

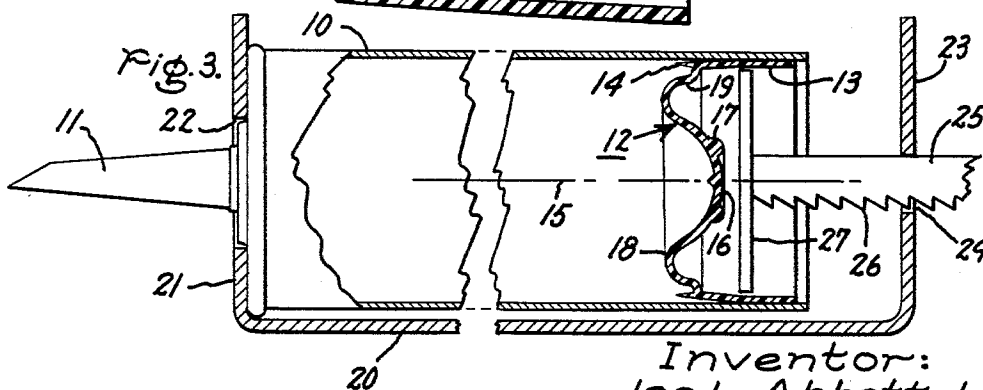
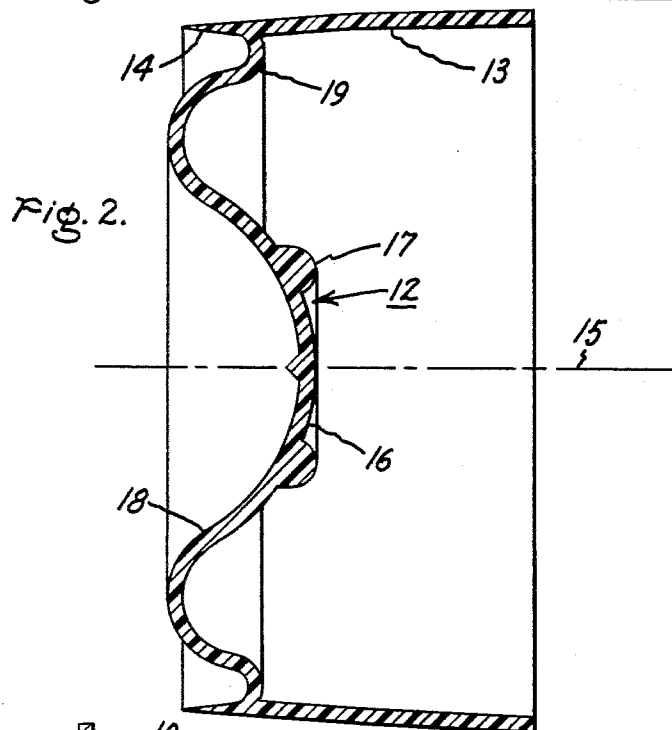
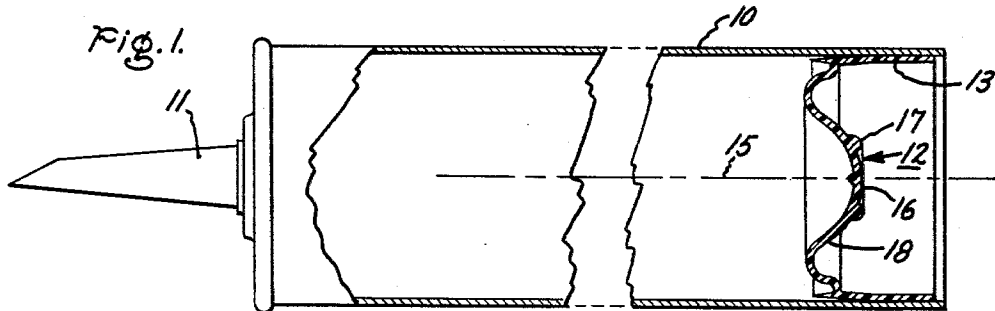
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DISPENSING CARTRIDGE PLUNGER

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1

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DISPENSING CARTRIDGE PLUNGER

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This invention relates to a combination end closure and plunger for cartridge-containers used in dispensing guns for caulking compounds, grease, oil and the like.

For the dispensing of viscous materials, such as caulking compounds and the like, numerous prior art dispensers have been employed. These dispensers generally comprise a cartridge assembly composed of a cylindrical body, a dispensing spout or nozzle at one end, and a combination end seal and plunger movably disposed in the cylindrical body. Upon movement of the plunger towards the nozzle, the contents of the cartridge assembly are forced out of the nozzle. Such cartridge assemblies have generally been designed for use in mechanical cartridge guns in which a piston plate forces the plunger towards the nozzle or have been designed for pneumatic dispensers in which air pressure forces the plunger towards the nozzle.

