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W. E. KRAMER ET AL

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DISPENSING APPARATUS

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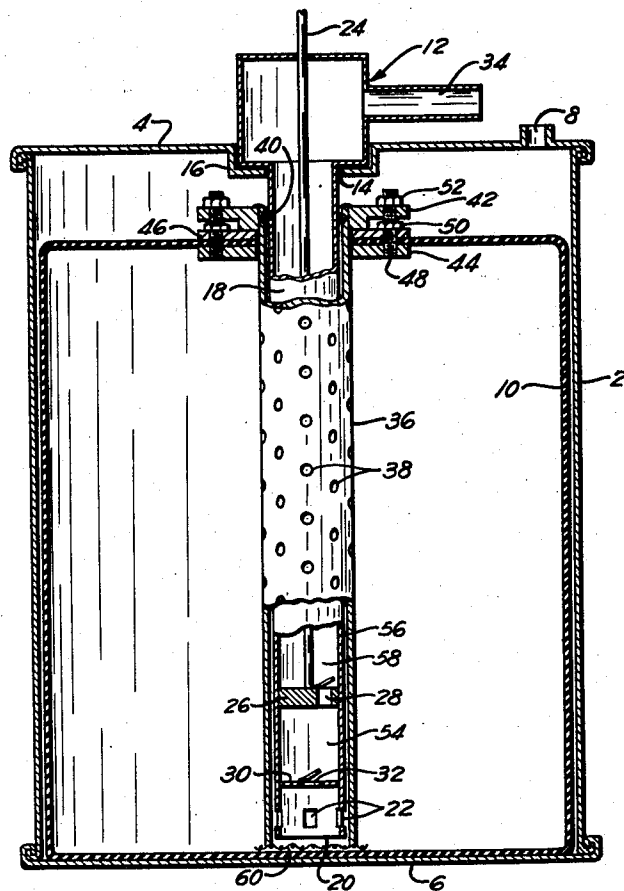


Fig. 1

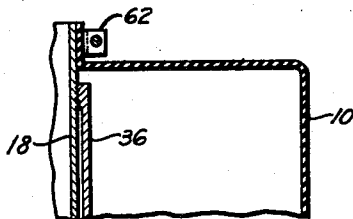


Fig. 2

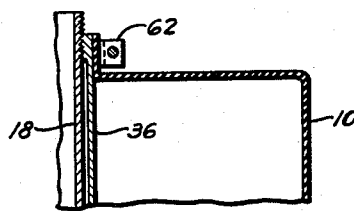


Fig. 3

INVENTORS
WILLIAM E. KRAMER
NICHOLAS MARUSOV

BY

Harold Block

THEIR ATTORNEY

1

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DISPENSING APPARATUS

William E. Kramer, Shaler Township, Allegheny County, and Nicholas Marusov, Penn Township, Allegheny County, Pa., assignors to Gulf Research & Development Company, Pittsburgh, Pa., a corporation of Delaware

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This invention relates to apparatus for dispensing a fluid, particularly a plastic or viscous fluid such as grease, tars, paints, mayonnaise, etc.

The problem of effectively removing substantially all of a highly viscous fluid such as grease from a drum has long been a troublesome one to the art. While many solutions have been proposed none has proved entirely satisfactory. The present dispensing apparatus not only assures the substantially complete removal of a highly viscous fluid from the container without contaminating the fluid during such operation but in addition completely eliminates the cleaning of the receptacle in which the fluid may be transported.

Briefly, the present arrangement comprises a normally closed receptacle provided with an opening in a wall thereof, a collapsible bag having an opening disposed in said receptacle, suction means communicating from the exterior of the receptacle through said opening of said bag and into the interior of said bag, and means sealing said opening of said bag to said suction means.

The invention can be better understood from a consideration of the following detailed description taken in connection with the accompanying drawings which are hereby incorporated and made a part of the present disclosure.

