

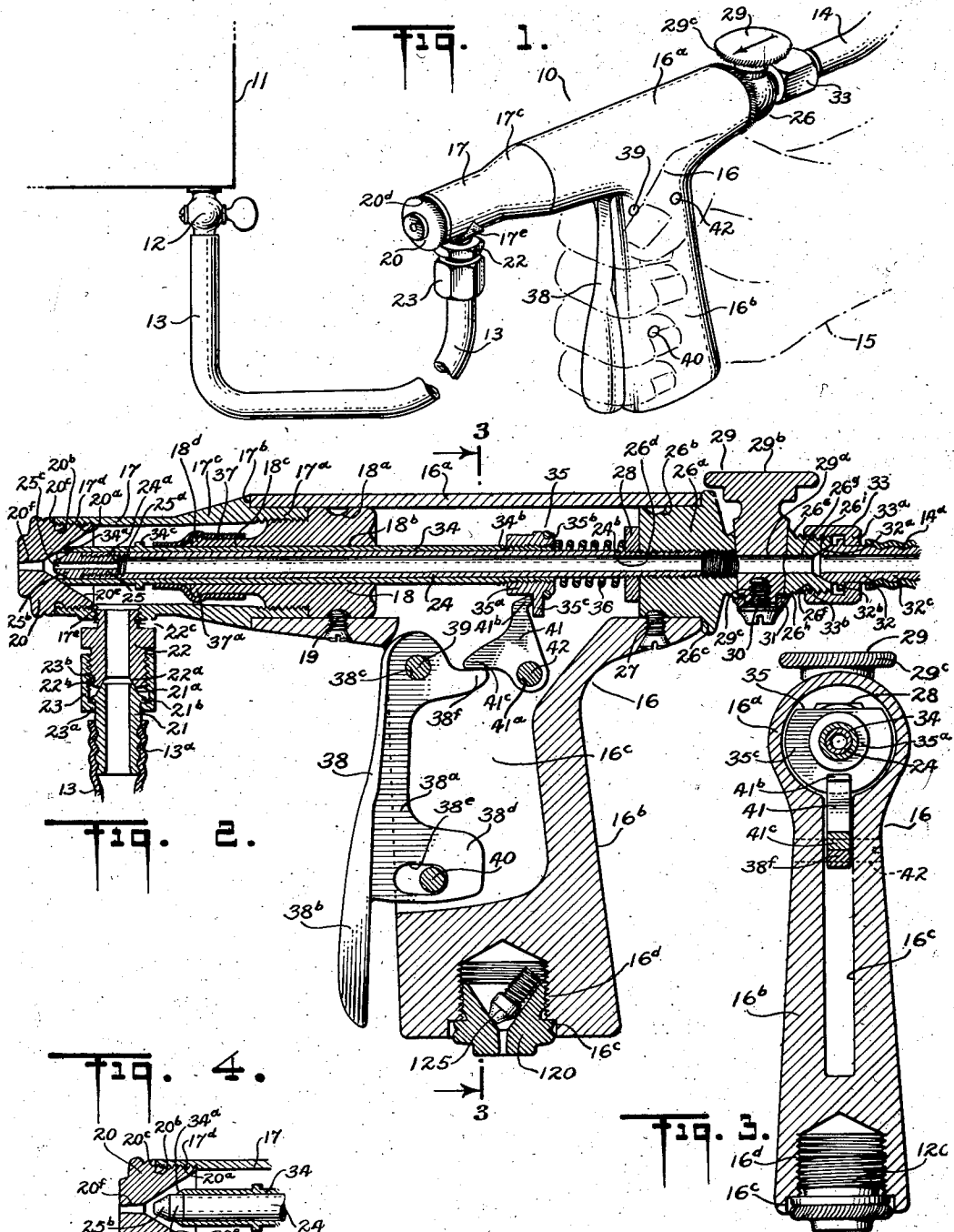
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SPRAY GUN

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## SPRAY GUN

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This invention relates to a spray-gun and more particularly to a gun for spraying paints, cements, and the like.

