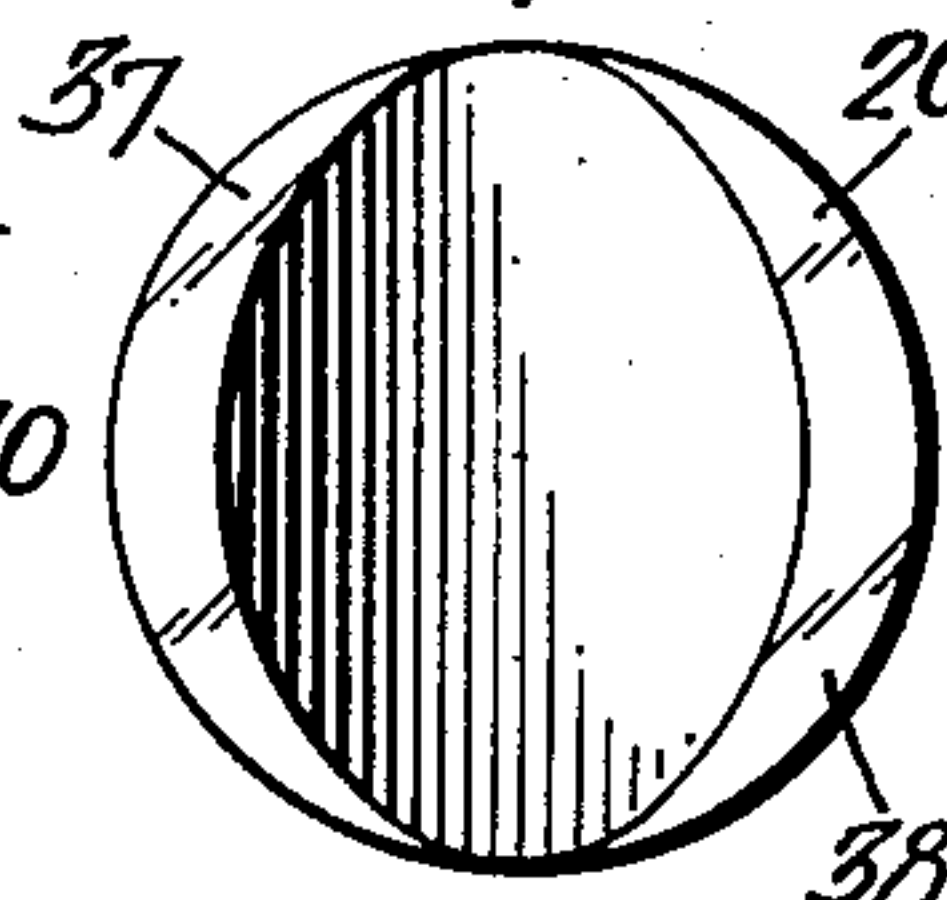


FIG. 7.



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FIG. 9.

