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Kifer

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[54] **FOLLOW PLATE FOR DISPENSING MATERIAL**

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[52] **U.S. Cl.** **222/386,** 222/389

[51] **Int. Cl.** **B67d 5/42**

[58] **Field of Search** 222/386, 386.5, 387, 389, 326, 222/327

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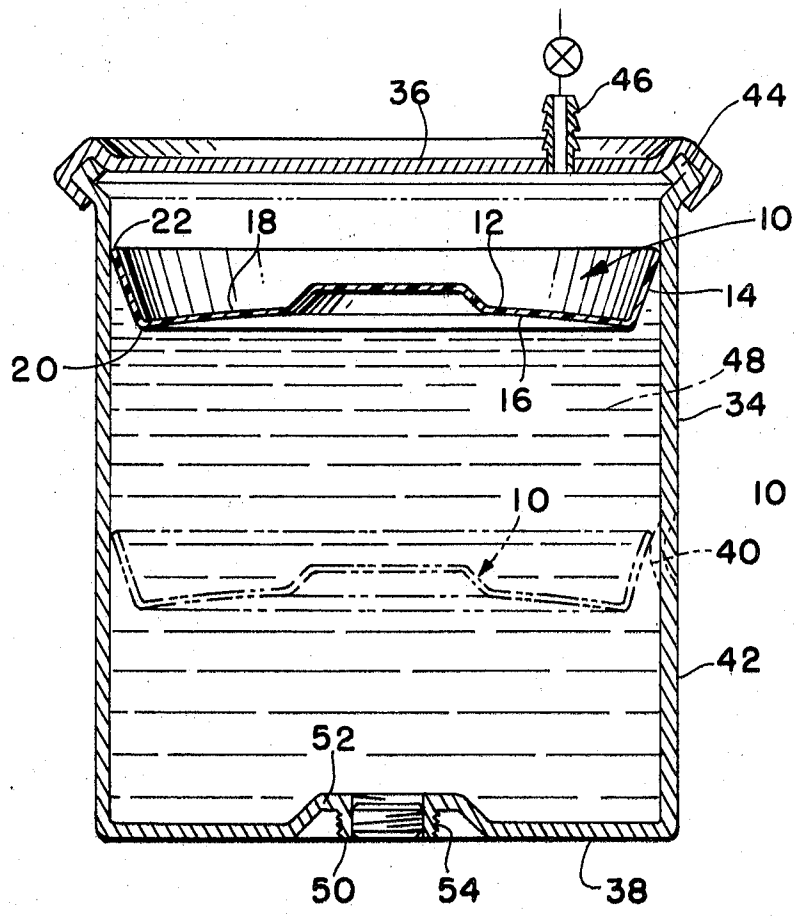
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[57] **ABSTRACT**

A follow plate particularly suitable for applying pressure on the flowable contents of a metal can or drum to force the material through an outlet opening which may be recessed within the lower end of the can to permit stacking of one can on top of another. The follow plate is made of a suitable flexible plastic material and preferably has a slightly conical face and a tapered flange about the periphery of the face including a free edge which engages the inner wall of the can. A hollow indentation may be provided in the face of the follow plate to receive the can outlet connection when the follow plate is against the lower end of the can. The conical shape of the face permits flexing of the face after engagement with the lower end of the can to force material disposed therebeneath toward the center and out through the outlet opening therein. The taper of the flange is desirably sufficient to permit the major diameter of the flange to ride over relatively large dents while avoiding contact between the dents and the minor flange diameter. Such relatively large taper of the flange also permits substantial tilting of the can and cocking of the follow plate without causing the follow plate to become wedged against movement within the can.