Among the objects of this invention are to provide a spray-gun or paint-gun which is of a simple, compact and inexpensive construction lending itself to a simple, direct and easy control; which is highly efficient and thoroughly reliable in operation over long periods of constant use; which is well adapted for spraying semi-viscous fluids without sticking or jamming, and for spraying fluids containing abrasive materials all with high efficiency, minimum deterioration or wear, and long operational life.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts as will be exemplified in the structure to be hereinafter described and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing there is shown one of the possible embodiments of the mechanical features of our invention in which,

Figure 1 is a perspective view of our spray-gun and certain of its associated equipment in which the manner of support and control are indicated diagrammatically,

Figure 2 is a vertical central sectional view on an enlarged scale of the spray-gun of Figure 1,

Figure 3 is a vertical sectional view, on an enlarged scale, as seen along the line 3—3 of Figure 2, and

Figure 4 is a fragmentary vertical sectional view illustrating certain features of operation.

Similar reference characters refer to similar parts throughout the several views in the drawing.

Referring now to the drawing and more particularly to Figure 1, there is shown a spray-gun or paint-gun 10 which is supplied with a fluid to be sprayed from a tank 11 by way of pet-cock 12 and flexible tube 13. Air under pressure, illustratively eighty pounds per square inch, is supplied spray-gun 10 by way of flexible tube 14 and an air line not shown. The spray-gun is conveniently held in the hand, indicated at 15, in a position preferably at a lower level than fluid tank 11, the purpose of which will appear more fully hereinafter, where it may be accurately directed at the work and quickly and precisely controlled in a manner more particularly described hereinafter.

Spray-gun 10 preferably includes a T-shaped housing 16, conveniently formed of a light weight, strong and non-corrosive material such as aluminum. The upper portion 16<sup>a</sup> of the housing may

be cylindrical in form (see also Figures 2 and 3) and is adapted to rigidly support certain operative parts of the device, as more particularly set forth below. The lower portion 16<sup>b</sup> of the T-shaped housing is conveniently fashioned as a hand-grip member by which the spray-gun may be held and directed at the work as indicated above.

Suitably mounted within and extending from one end of the cylindrical portion 16<sup>a</sup> of the housing is a cylindrical barrel 17 preferably formed of a tough non-corrodible material such as brass which lends itself to accurate machining. One end 17<sup>a</sup> of the cylindrical barrel threadedly engages a collar member 18 which is supported within the casing and maintained in substantially coaxial relation with the cylindrical barrel 17.

Collar 18 and the end 17<sup>a</sup> of the cylindrical barrel 17 are adapted to be snugly received within cylindrical housing 16<sup>a</sup> and maintained in rigid assembled relation therewith by set-screw 19, the tip of which seats within a circumferential grooved portion 18<sup>a</sup> of the collar; the rigidity of the assembled relation is enhanced by the circumferential shoulder portion 17<sup>b</sup> of the barrel which squarely abuts the extreme end of the cylindrical portion 16<sup>a</sup> of the housing.

To prevent unnecessary sharp projecting portions which might catch onto, for example, the garments of the operator or user, and further to reduce the thickness of the barrel wall and hence its weight, the outer surface of barrel 17 is preferably evenly tapered as at 17<sup>c</sup> commencing at a section flush with the outer surface of the cylindrical portion 16<sup>a</sup> of the housing and continuing until a relatively thin walled section is reached.

This construction assures a continuous outer surface throughout the regions indicated, a firm and rigid connection between barrel and the housing, and a minimum over-all size and weight of barrel.

Further assurance of the freedom from sharp projections is achieved by the use of fillister-head screws throughout (similar to the above-mentioned set-screw 19), which are counter-sunk so that their heads are flush with the surface contour of adjacent parts.

The thin wall end 17<sup>d</sup> of the barrel is interiorly threaded and adapted to engage a nozzle 20 (see also Figure 4) provided with an exteriorly threaded portion 20<sup>a</sup>, a circumferential grooved portion 20<sup>b</sup>, and a shoulder-abutment portion 20<sup>c</sup>. Nozzle 20 is circumferentially knurled as at 20<sup>d</sup> (see Figure 1) providing a gripping surface by which the nozzle may be screwed into the barrel

17 or conveniently removed therefrom for purposes of cleansing and replacement.

