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Jett et al.

[11] **3,779,465**

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[54] **SPLATTER PATTERN CONTROL FOR SPRAY GUNS**

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[52] **U.S. Cl.** **239/416,** 239/417

[51] **Int. Cl.** **B05b 7/12**

[58] **Field of Search** 239/416, 417, 329, 239/331, 373

[56] **References Cited**

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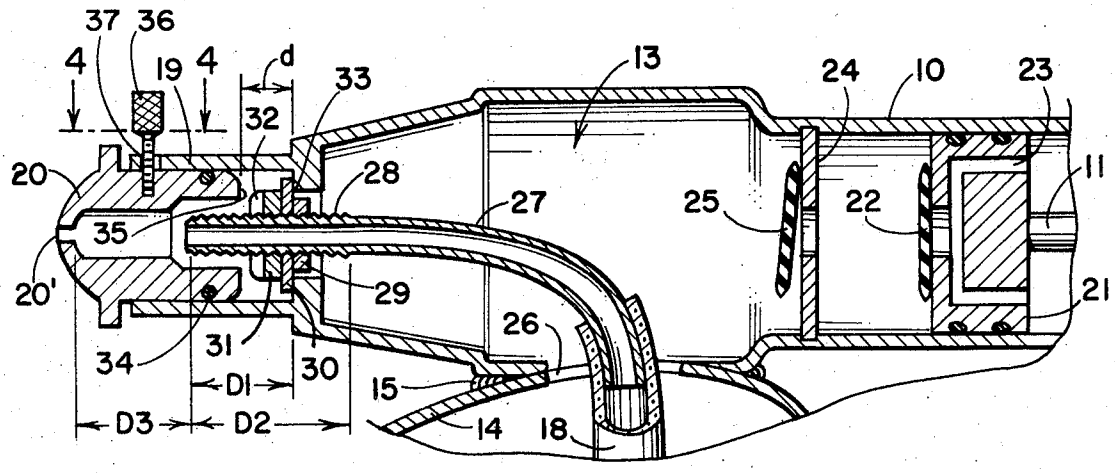
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Attorney—Pastoriza & Kelly

[57] **ABSTRACT**

A nozzle support head and nozzle held thereby are designed for cooperation with an air chamber receiving pressurized air and a delivery tube from a container of a spray composition. The delivery tube extends into the support head past a reduced diameter opening and terminates in a free end spaced from the outlet orifice of the nozzle. A portion of this free end includes an enlargement which blocks backward movement of the delivery tube when the enlargement engages the reduced diameter opening. The nozzle itself includes an internal portion which limits the degree of forward movement of the delivery tube in the support head and by making the position of the nozzle longitudinally adjustable on the support head, the distance between the reduced diameter opening and the internal portion can be varied thereby limiting the amount of air that can bypass about the enlarged portion and mix with spray composition so that the splatter pattern can be controlled. In addition, the enlargement itself may be shifted along the free end of the delivery tube to vary the spacing between the extreme end of the delivery tube and the nozzle orifice to provide further control of the splatter pattern.