Figure 1 is a vertical view, partly in section, of a dispensing device in accordance with a preferred embodiment of the present invention. Figures 2 and 3 are vertical sectional views of means for sealing the collapsible bags to the pump means.

Referring to Figure 1, reference numeral 2 denotes a rigid receptacle body provided with a cover plate 4 and a bottom 6. Cover plate 4 is provided with an air vent 8 permitting communication of the interior of receptacle 2 with the atmosphere.

Disposed within receptacle 2 is a collapsible bag 10, made of a suitable material such as synthetic rubber, polyethylene, a fluorocarbon plastic, etc., and substantially impermeable to air and inert to the material contained therein, adapted to contain a highly viscous material such as grease. Positioned within bag 10 and with a portion thereof extending exteriorly of the receptacle 2 is a pump 12. Pump 12 enters receptacle 2 through opening 14 in cover plate 4 and seats upon recessed portion 16 of cover plate 4. Pump 12, a conventional positive displacement pump, is provided with a suction stub 18 having inlets 20 and 22 adjacent the suction end thereof. Longitudinally disposed within suction stub 18 is a piston having a piston rod 24 and a piston head 26 containing a check valve 28. Adjacent inlets 20 and 22 of suction stub 18 and fixedly attached thereto is a cylinder base 30 having check valve 32. Piston rod 24 extends upwardly through the pump housing and can be reciprocated by hand or by suitable mechanical, electrical, pneumatic, or hydraulic means. Located adjacent the upper end of the pump housing is fluid discharge line 34.

Longitudinally disposed about suction stub 18 along substantially its entire length and having an inner diam-

2

eter slightly greater than the outer diameter of the suction stub is a perforated tubing 36 having openings 38 in the wall thereof. Openings 38 should be made of a size that will permit free flow of fluid therethrough. The size of the openings will depend on many variables. For example, the minimum size of the individual openings will depend on such variables as yield-shear stress of the fluid, flow behavior of the contained fluid, the desired pump delivery, the number of holes in the tube, etc. The maximum size of the openings will depend upon such factors as strength of the bag (shear or rupture strength), the strength of the perforated tubing, etc. Thus, in the case of grease of medium consistency, the openings can have a diameter of about 0.100 inch, preferably in excess thereof, for example from about 0.250 to about 0.500 inch. Adjacent the top of perforated tubing 36, above the openings 38, and disposed in an inner groove of the tubing is pressure seal or ring 40. Ring 40 is, in normal operation of the dispensing apparatus, in abutting relationship with suction stub 18 of the pump and forms a seal tight arrangement therewith. Adjacent the top thereof, perforated tubing 36 is provided with a horizontal adapter plate 42 which is soldered, welded or brazed thereto. The open end of bag 10 is provided with lower and upper clamp rings 44 and 46, respectively, which are securely held in place by one or more studs 48 and nuts 50. These rings provide a rigid support for the open end of bag 10. Studs 48 are extended and project upwardly through adapter plate 42 to receive nuts 52. In this way the perforated tubing, through its adapter plate 42, can be fixedly attached to the bag 10.

Operation of the dispensing apparatus shown in Figure 1 will be explained. It will be assumed that the bag 10 is filled with a highly viscous or plastic medium such as grease, the pump mechanism is in place as shown in Figure 1, and the bag 10 is sealed at its open end to the pump mechanism. When the piston is initially moved downwardly valve 28 will open and valve 32 will be closed. On the upstroke, however, valve 32 will open and valve 28 will close. On this stroke, a low-pressure area is created in chamber 54 defined by the piston head 26 and cylinder base 30 and the grease will flow from the interior of bag 10 through openings 38 in perforated tubing 36, downwardly through annulus 56 defined by the inner diameter of perforated tubing 36 and the outer diameter of suction stub 18, and then upwardly through inlets 20 and 22 and valve 32 into chamber 54. When the piston head is moved downwardly again, the valves will assume the same position as on the initial downward stroke and grease will move upwardly from chamber 54 through valve 28 into chamber 58. On the next upstroke of the piston, grease will flow into chamber 54 as before and that in chamber 58 will flow outwardly through outlet line 34 to the desired location.