A firm and tight fit between nozzle and barrel is assured in spite of dirt, grime, etc., by means of the above-mentioned circumferential grooved portion 20<sup>b</sup> of the nozzle which is contiguous with the shoulder-abutment portion 20<sup>c</sup> and adapted to receive any dirt or grime initially on the threaded portions or the abutting portions of either barrel or nozzle.

Nozzle 20 is formed with a substantially conical recessed portion 20<sup>e</sup> terminating in a tapered hole portion or orifice 20<sup>f</sup> through which the fluid is sprayed onto the work; the recessed portion and orifice being preferably coaxial with barrel 17 and cylindrical portion 16<sup>a</sup> of the housing.

To reduce excessive wear of the nozzle orifice and contiguous surfaces of the conical recessed portion, the nozzle is preferably made of a hard and durable material such as Monel metal which is relatively inexpensive, non-corrodible, and particularly well adapted to withstand the action of fine abrasives, such as finely ground quartz and sand which may be contained in the fluid to be sprayed.

Into the central space or chamber formed within barrel 17 and limited by collar 18 and nozzle 20, the fluid to be sprayed is conducted by way of the preferably flexible tubing 13 (conveniently rubber) as indicated above. The spray-gun end 13<sup>a</sup> of the rubber tubing preferably fits upon an enlarged corrugated coupling element 21 having a tapering coupling face portion 21<sup>a</sup> adapted to be received within a similarly tapered recessed portion 22<sup>a</sup> of coupling element 22; coupling elements 21 and 22 are urged into a firm contact relation by sleeve 23 having an inwardly extending rim portion 23<sup>a</sup> adapted to ride on a shoulder portion 21<sup>b</sup> of coupling element 21, and a threaded portion 23<sup>b</sup> adapted to engage a threaded portion 22<sup>b</sup> of coupling element 22.

Coupling element 22 is provided with a threaded end portion 22<sup>c</sup> which is received within a thick wall threaded portion 17<sup>e</sup> of the cylindrical barrel 17, conveniently at a point along the lower side of the barrel in its contemplated position of use (see Figure 1) and adjacent nozzle 20. The outer exposed portions of coupling element 22 and its associated sleeve 23 are preferably hexagonal in form (see Figure 1) presenting opposite surfaces for a wrench or the like which may be used in assembling the spray-gun or dismantling it for cleaning purposes.

Spaced within the above-mentioned chamber 17—18—20 and substantially coaxial therewith, is a tubular member 24, one end of which is interiorly threaded as at 24<sup>a</sup> and engages the threaded end portion 25<sup>a</sup> of a tip member 25. The extreme tip portion 25<sup>b</sup> of the tip member is substantially conical in form to conform to the conical recessed portion 20<sup>e</sup> of the nozzle from which it is spaced a suitable distance; illustratively a distance substantially equivalent to the diameter of orifice 20<sup>f</sup>. Tip member 25 is provided with an axial hole portion 25<sup>c</sup>; preferably of a diameter appreciably less than that of orifice 20<sup>f</sup>, which is maintained in substantial alignment with the orifice.

Tubular member 24 with its associated tip member 25 are maintained in coaxial relation with respect to barrel 17 partially by means of collar 18, as will more fully appear hereinafter, and partially by a collar portion 26<sup>a</sup> of an air-cock 26.

Collar portion 26<sup>a</sup> of the air-cock is snugly received within the cylindrical portion 16<sup>a</sup> of the

spray-gun housing where it is rigidly maintained by a fillister-head set-screw 27, the tip of which engages a circumferentially recessed portion 26<sup>b</sup> of the collar maintaining a shoulder portion 26<sup>c</sup> in abutment with the adjacent end of the cylindrical portion 16<sup>a</sup> of housing 16.

An axial interiorly threaded portion 26<sup>d</sup> of the air-cock engages a threaded end portion 24<sup>b</sup> of tubular member 24 maintaining the latter in proper spaced relation as indicated above; loosening of tubular member and air-cock being effectively prevented by lock nut 28 engaging the threaded end portion 24<sup>b</sup> of the tubular member and firmly abutting an end collar portion 26<sup>a</sup>.

