

April 17, 1962

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3,029,985

FLOW CONTROL PLUNGER

Filed Feb. 24, 1959

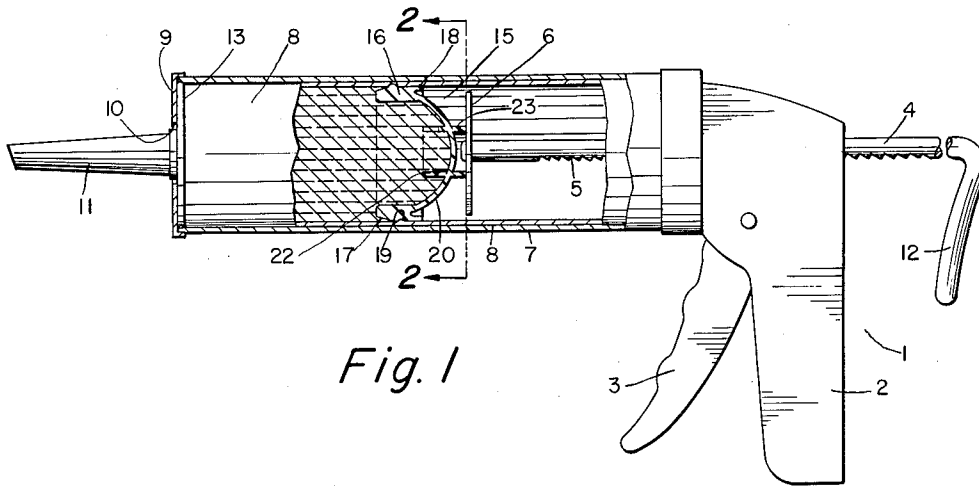


Fig. 1

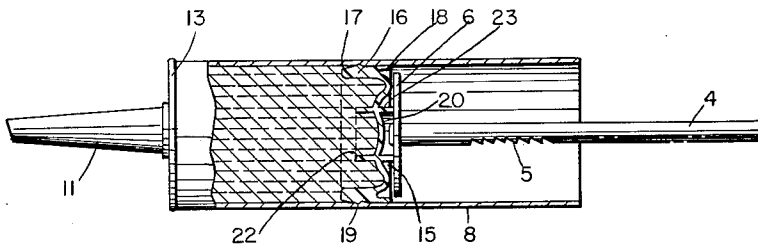


Fig. 3

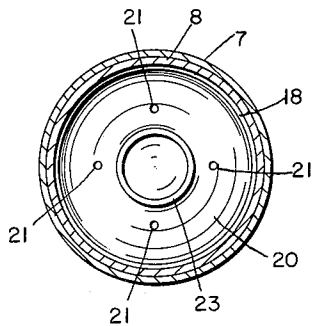


Fig. 2

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3,029,985

FLOW CONTROL PLUNGER

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Filed Feb. 24, 1959, Ser. No. 795,207

4 Claims. (Cl. 222-327)

This invention relates generally to plungers for feeding or expelling material from a container, but has reference more particularly to a plunger which is especially adapted for controlling the flow of viscous, mastic-like, or semi-fluid materials, such, for example, as caulking compound, from the cartridges or containers in which such materials are usually sold or dispensed.

While the plunger is adapted for general use in the dispensing of a wide variety of such materials, its use will be described, for purposes of illustration, in connection with the dispensing of caulking compound by means of a caulking gun.

In the dispensing of caulking material by means of a caulking gun, the gun supports a cartridge, usually of a disposable material, which contains the caulking compound, and the gun is provided with a lever-actuated plunger which engages and moves the cartridge piston toward the dispensing spout or nozzle of the cartridge, thereby displacing the caulking compound, so as to force it through the spout.

When the gun is subsequently set aside, the caulking compound which remains in the cartridge expands and oozes or drips from the spout.

Various expedients have been used, heretofore, to prevent the caulking compound from thus oozing or dripping from the spout, some of which embody the use of a flexible diaphragm, but none of these have proven satisfactory, since the diaphragm, in all cases, has been made so thin that it has a tendency to adhere to the compound and cannot overcome this adherence sufficiently or quickly enough to prevent the oozing or loss of compound from the dispensing spout. Moreover, in all cases where such as diaphragm has been employed, no provision is made for the release of air which is confined between the diaphragm and the caulking compound, so that it becomes extremely difficult to actuate the diaphragm, with any degree of efficiency.

The present invention has, as its primary object the provision of a control plunger, which overcomes the aforesaid disadvantages, and is highly effective as well as efficient in preventing loss of the compound from the dispensing spout, when the gun is temporarily set aside or is not in use.

More specifically, the invention has as its principal object the provision of a control plunger of the character described, which is so constructed that it can quickly and easily recover its initial form, which recovery is highly effective to prevent the oozing or loss of the compound from the dispensing spout of the cartridge.

Another object of the invention is to provide a plunger of the character described, in which provision has been made for the release of air which is confined between the plunger and the caulking compound, whereby actuation of the plunger, with a high degree of efficiency is permitted.

A further object of the invention is to provide a plunger of the character described, which is so constructed as to permit the application of uniform pressure to the plunger, irrespective of the area or size of the plunger or piston of the caulking gun.

A still further object of the invention is to provide a plunger of the character described, having a novel vac-

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uum cup appendage which is of value in retracting the caulking compound into the cartridge.

Other objects and advantages of our invention will be apparent during the course of the following description.

In the accompanying drawings forming a part of this specification, and in which like numerals are employed to designate like parts throughout the same,

FIG. 1 is a side elevation, partly in cross-section, showing the flow control plunger in its unstressed condition;

FIG. 2 is a cross-sectional view, taken on the line 2-2, of FIG. 1, and

FIG. 3 is a fragmentary cross-sectional view, similar to FIG. 1, but showing the flow control plunger in its stressed condition.

Referring more particularly to the drawings, reference numeral 1 designates generally a conventional type of caulking gun, comprising a handgrip 2, a trigger or actuating lever 3, a rod 4 having teeth 5, a plunger or piston 6 affixed to the front end of the rod 4, a cartridge support 7 adapted to receive a cylindrical cartridge 8, and which is closed at its front end, as by a plate 9 having a central opening 10 through which the dispensing spout or nozzle 11 of the cartridge 8 extends.

The trigger 3 is effective, when pulled toward the handgrip 2, to actuate a ratchet mechanism (not shown) which engages the teeth 5 of the rod 4, whereby to advance the rod to the left, as shown in FIG. 1, in a step-by-step movement. When the rod 4 is rotated about its longitudinal axis, as by means of the handle 12, disengagement of the ratchet mechanism with the teeth 5 is effected, so that the rod 4 and the plunger or piston 6 may be retracted to the right. Upon withdrawal of the rod 4 and piston 6, the cartridge 8, which contains the caulking compound, may be inserted in the support 7, as shown in FIG. 1, and when thus inserted, the lever 3 may be actuated to cause the plunger or piston 6 to enter the right-hand end of said cartridge.

The cartridge 8 may be a paper or cardboard tube, provided at its ends with metal reinforcing rings 13, containing the caulking compound, which is of a viscous or plastic nature.

For the purpose of ejecting the caulking compound from the cartridge and through the spout or nozzle 11, we have provided a plunger which is designated generally by reference numeral 15.

The plunger 15 is preferably made or molded, in one piece, from a soft plastic, such as polyethylene, and comprises a cylindrical body portion 16 of substantial thickness, i.e.; approximately .156", and about $\frac{1}{16}$ " long, having a beveled edge 17 which facilitates entry of the plunger into the cartridge 8. The body portion 16 of the plunger is also provided at its rear end with a cylindrical extension or projection 18, of the same external diameter as the body portion 16, but of substantially less thickness, i.e.; about $\frac{1}{32}$ ", and about $\frac{3}{16}$ " in length. This extension 18 aids in preventing the plunger 15 from being "cocked" or tilted during movement thereof in the cartridge 8. The body portion 16 of the plunger is further provided with an annular rib 19 on its outer surface, which is effective to produce a fluid-tight seal between the plunger and inner wall of the cartridge 8.

Extending rearwardly from the rear end of the radially-inner portion of the body 15 of the plunger is a dome-shaped element 20, which, in this case, is of substantial thickness, i.e. about .03125", and having an inner radius of about .84375" and an outer radius of about .875". It has been found, in actual practice, that any attempt to make the dome-shaped element 20 of a thickness substantially less than this thickness is impractical, due not only to the difficulties encountered in molding parts of polyethylene or similar plastics with lesser wall thick-

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nesses, but due also to the flimsiness or lack of rigidity of walls of lesser thickness.

For purposes to be presently explained, the dome-shaped element or wall 20 is provided with a plurality of circumferentially spaced holes 21, there being four such holes or openings, each about $\frac{3}{64}$ " in diameter, provided in this instance.

Extending from the inner wall of the element or wall 20 and axially inwardly into the plunger is a cylinder 22 which, with the inner wall of the element 20, forms a vacuum or suction cup, the function or purpose of which will be presently explained.

The plunger further includes a cylinder 23 which extends axially outwardly from the outer wall of the element 20, in axial alignment with the cylinder 22. The cylinders 22 and 23 are of a diameter about one-third that of the body 16 of the plunger, and the cylinder 23 is somewhat shorter than the cylinder 22. The function of the cylinder 23 will also be explained in connection with the description of the use or operation of the plunger.

The plunger 15, in its normal or unstressed condition, appears as shown in FIG. 1.

When the plunger or piston 6 is moved to the left, as shown in FIG. 3, the piston 6 engages the rear end of the cylinder 23 of the plunger 15, and continued movement of the piston 6 causes the wall 20 of the plunger to assume the distorted condition shown in FIG. 3 and the plunger, as a whole, to move or slide to the left, so as to displace the caulking compound under pressure through the dispensing spout 11 of the cartridge 8.

The aforesaid movement of the plunger 15 and distortion of the wall 20 thereof is effected in an easy and efficient manner, not only because the pressure of the piston 6 is applied uniformly to the wall 20 over a fairly large area, represented by the relatively large area of the rear end of the cylinder 23, but also because any resistance to the distortion of the wall 20, due to air which is entrapped between this wall and the caulking compound, is free to escape rearwardly through the openings 21 of the plunger.

Incidental to such distortion of the wall 20, the cylinder 22 is forced into the caulking compound in the manner shown in FIG. 3.

When the rod 4 and its piston 6 are released, the wall 20 of the plunger 15 will, due to its inherent resiliency, reassume its original form or condition, as shown in FIG. 1, and in so doing, the wall 20 as well as the cylinder 22 will act as suction or vacuum cups, causing the caulking compound to be retracted sufficiently to release the pressure of the compound, which would otherwise cause any of the compound within the spout 11 to ooze or leak from this spout. Even if this suction is not great, the pressure on the compound is relieved, so that it will not, as the result of expansion, cause the compound in the spout 11 to ooze or leak from this spout. Consequently, when the caulking gun is set aside after use, there will be no tendency for the compound to leak from the spout.

In any event, the construction of the plunger 15 is such that its inherent tendency to recover or reassume its original form is sufficient to overcome any tendency of the plunger to adhere to the caulking compound when the plunger 15 is released.

A further advantage of the cylinder 22 of the plunger is that it enters the caulking compound axially of the cartridge and thus acts as a guide to insure uniform and desired flexing or distortion of the wall 20, and obviating any tendency of the plunger 15 to become cocked or tilted during use.

It may be noted, in this connection that the distortion of the wall 20 of the plunger is not too great, and is limited to the extent indicated in FIG. 3, this limitation being imposed by the construction of the plunger, and the relative thicknesses of the parts thereof. Due to this limi-

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tation, the recovery of the plunger to its initial form is effected quickly and easily. Any distortion of the wall 20, beyond the form shown in FIG. 2 would result in a "set" or ultimate setting of the shape of the wall 20 which would result in the plunger becoming ineffective for its intended purpose, or would create a condition in which the wall 20 could not recover its initial form, at least not automatically.

It is thus seen that we have provided a control plunger which admirably fulfills all of the objects of the invention, and which can be made in commercially desirable quantities, at low cost.

It is to be understood that the forms of our invention herewith shown and described, are to be taken as preferred examples of the same, and that various changes may be made in the shape, size and arrangement of parts thereof, without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described our invention, we claim:

1. A caulking material cartridge for caulking guns, comprising a cylinder provided at its respective front and rear ends with a dispensing spout and with an axially movable plunger, said plunger comprising a cylindrical body having a resilient dome-shaped element extending rearwardly from said body, and having a first cylindrical element formed integrally with said dome-shaped element and extending forwardly from said dome-shaped element into said cartridge and providing with said dome-shaped element a suction cup, said first cylindrical element being of smaller diameter than said cylindrical body, whereby when an external force is applied to the resilient dome-shaped element in a direction to move the plunger axially to dispense caulking material from the cartridge said dome-shaped element will flex forwardly to project said forwardly extending cylindrical element into the caulking material axially of said cartridge, whereby said cylindrical element acts as a guide to insure uniform flexing of said resilient dome-shaped element and to minimize any tendency of the plunger becoming cocked or tilted during axial movement thereof, said plunger having a second cylindrical element extending from said resilient dome-shaped element in a direction therefrom opposite to that of said first-named cylindrical element, said second cylindrical element being of tubular configuration and formed integrally with said resilient dome-shaped element.

2. A caulking material cartridge, as defined in claim 1, in which said resilient dome-shaped element has a wall thickness of not less than about .030".

3. A plunger for use in dispensing viscous material formed in a single piece from plastic, said plunger comprising a cylindrical body having a resilient dome-shaped element, extending rearwardly from said body, and having a first cylindrical element formed integrally with said dome-shaped element and extending forwardly from the inner face thereof into the space formed by said cylindrical body and dome-shaped element, and providing with said dome-shaped element a suction cup of lesser diameter than said cylindrical body, whereby when the inner face of the dome-shaped element is placed against a mass of viscous material and an external force is applied to the outer face of the dome-shaped element and in a direction axially of the first cylindrical element to move the plunger forwardly to dispense said viscous material, said dome-shaped element will flex forwardly and said first cylindrical element will be projected into said viscous material and act as a guide to insure uniform flexing of said resilient dome-shaped element and to minimize any tendency of the plunger becoming cocked or tilted during movement thereof, said plunger having a second cylindrical element extending from said resilient dome-shaped element in a direction therefrom opposite to that of said first cylindrical element, said second cylindrical element being of tubular configuration and formed integrally with said dome-shaped element.

4. A plunger, as defined in claim 3, in which said resil-

ient dome-shaped element has a wall thickness of not less than about .030".

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