

[54] **IMPROVED VALVE DISPENSING APPARATUS**

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[58] Field of Search **251/63, 325, 324, 63.5; 137/625.38, 625.39; 222/571**

[56] **References Cited**

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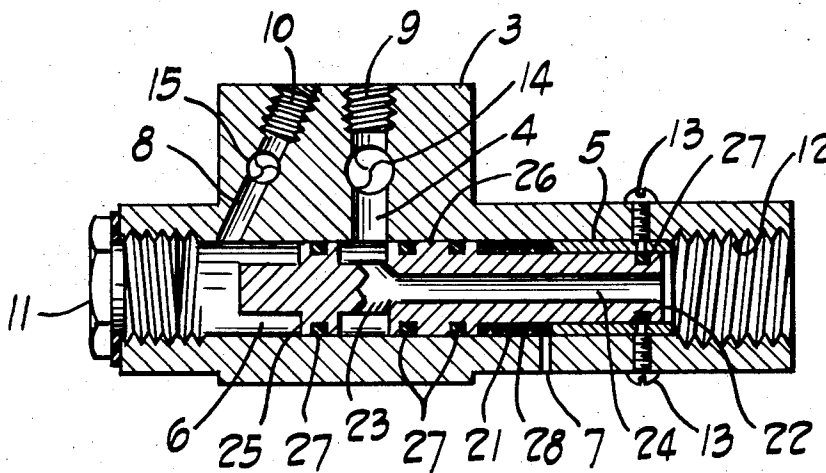
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[57] **ABSTRACT**

An improved valve dispensing apparatus comprising a housing defining a tubular chamber communicating with a material inlet and exit port and a unitary valve member defining a passageway axially sealingly slideable in the chamber is set forth. Also a process for dispensing of material having ductile particulates therein from such apparatus is disclosed. In the process, the valve member is moved to a position establishing registry of the passageway with the inlet and exit port for providing a pathway for flow of material. On movement of the valve member to establish registry, a wiping action is effected on the interior of the chamber while simultaneously sealing the annular space between the chamber and valve member, thereby causing dispensing of the material substantially completely through the passageway and suppressing accumulation of ductile particulates in the annular space. Return of the valve member to its original position again causes a wiping action on the chamber wall and additionally causes a suction force on undispensed material, thereby preventing dripping.