Air-cock 26 is provided with an outwardly extending bulbous portion 26<sup>e</sup> and a threaded end portion 26<sup>f</sup> both of which are provided with a central channel portion 26<sup>g</sup> interconnected with the interiorly threaded end portion 26<sup>d</sup>. Bulbous portion 26<sup>e</sup> of the air-cock is provided with a tapered hole portion conveniently fitted with a tapered plug 29 having a single transverse hole portion 29<sup>a</sup> therein adapted to cooperate with and interconnect channel portion 26<sup>g</sup> and interiorly threaded portion 26<sup>d</sup> of the air-cock upon proper rotational positioning of plug 29.

The upper end 29<sup>b</sup> of plug 29 is preferably of an enlarged circular form, the outer periphery of which is conveniently knurled as at 29<sup>c</sup> (see Figures 1 and 3) to permit a firm grip and assure precise air control; the extent of the air control being conveniently gauged by the arrow scratched on the upper end of the plug 29.

Air-cock 26—29 is maintained in a tight and serviceable condition by screw 30, threadedly received within the lower end portion 29<sup>e</sup> of plug 29, and its associated washer 31, the upper rim of which rides upon the flat surface 26<sup>h</sup> associated with the bulbous portion 26<sup>e</sup> of the air-cock.

The extreme outer end portion of air-cock 26—29 is interiorly recessed as at 26<sup>i</sup> and adapted to seat a tapered end portion 32<sup>a</sup> of coupling member 32. Air-cock and coupling member are maintained in air-tight relation by a sleeve member 33 having an inner rim portion 33<sup>a</sup>, which frictionally engages an outwardly extending rim portion 32<sup>b</sup> of coupling element 32, and a threaded portion 33<sup>b</sup> threadedly engaging a threaded end portion 26<sup>f</sup> of the air-cock.

The outer surface of sleeve 33 may be hexagonal in form (see Figure 1), thus presenting opposite gripping surfaces for a wrench or a similar tool whereby, upon turning sleeve 33 further up onto the threaded end of the air-cock, a rigid and air-tight coupling is achieved.

Compressed air is supplied the spray-gun, as mentioned above, by way of flexible hose connection 14, one end 14<sup>a</sup> of which is stretched over an enlarged corrugated portion 32<sup>c</sup> of air coupling member 32. A direct air passage is provided through air hose 14, through coupling member 32, air-cock channels 26<sup>g</sup>, 29<sup>a</sup> (where plug 29 is in an open position), 26<sup>d</sup>, tubular member 24, channel 25<sup>c</sup> of tip member 25, and out through orifice 20<sup>f</sup>. As indicated above, the air may be controlled at the spray-gun by merely rotating plug 29 into a completely closed or partially closed position depending upon the requirements of the work to be done.

The air flows out through the orifice 20<sup>f</sup> at a relative high velocity carrying with it a portion of the fluid contained in chamber 17—18—20 supplied, as mentioned above, from tank 11. The

fluid from chamber 17—18—20 flows between the conical tip portion of tip member 25 and the conical recessed portion 20<sup>e</sup> of the nozzle (see Figure 4) where it meets a column of air, coming from a relatively small central channel 25<sup>c</sup> of tip member 25, and moving at a relatively high velocity; air and fluid particles mixing in passing through orifice 20<sup>f</sup> and forming a spray which is directed at the work.

In order that the spray may be effectively controlled, there is provided a second tubular member 34 which is slidably mounted on tubular member 24 and is slidably received within the axial hole portion 18<sup>b</sup> of collar 18. One end of tubular member 34 terminates in a frusto-conical surface 34<sup>a</sup> which is adapted to firmly contact conical recessed surface 20<sup>e</sup> of nozzle 20. The other end of tubular member 34 is exteriorly threaded as at 34<sup>b</sup> and adapted to receive a hub portion 35<sup>a</sup> of a disk member 35 (see also Figure 3).

Slidably mounted tubular member 34 is normally urged into contact relation with nozzle 20 at their respective frusto-conical surfaces 34<sup>a</sup> and 20<sup>e</sup>, preferably by a coil spring 36 axially mounted about tubular member 24. One end of spring 36 is slightly expanded to be received within a grooved portion 35<sup>b</sup> of disk member 35 and the other end of the spring squarely abuts lock nut 28.