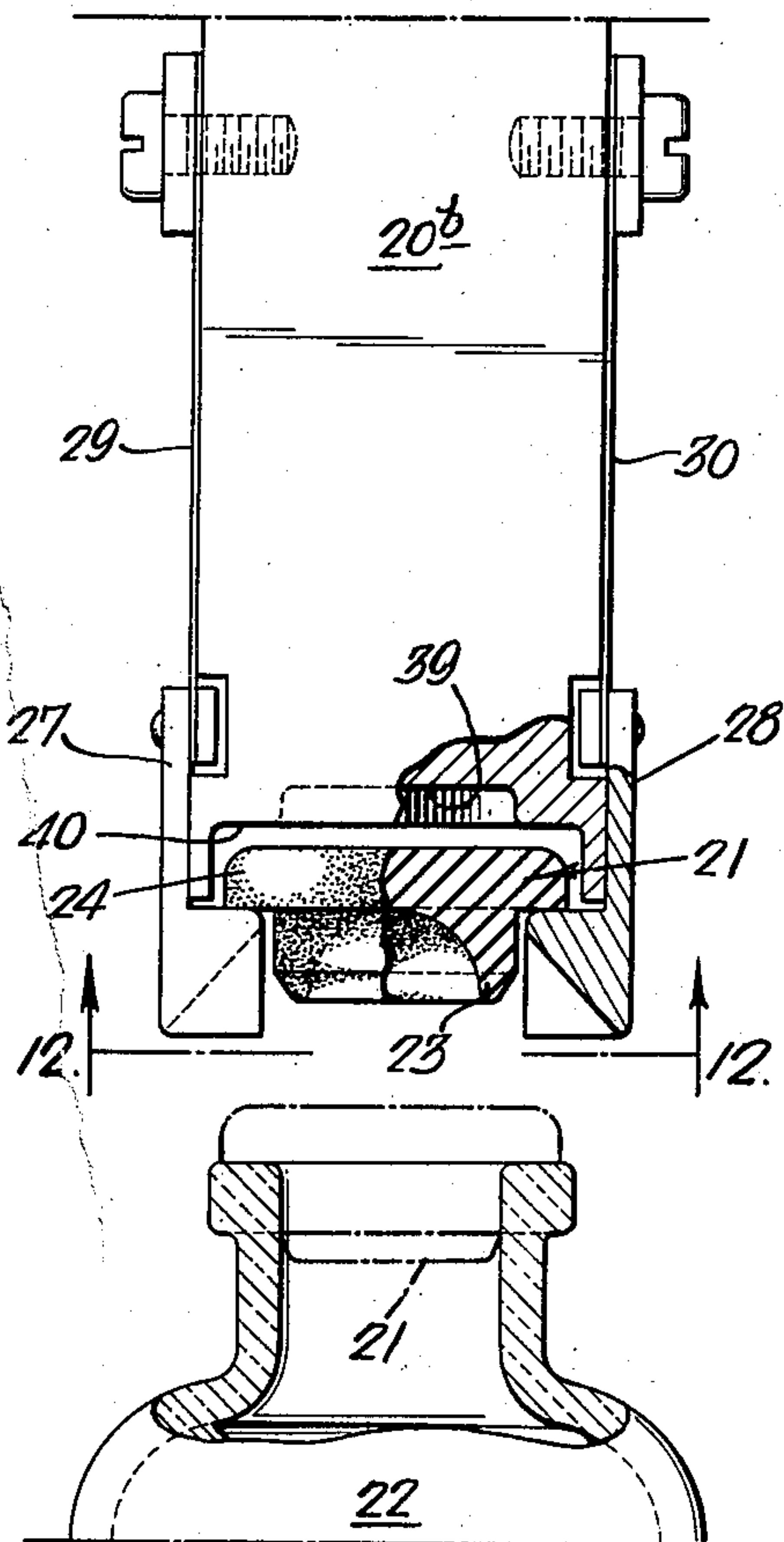


FIG. 10.

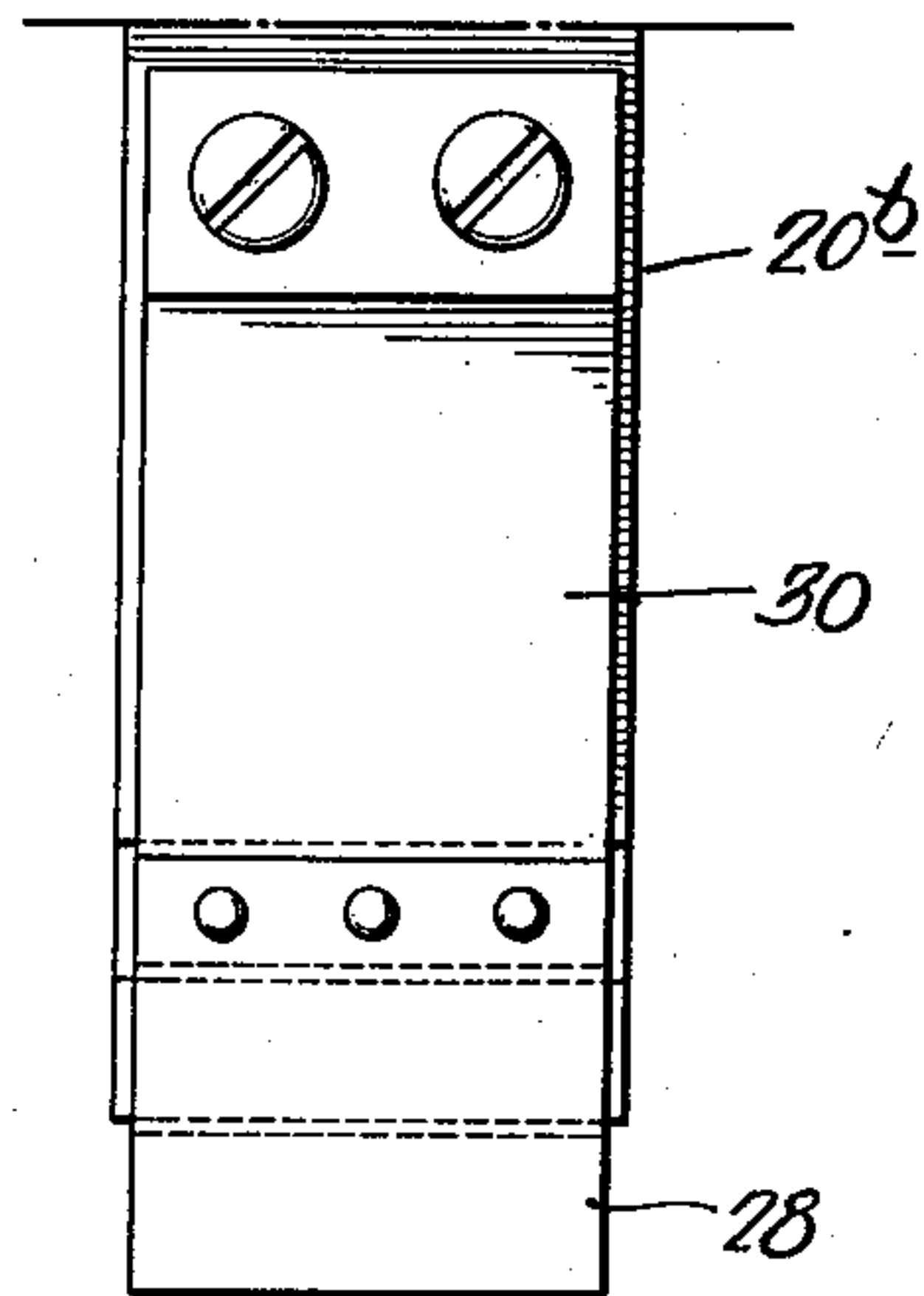


FIG. 11.