As previously noted, air vent 8 is open to the atmosphere and therefore the outside of the bag 10 is always under atmospheric pressure. The movement of grease from the bag through openings 38, annulus 56, inlets 20 and 22 into chamber 54 upon movement of the piston had also been noted. When this occurs, the pressure inside bag 10 is less than atmospheric and therefore a pressure differential exists between the inside and the outside of the bag. The force thereby applied to the bag is equal substantially to the outside area of the bag times this pressure differential. The bag therefore tends to collapse toward the suction stub and move the grease in the direction of the suction stub of the pump. As grease is removed from the bag by the pump, the bag tends to collapse against perforated tubing 36, and not against the suction stub, at which time substantially all of the grease has been removed therefrom. Since the perforated tubing is perforated throughout substantially its entire

length, the bag, or any portion of it, is incapable of moving against any portion of the suction stub creating pockets of grease which cannot reach the inlets 20 and 22 of the suction stub. Since the perforated tubing is made of a material, such as steel, which will not collapse as a result of the pressure differential created in removal of fluid from the bag 10, annulus 56 is kept open at all times for the desired movement of fluid to inlets 20 and 22 of the suction stub. To prevent bag 10 from collapsing against inlet 20 of the suction stub and hindering movement of fluid into the suction stub, a perforated screen 60 can be attached to the lower end of the perforated tubing 38.

In addition to preventing collapse of bag 10 against suction stub 18 and thereby forming pockets of grease which cannot communicate with inlets 20 and 22 of suction stub 18, perforated tubing 36 serves an additional function. When the fluid being dispensed by the present apparatus is a highly viscous and thixotropic fluid such as grease, movement of grease through openings 38 and through annulus 56 serves to work the same and reduce the viscosity thereof. Movement of the grease is thereby facilitated.

While the assembly of the device shown in Figure 1 can be effected at various times, one convenient assembly can be described. A user is supplied with a receptacle 2 in which is placed a bag 10 filled with grease. The bag is provided with clamp rings 44 and 46 held in place to the bag by means of studs 48 and nuts 50. Superimposed upon clamp ring 46 is a solid plate attached thereto by means of studs 48 and nuts 50. In place of cover plate 4 a solid cover plate would be provided. The user would remove the solid cover plate from the receptacle and thereafter the solid plate attached to the clamp ring 46. Perforated tubing 36 would next be inserted into the grease and adapter plate 42 would be fixed to the bag by means of the cover plates 44 and 46 and accompanying studs 48. Lastly the pump mechanism would be put in place and the suction stub inserted in perforated tubing 36. The operation described could then be started. When substantially all the grease has been removed from the bag, the bag can be removed from the pump mechanism and discarded. Another bag substantially full of grease could then be put in its place and the operation described could be continued. The receptacle 2 would not require cleaning after each operation, and the grease is at all times free from contamination. Since air is at no time in contact with the grease while it is in the bag, oxidation of the grease would thereby be prevented.

While the embodiment illustrated in Figure 1 and described herein in detail is satisfactory and in some cases preferred, it is understood that we do not intend to be limited thereby and that such embodiment can be modified without departing from the scope of the invention. Thus, the pumping means shown can be replaced with any conventional positive displacement pump means provided the suction stub of the pump is surrounded by a perforated tubing as shown and the interior of the pump mechanism is sealed from entry of fluid such as air during the operation thereof. Thus, the attachment of the bag, the perforated tubing and the suction stub of the pump, one to the other, can be varied as desired as long as means are provided for insertion of the pump mechanism into the bag, a perforated tubing is displaced about the suction stub of the pump, and means are provided for sealing the bag to the pump mechanism.

Thus, as can be seen in Figure 2, bag 10 can be sealed to the suction stub 18 of the pump by means of clamp 62 and perforated tubing 36 can be fixedly attached, as by screw attachment, to suction stub 18. Or, as illustrated in Figure 3, instead of sealing bag 10 to suction stub 18, it can be sealed instead to the upper end of perforated tubing 36.

