March 10, 1964 K. M. GROUT 3,124,276

PRESSURIZED DISPENSER HAVING DISPOSABLE CARTRIDGE

Filed June 5, 1961 2 Sheets-Sheet 1

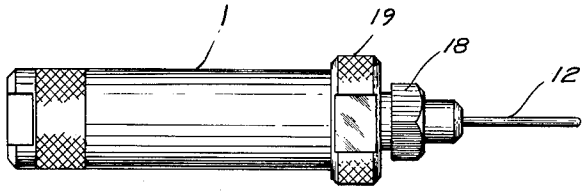


FIG. 1

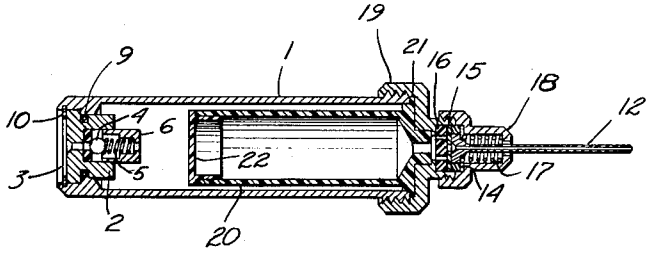


FIG. 2

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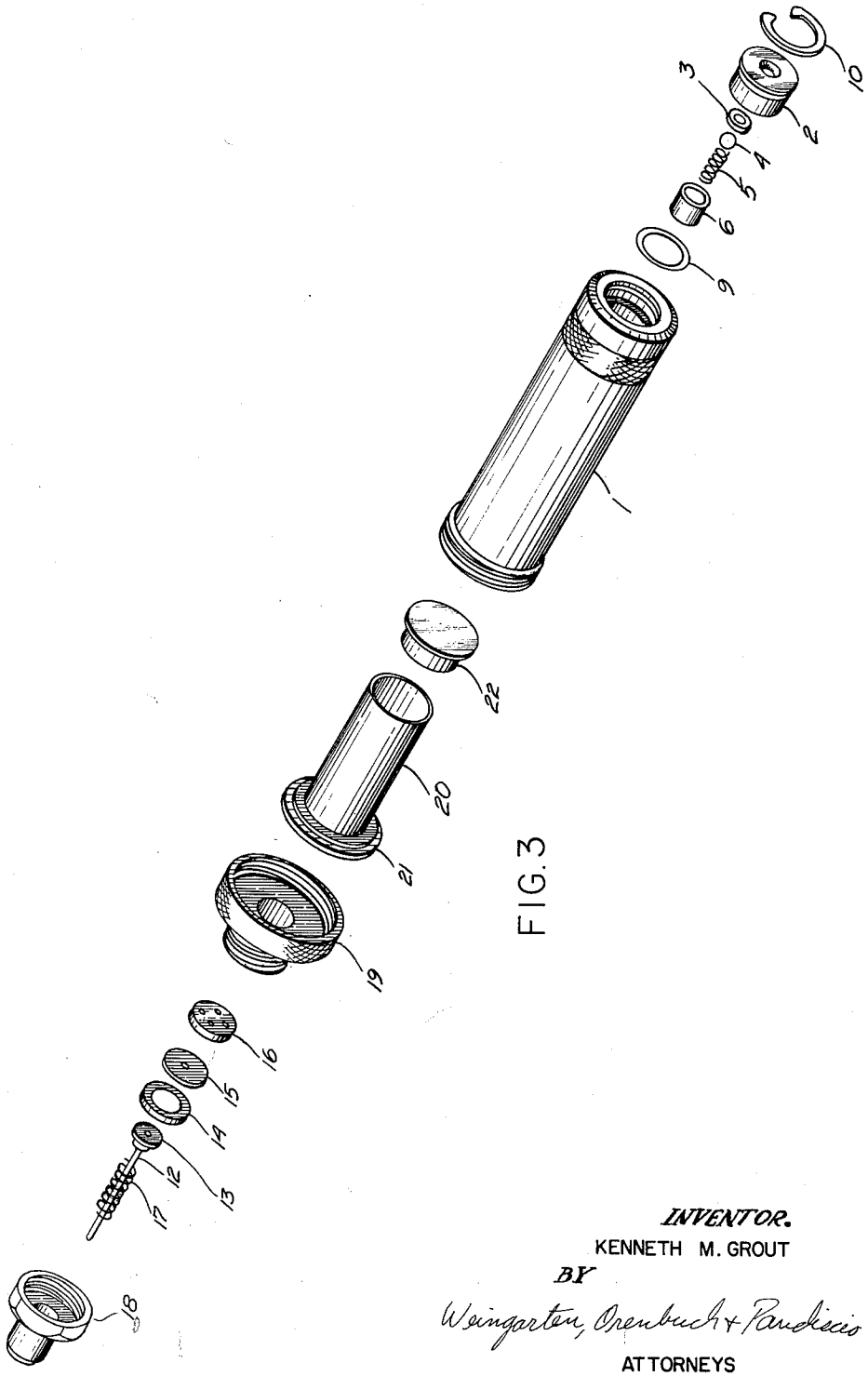


FIG. 3

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3,124,276

PRESSURIZED DISPENSER HAVING DISPOSABLE CARTRIDGE

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2 Claims. (Cl. 222—183)

This invention relates in general to fluid dispensing apparatus and more particularly pertains to a device containing a liquid under pressure which is dispensed through a sensitive control valve.