4 Claims, 3 Drawing Figures



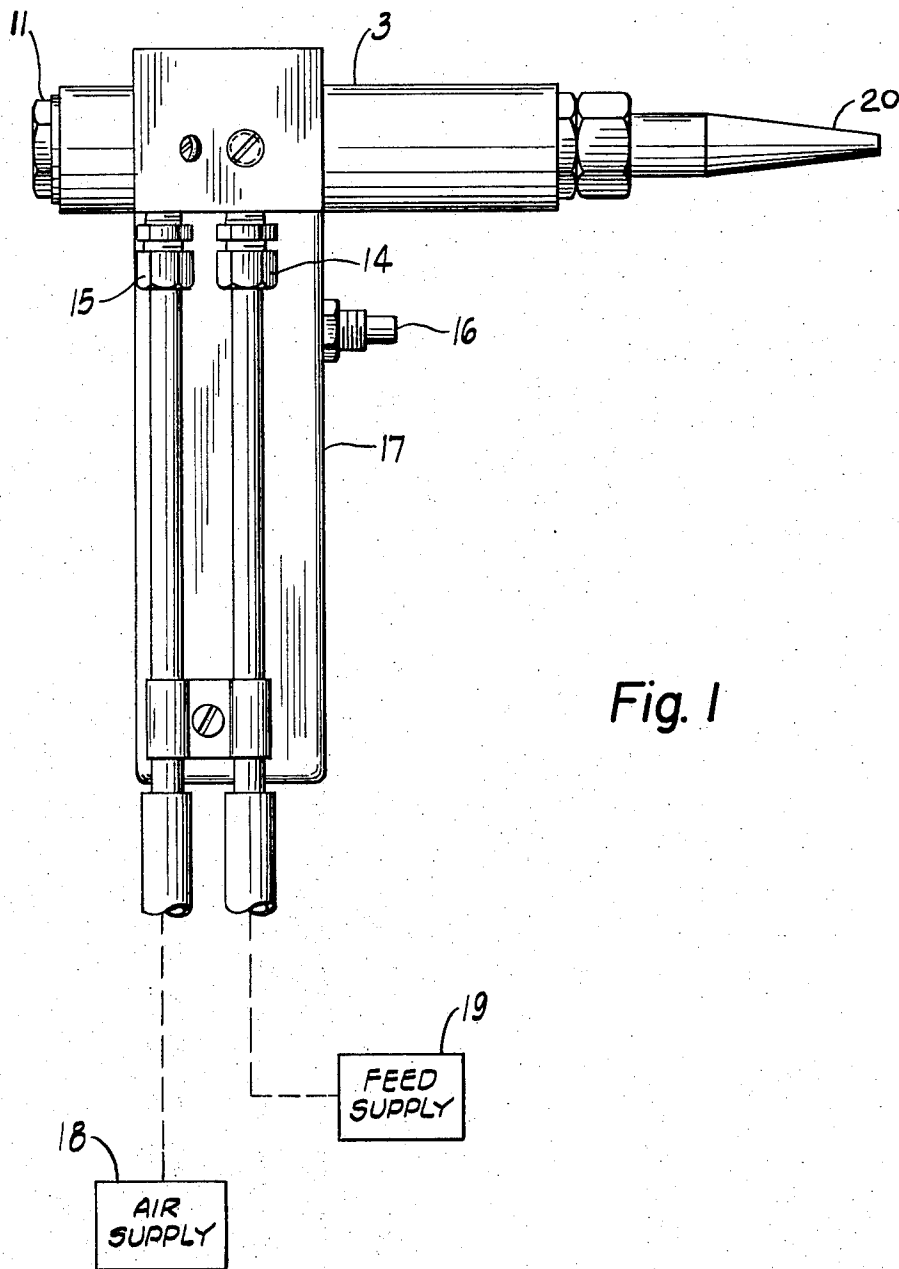


Fig. 1

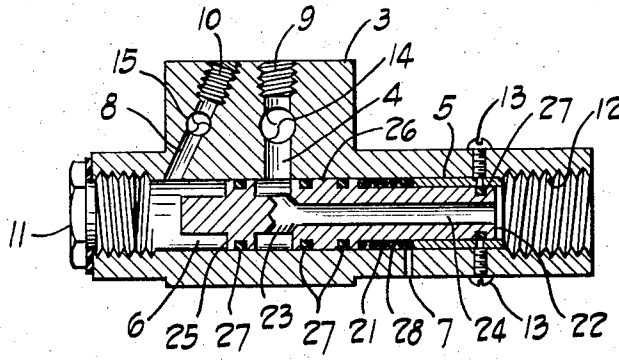


Fig. 2

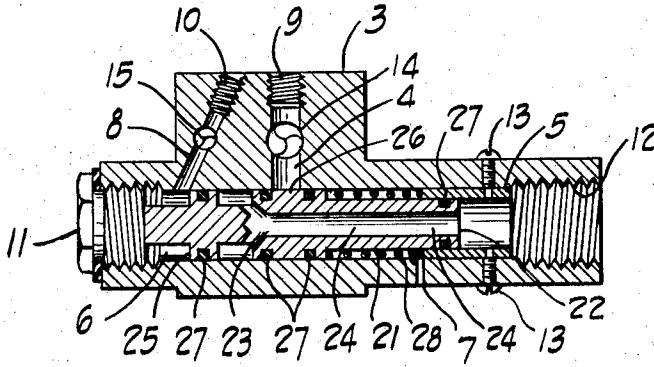


Fig. 3

AN IMPROVED VALVE DISPENSING APPARATUS

A type of non-drip dispensing apparatus particularly designed for the dispensing of liquid material such as paint is described in U. S. Pat. No. 3,146,913. It comprises a cap having a housing, a slideable tubular sleeve valve supported by the housing having a portal therein, and a piston supported by the sleeve valve. In operation, the cap is attached to a container of liquid; e.g., paint having an opening. Then, the piston is moved forward to engage the sleeve valve and move it so as to register the portal in the sleeve valve with the opening in the container. The container then, is tilted to a pouring position and paint is dispensed through a spout formed by the sleeve valve. To terminate flow, the piston and sleeve valve are returned to the original position, wherein the sleeve valve blocks the flow of material from the opening in the container. On retraction, the piston effects a suction force on the undispersed contents in the sleeve valve.

A second type of dispensing apparatus adapted for the non-drip dispensing of liquids and semiliquids; e.g., brazing paste is described in U. S. Pat. Nos. 3,132,775 and 3,160,331. In operation, liquid material to be dispensed is charged to a metering chamber through an inlet port in the apparatus. A piston at the rear part of the metering chamber supporting an axially slideable valve member is urged to a forward position ejecting the material from the metering chamber. As the piston is moved forward, the valve member moves so as to block the flow of material to the metering chamber from the inlet port. Additionally, the movement of the valve member opens a passageway to an exit port or discharge chamber. Flow of material is terminated when the piston reaches its most forward position and the metering chamber is empty. Then the piston and valve are caused to retract to their original position by resilient means in order to begin the process over again. As the valve member is urged back to its original position, suction force is exerted on the undispensed material in the discharge chamber to prevent dripping.

The valve dispensing apparatus of this invention has many advantages over previous dispensing apparatus of the non-drip type. One feature including its non-drip feature, is that there is a unitary valve member as opposed to a double-acting valve and piston which substantially reduces the chances for plugging and lessens cleaning requirements. Another feature is that the flow of material is directed through an internal passageway as opposed to a valve where the flow of material is directed around and over the external surface of the valve member. This feature substantially reduces the probability of clogging of seals and abrasive action thereon particularly where the material to be dispensed contains gross particulates, such as metal powder. Also this feature reduces the possibility of the valve member "freezing" in the chamber, often caused by ductile malleable particles being jammed between the valve member and chamber as the valve member is reciprocated. Another feature is that a wiping action by resilient seals is effected against the chamber wall or valve member preventing buildup of particulate material between the wall and the valve member, which may inhibit the reciprocation of the valve member from a closed (second) to open (first) position.

Other advantages of the valve dispensing apparatus and process are illustrated in the specification, claims, and accompanying drawings.

FIG. 1 is a perspective view of a dispensing gun employing the dispensing valve described herein with accompanying attachments and switches. FIG. 2 is a cross-sectional view of a specific embodiment of the valve in FIG. 1 for dispensing of material illustrating the unitary valve member supported by the tubular chamber in the first position. FIG. 3 is a cross-sectional view of the valve of FIG. 1 and similar to that of FIG. 2, except that the unitary valve member is shown in the second position, wherein the flow of material through the valve is blocked by the valve member.

Referring to the drawings, FIG. 1 represents a side view of the dispensing gun having pneumatic features employing a specific embodiment of the dispensing valve described herein. Valve housing (3) is mounted to handle (17) supporting inlet feed line (14) connected to feed supply (19) and inlet air line (15) connected to air supply (18). Nozzle (20) is mounted to exit and portion of the valve for dispensing of material where desired. Cap (11) is supported by the housing at the other end to provide for easy cleaning of the valve. For operation, trigger (16) is actuated to initiate dispensing of material through the nozzle and termination thereof.

Referring to the drawings, FIGS. 2 and 3, the valve for dispensing of liquid material comprising a housing (3) defining a tubular chamber (6) having a rear and front section, said chamber communicating with a material inlet port (4) and material exit port (12) and a unitary valve member (21) axially sealingly slideable in the chamber, the unitary valve member defining a passageway (24) which in operation, registers with the inlet and exit port for establishing a pathway for flow of material from inlet to exit. Cap (11) is threadably mounted at the back end of the housing for easy removal to facilitate cleaning of the valve.

The tubular chamber defined by the housing usually is in the shape of a cylinder as opposed to another shape, such as rectangular, octagonal, etc. For reasons of efficiency and usually it is easier to manufacture a valve member and chamber particularly in cylindrical form to provide sealing means to prevent leakage of material between the interior of the chamber and the exterior of the valve member. Inlet port (4) communicates with a material inlet feed line (14) at a 90° angle as indicated, so that the material to be dispensed can be charged to the inlet port. Usually, the material is fed to the inlet port under pressure and the rate of flow controlled by an external valve. Often, the valve is mounted directly on the dispensing gun embodying the valve assembly. The inlet port is provided with a plug at 9 which is threadably mounted therein for easy removal to facilitate cleaning of the inlet port. Exit port (12) denotes the section of the valve where material is dispensed from the tubular chamber. It is shown as being threaded so that it can be adapted for receiving a nozzle. Although the nozzle is not required, one is employed in the preferred embodiment for providing desired material application.

Sleeve (5) which is optional, is supported within the tubular chamber (6) for receiving unitary valve member (21). The sleeve is smooth and has a low coefficient of static friction with steel, usually below about 0.2 to reduce friction when the valve member is reciprocated

from the closed (second) to open (first) position and vice versa, and to enhance the ability of the seals supported by the valve member to wipe the interior of the sleeve thereby preventing buildup of material between the sleeve and exterior surface of the valve member. The sleeve can extend the full length of the tubular chamber or just a portion thereof as is shown in FIGS. 2 and 3. The sleeve is held in place by sleeve holders (13).

Unitary valve member (21) is sealingly axially slideable from the first or open position as noted in FIG. 2, to the second or closed position as noted in FIG. 3 in tubular (6). The unitary valve member defines an internal passageway (24) having a fore end (22), and an aft end (23). When the unitary valve member is in the first position, as shown in FIG. 2, the aft end of the passageway (23) is in registry with material inlet port (4) and the fore end of the passageway (22) is in registry with exit port (12), thus providing a pathway for flow of material from inlet port (4) to exit port (12) through passageway (24). The passageway aft end (23) is shown as a lateral inlet to the passageway and is bounded on the rear by a first shoulder section (25), and on the front by a second shoulder section (26). These shoulder sections (25 and 26), support O-ring seals (27), usually made of a resilient material such as rubber; e.g., neoprene. On the other hand, such O-rings can be supported by the chamber itself, so that the valve member is passed through these rings and sealing effected by contacting such shoulder sections.

As the drawing indicates shoulder (26) blocks the flow of material from the inlet port when the valve member is in the second position. At least one O-ring seal should be provided on each side of the inlet port (4) as is shown to insure adequate sealing. Of course, more O-ring seals can be placed along the unitary valve member than are shown if desired.

Air passage (8) is mounted within the housing so that air will be caused to impinge against the back wall of the first shoulder section (25). When air impinges against the first shoulder section, the unitary valve member is caused to move forward to a first position establishing registry between passageway (24) and inlet port (4) and exit port (12). Air vent (7) is mounted in said housing so that air pressure can be maintained or vented as desired when movement of the unitary valve member is required. Air passage (8) is capped with plug (10) so that cleaning of the air passage can be permitted and connects to air supply line (15).

It is to be understood that the air means for moving the unitary valve member from the second position to the first position is not the only means which will accomplish this result. Any means can be used which will cause movement of the valve member. For example, the unitary valve member can be moved mechanically by inserting a pushrod in the back of the housing, so that when finger pressure is applied, the valve member is moved forward. The pushrod can be actuated by a lever, trigger, or other mechanical means.

A resilient means is commonly used for the purpose of urging the valve member from the first position to the second position, however, other types can be used. An example of a resilient means is a compression spring supported by the unitary valve member. The resilient means could also be attached to a pushrod or trigger actuated mechanism if that type of mechanism were used for achieving the same result. Other means for

moving the valve member to and from each position is known to those skilled in the art and the means suggested herein, are representative and should not be construed as exhausting.

The apparatus is primarily used for the dispensing of fluent materials, such as for example, liquids and pastes. Liquids typifying the material which can be dispensed include: paint, resinous solutions; e.g., an epoxy, a polyester dissolved in vinyl monomer, and the like. Paste-like materials typifying the material to be dispensed include brazing paste, gel, putty, etc. An example of a brazing paste usually comprises a finely divided metal powder, such as copper dispersed in a hydrocarbon gel and liquid vehicle.