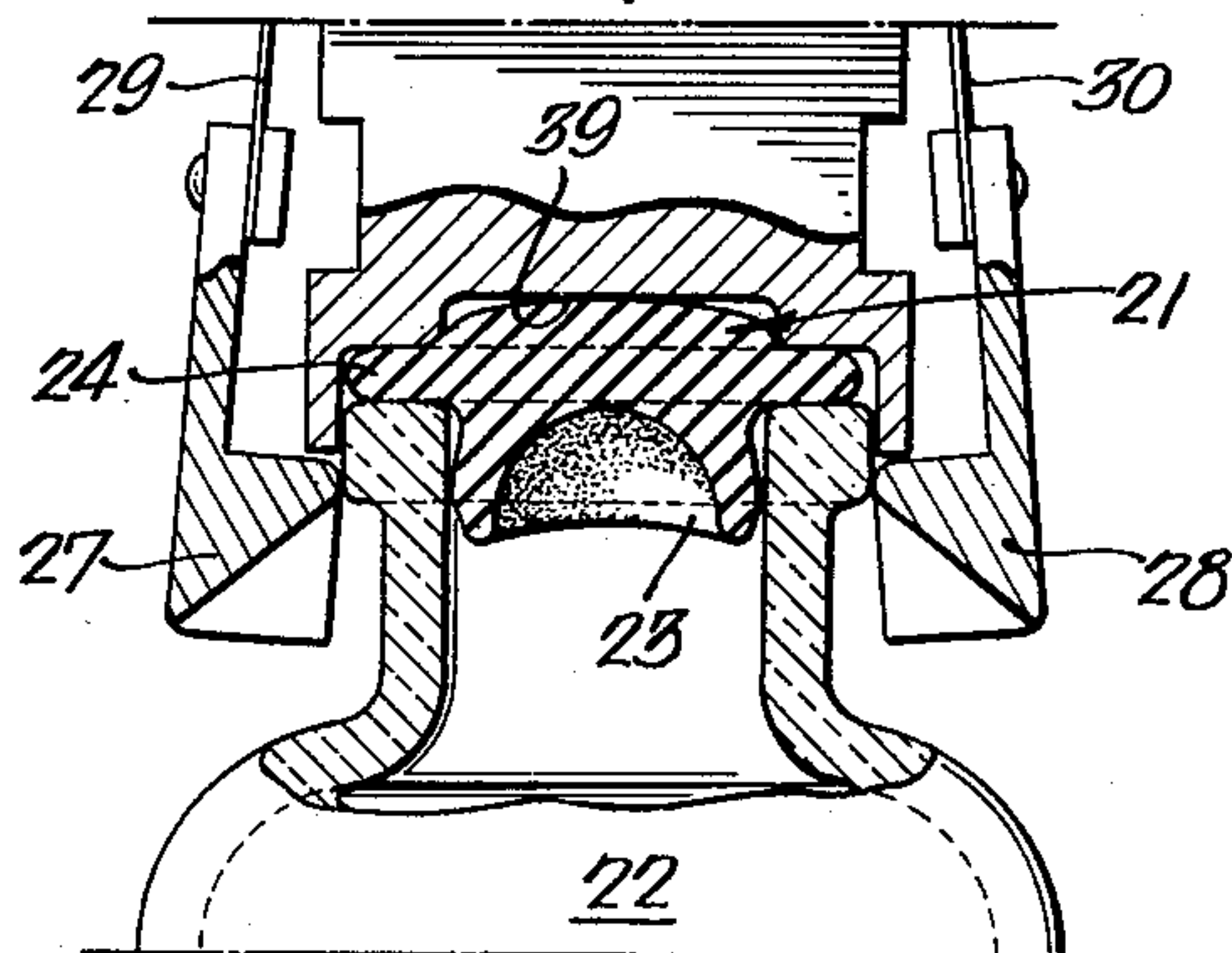
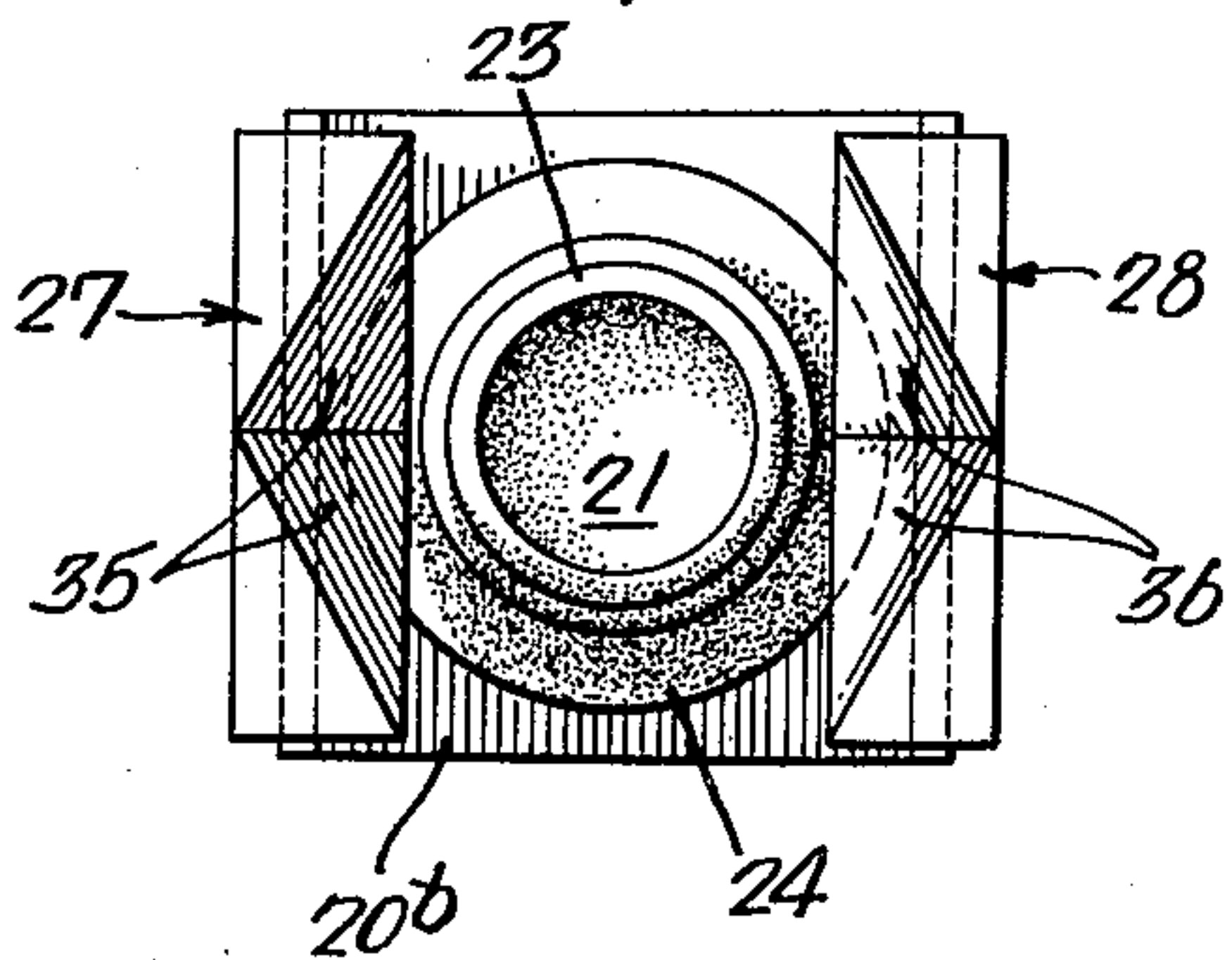