However, prior to the present invention, no satisfactory plunger has been available which operates satisfactorily for both mechanical type cartridge guns and pneumatic cartridge guns. Furthermore, many prior art plungers have not provided instant relief of the pressure on the contents of the cartridge assembly upon the release of the force on the plunger so that it has been impossible to provide instant cessation of the flow of the contents of the cartridge assembly from the nozzle. Prior art cartridge plungers, furthermore, have not been designed for ready insertion into the cylindrical cartridge body without entrapment of air between plunger and the cartridge contents. In addition, they have not been designed so as to clean all of the contents of the cartridge from the walls of the cylindrical body of the assembly, thereby providing sources of leakage between the contents of the cartridge assembly and the atmosphere.

The objects of the present invention are to provide an improved cartridge assembly plunger which can be used interchangeably in either mechanical dispensers or pneumatically actuated dispensers, which is readily inserted into the cylindrical body of a cartridge assembly, without air entrapment, which provides instant release of pressure on the contents of the cartridge assembly and which cleans the interior walls of the cylindrical body of the cartridge assembly and avoids the problems of leakage of substances between the interior of the cartridge assembly and the surrounding atmosphere.

Briefly stated, in accordance with one aspect of my invention, I provide a plunger for use in a caulking cartridge assembly and the like comprising a tapered, elongated lateral portion or side wall and a dome-shaped central portion connected to the side walls through a bellows arrangement and reinforced with an annular rib portion, whereby the plunger can be actuated by either mechanical pressure or pneumatic pressure, and whereby instant pressure release is obtained on the contents of the container whereby leakage is minimized.

My invention will be best understood from the following detailed description taken in connection with the drawing in which:

FIG. 1 is a sectional view of a cartridge assembly including the plunger of the present invention in the undeformed state,

FIG. 2 is a sectional view, approximately to scale, of the plunger of the present invention, and

FIG. 3 is a sectional view of the caulking cartridge assembly of FIG. 1 in a caulking gun of conventional structure.

2

As shown in FIG. 1, the dispensing cartridge assembly has a cylindrical body 10 which can be formed of a plastic material such as polyethylene or more often from two or more plies of spirally wound paper. To one end of body 10 is affixed a discharge nozzle 11, which is shown as a unitary member but which can comprise a nozzle portion joined by any suitable means to a closure portion which in turn is joined by any suitable means to cylindrical body 10. Alternatively, cylindrical body 10 and nozzle portion 11 can be formed of a single molded plastic material, such as molded polyethylene. Nozzle 11 can be sealed by any suitable means (not shown). The present invention is directed to the plunger which is designated generally by the numeral 12 and which is shown in greater detail to approximate scale in FIG. 2. As shown in FIGS. 1 and 2, the plunger 12 is imperforate and comprises side wall 13 which is an elongated tapered member with a leading edge 14. Wall 13 can be described geometrically as the frustum of a cone. Side wall 13 is tapered at an angle of from about 2 to 5 degrees from axis 15 of plunger 12.

The general diameter of plunger 12 is selected so that the diameter of leading edge 14 is several mils less than the inside diameter of body 10 and the diameter of the rear edge of wall 13 is several mils greater than the inside diameter of body 10. The available clearance between leading edge 14 and body 10 permits easy insertion of plunger 12 into body 10. During this insertion the entire plunger 12 is usually deformed so that air can escape from inside of body 10 instead of being trapped between plunger 12 and the contents of the cartridge assembly, which contents are added before the plunger 12 is inserted.

Located centrally of side wall 13 is dome portion 16 which is generally spherical in shape and which extends in a direction transverse to axis 15 a distance of about 40 to 60 percent of the diameter of leading edge 14 of side wall 13. An annular rib 17 is formed integral with dome portion 16. Axis 15 also forms the axis of rib 17. The inside diameter of rib 17 is approximately 20 to 30 percent of the diameter of leading edge 14 of side wall 13. The cross-sectional area of rib 17 is relatively small compared to its diameter. Bellows 18 connects dome portion 16 with side wall 13.

Plunger 12 can be formed of any desired material, with the preferred material of construction being polyethylene, but with satisfactory plungers capable of being formed from polystyrene, polycarbonate, resins and the like. The use of the materials of construction just described permits a limited amount of flexibility and relative movement between the various sections of the plunger 12 even though the entire plunger is of unitary construction. Particularly, the flexible nature of the materials of construction permits the forward movement of dome portion 16 with respect to leading edge 14 upon the application of pressure to dome 14. The limited movement is permitted primarily because of the presence of bellows 18. The flexible nature of the material also permits expansion of the portion of side wall 13 near leading edge 14, so that a tight fit is possible between the side wall 13 and the inner wall of body 10. Shoulder 19, which is formed by bellows 18, forms a limiting surface for forward movement of a piston, which is used in mechanical caulking cartridge guns to force plunger 12 towards nozzle 11.

