This invention relates to dispensers for dispensing sealants, adhesives, caulking compounds and the like, which are in semisolid or liquid state, and more particularly to such dispensers wherein the semisolid or liquid material is dispensed under control of a manually operable dispensing valve.

The invention is especially concerned with dispensers such as described for pressurized dispensing of semisolid and liquid materials, e.g., epoxy compounds, silicones etc., which tend to set after a period of time and which, upon setting, are difficult to remove. When such materials are dispensed by means of a dispenser having a dispensing valve, the valve needs to be cleaned after each interval of use. Otherwise, the material would set up in the valve and clog it. Such cleaning is an uneconomical time-consuming operation. Accordingly, among the several objects of this invention may be noted the provision of dispensers such as described in which is used an inexpensive type of dispensing valve and in which the valve is adapted readily to be removed and discarded after an interval of use, and a new valve readily applied to the dispenser for the next interval of use; the provision of dispensers such as described in which dispensing is from a cartridge contained in the dispenser, and in which the outlet of the cartridge is conveniently held in sealing engagement with the base of the valve to confine efflux of material from the cartridge to the valve; the provision of a cartridge-type dispenser such as described utilizing a collapsible cartridge squeezed by fluid pressure for pressurizing the contents of the cartridge and having its outlet held in sealing engagement with the base of the valve by the fluid pressure, and a special closure for a collapsible cartridge for this purpose; and the provision of a dispenser such as described as to which material to be dispensed may be supplied under pressure from a remote source. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims. In the accompanying drawings, in which several of various possible embodiments of the invention are illustrated:

FIG. 1 is a longitudinal section of a first type of dispenser of this invention utilizing a rigid cartridge;

FIG. 2 is a view of the right end of the FIG. 1 dispenser;

FIG. 3 is an enlarged section of the valve end of the FIG. 1 dispenser, showing the dispensing valve of the dispenser closed;

FIG. 4 is a view corresponding to FIG. 3 showing the dispensing valve open;

FIG. 5 is a longitudinal section of a modification utilizing a collapsible cartridge or tube;

FIG. 6 is a section showing a modified valve mounting arrangement;

FIG. 7 is a longitudinal section, broken away in the center, of another modification utilizing a different type of dispensing valve;

FIG. 8 is a longitudinal section showing a modification in which material to be dispensed is supplied under pressure from a remote source;

FIG. 9 is a view of one face of a collapsible cartridge or tube such as may be used in FIG. 5 having a special closure of this invention, with parts broken away and shown in section;

FIG. 10 is a side elevation of FIG. 9;

FIG. 11 is a section taken on line 11-11 of FIG. 9;

FIG. 12 is a section showing a modification of FIG. 9; and

FIG. 13 is a view corresponding to FIG. 11 showing part of the closure removed.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

Referring to FIG. 1 of the drawings, a first dispenser of this invention is shown to comprise an elongate housing or barrel 1 of a size such as may be readily held in the hand, and which is adapted for reception of a cartridge C containing a supply of the material to be dispensed. Barrel 1 has a cylindric body 9 open at one end constituting its rearward end (its air end) and as viewed in FIG. 1A. At its other and forward end, the barrel is necked down to provide an integral end head 5 for the barrel. The latter has an axial hole 7 therein of smaller diameter than the internal diameter of the cylindric barrel body 3.

As shown in FIG. 1, cartridge C has a cylindric body 9 open at one end (its rearward end) and at the other end constituting an outlet at its other end (its forward end). The body of the cartridge has a slidable fit in the barrel, and the cartridge extends lengthwise in the barrel with its open rearward end toward the rearward end of the barrel. At its rearward end, the cartridge has an outwardly extending annular rim 13. The cartridge is molded of plastic (such as polyethylene) and is substantially rigid. A molded plastic follower 15 is slidable in the cartridge for pressurizing the contents of the cartridge and forcing the contents out through the neck 11.

A closure cap 17 is removably threaded on the rearward end of the barrel. A packing ring 19 is provided in this cap for engagement with the rim 13 at the rearward end of the cartridge when the cap is threaded forward on the barrel. As shown in FIG. 1, cap 17 has a fitting 21 for connection of a compressed air line (not shown) for delivery of compressed air to the forward end of the cartridge to apply pressure to the follower tending to force it forward in the cartridge (i.e., toward the neck end of the cartridge).

A dispensing valve designated in its entirety by the reference character V is removably mounted at the forward end of the barrel 1. As shown best in FIGS. 3 and 4, this valve is of the type comprising a base 23, a tubular elastic bushing 25 extending through and secured to the base, and a valve stem or nozzle 27 extending through the bushing and tiltable relative to the base for flow through the stem. More particularly, the base 23 comprises a sheet metal cup, the bottom of which is designated 29 and the cylindric wall of which is designated 31. The latter has a rolled outwardly projecting rim 33. The diameter of the rim is less than the internal diameter of the barrel but greater than the diameter of hole 7 in the head 5 of the barrel. The bottom of the cup 23 has a central hole 35 with an inturnd lip 37 around the hole. The tubular bushing 25, which is made of rubber (natural or synthetic) is relatively thick-walled and has a tapered shank 39 extending from a frusto-conical end head 41 with an annular peripheral groove 43 at the root of the shank receiving the lip 37. The bushing is assembled with the cup by squeezing the shank through the hole 35 from the bottom of the cup to the point where the head 41 of the bushing engages the bottom of the cup, whereupon the shoulder of the shank at the forward side of the groove 43 snaps out over the lip 37.

The nozzle 27, which is conventionally molded of plastic, comprises a tube 45 having a valve head 47 clos-
ing its inner end, this head 47 being engageable with the head 41 of the rubber bushing 25 around the inner end of the bore of the bushing. The nozzle has ports 49 adjacent the valve head 47, and is adapted to be angled relative to the base 23 as shown in FIG. 4 to open up the ports 49 at the base of the contents of the cartridge C through the nozzle. Bushing 25 has a counterbore 59 at its inner end in the region of ports 49 for free access of the contents to ports 49 when the nozzle is angled.

The cup-shaped base 23 of the valve V is mounted in the nose-shaped head 5 of barrel 1 with its rim 33 engaging the inside of head 5 around the hole 7. The valve head 47 at the inner end of nozzle 27 is received in the neck 11 of cartridge C, the end of the neck 11 engaging the frusto-conical end head 41 of the rubber bushing 25 all around the valve head 47. In assembling the dispenser, the cap 17 is threaded forward on the rearward end of the barrel to act against the rearward end of the cartridge C to apply endwise pressure to the cartridge for forcing it forward in the barrel thereby to hold the forward end of the neck 11 of the cartridge in sealing engagement with the resilient gasket provided by head 41 of the bushing 25 on the inside of the base 23 of the valve V. This also clamps the valve V in position within the nose-shaped head 5 of the barrel.

The valve V may be held centered in the head 5 by a retainer 51 snapped in the head 5 through the hole 7. This snap-in retainer 51 is shown as comprising a short thin-walled tubular cylindrical element 53 having a sliding fit through hole 7 within the cylindric wall 51 of the cup-shaped valve base 23. At the outer end of element 53 is a flange 55 engageable with the outside of head 5 around the hole 7. Element 53 has an annular peripheral head 57 spaced from the flange adapted to snap in through hole 7 and engage the inside of head 5 around hole 7.

With air pressure in the cartridge C behind the follower 15, the tip of the nozzle 27 may be pressed against an object to which the contents of the cartridge are to be applied to tilt the nozzle 27 relative to the base 23 of the valve (see FIG. 4). This opens up ports 49 for flow of the material from the cartridge out through the nozzle. Retainer 51 holds the base 23 of the valve against tilting in the head 5 when the tip of the nozzle 27 is pressed against the object.

After an interval of use of the dispenser, it is a simple matter to remove the valve by removing the cap 17, taking out the cartridge C, and removing the retainer 51, whereupon the valve V is free to be dropped out of the open rearward end of the barrel 1. A new valve may then be readily inserted by dropping it in through the open end of the barrel, a new cartridge C inserted in the barrel, and cap 17 and retainer 51 re-applied. With the forward end of neck 11 forced into sealing engagement with the gasket constituted by the rubber head 41 on the base 23 of the removable valve V, the efflux of the contents of the cartridge is confined to the valve, keeping the barrel 1 clean.

As above described, the dispenser has a compressed air line connected to the barrel 1 fitting 21, the air line remaining connected to the barrel during the use of the dispenser. It will be understood, however, that the dispenser may be pressurized as by initially charging it with air under pressure from a source of compressed air through a check-valved fitting on cap 17, and disconnecting it from the source, the charge of compressed air then being retained in cartridge C behind the follower 15.

FIG. 5 shows a modification of the above utilizing a collapsible cartridge or tube T (like a toothpaste tube) and in which the contents of the tube T are squeezed out by squeezing the tube. The latter has an externally threaded neck 61 on which a closure cap is internally threaded for closing it. After removal of this cap, and before insertion of the tube in the barrel 1, a piston 63 having a sliding sealing fit in the cylindric body 3 of the barrel is threaded on the neck 61. Tube T fits loosely in the barrel so that piston 63, after insertion of the tube with the piston thereon in the barrel, is subject to the pressure of air in the barrel (introduced via fitting 21 in cap 17). This forces the tube T forward in the barrel to maintain sealing engagement of the forward end of the neck 61 of the tube with the gasket constituted by the head 41 of the rubber bushing 25 of valve V. Air pressure also acts on tube T to tend to collapse it thereby to squeeze out the contents of the tube when valve V is opened.