FIG. 12.



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FIG. 13.

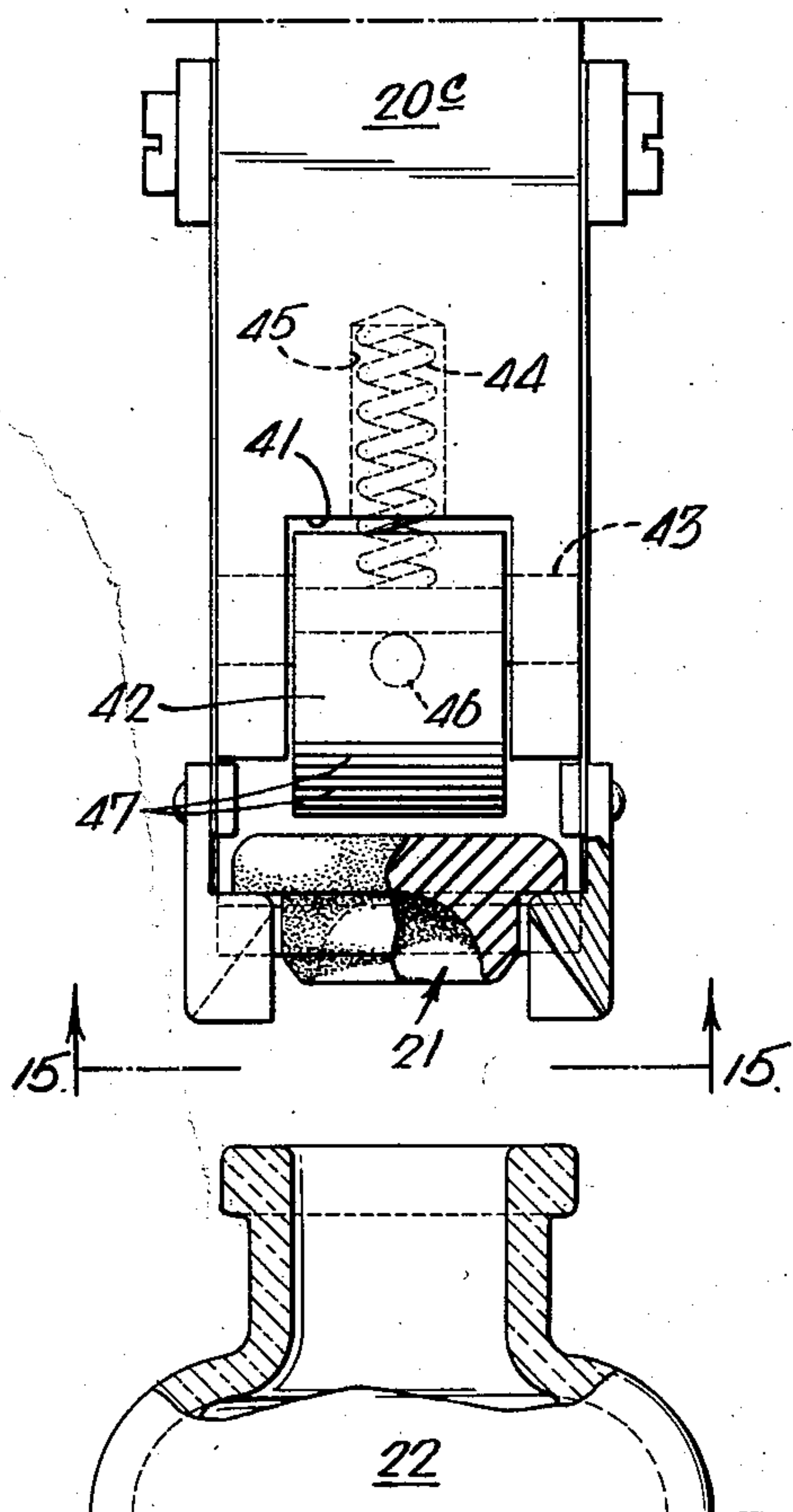


FIG. 14.

