Dec. 4, 1962 D. E. TRUMBULL 3,066,836

REPLACEABLE DISPENSER FOR SEALANT GUN

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FIG. 1

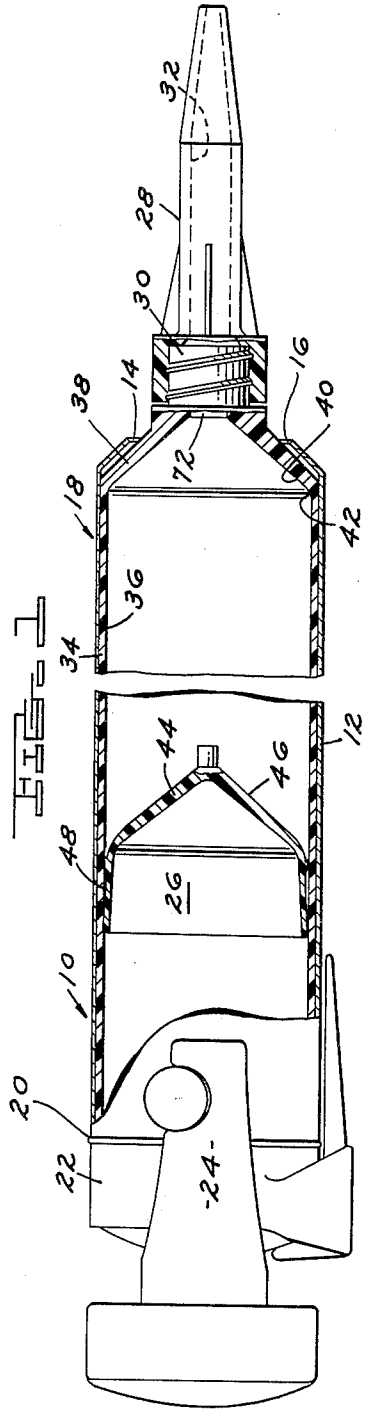
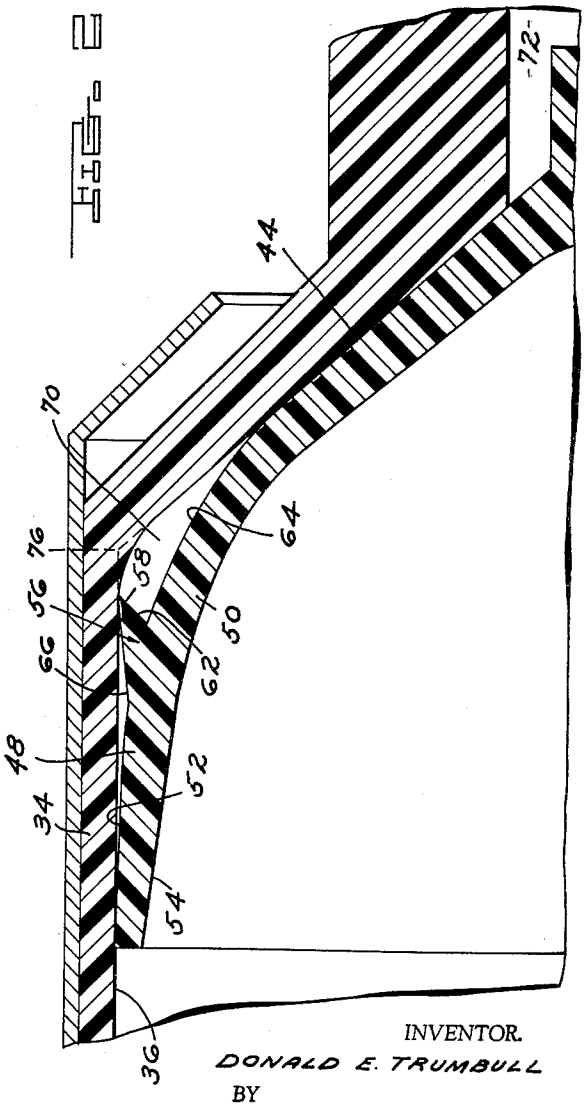


FIG. 2



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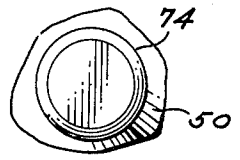