The invention is directed broadly to the dispensing of various types of fluids and is especially pertinent to operations where a liquid is dispensed in small quantities, as in drops, under the manual control of an operator. Where many such manual operations are to be performed, it is important that the dispenser be readily manipulated without unduly fatiguing the operator. It is an object of the invention, therefore to provide the dispensing device with a valve which responds to a small amount of applied force and yet permits relatively precise control over the amount of material issuing from the dispenser.

The invention resides in a structure which is loaded with the material to be dispensed by inserting a liquid filled disposable cartridge in a chamber having a dispensing valve at one end and a check valve at its other end. After the cartridge has been inserted in the chamber, the chamber is charged through the check valve with a gas until a specific pressure is obtained in the chamber. The liquid in the cartridge is forced by the gas through the valve, when the valve is opened by the operator, into a hollow needle. The dispensing valve is constructed so that the valve is opened by forcing the free end of the needle to an off-centered position. Due to its construction a small amount of pressure is adequate to open the valve and the bore of the needle is such as to restrict the flow of liquid through it to rates which permit the operator to easily control the amount of liquid emitted from the needle. The dispenser is self-contained in that once charged with liquid and compressed gas, the dispenser can be used free of any connections to sources of compressed gas or liquid reservoirs. When the liquid in the cartridge is exhausted, the dispenser is recharged by replacing the exhausted cartridge with another liquid filled cartridge and again pressurizing the chamber with a gas. The cartridge may be manufactured at such low cost that they are simply disposed of when their contents have been exhausted.

It is contemplated that the invention will be used to dispense plastic materials such as epoxy resins, polyurethanes, and polyesters, which are characterized by a relatively short polymerization period. Generally, those materials are "tacky"; that is, they tend to be adherent and coat the surfaces with which they are brought into contact. Upon polymerization, the plastic materials harden. It is desirable, therefore, after a cartridge has bean exhausted, to clenase the dispenser preparatory to the use of another cartridge holding an incompatible material. To this end, a cartridge containing a solvent is inserted in the dispenser and the solvent is forced by a compressed gas through the valve and the needle to purge all traces of the previously dispensed material. After purging, a cartridge containing a different material may be employed without fear of contamination by the material previously dispensed.

It is known that moisture hastens the polymerization of plastic materials such as epoxy resins and polyesters. To retard polymerization of the plastic material, therefore, the gas used to pressure the chamber is preferably a desiccated inert gas such as argon. Dry air may also be used as the gaseous pressurizing substance. Further to

retard the polymerization of the plastic materials, the cartridges and the dispenser itself may be stored in a refrigerator until needed. When it is realized that the time required for the plastic materials to polymerize usually does not exceed a day, the importance of retarding polymerization can be better appreciated.

The invention, both as to its construction and mode of operation, can be more fully understood from a perusal of the following exposition when considered in conjunction with the accompanying drawings in which:

FIG. 1 depicts the external appearance of a dispenser constructed in accordance with the invention;

FIG. 2 is a cross-sectional view showing the interior details of the dispenser; and

FIG. 3 is an exploded view showing the components which together constitute the dispenser.

Referring now to FIGS. 2 and 3, the dispenser is seen to comprise a metallic body **1** having the form of a hollow cylinder. One end of the cylindrical body is closed off by a check valve constituted by a valve housing **2**, a valve seat **3**, a ball **4**, a helical spring **5**, and a spring retainer **6**. The valve housing **2** has a peripheral groove for receiving an O ring **9**. The valve housing **2** is provided with internal threads which mate with the external threads of the retainer **6** whereby those two parts are held together to provide an interior chamber in which valve seat **3**, ball **4**, and spring **5** are enclosed. Both valve housing **2** and spring retainer **6** have central apertures communicating with the interior chamber. Spring **5** is disposed in retainer **6** and forces the ball against the valve seat. With the ball seated, the valve is closed since the ball seals off the aperture in the valve seat.

The check valve assembly fits tightly within one end of cylindrical body **1** and is held in place by a retaining ring **10** which engages a groove in that end of the body. In order to prevent the pressurized gas within the body **1** from leaking out around valve housing **2**, an O ring **9** is disposed about the periphery of the valve housing and forms an effective seal between that housing and the body **1**.