Thus, it will be seen that spring 36 normally presses surface 34<sup>a</sup> of member 34 into firm contact with surface 20<sup>e</sup> of nozzle 20 and thereby cuts off communication between chamber 17—18—20 and orifice 20<sup>f</sup>. When in this position the column of air flows at high velocity through member 24 and orifice 20<sup>f</sup> without drawing any of the fluid from chamber 17—18—20. If now, the surface 34<sup>a</sup> is retracted from the surface 20<sup>e</sup> (in the manner hereinafter explained) the fluid in the chamber 17—18—20 flows or is drawn into the path of the escaping air and is sprayed thereby out through the orifice 20<sup>f</sup>.

This construction is particularly adapted to withstand wear under the action of fluids containing abrasive materials since the flow of fluid at high velocity is largely limited to the especially durable nozzle orifice and since the flow at low velocities past the partitioning or cut-off section is substantially uniform through 360° about the axis of the chamber and nozzle thus causing a uniform wear. A tight closure at the partitioning section or at the section of fluid cut-off is assured, in spite of wear by the action of spring 36 on the tubular partitioning member 34.

To prevent the leakage of fluid into the sliding joint between the slidably mounted tubular member 34 and collar 18, and thus to prevent excessive wear and/or sticking and jamming of the slidable member; a flexible jacket 37, preferably rubber, is stretched onto the tubular member 34 adjacent a circumferential rim portion 34<sup>c</sup> thereof and onto an extended neck portion 18<sup>c</sup> of the collar 18. A tight connection between the tubular member and neck portion of the collar may be assured by cementing the rubber onto these portions in any suitable manner.

In order that the rubber jacket 37 may permit relative motion between tubular member 34 and collar 18 without jamming or without necessitating an excessive force, the jacket is preferably initially expanded as at 37<sup>a</sup> by a flange 18<sup>d</sup> formed on neck portion 18<sup>c</sup> of the collar.

Thus, upon retraction of member 34 (as hereinafter explained), jacket 37 expands circumferen-

tially (sufficient clearance being allowed between jacket 37 and barrel 17 to prevent obstruction of the sleeve in expanding) and so preserves a tight joint between tubular member 34 and collar 18.

Retraction of the slidable tubular member 34 against the action of spring 36 is preferably effected by a lever 38, conveniently constructed of a strong, durable and non-corrodible metal such as brass, in the form of an irregular flat portion 38<sup>a</sup> and a broad half-round edge portion 38<sup>b</sup>. The flat portion 38<sup>a</sup> of the lever is snugly received within a deep slotted portion 16<sup>c</sup> of the spray-gun housing 16 (see also Figure 3) where it is constrained from loose side-play although freely permitted to move back and forth within the slot. Lever 38 is provided with an upper hole portion 38<sup>c</sup> which is adapted to receive a screw 39, the threaded end of which engages a threaded portion of the hand-grip portion 16<sup>b</sup> of the spray-gun housing; screw 39 thus serving as a pivotal mount for the lever. To prevent excessive movement of lever 38, a flat portion 38<sup>a</sup> thereof is deepened as at 38<sup>d</sup> and provided with a slotted portion 38<sup>e</sup> laid out along an arc described from the pivotal screw 39. Slotted portion 38<sup>e</sup> is preferably of such dimensions as to snugly receive a stop 40 conveniently in the form of a screw threaded into a suitable threaded hole provided therefor in the hand-grip portion of housing 16 (see also Figure 1).

With lever 38 so mounted in the hand-grip part 16<sup>b</sup> of the spray-gun housing, the half-round flat portion 38<sup>b</sup> is positioned along the front edge of the handle or grip and is adapted to receive the direct pressure from the fingers of the hand (see Figure 1) as this portion of the spray-gun is tightly squeezed or gripped.

It may at this point be noted that the lever 38, and especially its half-round outer portion, is of sufficient length to accommodate the finger width of the hand so that a highly efficient gripping action (and hence control as will appear more fully hereinafter) is achieved. The width of the half-round outer portion 38<sup>b</sup> of the hand-lever is preferably somewhat in excess of the adjacent front edge of the hand-grip portion of the spray-gun housing so as to effectively prevent squeezing or pinching of the fingers between lever and hand-grip.