While it is preferred to maintain air vent 8 open to

the atmosphere and operate only with the pressure differential occurring between it and that inside bag 10, it is understood that in small containers, air vent 8 could be sealed and that portion of the bag between it and the receptacle maintained under superatmospheric pressure. However, since the pressure differential employing atmospheric pressure is generally sufficient to cause collapse of the bag 10 and since such operation permits the use of a rigid receptacle of relatively light material, because both sides of the receptacle would be under the same pressure, operation at atmospheric pressure is preferred.

Obviously, many modifications and variations of the invention, as hereinabove set forth, can be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed, as are indicated in the appended claims.

We claim:

1. In combination, a closed receptacle provided with an opening in a wall thereof, a collapsible bag having an opening disposed in said receptacle, suction means communicating from the exterior of said receptacle through said opening of said bag and into the interior of said bag, and means sealing said opening of said bag to said suction means.

2. In combination, a closed receptacle provided with an opening in a wall thereof, a collapsible bag having an opening disposed in said receptacle, suction means communicating from the exterior of said receptacle through said opening of said bag and into the interior of said bag, said suction means comprising a longitudinally disposed suction stub and a perforated tube longitudinally disposed about said suction stub and spaced a distance therefrom, and means sealing said opening of said bag to said suction means.

3. In combination, a closed receptacle provided with an opening in a wall thereof, a collapsible bag having an opening disposed in said receptacle, suction means communicating from the exterior of said receptacle through said opening of said bag and into the interior of said bag, said suction means comprising a longitudinally disposed suction stub and a perforated tube longitudinally disposed about said suction stub and spaced a distance therefrom, positive displacement pump means disposed in said suction stub, and means sealing said opening of said bag to said suction means.

4. In combination, a closed receptacle provided with an opening in a wall thereof, a collapsible bag having an opening disposed in said receptacle, a perforated tube longitudinally disposed in said bag, means sealing said opening of said bag to said perforated tube, a pump mounted exteriorly of said receptacle having a suction stub extending into said perforated tube and disposed a distance away therefrom, means adjacent the entry of said suction stub into said perforated tube providing a seal between said perforated tube and said suction stub, and positive displacement pump means disposed in said suction stub.

5. In combination, a closed receptacle provided with an opening in a wall thereof, a collapsible bag having an opening disposed in said receptacle, pump mechanism communicating from the exterior of said receptacle through said opening of said bag and into the interior of said bag, the portion of said pump mechanism within said bag comprising a suction stub, positive displacement pump means longitudinally disposed within said suction stub, perforated tubing extending longitudinally about said suction stub and spaced a distance therefrom, said perforated tubing extending longitudinally away from said suction stub, and means sealing said opening of said bag to said portion of said pump mechanism within said bag.

6. In combination, a closed receptacle provided with an opening in a wall thereof, a collapsible bag having an opening disposed in said receptacle, at least one clamp ring provided about said opening of said bag and fixedly

5

attached thereto, a perforated tube longitudinally disposed within said bag, means sealing the upper end of said perforated tube to said clamp ring, a pump mounted exteriorly of said receptacle having a suction stub extending into said perforated tube and disposed a distance away therefrom, means adjacent the entry of said suction stub into said perforated tube providing a seal between said perforated tube and said suction stub, and positive displacement pump means disposed in said suction stub.

7. In combination, a closed receptacle provided with an opening in a wall thereof, a collapsible bag having an opening disposed in said receptacle, suction means communicating from the exterior of said receptacle through said opening of said bag and into the interior of said

6

bag, said suction means comprising a longitudinally disposed suction stub and means longitudinally disposed about said suction stub and coextensive therewith in the path of movement of said bag upon collapse thereof barring contact of said bag with said suction stub, and means sealing said opening of said bag to said suction means.

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