2 Claims, 6 Drawing Figures



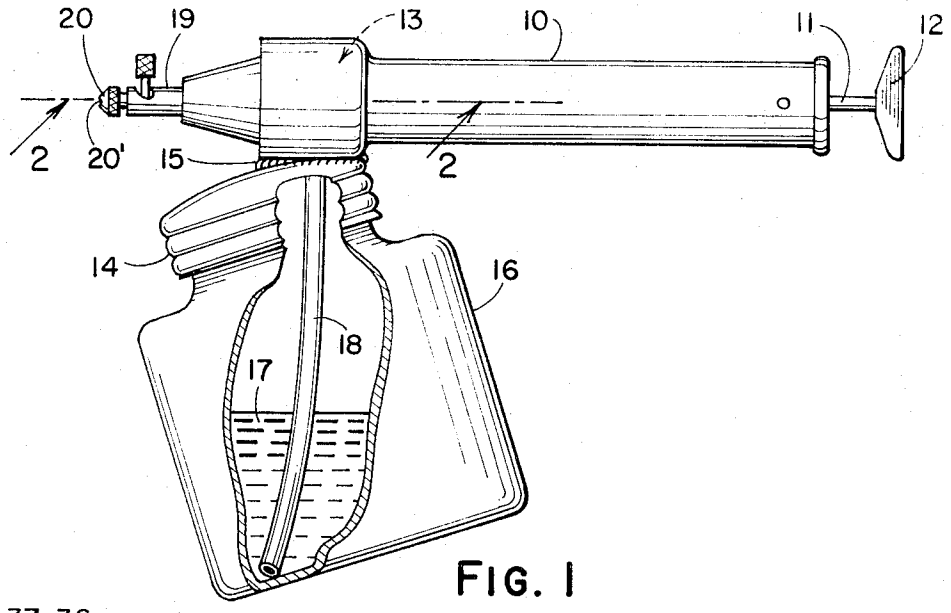


FIG. 1

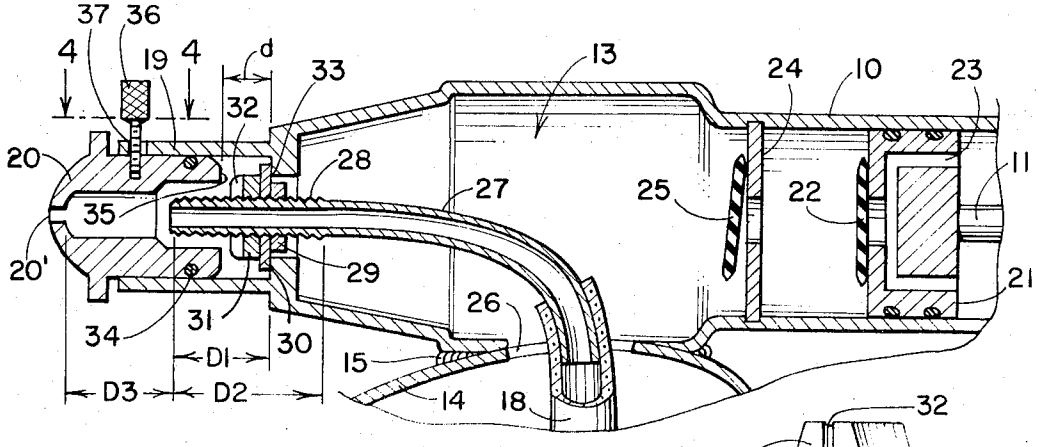


FIG. 2

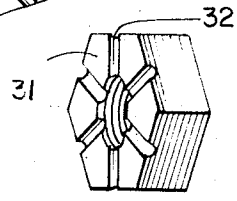


FIG. 3

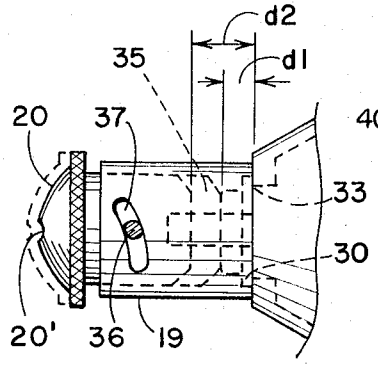


FIG. 4

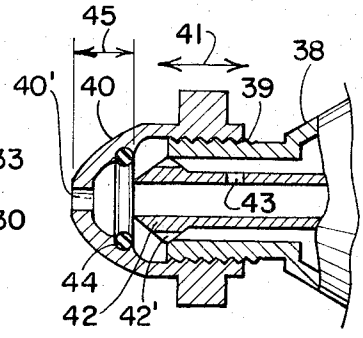


FIG. 5

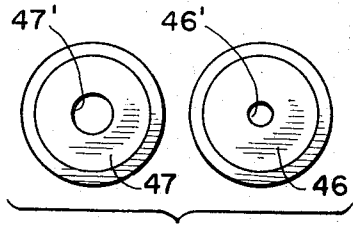


FIG. 6

SPLATTER PATTERN CONTROL FOR SPRAY GUNS

This invention relates generally to spray guns and more particularly to an improved head and nozzle assembly for controlling the splatter pattern of the spray composition ejected from the gun.

BACKGROUND OF THE INVENTION

It is common practice in new building construction, using dry wall material for walls and ceiling to provide a textured finish by spraying a suitable composition onto the wall and ceiling surfaces. Normally, the texture material is forced through a hose by a motor powered pump. The material is broken up and mixed with air in a nozzle from an air compressor or other pressurized source. The mixture of air and textured material or spray composition is ejected out of the nozzle onto the walls, the splatter pattern giving the surface a uniform look which helps hide imperfections. The texture coating also serves as a base coat for paint.

The usual spray equipment involved is somewhat bulky, usually including the mixture, pump and air compressor mounted on a flat bed truck. Gasoline engines are utilized to provide power for the pumps. Once all of the interior walls of a new construction have been sprayed, the equipment and the flat bed truck are removed. However, if small patches are missed or a wall should become damaged and require repair, it is normally a nuisance as well as expensive to bring back the entire flat bed truck constituting the spray rig. It would be far preferable if there were developed a simple way of spraying such patches with a small hand unit.

Such a small portable easily usable type hand unit has been developed wherein a manually operable air compressor in conjunction with a small container holding a small quantity of the spray composition similar to a garden or insecticide spray system is utilized. Since the spray composition is normally thicker than the usual compositions employed with garden or insecticide type sprayers, the nozzle orifice has been made larger and the spray composition delivery tube has been made somewhat larger. The critical factor, however, arises in attempting to control the splatter pattern of the ejected composition-air mixture from the nozzle on the wall surface. In making repairs, it is, of course, desirable to match the particular texture pattern initially provided on the wall. This pattern may vary from a relatively small grain appearance such as on an orange peel to a fairly large or "lumpy" appearance.