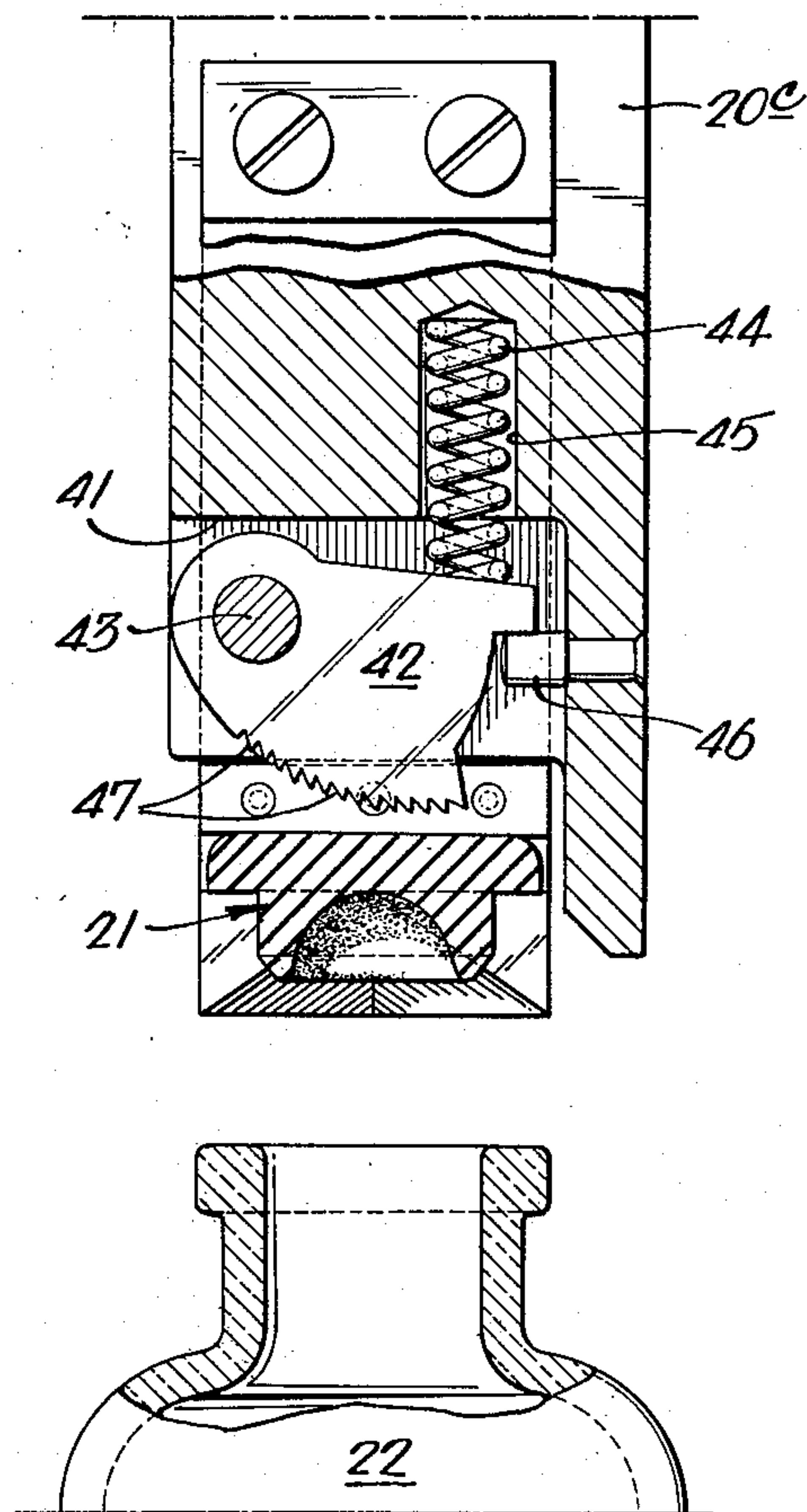


FIG. 15.

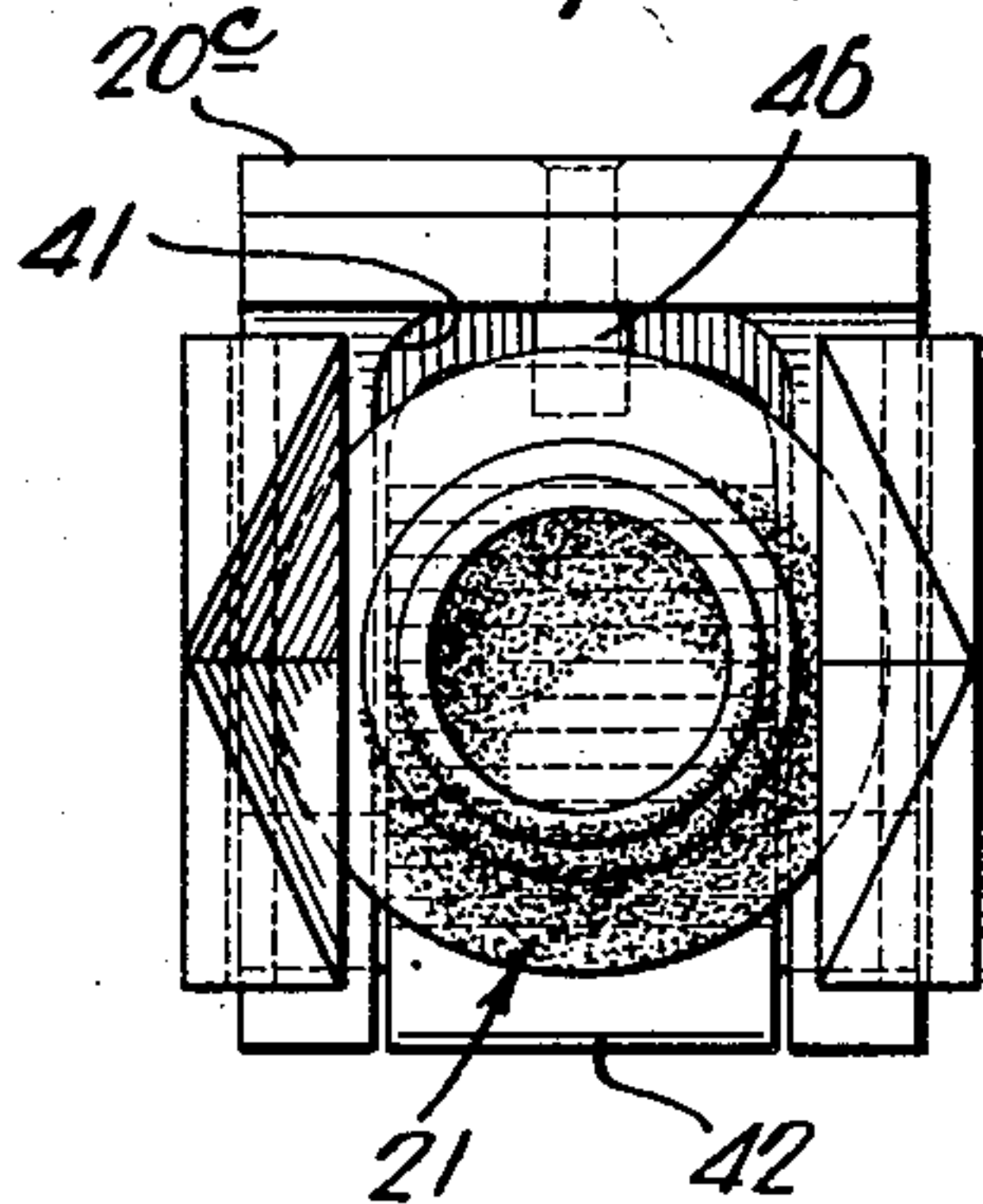
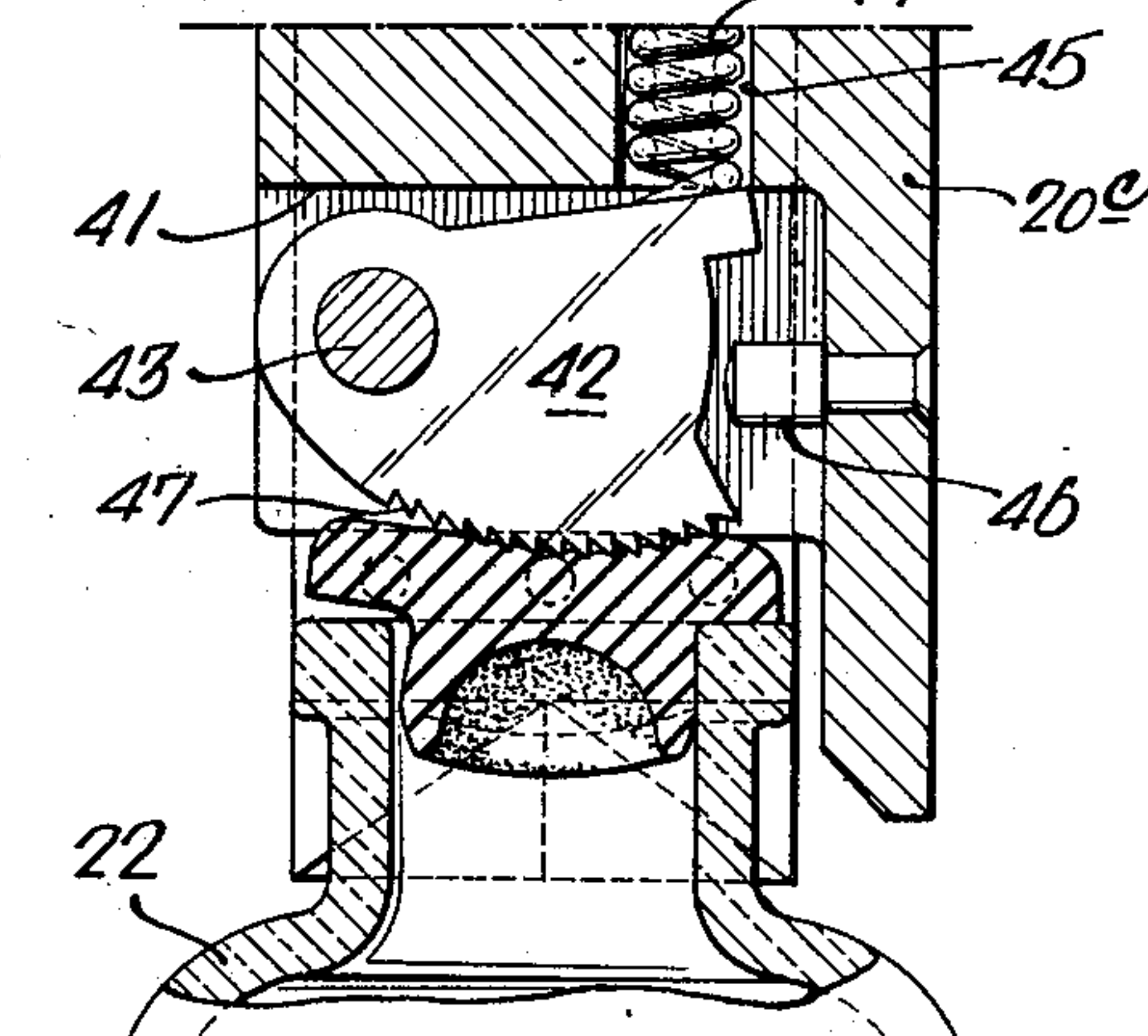


FIG. 16.