FIG. 5

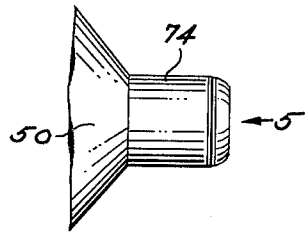

FIG. 4

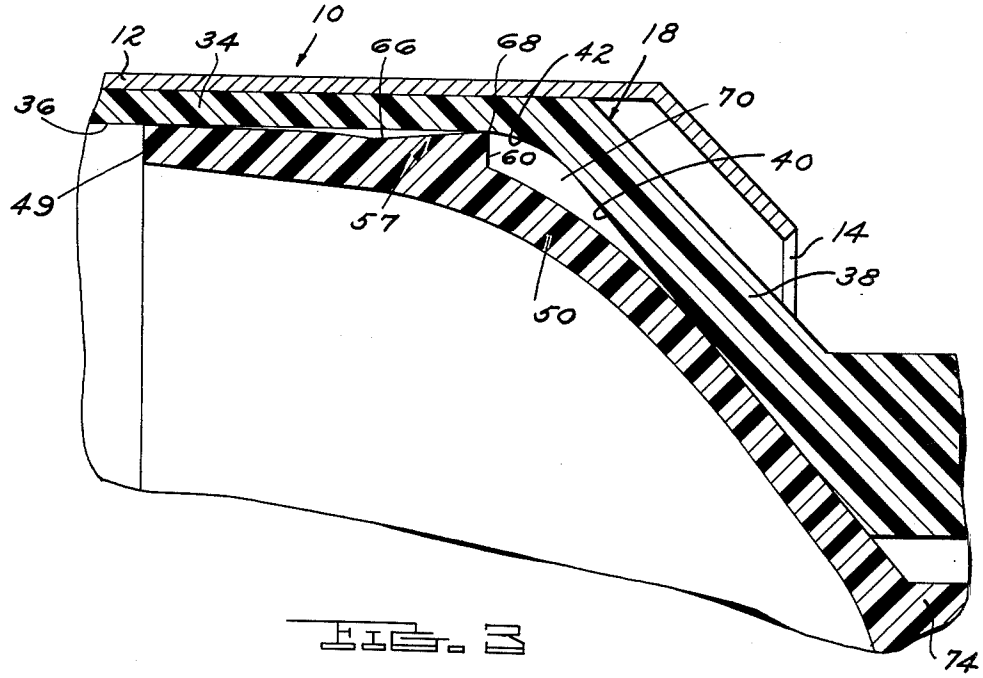

FIG. 3

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REPLACEABLE DISPENSER FOR SEALANT GUN

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Filed Feb. 19, 1962, Ser. No. 173,941
4 Claims. (Cl. 222—327)

This invention relates to improvements in replaceable dispensers for sealant guns and the like.

Sealant guns of the type shown in U.S. Patent No. 2,838,210 and in the application of George S. Pyles for Sealant Gun, Serial No. 805,466, filed April 10, 1959, now U.S. Patent No. 3,042,268, have the sealant compound or the like to be dispensed from the gun contained within a replaceable cartridge dispenser comprising a polyethylene cartridge of generally cylindrical configuration closed at one end by a forward wall to which a nozzle may be connected, with a plunger in the cartridge behind the sealant compound such that upon application of a force applied to the rear of the plunger urging it against the sealant compound, the compound is dispensed through the nozzle connected to the forward wall of the cartridge. The specific improvements disclosed herein relate to the plunger and its cooperative relation with the cartridge.

Prior to the development of the improvements disclosed herein, the plunger shown in the U.S. Patent No. 2,838,210 was modified to provide a forwardly extending skirt adjacent the convex forward wall of the plunger, which skirt cooperated with the inner wall surface of the cartridge to wipe sealant compound therefrom as the plunger was urged forwardly in the cartridge against the sealant compound therein. As a consequence the internal wall of the cartridge was fairly cleaned out by the movement of the plunger. However this forwardly extending skirt modification, while cleaning the walls of the cartridge, interfered with the complete exhaustion of sealant material from the cartridge because as the plunger approached the convex forward wall of the cartridge the skirt on the plunger engaged such wall preventing the plunger from completely bottoming in flush mated relation with the forward wall of the cartridge. As a consequence sealant material remained in the cartridge even when the plunger had been urged to its extreme forward position. Taken over thousands or millions of cartridges, the amount of sealant material remaining added up to substantial quantities.