3 Claims, 6 Drawing Figures



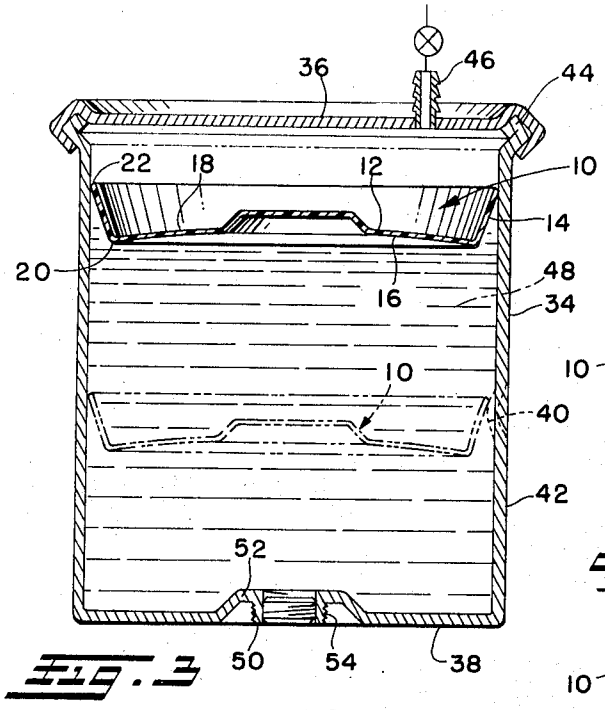


Fig. 3

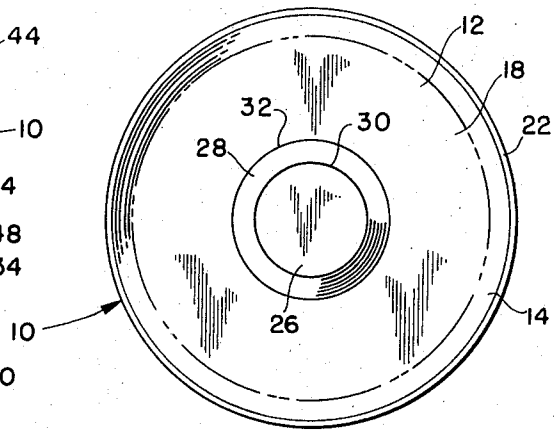


Fig. 2

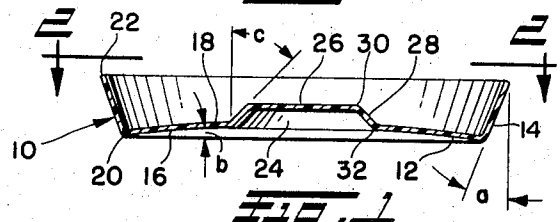


Fig. 1

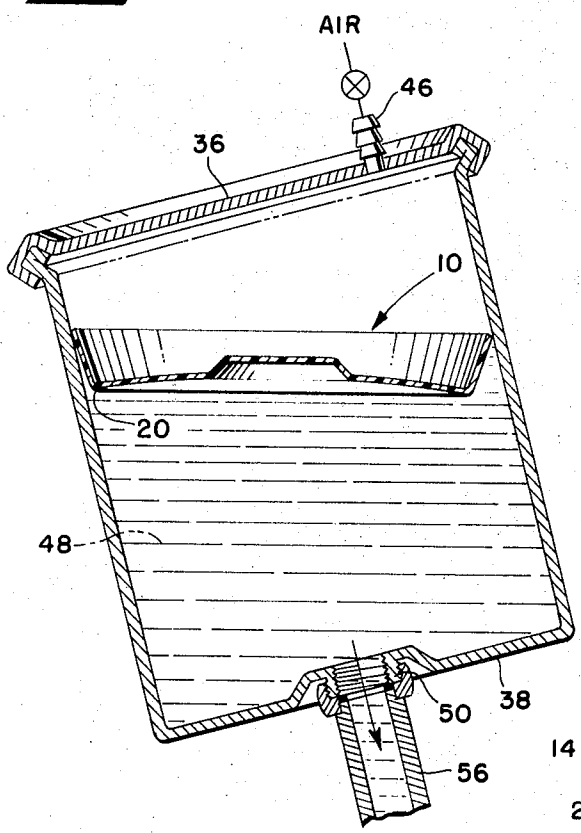


Fig. 4

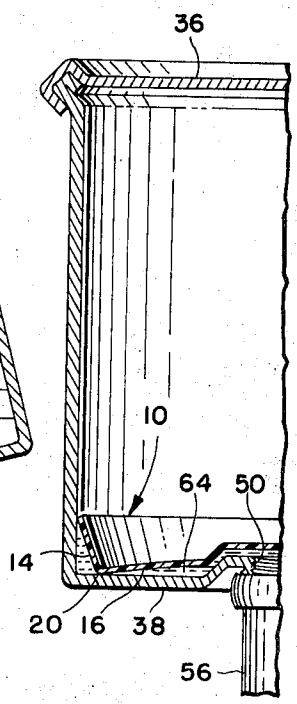


Fig. 5

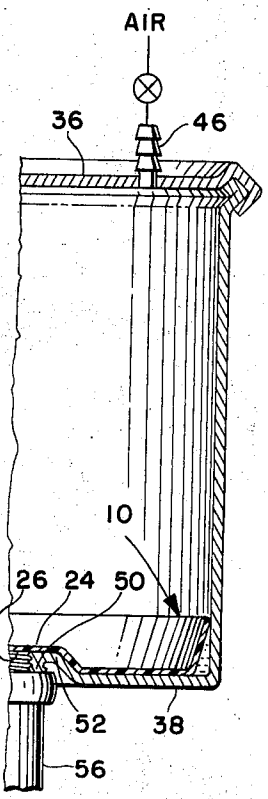


Fig. 6

FOLLOW PLATE FOR DISPENSING MATERIAL

BACKGROUND OF THE INVENTION

The present invention relates generally as indicated to a follow plate or piston for dispensing fluid products from a receptacle such as a can or drum, and more particularly to certain improvements in such a follow plate to prevent the follow plate from hanging up within the can and obtain maximum removal of material from the can.

The follow plate of the present invention is designed to be disposed within the receptacle in pressure contact with the material to be dispensed for forcing the material through an outlet opening at one end of the receptacle. Conventional follow plates of this general type are usually made of metal and oftentimes become wedged against movement within the receptacle during tilting of the container or because of a dent or other obstruction in the wall of the container.

The type of receptacle with which the present invention is primarily designed to be used is a metal can or drum whose inner diameter is usually not very uniform throughout its length, and the drum can also be fairly easily dented. The outlet opening for the material also usually has a threaded coupling which is recessed within the lower end of the can to permit stacking of the cans one on top of the other. A typical receptacle might be a 5 gallon can containing a flowable material such as a plastic car body filler material.

Because the outlet connection for the receptacles are usually recessed within an end of the receptacles to permit stacking, it is a problem to obtain complete removal of the material being dispensed, particularly the material surrounding the recessed outlet connection. In addition, whenever the container is tilted as when attaching a valved conduit to the outlet connection, the resulting flow of material within the can may cause the follow plate to become wedged against movement within the can. This is especially possible when using a conventional metal follow plate having a cylindrical or nearly cylindrical flange portion which is substantially inflexible and easily jams against movement with only slight cocking.