FIG. 6 shows a modification involving a different mode of mounting the valve V at the nose of the barrel. As shown herein, valve V is modified by cutting off the cylindric wall of the base of the valve, so that the base consists solely of disk 29c remaining after cutting off the cylindric wall. Otherwise the valve is the same as shown in FIGS. 3 and 4. At 71 is shown an adaptor comprising a thin-walled tubular body 73 of external diameter slightly smaller than the diameter of the hole 7 in the head 5 of the barrel with an outwardly extending annular flange 75 at one end of the body. The adaptor is dropped into the barrel (from the open rearward end of the barrel) so that it projects out through hole 7 with flange 75 engaging the inside of head 5 around hole 7, thereby constituting a tubular extension of the barrel. Body 73 is externally threaded, and a nut 77 is threaded thereon into tight engagement with the outside of head 5 around hole 7 to lock the adaptor in place. The base 29b of valve V is seated on the outer end of the adaptor (the diameter of disk 29c being somewhat smaller than the external diameter of the tubular body 73 of the adaptor), and clamped in place by an end head 79 threaded on the outer end of the adaptor. End head 79 has an axial hole 81 for accommodating the inner end of shank 39 of the rubber bushing 25 of the valve. A cartridge similar to that shown in FIGS. 1, 3 and 4 is used in this modification with the tube T slidable in the flange of the barrel so as to engage in sealing engagement with the gasket constituted by the head 41 of the rubber bushing the same as in FIGS. 1, 3 and 4. In this modification, valve V may be removed simply by removing the removable barrel end head 79.

Another modification of the dispenser, particularly adapted for spot application of sealants, adhesives, etc., is shown in FIG. 7. Here the barrel and cartridge are essentially the same as the barrel 1 and cartridge C shown in FIGS. 1–4. An adaptor 71 like that of FIG. 6 is used, but without the nut 77 shown in FIG. 6. An end head 79 like that shown in FIG. 6 is also used. A thin-walled valve V1 is removableably clamped between the end head 79 and the end of the neck 11 of the cartridge C.

Valve V1 comprises a sheet metal mounting cup 93, the base of which is designated 95. Extending in one direction from the periphery of the base 95 of the cup is an annular cylindrical skirt 97. Projecting in the other direction from the center of the base of the cup is a cup-shaped boss 99. Boss 99 has a center hole 101 in its outer end. Mounted in the cup 93 is a valve body 103, conventionally molded of plastic, comprising a tubular stem 105 having an annular flange 107 adjacent one end constituting its forward end. Flange 107 is formed on the cup 93 seated against the base of the cup, with stem 105 projecting rearward out of the cup. Valve body 103 holds a rubber packing ring 109 in the boss 99. The bore of the tubular stem 105 of the valve body is enlarged at its flanged end providing an enlarged valve chamber 110. Stem 105 has ports 111 for communication from cartridge C to this chamber.

An elongate valve member 113 extends slidably through the center hole of packing ring 107. This has a solid inner end portion 115 and a tubular outer end portion 117, with radial ports 119 toward the inner end of tubular portion 115. A spring 121 accommodated in chamber 110 acts against a collar on valve member 113 to bias it outward to closed position wherein ports 119 are within packing ring 109 and blocked thereby. Member 113 is adapted
to be pushed inward against the bias of spring 121 to bring ports 119 into chamber 110 for flow of material entering chamber 110 via ports 111 from the cartridge C out through tubular portion 117 of member 113. A rubber gasket 123 is seated against flange 107, and a rubber washer 125 is seated around the boss 99. The end of portion 115 of the valve stem acts against a soft rubber insert 127 in the stem 105. The cup 93 of valve V1 is positioned on the neck 11 of the cartridge C with gasket 123 engaging the end of the neck and stem 105 entered in the neck. Head 79 is threaded on adapter 71, engaging the washer 125 around the boss 99, so that the base of the cup 93 is tightly clamped between the head 79 and the end of the neck 11. The tubular outer end portion 117 of the valve member constitutes a nozzle, to which is applied a cap 129 having ports 131 around a projecting nose 133. By momentarily pressing nose 133 against an object, valve member 113 is pushed inward relative to the cup 93 to bring ports 119 into chamber 110 for flow of material (under air pressure within the cartridge behind follower 15) out through portion 117 and the ports 131 to provide a spot application of the material.