Action of lever 38 on the slidable tubular member 34 is preferably achieved through a mechanical element 41 provided with a hole portion 41<sup>a</sup> adapted to snugly receive a pivotal mounting screw 42 (see also Figures 1 and 3) suitably secured in the hand-grip portion of the spray-gun housing. Mechanical element 41 is conveniently of brass and of such a thickness as to be snugly received within the slotted portion 16<sup>c</sup> of the spray-gun housing (see Figure 3), and is preferably provided with a toe portion 41<sup>b</sup> which directly contacts an outwardly extending flange or rim portion 35<sup>c</sup> of the disk member 35 (see also Figure 3) which, as above-mentioned, threadedly engages the tubular member 34. Element 41 is provided with a heel portion 41<sup>c</sup> which contacts an extended toe or finger portion 38<sup>f</sup> of lever 38 whereby motion of lever 38 is transmitted by way of mechanical element 41 and disk 35 to the tubular member 34.

In order that maximum efficiency of the linkage between lever and retractable tubular member may be realized, the point of contact 38<sup>f</sup>—41<sup>c</sup> is in substantial alignment with pivotal supports 39 (see Figure 3) and 42, and similarly contact

41<sup>b</sup>—35<sup>c</sup> is substantially in alignment with the perpendicular from pivotal support 42 to the direction of motion of tubular member 34. The mechanical forces of action and reaction at the points of contact act in directions in substantial alignment with the permissible directions of motion of the contact surfaces thus providing a highly efficient mechanical linkage and one in which wear between lever and tubular member is substantially reduced.

As mentioned above, the extreme end of tubular member 34 is urged into a firm contact with the recessed wall portion of nozzle 20 under the action of the relatively stiff spring 36 (necessitating a lever of commensurately high mechanical advantage in order to actuate the tubular member against the spring action; the mechanical advantage here being the relative lengths of portions 38<sup>b</sup> and 38<sup>f</sup>). To provide a firm contact under the action of spring 36, a slight amount of play is allowed between the lever 38, mechanical element 41 and disk 35 associated with the tubular member 34. This play is provided through the slotted portion 38<sup>c</sup> of the hand-grip lever; and may be controlled by the length of slot provided.

In using the spray-gun, the slight amount of play provided is immediately taken up by that light pressure of the hand which is just necessary to hold the spray-gun firmly.

As the grip of the hand on the butt or hand-grip portion of the spray-gun housing is tightened, lever 38 is rotated in a counter-clockwise direction as seen in Figure 2, about the pivotal support 39. Throughout this motion toe or finger portion 38<sup>f</sup> of the lever acts on heel 41<sup>c</sup> of the mechanical element 41 causing a clockwise rotation of the latter about pivotal support 42, resulting in a retraction of slidable tubular member 34 (against the action of spring 36) under the action of toe 41<sup>b</sup> of the mechanical element or disk 35 associated therewith.

Further retraction of the tubular member under a continued increased grip of the butt of the spray-gun is prevented by the end portion of lever slot 38<sup>c</sup> coming up against the stop 40. This, however, does not occur (see Figure 4) until the end of tubular member 34 is clear of the slant-walled or conical tip portion of the tip member 25 associated with the inner tubular member 24 thus removing the partition between fluid chamber 17—18—20 and orifice 20<sup>f</sup> and allowing free passage of the fluid material from the chamber out through the orifice.

By changing the amount of pressure applied by the hand in gripping the spray-gun the extent of the retraction of slidable member 34, and hence the size of the passage between chamber and nozzle orifice may be effectively regulated. This gives an effective control of the amount of fluid sprayed and the proportion of fluid to air thus permitting a change in the characteristics of the spray dependent upon the nature of the work being done.

A relaxation of the hand permits a reestablishment of the partition between fluid chamber 17—18—20 and orifice 20<sup>f</sup> and effectively cuts off the flow of the spray fluid. There is, however, a maintenance of the direct passage of air out through the nozzle orifice 20<sup>f</sup> which may be directed against the wet sprayed work surface to produce a rough or stipple effect pleasing to the eye; the direct air flow serves to maintain tip 25 and nozzle 20 in a clean condition, assuring high operating efficiency and effectively prevent-

ing sticking, jamming or other operational delays.