The principal object of the present invention is to provide a cartridge and plunger assembly which while wiping clean the inner wall of the cartridge is so constructed and arranged that the plunger will bottom in flush mating engagement with the forward wall of the cartridge to expel all cartridge contents from between the mating surfaces. A concomitant object is the provision of a plunger having a peripheral cartridge wall wiping lip with the plunger and lip so designed that the plunger may fully seat in mating flush engagement with the forward wall of the cartridge to dispense substantially all of the material from the cartridge when the plunger is in its extreme forward position.

Another object of the invention is in the provision of a wiping lip as aforesaid which extends forwardly of its point of connection with the plunger and which reacts to the pressure of sealant material in the cartridge thereagainst to be pressed radially outwardly against the wall of the cartridge to effect a seal and wiping action therewith, but wherein the leading edge of the lip is disposed rearwardly of the forward wall of the plunger to allow such forward wall to nest against and within the forward wall of the cartridge.

Another object of the invention is the provision of a

wiping lip which exhibits a forwardly directed face extending radially away from the plunger and disposed substantially perpendicular to the axis of the plunger and having a marginal edge adapted to engage and wipe the interior of the cartridge as the plunger is urged forwardly therethrough.

A further object of the invention is the provision of a polyethylene plunger having a conical forward end portion and a substantially cylindrical rear end portion connected by a radius wall portion with a wiping lip integral with the plunger in the region of the cylindrical wall portion and extending forwardly in overhanging spaced relation the radius wall portion with the leading edge of such overhanging lip spaced rearwardly of the conical forward end of the plunger such that the conical end of the plunger will nest in flush mating relation with a correspondingly shaped forward end wall of the cartridge while the leading edge of the lip is spaced rearwardly from such conical forward end of the cartridge.

Other objects, advantages, and meritorious features will more fully appear from the specification, claims, and accompanying drawings wherein:

FIG. 1 is a longitudinal view partially in section through a sealant gun of the type shown in the aforesaid application of George S. Pyles, showing a cartridge dispenser embodying the invention disclosed herein;

FIG. 2 is an enlarged fragmentary cross-sectional view through the cartridge shown in FIG. 1 with the plunger disposed in flush nesting abutment with the forward wall of the cartridge, such plunger being of one preferred form;

FIG. 3 is a view similar to FIG. 2 but wherein the wiping lip of the plunger is of a different form;

FIG. 4 is a fragmentary view of the nose of the plunger shown in FIG. 1; and

FIG. 5 is an end view looking in the direction of arrow 5 of FIG. 4 of the nose of the plunger.

A detail discussion of the arrangement and operation of the sealant gun **10** shown in FIG. 1 will be found in the aforesaid application of George S. Pyles. However to review important features pertinent to the instant disclosure, the gun includes a rigid barrel **12** of cylindrical shape having a reduced diameter forward wall portion **14** provided with a cartridge nozzle receiving opening **16** through which projects the forward end of a replaceable polyethylene cartridge **18**, also of generally cylindrical configuration. The cartridge **18**, open at its rear end, in provided with a peripheral flange **20**, encircling such open end, which is received between a valve closure cap **22** and the rear end edge of the barrel **12** to be sealingly gripped therebetween such that the cartridge is longitudinally suspended within the barrel. The barrel **12** and closure cap **22** are held releasably together by means of a retainer assembly generally indicated at **24**. Upon loosening of the retainer assembly the barrel **12** may be removed from the cap and the cartridge **18** removed from the barrel by slipping the barrel over the forward end of the cartridge and nozzle.

Material to be dispensed by the gun is contained within the cartridge ahead of the plunger **26**. Air pressure is supplied to the cartridge through cap **22** rearwardly of the plunger to urge the plunger forwardly to press against the sealant compound or the like to urge the same out of the cartridge through the nozzle **28**. As brought out in the aforesaid application of Pyles the nozzle **28** is threadedly received over a spout-like prolongation **30** at the forward end of the cartridge. The spout-like prolongation **30** has an axially disposed passage therethrough communicating with the interior of the cartridge and with a passageway **32** through the nozzle.