Another drawback of conventional metal follow plates is that they do not readily ride over bumps or dents in the side walls of the cans, and thus are apt to get hung up in the cans. Most internal can diameters are also not ordinarily uniform throughout their lengths, and accordingly a metal follow plate which may have a proper close sliding fit in one portion of the can is not likely to have a proper sliding fit in all portions thereof.

SUMMARY OF THE INVENTION

With the foregoing in mind, it is a principal object of this invention to provide an improved follow plate for dispensing material from a can or other receptacle.

Another object is to provide such a follow plate which is especially suitable for use with metal cans or durms having recessed outlet connections in the lower end thereof to facilitate stacking.

A further object is to provide such a follow plate which is less susceptible to jamming within the can or drum and does not become wedged in place when the can or drum is tilted.

A still further object is to provide a follow plate which insures more complete removal of the material from the can or drum.

These and other objects of the present invention are obtained by making the follow plate of a suitable flexible plastic material having a generally annular face and a tapered projecting flange portion attached to the periphery of the face. The tapered flange has a major diameter defining a free edge for engagement with the inner wall of a container and a sufficiently smaller minor diameter to clear any bumps or dents on such inner wall. The taper of the flange is also desirably sufficient to permit substantial tilting of the can and cocking of the follow plate while still maintaining line contact between the free edge of the flange and the inner wall of the can, thereby preventing wedging of the follow plate against the inner wall of the can.