FIG. 8 illustrates another dispenser of this invention used in conjunction with a remote supply of material to be dispensed, as distinguished from a dispenser with a self-contained supply. The dispenser shown in FIG. 8 comprises an elongate tubular housing 141 constituting a handle adapted to be held in the hand. Threaded on one end of this housing or handle constituting its forward end is a head 143 having an axial hole 145 therein. A dispensing valve V, of the same type as the valve V shown in FIG. 6, is located in the head 143 with its nozzle 27 extending out through the hole 145. The margin of the base 29a of the valve is clamped between the head 143 and the rim of an adaptor 147 which may be molded of a suitable plastic. The adaptor has a cylindrical head 149 fitting in the head 143, and having a diameter corresponding to the outside diameter of handle 141. Head 149 has a recess 151 in its forward side accommodating the head 41 of the valve bushing 25 and the head 47 of the valve nozzle 27. A nipple 153 adapted for connection of a supply line 155 extends back from the head in communication with recess 151. The rearward side of the adaptor head 143 abuts the forward end of the handle 141, and the head 143 is threaded rearward on the handle to effect application on endwise pressure to the adaptor (which constitutes a supply means for supplying material to be dispensed to the valve V under pressure) so as to hold the forward (outer) end of the adaptor in sealing engagement with the base 29a of the valve. The valve is readily removable simply by taking off the head 143.

FIGS. 9–11 show a collapsible cartridge or tube T such as may be used in the FIG. 5 version of the dispenser of this invention having a closure 161 adapted to provide a piston functioning the same as the piston 63 shown in FIG. 5. Tube T, per se, is a conventional squeeze tube (like a toothpaste tube) having a circular end head 163 from which projects the externally threaded neck 61. Closure 161 comprises a tubular stem 165 threaded on the neck, this stem having a circular flange 167 at its inner end constituting the piston. This flange or collar is of larger diameter than the end head for entry thereof in the barrel 1 as shown in FIG. 5 with the tube T behind the piston. A cap 169 is threaded on the stem over its outer end, and is removable to open up the stem. The cap may be a plug 171 projecting into the stem.

FIGS. 12 and 13 illustrate a modified piston providing closure for the tube T comprising a tubular stem 173 threaded on the neck and formed at its inner end with a piston 175 corresponding to piston 167. Stem 173 has an integral outer end closure portion 177, and is provided adjacent its outer end with an annular peripheral groove 179, at which the stem may be cut for removal of the outer end closure portion to open up the stem.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A dispenser comprising a barrel having a cylindric body open at one end constituting its rearward end and having a head at its other and forward end, said head having an axial hole therein, a cartridge extending lengthwise in the barrel having a neck at its forward end, a dispensing valve removably mounted at the forward end of the barrel, said valve comprising a base and a nozzle movable relative to the base for opening the valve, said base engaging the inside of said head around said hole and said nozzle extending out through said hole, and means for applying endwise pressure to the cartridge to hold the forward end of the neck of the cartridge in sealing engagement with the base of the valve, said head being integral with the barrel, and said base being clamped by said endwise pressure between the neck of the cartridge and the head.

2. A dispenser comprising a barrel having a cylindric body open at one end constituting its rearward end and having a head at its other and forward end, said head having an axial hole therein, a relatively rigid cartridge containing material to be dispensed extending lengthwise in the barrel, said cartridge being open at its rearward end and having a neck at its forward end, a dispensing valve removably mounted at the forward end of the barrel, said valve comprising a base and a nozzle movable relative to the base for opening the valve, said base engaging the inside of said head around said hole, and said nozzle extending out through said hole, the forward end of the neck of said cartridge engaging the base of the valve, said cartridge having a length from the forward end of its neck to its rearward end such that its rearward end projects out of the rearward end of the barrel, and a closure removably secured on said rearward end of the barrel, said closure engaging the rearward end of the cartridge where it projects out of the rearward end of the barrel and said cartridge being compressed endwise between said closure and the base of the valve so that the cartridge removably clamps the valve in position, the rearward end of the cartridge is in sealing engagement with said closure and the forward end of the neck of said cartridge is in sealing engagement with the base of the valve, said cartridge having a follower therein for pressurizing material in the cartridge, and said closure having means for connection of a fluid pressure supply for delivery thereof to the space in the cartridge between the closure and the follower to apply pressure to the follower for pressurizing said material.

3. A dispenser as set forth in claim 2 wherein said head is integral with the barrel.

4. A dispenser as set forth in claim 2 wherein said barrel has a tubular extension at its forward end of smaller diameter than the cylindric body of the barrel, and said head is threaded on said extension.

5. A dispenser as set forth in claim 2 wherein the base of the valve has a central opening and the valve includes a rubber bushing extending through said opening, said bushing having an integral head on the inside of said base, the nozzle extending through the bushing and having a valve head on its inner end and being ported for flow therethrough on movement relative to the base, the forward end of the neck of the cartridge surrounding said valve head and sealingly engaging the head of said rubber bushing.

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