In operation, the unitary valve member is moved forward from the second position to the first or open position, as shown in FIG. 2, by forcing air from air supply tank (18) into air passage (8) located at that rear of the tubular chamber and opening air vent (7). As the valve member is urged forward from the second position to the first position, spring (28) supported by the unitary valve member is compressed. Wiping of the chamber walls by O-ring seals supported on shoulders (25 and 26) is effected during movement while simultaneously blocking flow of residual material between the wall surface and unitary valve member. Material then is charged to the inlet port (4) from feed supply tank (19) through inlet feed line (14) then passed through the passageway in the unitary valve member and out exit port (12). When the flow of material is to be stopped, the air pressure in passage (8) is shut off and spring (28) causes the unitary valve member (21) to return to a second position, illustrated in FIG. 3. Again, a wiping action is effected on the chamber wall cleaning residual material therefrom. As the valve member is moved to the second position, shoulder section (26) sealingly moves to block inlet port (4), thus preventing flow of material into the passageway in the valve member, as well as into the annulars between and chamber and said valve member. Additionally, as the valve member is moved to the second position, a suction force is created by the valve member on the undispersed material in exit port (12), thus preventing drooling or dripping from the exit port or nozzle coupled thereto.

The valve housing and unitary valve member can be constructed out of materials commonly used for construction of such devices. Such materials include: steel, tin, stainless steel, monel, iron, and other metals, and polymeric materials such as cellulose acetate, cellulose acetate butyrate, nylon, epoxy resins, polyesters, and so forth. The unitary valve member can be made out of like or unlike material to that of the housing. The sleeve optionally used to support the valve member generally is made of a material having a low coefficient of friction; e.g., polytetrafluoroethylene, polyethylene, polypropylene, etc.

The unitary valve member is preferably constructed of a material different from that of the tubular chamber; e.g., one of a metal and the other of a non-metal, especially for the dispensing of a paste material containing gross malleable or ductile particles (Tyler standard mesh size of 60-300). Flexible paste wiping action between the interior wall of the chamber and exterior of the valve member is established and preferably of a plurality of zones to prevent deformation of the gross particles. Metal to metal seals as opposed to flexible seal often cause deformation of the particles. The uni-

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tary valve member should be slightly smaller than the tubular chamber or sleeve, if a sleeve is employed. Clearance between the unitary valve member and the tubular chamber or sleeve should be about 0.001 to 0.01 thereby reducing the possibility of deforming such gross malleable and ductile particles during dispensing of a paste containing the same.

What is claimed is:

1. A valve for dispensing of liquid or semi-fluid material which comprises:

a housing defining a tubular chamber communicating with an inlet port for receiving material and an exit port for dispensing of material therefrom, said chamber having a rear and front sections, and a sleeve therebetween, and said chamber communicating with an air passage and a vent therefor;

a unitary cylindrical valve member sealingly axially slideable into said sleeve between a first front position and a second rear position in said tubular chamber, said member defining an internal passageway having an aft end for receiving material from the inlet port and a fore end for dispensing of material to the exit port, said aft end being a lateral inlet to said internal passageway, said lateral inlet being bounded by a rear first shoulder section and a front second shoulder section, said shoulder sections being sealingly slideable in said chamber, said valve member when in said first front position establishing registry of said passageway with said inlet port and said exit port, thereby providing a pathway for flow of material from said inlet port to said exit port, said valve member when in said second rear position establishing nonalignment be-

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tween said passageway and said inlet and exit ports, said valve member sealingly blocking the flow of material between said inlet port and said aft end of said passageway while in said second rear position; said air passage being situated to the rear of said first shoulder section, and said air vent forward of said second shoulder when said valve is in said second rear position;

means for urging said unitary valve member from said second rear position to said first front position establishing registry of said passageway with said inlet and exit ports for dispensing of material; and

means for urging said unitary valve member from said first front position to said second rear position for terminating flow of material from said exit port and for causing said valve member to exert a suction force on undispensed material in said exit port, thereby preventing dripping from said exit port.

2. The valve of claim 1, wherein said sleeve has a coefficient of static friction with steel of not greater than about 0.2.

3. The valve of claim 2, wherein said means for urging the valve from first to second position is a spring means and wherein said first and second shoulder sections on said valve member each supports at least one O-ring seal.

4. The valve of claim 2 wherein said inlet port is blocked by the unitary valve member in the second position by at least one O-ring seal on each side of the inlet port.

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