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STOPPER-APPLYING MACHINES

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11 Claims. (Cl. 53—321)

This invention relates to machines for inserting flanged resilient stoppers in containers such as glass bottles.

Flanged rubber stoppers are commonly employed in conjunction with glass bottles such as pharmaceutical bottles. The stoppers are applied to the bottles by a machine having a movable plunger which serves to push the stoppers into the bottles. In the application of each stopper to a bottle, the stopper is held in position over the bottle by a holder separate from the plunger, and the plunger pushes the stopper into the bottle and out of engagement with the holder. Following the application of a stopper to a bottle, a metal cap is applied which holds the stopper in place. However, the stopper-applying operation prior to the application of the metal cap has presented a problem for the following reasons.

(1) Where the stopper and/or the bottle are wet or coated with some kind of chemical such as silicone, there is a tendency for the stopper to pop out of the bottle due to the fact that the air in the bottle is compressed when the stopper is inserted and there is insufficient friction between the stopper and the bottle to resist the force of the compressed air.

(2) Where the stopper and the bottle are sterilized and permitted to dry before the application of the stopper, the friction between the stopper and the bottle is frequently so great as to strongly resist full insertion of the stopper with its flange engaging the top of the bottle. This is aggravated by the fact that the portion of the stopper which enters the bottle tends to expand when pressure is applied by the usual plunger over the entire top surface of the stopper.

(3) If it should happen that there is no bottle in position under the plunger, the stopper will be pushed out of the holder as the plunger moves down.

The principal object of the present invention is to overcome the above-mentioned objections.

A specific object of the invention is to provide improvements in a stopper-applying machine whereby the stopper is deformed during the applying operation to overcome the objections in regard to insertion of the stopper.

Another object of the invention is to provide a stopper-holding arrangement whereby the stopper is retained in the event that a bottle is not in position beneath the plunger at the time of the stopper-applying operation.

Other objects and features of the invention will be apparent from the following detailed description with reference to the accompanying drawings, in which

Fig. 1 is a part elevational and part sectional view of a plunger arrangement according to this invention and an associated bottle;

Fig. 2 is a side elevational view of the plunger;

Fig. 3 is a bottom view taken along line 3—3 of Fig. 1;

Fig. 4 is a part elevational and part sectional view showing the application of the stopper to the bottle;

Fig. 5 is a bottom view of the stopper showing more fully the distortion of the stopper which takes place;

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Fig. 6 is a view generally similar to Fig. 4 showing another embodiment of the plunger structure;

Fig. 7 is a bottom view of the plunger taken along line 7—7 of Fig. 6;

Fig. 8 is a side elevational view further showing the plunger structure and the stopper-applying operation;

Fig. 9 is a view generally similar to Fig. 1 showing a further embodiment of the invention;

Fig. 10 is a side view of the plunger of Fig. 9;

Fig. 11 is a view generally similar to Fig. 4 showing the application of the stopper;

Fig. 12 is a bottom view taken along line 12—12 of Fig. 9;

Fig. 13 is a view generally similar to Fig. 1 showing a further embodiment of the invention;

Fig. 14 is a view mostly in section taken centrally and longitudinally of the plunger arrangement in Fig. 13;

Fig. 15 is a bottom view taken along line 15—15 of Fig. 13; and

Fig. 16 is a view similar to Fig. 14 showing the application of the stopper.

Referring first to Figs. 1 to 5, as in the conventional stopper-applying machine, there is provided a vertically movable plunger 20 which serves to push a stopper 21 into the neck of a bottle 22 positioned below the plunger. The resilient, e. g. rubber, stopper 21 is of the type commonly employed and it comprises a portion 23 which enters the neck of the bottle and a flange 24 which is intended to engage the top of the bottle. The present invention is not concerned with the details of the stopper-applying machine whereby bottles are brought successively beneath the movable plunger and stoppers are fed successively to a holding means. This invention is concerned only with the structure of the plunger and the manner of holding each stopper for application thereof to a bottle.

In accordance with the present invention, in the embodiment shown in Figs. 1 to 5, the plunger 20 is preferably of rectangular cross section and its lower portion is recessed transversely and has opposed inclined surfaces 25 and 26 which exert pressure on opposed areas of the stopper flange coincidentally with insertion of the stopper as shown in Fig. 4. This embodiment is intended particularly to be used where the coating surfaces of the stopper and bottle are wet or coated and there is a tendency for the stopper to pop out of the bottle after it has been inserted, due to the compression of the air in the upper part of the bottle. As may be seen in Fig. 4, the squeezing of opposed areas of the stopper flange between the top of the bottle and surfaces 25 and 26 causes transverse displacement of the rubber of the stopper and consequent transverse distortion of the stopper which permits the air in the bottle to escape as it is compressed. Fig. 5 shows how the stopper is deformed from the broken line position. The transverse distortion of the stopper portion 23 permits some of the compressed air to escape through the passages between portion 23 and the wall of the bottle and beneath the portions of flange 24 which have no downward force thereon. Thus, the air pressure within the bottle is reduced sufficiently to preclude later pop-out of the stopper.