It may at this point be noted that as a result of the maintenance of the direct flow of air out through the nozzle there is substantially no back pressure against either the spray-gun or the air line upon cutting off the spray liquid. Thus the various parts of the gun are subjected to pressures substantially constant throughout operation which precludes sudden stresses on the various parts, lessens wear and generally makes for a smoother operation of the gun and its auxiliary equipment.

In using the spray-gun, the fluid-containing tank 11 is preferably positioned at a level slightly above that of the barrel portion 17 of the gun (see Figure 1) so that the fluid to be sprayed will feed by gravity into the chamber 17—18—20 of the spray-gun where its flow about the tip of the air conduit of tubular member 34 may be effectively controlled all as more particularly set forth above; the flow of liquid into chamber 17—18—20 is aided by the aspiratory action of the air at high velocity passing from tip 25 out through the orifice 20<sup>f</sup> of an enlarged section.

In order that the type of spray may be completely changed, or in order that the progress of the work need not be impeded due, for example, to an accidental jamming or sticking of the spray-gun because of an over-sized particle lodging in orifice 20<sup>f</sup>, or for example iron rust lodging in channel 25<sup>c</sup> of tip member 25, an auxiliary nozzle and tip member are conveniently carried within the lower part of the hand-grip portion of the spray-gun. This portion is threaded as at 16<sup>d</sup> to receive an auxiliary nozzle 120 and is recessed as at 16<sup>e</sup> to accommodate a portion of the unthreaded tip end part of the nozzle to prevent undue projection of the same above the outer surface of the gun butt.

Conveniently supported within the interiorly threaded butt portion of the spray-gun, and resting on auxiliary nozzle 120, is the auxiliary tip member 125. This construction is of considerable practical advantage in that an extra nozzle or tip member may be accessible to the operator or workman thus permitting execution of the work with minimum delay in spite of the many possible causes for delay.

It will thus be seen that there has been provided in this invention a device in which the various objects hereinbefore noted together with many thoroughly practical advantages are successfully achieved.

As many possible embodiments may be made of the above invention, and as many changes might be made in the embodiment above set forth, it is to be understood that all matter hereinbefore set forth or shown in the accompanying drawing is to be interpreted as illustrative and not in a limiting sense.

We claim:

1. In a device of the character described, in combination, a body portion having a chamber including oppositely positioned open end wall portions, a tubular member extending into said chamber through an open end wall portion thereof having an end portion maintained spaced from, behind and in substantial alignment with an opposite open end wall portion of said chamber, a second tubular member slidably mounted on said first-mentioned tubular member extending into said chamber through said first-mentioned open end wall portion thereof, means for moving said slidably mounted tubular member

into contact engagement with said second open end wall portion of said chamber and retracting it therefrom, and flexible walled means for effectually sealing said chamber at the point of entrance therinto of said slidably mounted tubular member.

2. A spray-gun comprising, in combination, a body portion having a chamber for paint and the like, with an outlet through which the paint is to be expelled; a tubular compressed air conduit within said chamber, having a nozzle near said outlet but spaced therefrom and in predetermined relation thereto, leaving a pocket of constant dimensions between said nozzle and outlet; a valve member encircling said tubular conduit near its nozzle, and arranged to supply a partition between the paint chamber and said pocket, to shut off and regulate the flow of paint to said pocket and outlet; means supplying a seat for said valve member, said seat encircling the nozzle and spaced from said outlet, the outer extremity of the nozzle being positioned between the valve seat and the outlet; manually operable means for seating, unseating and regulating said

valve member; and means for controlling the flow of compressed air through the nozzle, pocket and outlet, independently of the operation of said valve member.

3. A spray-gun comprising, in combination, a body portion having a chamber for paint and the like, with an outlet through which the paint is to be expelled; a tubular compressed air conduit within said chamber, having a nozzle near said outlet but spaced therefrom and in predetermined relation thereto, leaving a pocket of constant dimensions between said nozzle and outlet; a valve member consisting of a sleeve encircling said tubular conduit near its nozzle, and arranged to supply a partition between the paint chamber and said pocket, to shut off and regulate the flow of paint to said pocket; means supplying a seat for said valve member, said seat encircling the nozzle and spaced from said outlet; and manually operable means for seating, unseating and regulating said valve member.

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