The cartridge and plunger disclosed in the instant ap-

plication may be formed of the same materials having the same flexibility and resistance to flexure as the cartridge and plunger disclosed in the aforesaid application. Similar to the disclosure of the aforesaid application the cartridge comprises a cylindrical portion 34 which is slidably received within the rigid barrel 12 and is provided with an internal cylindrical surface 36. The rear end of the cartridge at flange 20 is open so that the plunger 26 may be received therethrough. The forward end of the cartridge is provided with a conically shaped forwardly extending forward end wall 38 of an increasing thickness from the cylindrical portion 34 toward the spout-like prolongation 30. The conical forward wall or forward end of the cartridge has an internal conical surface 40 which through an internal radius surface 42 smoothly blends with the internal cylindrical surface 36.

Despite the fact that the forward conical wall 38 of the cartridge is spaced rearwardly from the reduced diameter forward wall 14 of the barrel 12, so that the conical wall of the cartridge is not supported by the barrel 12, the conical shape of the forward end of the cartridge serves to sufficiently rigidify it so that it will withstand lateral pressure of the nozzle 28 as the nozzle is urged laterally against a workpiece to which sealant compound is being applied.

The plunger 26 is of cup-shaped configuration having a forwardly extending conically shaped front end wall portion 44 whose forwardly facing exterior surface 46 corresponds or conforms in angular relation to the axis of the plunger and cartridge to the angular relation of the inner surface 40 of front wall 38 of the cartridge so that the front wall of the plunger will nest in flush abutment against and within the internal conical surface 40 of the forward end of the cartridge as shown in FIGS. 2 and 3. The plunger includes a substantially cylindrical rear end portion 48, which while substantially cylindrical is, as shown in the enlarged views of FIGS. 2 and 3, specifically in the form of a truncated cone. The forward end portion 46 of the plunger and the rear end portion 48 are connected together by an intermediate portion 50 in the form of a radius wall section. The rear edge 49 of the substantially cylindrical portion 48, or truncated cone, slidably engages the interior surface 36 of the cartridge and upon application of fluid pressure rearwardly of the plunger is urged radially outwardly to form a sliding fluid-tight seal with the wall of the cartridge. It will be observed that the angle of slope of the exterior surface 52 of the rear end portion 48 of the plunger is slightly different than the slope of interior surface 54 so that the portion 48 may be said to be tapered rearwardly. The inside taper 54 is for the purpose of enabling the plungers to be readily extracted from the forming molds in which they are made. The sloping exterior surface 52 of the rear portion 48 of the plunger, which surface falls gradually inwardly away from the wall 36 of the cartridge toward the forward end of the plunger, allows the portion 48 to expand radially outwardly to increase the area of contact with the wall 36 of the cartridge to improve the seal between the plunger and cartridge.

In substantially the region of portion 48 or at the junction of portion 48 with the radius wall portion 50 there is an integral wiping, sealing, and plunger stabilizing lip extending continuously peripherally around the plunger and having an outwardly flared leading edge portion. In FIG. 2 such lip is shown at 56 as having a leading edge portion 58 which extends forwardly in overhanging spaced relation to radius wall 50. The lip also has a forwardly directed face 62 inclined at an angle to the axis of the plunger. Face 62 and the exterior surface 64 of the intermediate radius wall portion 50 cooperatively define a sealant material trapping groove.

In the construction shown in FIG. 3 the lip is provided with a forwardly directed face 60 disposed substantially perpendicularly to the axis of the plunger. The periphery of face 60 terminates in an edge 63 which corresponds

to the leading edge 58 of lip 56 of FIG. 2 in that it is disposed in radially outwardly spaced relation to the radius wall portion 50 and bears against the inner surface 36 of the cartridge 34. It will be observed that the lip of FIG. 2 and the lip of FIG. 3 are both flared outwardly beyond the normal line of the exterior surface of the plunger at the intersection of portions 48 and 50 so that in effect the lip appears to have a relieved portion as at 66. Such relief allows for radial expansion of the plunger to improve the seal between the plunger wall and the cartridge wall.

The lip shown in FIG. 2 is flexible radially outwardly upon the reaction of sealant compound trapped within the aforementioned groove as the plunger is urged forwardly against compound in the cartridge. Such outward flexure of the lip serves to increase the sealing action or wiping action between the lip and the inner wall 36 of the cartridge. In the case of both lips it will be observed that the forward leading edge portion 58 of lip 56 and forward leading edge 68 of lip 57 of FIG. 3 are spaced rearwardly of the conical forward wall of the plunger so that when the plunger bottoms against the forward end of the cartridge, the lips will be spaced rearwardly of the forward end of the cartridge allowing flush mating engagement of the forward end of the plunger and cartridge walls. While a small space will remain as at 70, such space is so small as to be of insignificant consequence.

More particularly the leading edge 58 of lip 56, and leading edge 68 of lip 57 are disposed rearwardly of an imaginary line of intersection 76 of the projection of conical surface 46 of the plunger and an imaginary cylindrical projection of the plunger at its greatest diameter (corresponding to a cylindrical projection of surface 36 of the cartridge).

In the aforementioned modified form of the plunger disclosed in U.S. Patent 2,838,210 in which the plunger is provided with a forwardly extending wiping skirt, the skirt extended beyond the convex forward wall of the plunger and engaged the concave surface at the forward end of the cartridge preventing the plunger from completely bottoming in the cartridge and allowing sealant compound to remain between the forward wall of the plunger and the cartridge. However as will be evident from a consideration of FIGS. 2 and 3, all of the sealant compound between the conical surfaces of the plunger and cartridge forward walls will be exhausted from the cartridge.

It will be noted that the apex of the conical wall of the plunger enters the nozzle opening 72 of the cartridge when the plunger is fully bottomed in the cartridge. The nose of the plunger at the apex of its conical surface may be provided with a forwardly extending cylindrical projection 74 as shown in FIGS. 4 and 5. Such cylindrical nose serves to expel additional sealant compound from the cartridge as it projects into the nozzle opening. It will be noted that the diameter of such nose projection is sufficiently less than the diameter of the nozzle opening so that the nose is assured of entering the opening as the plunger bottoms in the cartridge.

What I claim is:

1. A dispenser for use in sealant guns and the like comprising: a cylindrical plastic cartridge having an open rear end and having a conically shaped forward end with a nozzle opening therethrough at its apex, a cup-shaped plastic plunger slidably received in the cartridge and having a substantially cylindrical portion extending rearwardly of a conically shaped forward end portion with the rear edge of said substantially cylindrical portion closely slidably juxtaposing the interior wall surface of the cylindrical cartridge and expansible radially outwardly against the inner wall of the cartridge upon application of fluid pressure within the cartridge behind the plunger to establish a sliding fluid pressure seal between the cartridge and plunger, said plunger having a

radius wall portion extending between and connecting said conically shaped forward end portion and said substantially cylindrical portion, a sealing lip extending continuously peripherally around the plunger and integral therewith in the region of the connection between the cylindrical and radius wall portions, said lip having a radially outwardly flared forward relatively sharp leading edge portion disposed in continuous peripheral sliding sealing engagement with the inner wall surface of the cartridge and disposed rearwardly of the conically shaped forward end portion of the plunger, said conical forward end portion of the plunger nesting in flush mating abutment with the conically shaped forward end of the cartridge and with the apex of the forward end portion of the plunger entering the nozzle opening of the cartridge and with said leading edge of the lip spaced rearwardly from said conically shaped forward end of the cartridge when the plunger is at its extreme forward position in the cartridge.

2. The invention as defined in claim 1 characterized in that said forward leading edge portion of the lip extends forwardly of said substantially cylindrical portion of the plunger and overhangs in radially outwardly spaced relation the said radius wall portion of the plunger to form with such radius wall portion a forwardly opening groove for trapping therewithin cartridge contents during forward urging of the plunger against contents of the cartridge, and said leading edge portion being radially outwardly flexible to be urged into sliding sealing engagement with the inner wall of the cartridge by reaction of cartridge contents trapped in said groove.

3. The invention as defined in claim 1 characterized in that said lip is provided with a forwardly facing radially extending face disposed substantially perpendicular to the axis of the substantially cylindrical portion of the cartridge and the said forward leading edge portion of the lip comprises the peripheral edge portion of such face.

4. The invention as defined in claim 1 characterized in that said plunger at the apex of its conical wall portion is provided with a forwardly projecting cylindrical portion coaxially aligned with the nozzle opening of the cartridge to enter therein when the plunger is urged to its extreme forward position in the cartridge.

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