The opposite end of hollow cylindrical body **1** is closed off by a dispensing valve having a hollow needle-like nozzle **12** whose enlarged end **13** fits within an annular washer **14**. The dispensing valve also includes a circular diaphragm **15** having a central aperture therein, a grid **16** which is constituted by a perforated disc, helical spring **17**, a nozzle body **18**, and a nut **19** having both internal and external threads. Nozzle body **18** is provided with internal threads which engage the external threads of nut **19**. When screwed together, the nut and nozzle body enclose a chamber in which are disposed grid **16**, diaphragm **15**, washer **14**, spring **17**, and a portion of nozzle **12**. Nozzle body **18** is provided with an aperture through which the shank of nozzle **12** protrudes. Helical spring **17** surrounds that portion of the nozzle which is within the chamber and bears against the enlarged end of the nozzle. The enlarged end of the nozzle, consequently is compelled to press diaphragm **15** against grid **16**. When the diaphragm is pressed against the grid, the diaphragm's central aperture is masked by the solid central area of the grid.

The material to be dispensed is contained in a cartridge **20** having a flange **21**. The cartridge is closed by a cap **22** having perforations in it of such size that the viscous material in the cartridge is unable to pass through the perforations whereas a gas encounters little difficulty in passing through the cap. The cartridge is preferably fabricated of a material such as Teflon. When assembled, as shown in FIG. 2, flange **21** is clamped between the end of body **1** and the interior of nut **19**. The compressive force of that clamp upon the deformable flange results in a pressure tight seal being formed. The flanged

end of the cartridge terminates in a neck which has a port in it permitting the material to flow out of the interior of the cartridge into the dispensing valve. The cartridge preferably fills about three quarters of the space in the interior of body **1**, the remaining one quarter of that space then being filled with a pressurized gas introduced through the check valve. The pressurized gas forces the material in the cartridge through the port into the dispensing valve. The material under pressure enters the apertures in grid **16** and exerts force against diaphragm **15**. On the other side of the diaphragm **15**, the enlarged end **13** of nozzle **12** exerts an opposing force against the diaphragm due to helical spring **17** being compressed between the enlarged end and the nozzle body **18**. The two opposing forces are adjusted so that the pressure exerted by spring **17** causes the dispensing valve to be normally closed.

Forcing the free end of nozzle **12** to an off-centered position causes the enlarged end to pivot at a point on its periphery. That pivotal movement is sufficient to relieve the force of spring **17** acting on diaphragm **15**. The pressure on the opposite side of the diaphragm forces the diaphragm to follow the pivotal movement of the nozzle's enlarged end, thereby causing the diaphragm to pivot away from grid **16**. Thus, the central aperture in the diaphragm is unmasked and the material under pressure is forced through the holes in grid **16**, through the diaphragm's central aperture, and through the nozzle **12**. The nozzle's interior diameter is such that the material cannot flow through it at a rapid rate and the hollow nozzle restricts the efflux of the dispensed material. The amount of material being dispensed is easily controlled since releasing the nozzle **12** from its off-centered position causes spring **17** to return the diaphragm **15** to the position where its central aperture is masked by grid **16**, thus shutting off the flow of material.

The initial charge of gas inserted into the interior of the dispenser should be under sufficient pressure to cause all the material in the cartridge to be dispensed without requiring another pressurizing recharge.

The external appearance of a dispenser constructed in accordance with the invention is depicted in FIG. 3. That dispenser is provided with knurls as it is intended to be used manually.

What is claimed is:

1. Apparatus for dispensing a viscid material, such as an epoxy resin, the dispensing apparatus comprising:

a hollow housing adapted to be internally pressurized;

a nozzle body having in it a dispensing valve;

a cartridge for containing the material to be dispensed,

the cartridge being impermeable to the contained material and having a flanged end terminated in a neck having a central port permitting efflux of the material in the cartridge;

the housing and nozzle body having cooperating means removably securing the dispensing valve to the housing with the flange of the cartridge clamped between the housing and the nozzle body form a pressure tight seal and the major portion of the cartridge being within the housing;

the neck of the cartridge fitting closely adjacent to the nozzle body whereby material issues from the cartridge directly into the dispensing valve;

a check valve secured to the housing, the check valve when unseated permitting the interior of the housing to be pressured;

and the other end of the cartridge being permeable to the pressurized medium in the housing.

2. Dispensing apparatus according to claim 1 wherein the dispensing valve comprises, a grid having openings therethrough, a diaphragm having a central aperture, a nozzle having a passage extending longitudinal through it, the nozzle having an enlarged end, and a helical spring disposed about the nozzle, the nozzle body providing a chamber in which the enlarged end of the nozzle is disposed, the nozzle body having an aperture therein through which the nozzle protrudes, the helical spring being compressed between the interior of the nozzle body and the enlarged end of the nozzle whereby the enlarged end forces the diaphragm against the grid, the central aperture of the diaphragm being aligned at the enlarged end of the nozzle with the nozzle's central passage, the grid being arranged to mask the central aperture in the diaphragm when the diaphragm is forced thereagainst, and the material to be dispensed being forced by the pressure in the housing through the openings in the grid and against the diaphragm to exert a force thereon counter to the force exerted by the compressed helical spring.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,124,276 March 10, 1964

Kenneth M. Grout

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 8, before "form" insert -- to --;
line 22, for "longitudinal" read -- longitudinally --.

Signed and sealed this 7th day of July 1964.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents