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G. S. PYLES

2,670,241

FLOW GUN

Filed May 22, 1951

2 Sheets-Sheet 1

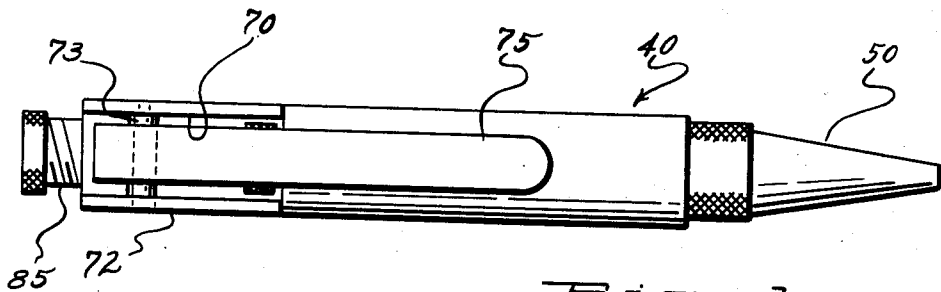


Fig. 1

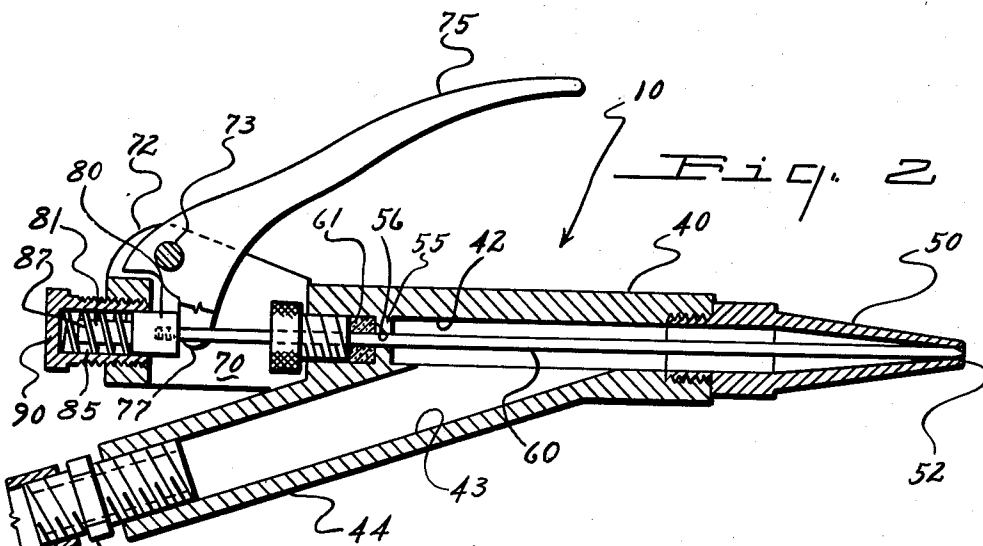


Fig. 2

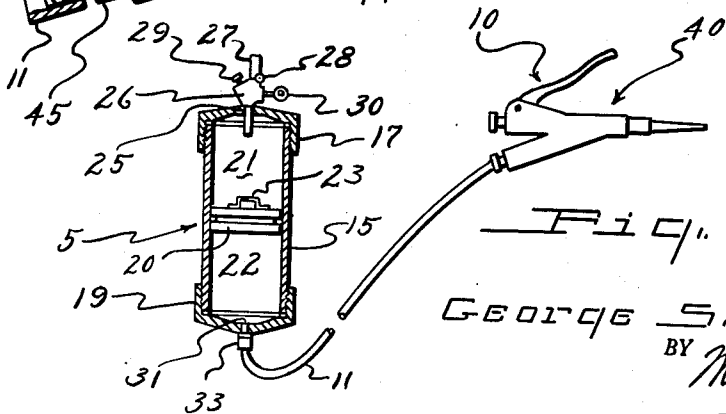


Fig. 3

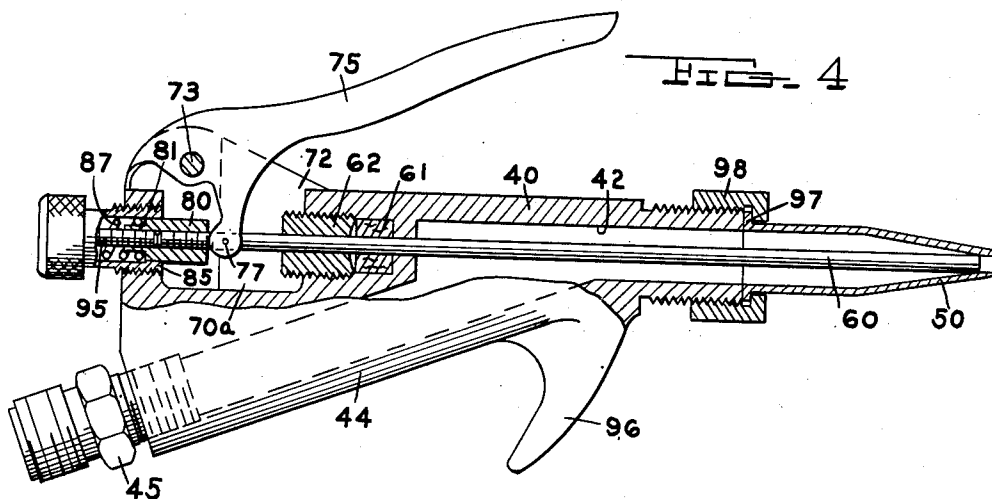
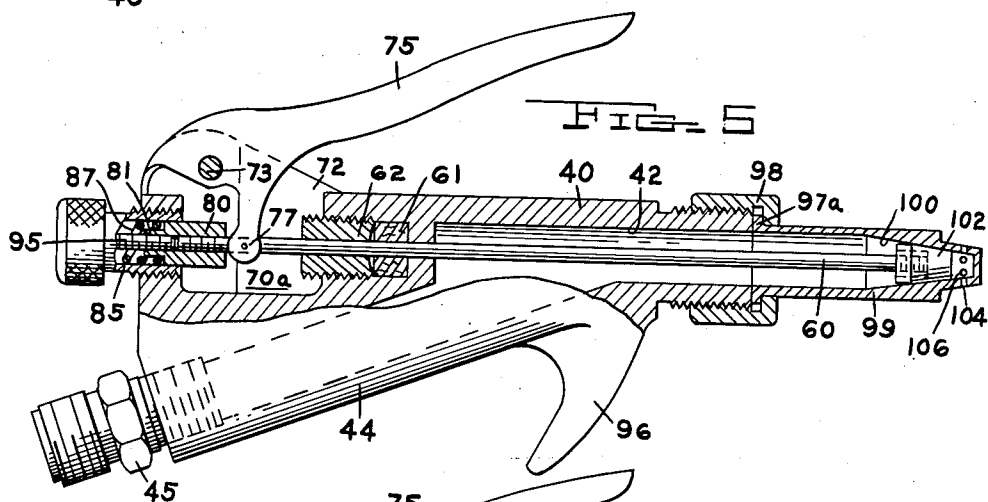
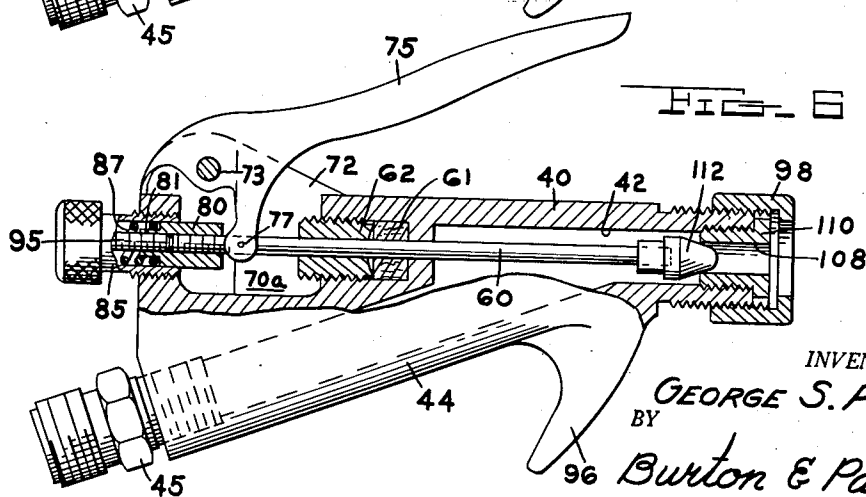
INVENTOR.
George S. Pyles
BY *Wm. Graham*
Attys=

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G. S. PYLES
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2 Sheets-Sheet 2



INVENTOR.

GEORGE S. PYLES

BY

Burton E Parker
ATTORNEYS

UNITED STATES PATENT OFFICE

2,670,241

FLOW GUN

George S. Pyles, Detroit, Mich.

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2 Claims. (Cl. 299-150)

1

This invention relates to devices having to do with the flowing of viscous liquids, such as plastic solutions, onto the surfaces on which they are to be used.

More particularly, it relates to what might be termed a flow gun or liquid delivery device of the nozzle type which is used to eject viscous liquids onto surfaces for use.

One object of the invention is to provide a device of this character adapted for flowing viscous plastic solutions safe-guarded from exposure to air until the moment of final discharge from the nozzle of the gun.

Another object is to provide a device of the character described which is adapted to eject viscous liquids where desired for use in carefully controlled quantities and onto any surface where such liquid might be desired for use.

Another object is to provide a flow gun of the character set forth wherein simple control means is provided to regulate the amount of liquid delivered accurately and as desired and wherein the device is adapted to function in an efficient manner at all times.

A meritorious feature is that my improved flow gun is designed to accommodate delivery nozzles of varying design and to employ valve mechanism of varying design to fit a particular delivery nozzle, all as hereinafter set forth.

This gun is particularly adapted to deliver glue, cement, and other heavy plastic sealing compounds wherever the same are employed. Typical fields of use reside in sealing glass panes within frames, fastening down weatherstrips, sealing body joints and cement gaskets. Wherever two parts are intended to be sealed together, it may be used to deliver the sealing compound along the joint.

Generally speaking, the gun is used to deliver plastic material under relatively high pressures, such as 3000 to 4000 pounds per square inch, and it is particularly advantageous for use in the furniture industry to deliver glue or cements of various types.

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

Fig. 1 is a top plan view;

Fig. 2 is a medial longitudinal section with some parts shown in side elevation;

Fig. 3 shows partly in section and partly in elevation a complete flow unit of which my improved nozzle device forms a part;

Fig. 4 illustrates a slightly modified form of gun

2

as compared with the first three figures of the drawing;

Fig. 5 illustrates a gun of the same general character as Fig. 4, but provided with a different type of delivery nozzle; and

Fig. 6 illustrates a gun of the same general character as Figs. 4 and 5, but provided with a slightly different type of delivery nozzle.

This application represents a continuation in part of my application Serial No. 55,409, filed October 19, 1948, now abandoned, which in turn was a continuation in part of my application Serial No. 616,753, filed September 17, 1945, now abandoned.

Referring to the drawings, I show in Fig. 3 the complete apparatus whereby the flow of viscous fluid is delivered through my improved flow gun. The fluid to be delivered is provided in a closed reservoir and a flow line extends therefrom to the gun. For example, there is a pressure reservoir 5 adapted to contain viscous liquid which may be a plastic out of contact with the air. This plastic may be delivered under pressure from the reservoir to the gun. The gun is generally designated as 10. Delivery of the plastic from the reservoir to the gun is by way of a flexible hose 11.

The reservoir comprises a cylinder 15 closed at its ends by threaded caps 17 and 19. A piston 20 is reciprocally mounted within the cylinder dividing it into an air chamber 21 and a liquid chamber 22. The piston may be readily removed from the cylinder to enable refilling of the latter and for this purpose I provide the piston with a handle 23. The cap 17 has an air inlet for it 25 provided with a fitting 26 through which air is admitted to the chamber 21 from a source of air under pressure through a line 27. The fitting is provided with a conventional control valve 28, a conventional safety valve 29, and a pressure indicating dial 30. The bottom cap 19 has an outlet port 31 provided with a fitting 33 for connection to the hose 11. It is apparent that as air is delivered under pressure into the chamber 21, pressure is exerted upon the piston 20 and through the piston upon the fluid for delivery thereof through the line 11 to the gun.

This invention concerns itself with the gun and not with the general assembly. The flow gun is indicated in detail in Figs. 1, 2, 4, 5 and 6. The construction shown in Figs. 1 and 2 will be first described. The flow gun comprises an elongate body element 40 having an axial fluid passage bore 42 extending from its forward end toward the rear end thereof. The body is pro-

3
vided with angular extension or hand grip portion 44 which is hollowed out to provide a bore 43 that communicates with the axial bore 42 of the body. The extension 44 may be provided with a fitting 45 which connects the outer end of the hose 11 therewith for the delivery of fluid through the bore 43 into the bore 42.

In the construction of Figs. 1 and 2 there is a discharge nipple 50 threaded into the outer end of the body 40. This discharge nipple is tapered off externally and internally. The internal taper provides a valve seat 52. The axial fluid passage bore 42 is closed at the rear by a transverse wall 55. This wall has an axial opening 56 through which the stem of a valve may slidably extend. The valve shown is in the form of a needle valve having a stem 60 which extends axially of the bore 42 and through the opening 56. A packing element 61 is provided surrounding the valve stem 60 and seated within a recess in the body 40. This packing is retained in place by a threaded plug 62. The valve stem slides through the plug as shown.

It should be noted that the body wall 55 is disposed somewhat rearwardly of the midsection of elongate body 40. The extension conduit 44 is integral with body 40 and extends rearwardly away from that body at an angle of less than 45° to the longitudinal liquid passageway extending axially through such body. The delivery conduit opens into and communicates with the longitudinal liquid passageway 42 immediately forwardly of the body wall 55. Since the wall of conduit 43 intersects directly the wall of the longitudinal bore passageway 42, as shown in the various figures of the drawing, and since the angle between the two is less than 45°, the opening through which the two communicate is an ellipsoid having a substantially greater area than the cross-sectional area of either the passageway or the conduit. By reason of this relationship, flow resistance from source to nozzle is minimized and is substantially uniform, resulting in uniform flow of the viscous material under any given pressure.

Furthermore, this particular relationship of parts and passageways results in a line of flow from the delivery conduit into the passageway 42 which is substantially unbroken, further reducing the back pressure. This continuous line of feed to the nozzle is also of extreme importance in producing continuous and uniform flow of the viscous material from the source to the point of application. Such continuity eliminates pockets wherein the viscous material during its flow toward the nozzle may accumulate. Such pockets and blockages are inimicable to continued satisfactory operation because of the fact that accumulated material dries during the period of nonuse of the gun and seriously impairs subsequent flow of material from the source to the nozzle.

In addition to this continuity of flow, reduction of back pressure, and elimination of pockets, it should be noted that the delivery conduit 44 communicates with the body of the gun at substantially its point of equilibrium, thus maintaining a delicate balance of the gun which facilitates manipulation of the same.

The body is provided adjacent its rear end with a transverse slot or recess 70 which recess is aligned with and located to the rear of the axial bore 42. Valve stem 60 extends through the recess. This portion of the body is provided with a pair of bosses 72 between which is pivoted

a lever 75 upon a pivot pin 73. The lower end of this lever is bifurcated as at 77 and the stem 60 extends therethrough. The stem is provided with a head or button 80 adjustably threadedly secured thereon which is adapted to be engaged by the bifurcations 77 of the lever as hereinafter described.

An important phase of the invention resides in the positioning of lever 75 with reference to delivery conduit 44. It should be noted that the operating lever in its position of rest, or inoperative position as shown in the drawings, extends forwardly from its pivot point at an angle to the elongate body 40 and lies in substantial parallelism with the delivery conduit 44. Thus during manipulation the operator grasps the gun about the outer faces of the lever 75 and delivery conduit 44, simply squeezing the hand when he desires to open the valve against the bias of the spring. Furthermore, the weight of the gun when so grasped is sustained at substantially its center of gravity by reason of the heretofore described relationship between delivery conduit 44 and elongate body 40 and the relationship between said delivery conduit and the rearwardly pivoted forwardly extending operating lever 75.

The cup-shaped plug 85 is adjustably threaded through the rear end of the body and extends into the recess 70. The bore of this cup-shaped plug is adapted to slidably receive the head 80 of the stem. This head 80 has a rearward extension 81 of reduced diameter. A spring 87 encircles the extension 81 and seats at one end against the head and at the opposite end against the end wall 99 of the plug 85. Threaded adjustment of the plug within the end of the body varies the tension on the spring and also varies the maximum permitted movement of the valve.

It is apparent that the fluid delivered through the gun is protected at all times from exposure to the air. The valve seats at the tip of the nozzle so that the fluid being delivered is not exposed to the air until it is ejected from the gun. The spring 87 maintains the valve normally closed and holds the operating lever 75 elevated. When the lever is depressed, compressing the spring, the valve is opened and fluid can be forced under pressure from the tank through the gun.

Fig. 4 illustrates a similar type of gun structure except for details hereinafter set forth. There is an elongate body 40 having an axial bore 42. This body has an angular extension 44 provided with a coupling 45 which is adapted to couple a flexible hose thereto. The extension 44 is hollowed out to provide a fluid passageway to deliver fluid to the bore 42, and the relationship between delivery conduit and the longitudinal or axial bore 42 is the same as that heretofore described in conjunction with the modification disclosed in Figs. 1-3.

There is a needle valve having a stem 60 which extends through the axial bore and through the packing gland 61 and plug 62 as shown. There is a recess 70a which differs slightly from the recess 70 of Fig. 2 in that it does not extend all the way through the body 40. Such body is provided with bosses 72 between which is pivoted an operating handle 75 upon a pivot pin 73.

The stem is provided with a head 80 adjustably threaded thereon. This head has a rearward extension 81 of reduced diameter and a spring 87 encircles this extension and is seated within the cored-out interior of a cup-shaped plug 85. The spring bears at one end against the head 80 and

at the opposite end against the end of the plug to maintain spring pressure on the valve.

The handle 75 has a bifurcated lower portion 77 as hereinabove described which is adapted to engage the head to urge the valve rearwardly when the handle is depressed against the tension of the spring 87. As heretofore described in conjunction with the modification illustrated in Figs. 1-3, the parallel relationship between handle 75 and delivery conduit 44 inheres in the modified structure of Figs. 4-6 and all the advantages heretofore described in conjunction with such relationship are inherent in this structure.

This construction differs from the one in Fig. 2 in that a set screw 95 is threaded into the rear end of the head 80 to engage the end of the stem 60 to hold such stem at adjusted threaded position within the head. When it is desired to reduce the amount of liquid delivered from the outlet end of the gun, the stem 60 may be threaded outwardly to reduce the permitted valve opening and the set screw 95 may then be threaded down against the end of the stem. The reverse movements can be carried out when it is desired to increase the size of the valve opening. Through the dual threaded adjustment of the head 80 and stem 60 and of the threaded plug 85 in the rear end of the body, it is possible to provide very accurate and careful control of the quantity of liquid to be delivered. The valve stem also is held against accidental rotation within the head which would produce unauthorized variation in the amount of liquid delivered.

In this particular unit there is a downwardly extending handle portion 96. This finger guard handle portion projects downwardly from the elongate body at approximately its juncture with the hand grip portion 44 and lies in the plane defined by them. The handle portion, as clearly illustrated in the drawings, is so located that the gripping fingers of an operator lying rearwardly thereof grasp the hand grip portion and bear against the handle and those fingers which may be forwardly of the handle grasp the elongate body or wall of the longitudinal passageway. This greatly facilitates manipulation of the gun and accurate placement of the same when utilizing the high pressures for which this piece of equipment is intended. The nozzle or tip 50 is provided with an outwardly projecting radial flange 97 and this is adapted to be received within an internally threaded collar 98 as shown in Fig. 4 to secure the tip to the end of the gun body. This collar 98 also serves, as shown in Figs. 5 and 6, to permit the securement of different nozzles or tips to the gun body.

Fig. 5 is similar to the construction shown in Fig. 4 except that the collar 98 is employed to secure a nozzle outlet of a different character as shown in Fig. 4. The nozzle tip of Fig. 5 is indicated by the numeral 99. It is provided with an internally tapered valve seat 100 adapted to seat a valve 102 which is mounted upon the outer end of a stem 60 and the stem extends rearwardly through the axial bore 42 of the body 40 and through the packing gland elements 61 and 62 and through the recess 70a. A head 80 is threaded on the rear end of the stem. This head is disposed within the recess 70a. It extends slidably into the bore of the threaded plug 85. The head is provided with the reduced diameter rearward extension 81. A spring 87 surrounds this extension 81 and is held under compression between the head and the end of the plug 85 to urge the valve to its seat.

There is a handle 75 pivoted upon a pin 73 and adapted to be swung to open the valve against the tension of the spring, all as described.

The nozzle tip is provided with a different outlet, however, in that the outer end has a reduced diameter tapered tip 104 which is closed at the end but provided with transverse discharge openings 106. This particular type of tip is adapted to be received within a counterbore or recess in material to eject liquid against the side wall of such counterbore or recess. Other than as embodied in this nozzle tip, the construction is as described in Fig. 4.

Fig. 6 represents another modification which departs from the construction of Figs. 4 and 5 only in the type of tip fitting provided on the body of the gun. The construction of the gun is the same as that shown in Fig. 5 except that the collar 98 is shown as provided with a valve seat 108. This valve seat element is threaded into the outer end of the gun. The outer end of the gun is in this instance threaded internally and externally. The seat element 108 has an outwardly projecting flange 110 which overhangs the end of the body. This seat element provides a seat for the valve proper indicated as 112. This particular valve 112 is shown as of slightly different formation than the valve 102 of Fig. 5 but either may be used. The valve seat element when threaded into the outer end of the gun is shown in Fig. 6 as spaced slightly from the end of the collar 98 so that any suitable type of outlet connection might be received within the collar and coupled therewith in communication with the bore of the valve seat 108 to provide for the discharge of liquid as described. Otherwise as hereinabove stated, the construction of this figure is the same as that of Fig. 5.

Numerous important advantages derive from the construction heretofore set forth. Leakage is eliminated and the valve is so supported that it will not be bent, thereby risking binding of the valve and consequent faulty operation. The valve stem extending through the longitudinal liquid passageway is clear of obstruction and does not in any way interfere with the flow of viscous material through the gun.

Any tendency of the valve stem to bend or flutter because of its lack of positive support forwardly of the transverse body wall is eliminated because the rear end portion of the stem is securely supported. In the absence of a slidable guide for the valve stem, such as the head 80 at the rear of the stem, the thrust of the valve return spring is unsatisfactory due to binding of the valve stem under pressure of the liquid being delivered through the gun passageway.