In order to hold the stopper in position above the bottle for insertion therein by the plunger as above-described, a pair of holders 27 and 28 are provided at the lower end of the plunger 20, being secured to the lower ends of flat springs 29 and 30 as by means of rivets 31 and 32. The upper ends of the flat springs 29 and 30 are secured to opposite sides of the plunger 20 as by means of screws 33 and 34. The holders 27 and 28 are formed as shown at 35 and 36 to be cammed outwardly by the top of the bottle as the stopper is inserted therein as shown in Fig. 4.

With this arrangement, the plunger itself supports the stopper, and the stopper is released only if a bottle is in position to receive it. In the event that a bottle is not in position to receive the stopper, the stopper is not released but is simply carried upward by the plunger to be applied to a bottle on the next downward stroke of the plunger.

Figs. 6 to 8 show an embodiment wherein the plunger 20a is formed at its lower end to provide opposed downwardly convex surfaces 37 and 38 which exert downward forces on the stopper flange and cause distortion of the stopper as it is being pressed into the bottle neck by the plunger. The displacement of the rubber causes distortion of the stopper portion 23 so as to permit escape of compressed air as in the previously described embodiment. Aside from the different form of the plunger, the parts are the same as in the first embodiment.

Figs. 9 to 12 shown an embodiment wherein the plunger 20b is recessed to receive the upper part of the stopper and has a relatively deep circular recess 39 surrounded by a flat surface 40 which engages the entire stopper flange. This embodiment is particularly intended for use where the stopper and bottle are dry and it is desired to lessen the friction between the stopper and the bottle so as to enable full insertion of the stopper. As shown in Fig. 11, as the stopper is inserted, the surface 40 presses the entire flange of the stopper against the top of the bottle and the inward displacement of the rubber causes contraction of the stopper portion 23. This causes decrease of the friction between the stopper and the bottle and enables full insertion of the stopper.

Figs. 13 to 16 show an embodiment wherein the plunger 20c has a relatively large recess 41 in which there is a shoe 42 mounted on pivot pin 43 which extends across the recess. The shoe 42 is biased by a helical spring 44 seated within a recess 45, the spring biasing the shoe against a fixed stop 46. The shoe 42 has serrations 47 to frictionally engage the top of the stopper. As may be seen in Fig. 16, as the stopper is inserted, the pivoted shoe acts against its spring to apply transverse force to the top of the stopper thereby distorting the stopper. This embodiment is particularly intended for use to release compressed air to prevent popping-out of the stopper as previously mentioned.

From the foregoing description, it will be seen that the invention provides means on the plunger of a stopper-applying machine for distorting the resilient stopper as it is inserted in a bottle, either to relieve air pressure in the bottle or to decrease friction between the stopper and the bottle. Further, the invention provides novel means for supporting the stopper from the plunger itself.

While certain embodiments of the invention have been illustrated and described, the invention is not limited thereto, but contemplates such other embodiments and modifications as may occur to persons skilled in the art.

I claim:

1. In a machine for applying one-piece flanged resilient stoppers having insertable portions to containers, a movable plunger member operable to push a stopper into a container, resiliently mounted holders on said member to support the stopper for insertion in the container and engageable by the top of the container to be spread thereby and release the stopper as it is introduced into the container, and means on said member to exert force on the stopper entirely above the container effective to deform the insertable portion of the stopper transversely coincidentally with the application of inserting pressure so as to insure fully effective application of the stopper to the container.

2. A machine according to claim 1, wherein said mem-

ber has pressure-applying portions thereon arranged to exert pressure on local areas of the stopper flange to deform the stopper so as to permit escape of air from the container.

3. A machine according to claim 1, wherein said member has a pressure-applying surface thereon arranged to exert pressure on the entire stopper flange to effect contracting deformation of the stopper and thus reduce friction between it and the container.

4. A machine according to claim 1, including an element pivotally mounted on said member and adapted to exert transverse force on the top of the stopper to deform the stopper so as to permit escape of air from the container.

5. In a machine for applying one-piece flanged resilient stoppers having insertable portions to containers, a movable plunger member operable to push a stopper into a container, and two opposed local surfaces on the stopper-engaging end of said member for applying pressure entirely above the container only to two opposed local areas of the stopper flange so as to deform the insertable portion of the stopper transversely coincidentally with the application of inserting pressure, thereby to insure fully effective application of the stopper to the container.

6. A machine according to claim 5, wherein said member is recessed at its stopper-engaging end and has two opposed inclined surfaces for applying pressure only to two opposed local areas of the stopper flange.

7. A machine according to claim 5, wherein said member has two opposed convex surfaces for applying pressure only to two opposed local areas of the stopper flange.

8. In a machine for applying one-piece flanged resilient stoppers having insertable portions to containers, a movable plunger member operable to push a stopper into a container, resiliently mounted holders on said member to support the stopper for insertion in the container as it is introduced into the container, and two opposed local surfaces on the stopper-engaging end of said member for applying pressure entirely above the container only to two opposed local areas of the stopper flange so as to deform the insertable portion of the stopper transversely coincidentally with the application of inserting pressure, thereby to insure fully effective application of the stopper to the container.

9. A machine according to claim 8, wherein said member is recessed at its stopper-engaging end and has two opposed inclined surfaces for applying pressure only to two opposed local areas of the stopper flange.

10. A machine according to claim 8, wherein said member has two opposed convex surfaces for applying pressure only to two opposed local areas of the stopper flange.

11. In a machine for applying one-piece flanged resilient stoppers having insertable portions to containers, a movable plunger member operable to push a stopper into a container, and means including an element pivotally mounted on said member and adapted to exert transverse force on the top of the stopper to deform the insertable portion of the stopper transversely coincidentally with the application of inserting pressure so as to permit the escape of air from the container and insure fully effective application of the stopper to the container.

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