The operation of the plunger of the present invention is best understood by reference to FIG. 3. In FIG. 3 is shown a caulking gun having a semi-cylindrical body portion 20 and a front plate 21 defining an aperture 22 through which nozzle 11 fits, and a back plate 23 defining an aperture 24. Extending through aperture 24 is plunger rod 25 which has affixed thereto teeth 26 for engaging a

3

conventional trigger operated ratchet mechanism not illustrated, plunger rod 25 drives plunger plate 27 towards nozzle 11. Since forward movement of nozzle 11 is impossible because of front plate 21, the contents of the caulking cartridge assembly are forced out of the nozzle 11. The relative forward movement of dome 16 towards nozzle 11 is limited by contact of plunger plate 27 with shoulder 19. Forward movement of dome portion 16 transmits forces through bellows 18 which keeps leading edge 14 in contact with the inner surface of cylindrical body 10 so that as plunger 12 moves towards nozzle 11, leading edge 14 acts as a doctor blade and cleans the contents of the caulking cartridge assembly from the inner surface of wall 10.

Since the contents of the cartridge cannot move into the space between side wall 13 and wall 10, there is no tendency for irregular displacement of wall 13 with respect to wall 10, and, therefore, the probability of leakage of air into the cartridge assembly or of the contents of the caulking cartridge assembly into the air is minimized. Annular rib 17 serves to stiffen the entire plunger assembly 12 and, in particular dome 16, so as to prevent inversion of dome 16 and bellows 18. Bellows 18 retains its bellows configuration in the undeformed state prior to the application of pressure to the plunger assembly, during the application of pressure, and after the pressure is released. The inherent characteristics of the combination of dome 16 with annular rib 17 and bellows 18 causes a backward pressure against plunger plate 27 so that as soon as the pressure on plunger plate 27 is released, dome 16 forces plunger plate 27 in a direction away from nozzle 11 thereby instantaneously relieving pressure within the cartridge assembly so that there is no tendency for the contents of the cartridge to leak from, or be forced out of, nozzle 11.

While FIG. 3 shows the actuation of caulking cartridge plunger 12 by mechanical means, the plunger can also be activated pneumatically. Upon pneumatic actuation, the entire caulking cartridge assembly is inserted into a pneumatic caulking cartridge gun (not shown) and pneumatic pressure is applied to plunger 12. The pneumatic pressure applied to the plunger 12 forces the plunger 12 towards nozzle 11. A particularly important feature of the present invention is the elongated nature of side wall 13, which eliminates a serious problem usually found in the pneumatic operation of cartridge plungers. This problem is the tendency of the cartridge plungers to tip under pneumatic pressure, thereby exposing the contents of the cartridge to the gas used for the pressure and also thereby preventing proper operation of the caulking cartridge. In the present invention, the caulking cartridge plunger has side walls 13 which are at least about 40 percent of the length of the diameter of caulking cartridge plunger 12, e.g., from 40 to 90 percent of the diameter. These elongated side walls permit satisfactory operation of the plunger, and this feature, in combination with dome portion 16, annular rib 17, bellows 18, and leading edge 14, provide for uniform travel of the caulking cartridge plunger towards nozzle 11 with the inner walls 10 of the caulking cartridge assembly being cleaned and without any tendency for inversion of plunger 12. Upon

4

release of pneumatic pressure, the tendency of dome 16 is to be forced away from nozzle 11, thereby instantly releasing the pressure on the contents of the cartridge assembly.

It should be understood that the plungers of the present invention are satisfactory for cartridge containers used in dispensing all types of conventional materials, such as grease, oil, caulking compounds, and the like. It is contemplated that obvious modifications of this invention will occur to those skilled in the art and that such modifications shall come within the scope of the appended claims, which are intended to cover all changes and modifications of the invention hereinbefore described which do not constitute departures from the spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An imperforate cartridge plunger of the type described comprising in the undeformed state an elongated, rearwardly extending lateral portion adapted to contact the inner wall of a cylindrical dispensing cartridge, a dome-shaped central portion having an annular rib integral therewith, and a bellows connecting said lateral portion and said central portion, said annular rib being designed to stiffen said plunger and to prevent inversion of said dome-shaped central portion and said bellows.

2. An imperforate cartridge plunger comprising in the undeformed state a tapered, elongated, rearwardly extending lateral portion adapted to contact the inner wall of a cylindrical dispensing cartridge and being tapered towards a leading edge, a dome-shaped central portion having an annular rib integral therewith and a bellows connecting said central portion with said lateral portion adjacent said leading edge, said annular rib being designed to stiffen said plunger and to prevent inversion of said dome-shaped central portion and said bellows.

3. An imperforate cartridge plunger comprising in the undeformed state an elongated, rearwardly extending lateral portion adapted to contact the inner walls of a cylindrical dispensing cartridge, said lateral portion being tapered toward a leading edge, a dome-shaped central portion having an annular rib integral therewith, and a bellows connecting said central portion to said lateral portion adjacent said leading edge, said annular rib being designed to stiffen said plunger and to prevent inversion of said dome-shaped central portion and said bellows, said lateral portion extending rearwardly a distance equal to at least about 40 percent of the diameter of said leading edge.

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