The face of the follow plate may also be provided with a central hollowed indentation of sufficient depth to permit it to fit over the can outlet connection when the follow plate comes to rest against the lower end wall of the can. The face of the follow plate may also be made slightly conical whereby continued pressure against the follow plate will cause the conical face to deform squeezing the material therebeneath toward the center of the can for discharge through the outlet opening resulting in maximum removal of material from the can.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail a certain illustrative embodiment of the invention, this being indicative, however, of but one of the various ways in which the principles of the invention may be employed.

BRIEF DESCRIPTION OF THE DRAWING

In the annexed drawing:

FIG. **1** is a longitudinal section through a preferred form of follow plate constructed in accordance with the present invention;

FIG. **2** is a top plan view of the follow plate of FIG. **1**;

FIG. **3** is a longitudinal section through a receptacle containing such follow plate, showing the location of the follow plate at several elevations within the receptacle as the material is dispensed from the receptacle;

FIG. **4** is a longitudinal section showing the operation of the follow plate when the can or drum is tilted; and

FIGS. **5** and **6** are partial longitudinal sections showing the follow plate within the receptacle to illustrate how the follow plate obtains substantially complete removal of the material from the receptacle.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now in detail to the drawings, and initially to FIGS. **1** and **2** thereof, there is shown a follow plate **10** in accordance with this invention which is generally in the form of an annular disc **12** having a peripheral flange **14**. The disc **12** preferably has a slightly conical face **16** which seats against the material to be dispensed when disposed within a receptacle in a manner to be subsequently described.

The flange **14** extends around the entire outer periphery **20** of the disc **12** and is tapered outwardly to a substantial extent terminating in a free edge **22** at the major diameter of the flange which is substantially greater than the minor diameter of the flange. In the embodiment illustrated, the flange is tapered at an acute angle *a* of approximately 21°.

The slightly conical face **16** of the disc, in about the center thereof, is desirably provided with a hollowed indentation or recess **24** which extends rearwardly in the same direction as the flange **14.** The bottom surface **26** of the indentation is desirably generally flat and is joined with the face **16** by a frusto-conical flange **28** having an inner edge **30** integral with the surface **26** and an outer edge **32** integral with the face **16.**

In the particular embodiment illustrated, the angle *b* of the conical face **16** is about 4° from the horizontal, and the flange **28** extends at an angle *c* of about 45° relative to the horizontal. The dimensions of the follow plate may vary substantially, and are dependent upon such factors as the size and shape of the can or drum with which the follow plate is employed. However, a typical follow plate **10** constructed in accordance with this invention may have minor flange diameter of approximately 10 ¼ inches and a major flange diameter of approximately 11 ⅜ inches, providing a clearance space at the minor flange diameter of approximately 9/16 inches all the way around the follow plate for clearing any dents or bumps on the inner wall of the container. Moreover, the follow plate may be made of any suitable flexible plastic material such as polyethylene or polypropylene.

In FIG. **3** there is illustrated a can or drum **34** with which the follow plate **10** of the present invention may be employed. The drum **34** is generally cylindrical in shape and includes upper and lower ends **36** and **38.** Because the drum is usually made of metal, it is capable of being easily dented, as shown by dent **40** in the side wall or body **42** of the drum, and the inner diameter of the drum is usually not uniform throughout its length.

The ends **36** and **38** of the drum **34** may be seal-connected with the body **42** either by welding, brazing, or a conventional double seam construction as shown at **44.** An inlet opening **46** in the upper end of the drum permits an air line to be connected to the drum for pressurizing the drum as schematically shown in FIGS. **3** through **6.**

The drum **34** is of course filled with the material **48** to be dispensed, for example, plastic car body filler or other flowable material. Within the drum **34** is the follow plate **10** which seats against the upper surface of the material to be dispensed, with the conical face **16** against the material. The opposite side **18** of the face **16** is exposed to the pressurized air introduced into the container through the inlet opening **46** previously described.