Stem 60 is not only supported within the transverse body wall 55 of the gun, but it is supported rearwardly by the head which slides within the plug that carries the spring. The packing is disposed rearwardly of the transverse wall through which the stem extends and for that reason a tight joint is obtainable. Whatever the effect of the high pressure utilized in applicant's gun may be insofar as bending the valve stem forwardly of the transverse body wall is concerned, there is no binding of the rear end of the stem which interferes with free slidable movement of the stem as a whole.

The importance of balance and manipulability attributable to the relationship between elongate body, delivery conduit, and valve actuating handle cannot be too greatly emphasized. This compactness and focusing of the equilibrium center

within the grasp of the operator's hand permits rapid and facile movement of the gun by the operator from point to point during use.

What I claim is:

1. A flow gun for relatively viscous material comprising, in combination, an elongate body provided with a longitudinal bore terminating at the front end of the body in a discharge outlet and defining adjacent thereto a valve seat, said bore terminating at the rear end in a body wall extending generally transversely of the bore, a valve in the bore adapted to close upon the seat and having a stem extending slidably through said transverse body wall and projecting rearwardly thereof, said body having a hand grip portion projecting rearwardly angularly from approximately the mid-section of its underside at an angle of less than 45°, said hand grip portion provided with a delivery conduit passageway for viscous material extending therethrough and opening into said bore at an angle of less than 45° directly forwardly of the transverse body wall and forming with the bore a continuous generally smooth passageway for viscous material, a valve actuating lever pivotally mounted upon the body adjacent to the rear end of the body and coupled with the rearwardly projecting portion of the valve stem to actuate the valve, said lever projecting forwardly from its pivotal mounting upon the body at an angle of less than 45° and overhanging the body and with the top side of the lever when the valve is closed disposed substantially parallel to the underside of the hand grip portion and substantially in the plane of the body and the hand grip portion whereby the lever and the hand grip portion are adapted to be grasped within one hand of an operator, said body provided with a handle portion projecting downwardly therefrom at approximately the juncture of the hand grip portion therewith and lying in the plane defined thereby.

2. A flow gun for relatively viscous compositions comprising, in combination, an elongate body provided with a longitudinal, continuously smooth surfaced, generally cylindrical passageway terminating at the front end in a discharge outlet and defining interiorly adjacent thereto a valve seat, said passageway terminating at the rear end in a body wall extending generally transversely thereof, a valve in the passageway adapted to close upon the seat and having a stem extending

lengthwise through the passageway and slidably through the body wall, said body having a hand grip and cylindrical delivery conduit portion projecting rearwardly angularly from the underside midsection at an angle less than 45° and with its cylindrical delivery conduit wall intersecting directly the cylindrical wall of the longitudinal passageway through the body, whereby a communicating opening between the conduit and passageway of substantially greater area than the cross-sectional area of either is formed to thereby facilitate passage of the viscous composition from the conduit into the passageway, and a valve actuating lever pivotally mounted on the body adjacent its rear end and coupled with the valve stem to actuate the valve, said lever projecting forwardly from its pivotal mounting on the body and overhanging the top side of the body in the plane defined by the body and the hand grip portion at an angle of less than 45°, the top of the lever when the valve is closed being disposed substantially parallel to the underside of the conduit and hand grip portion, said lever and hand grip portion being adapted to be grasped within one hand of an operator, said body characterized in that it is provided with a handle portion projecting downwardly therefrom at approximately the juncture of the hand grip portion therewith and lying in the plane defined by said hand grip portion and body, said handle being so located that the gripping fingers of an operator rearwardly thereof bear against the hand grip portion of the body and those forwardly of the handle bear against the wall of the longitudinal passageway.

GEORGE S. PYLES.

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