The lower end **38** of the can or drum **34** is substantially flat as shown except for the outlet connection **50** which is desirably recessed within such lower end **38** to permit stacking of the cans or drums with the ends of the cans in full contact. In the example illustrated in FIG. **3,** the recessed portion **52** of the can is sufficiently depressed with respect to the end of the can to accommodate a nipple **54** having internal threads for engagement by a suitable plug and external threads for attachment of a cock valve or the like to control the flow of material from the can.

The dimensions of the follow plate **10** are such that the major diameter at the free edge **22** of the tapered flange **14** is in sliding sealed engagement or contact with the inner surface of the side wall or body **42** of the can and the minor diameter freely clears any internal dents or bumps in the can body, such as dent **40.** The flange **14** is also sufficiently flexible that the free edge **22** readily slides over the dents and still provides the desired wiping action along the inner surface of the can. The same sealing contact is maintained between the free edge of the follow plate and the inner surface of the drum even though its dimensions may vary somewhat over the length of the drum. Because of the flexibility and shape of the flange, the follow plate will not hang up during movement within the drum, and the flange will also readily recover after flexing to maintain the desired sealing contact or close fit with the inner surface of the can.

FIG. **4** illustrates a position assumed by the follow plate **10** when the can **34** is tilted as it might be to facilitate attachment of a suitable conduit **56** to the lower outlet connection **50** of the can. As shown, substantial tilting of the can and cocking of the follow plate can occur. Despite such cocking of the follow plate within the can, the substantial taper of the flange will cause the free edge of the flange to remain in line contact with the inner surface of the can body and maintain the minor diameter of the flange out of contact with such inner surface, thereby preventing wedging contact between the flange and can body. Accordingly, when the can is righted once again the air pressure acting on the upper surface of the follow plate will also right the follow plate. Moreover, because the follow plate is made of a flexible plastic, it will readily give when pressure is exerted on it tending to straighten the follow plate out thus resisting cocking.

Another advantage of the substantial taper of the flange **14** is that the material which fills the clearance space between the flange and inner surface of the can during operation as shown in FIG. **3** also tends to stabilize the follow plate, and resist cocking thereof.

FIGS. **5** and **6** illustrate the functioning of the follow plate **10** after engagement of the plate with the lower end **38** of the can. In FIG. **5,** the outer periphery **20** of the face **16** is shown at rest against the end **38,** with material still trapped between the can end **38** and conical face **16.** However, as continued pressure is exerted on the follow plate **10,** the follow plate deforms, flattening the conical face **16** against the can end and causing the material to flow toward the center of the can for discharge through the central outlet connection **50** as shown in FIG. **6.** The depth of the indentation **24** is sufficient to provide a slight clearance between the follow plate and the recessed portion **52** of the can when the conical face of the follow plate is flattened against the lower end of the can as shown.

From the foregoing, it will now be apparent that the follow plate of the present invention insures against the follow plate becoming wedged or hung up within the container despite dents or bumps or variations in the inner diameter of the container. The shape of the follow plate also aids in discharging the last of the material from containers provided with recessed discharge openings in the lower end thereof.

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

I claim:

1. In combination, a generally cylindrical receptacle for flowable products and a follow plate slidably received within said receptacle, said follow plate comprising a generally annular disc having a tapered peripheral flange axially extending thereform, said flange being made of a flexible plastic material and having a major diameter which is sufficient to remain in sliding sealed engagement with the inner wall of the receptacle during axial movement therewithin toward the lower end of said receptacle, said lower end of said receptacle being substantially flat over the major portion thereof and having a central outlet opening therein, said annular disc also being made of a flexible plastic material and having a slightly conical face extending from the radial outer edge toward the center away from said lower end of said receptacle on the side which contacts the flowable material, said conical face being deformable under pressure against said lower end of said receptacle from the radial outer edge toward the center to squeeze material toward the center of the receptacle for discharge through said central outlet opening.

2. The combination of claim 1 wherein said central outlet opening is recessed in said lower end of said receptacle, and said conical face has a substantially central hollowed indentation therein which fits over and receives said central recessed outlet opening when said follow plate engages said lower end of said receptacle as aforesaid.

3. The combination of claim 1 wherein said flange has a taper of approximately 21° and said conical face has a taper of approximately 4°.

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