A control of the spray pattern from a portable hand spray unit can be accomplished by controlling the amount of air permitted to mix with the spray composition prior to ejection from the nozzle. Generally, the more air that mixes with the spray composition the finer will be the textured pattern or splatter pattern on the wall whereas the less air provided the more pronounced will be the texture on the wall. The delivery tube for the spray composition normally passes up from a container into the nozzle support head where it ejects material into the nozzle to mix with air passing from the hand operated compressor over the end of the delivery tube also into the nozzle. By controlling the annular space between the outside of the delivery tube and the interior annular wall of the nozzle head structure, the amount of air permitted to mix with the composition can be varied. One such control takes the form of providing a reduced diameter opening in the nozzle support head through which the delivery tube passes. An enlargement on the free end of the delivery tube can then be caused to seat back against this reduced diameter opening thereby restricting the amount of air that can flow around the enlargement into the nozzle itself. Usually a coiled spring is utilized to bias or urge the enlarged portion of the free end of the delivery tube against the annular shoulder or collar defined by the reduced diameter portion. This coiled spring may be sandwiched between the reduced diameter portion and the nozzle itself and thus by adjusting the longitudinal position of the nozzle on the end of the nozzle head support, the compression force of the spring against the enlargement which is seated against the reduced diameter opening can be varied and thereby affect the amount of air that can be bypassed about the enlargement.

The major problem with the foregoing arrangement is the fact that the spring constant of any spring varies with use and age so that the compression force varies. As a result, it it very difficult to provide a consistent splatter pattern for any particular setting of the nozzle.

BRIEF DESCRIPTION OF THE PRESENT INVENTION

The present invention constitutes an improved portable hand spray device particularly useful for repairing small patches of interior walls wherein an extremely accurate control of the splatter pattern can be realized without the use of springs all to the end that a consistent result is attained even after prolonged use of the device.

More particularly, a nozzle is supported on a support head on a portable spray gun which communicates with air and the free end of a spray composition delivery tube but wherein no springs are incorporated. In this respect, the support head includes a reduced diameter opening through which the free end of the delivery tube extends and the nozzle includes an internal portion spaced from the reduced diameter portion. The free end of the delivery tube in turn includes an enlargement sandwiched between the reduced diameter opening and the internal portion of the nozzle and has a limited degree of longitudinal travel back and forth. Cooperating means on the nozzle and support head are provided enabling adjustment of the longitudinal position of the nozzle itself, this adjustment in turn changing the spacing between the reduced diameter portion and the internal portion of the nozzle so as to change the limit of longitudinal movement of the delivery tube. By this arrangement, a controlled amount of air can pass through the reduced diameter opening about the enlargement of the delivery tube to mix with spray composition from the free end of the delivery tube in the nozzle.

In a preferred embodiment of the invention, the longitudinal position of the enlargement itself on the free end of the delivery tube may be shifted or changed such as to vary the spacing between the extreme free end of the delivery tube and the orifice in the nozzle. This adjustment will also affect the splatter pattern of the ejected spray.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the invention will be had by referring to the accompanying drawings in which:

FIG. 1 is an enlarged perspective view partly cutaway of the spray gun of this invention;

FIG. 2 is an enlaged fragmentary cross-section of the head support and nozzle assembly taken in the direction of the arrows 2—2 of FIG. 1;

FIG. 3 is a perspective view of one of the components of the system of FIG. 2;

FIG. 4 is a fragmentary plan view of the support head and nozzle assembly looking in the direction of the arrows 4—4 of FIG. 2;

FIG. 5 is a fragmentary cross-section of a nozzle support head and nozzle assembly of a modified form of the invention for use with more viscous spray compositions; and,

FIG. 6 illustrates in front elevational view nozzles having different sized orifices which may be interchanged with the nozzles shown in the other figures.

DETAILED DESCRIPTION OF THE INVENTION

Referring first to FIG. 1, there is shown a spray gun including means for providing air under pressure in the form of a simple cylinder 10 incorporating a piston head connected to a piston rod 11 terminating in a handle 12 for manual pumping. The forward end of the cylinder 10 includes an air chamber 13 communicating with a suitable opening in a cap 14 rigidly secured to the lower wall of the chamber 13 as at 15. A container 16 for a spray composition 17 is threadedly held by the cap 14 as shown. The spray composition is passed thru the air chamber 13 as by a delivery tube 18. Preferably this delivery tube is also of plastic and of a somewhat larger diameter than conventional type delivery tubes in order to handle the more viscous spray composition 17.

The forward portion of the air chamber 13 terminates in a nozzle support head 19 for holding a nozzle 20 having an outlet orifice 20'.

Referring now to the enlarged cross-section of FIG. 2, there is shown at the right hand portion the piston 21 connecting to the end of the piston rod 11. This piston may include a check valve in the form of a flap 22 for admitting air through internal passages 23 in the piston when the piston is drawn to the right and forcing air from the front of the piston through a second check valve in the form of an opening in a slender head portion 24 and flap 25. Any other suitable check valve arrangement may be provided, all that is required being the supply of air under pressure into the air chamber 13.

It will be noted that there is provided an opening 26 in the lower portion of this air chamber communicating with a corresponding size opening in the cap 14 for the container described in FIG. 1. It will also be clear that the delivery tube 18 extends up through the opening 26, this opening being large compared to the diameter of the tube so that there is ample room for air in the chamber 13 to pass about the delivery tube 18 into the container 16. Also, the enlarged opening 26 permits easy assembly and disassembly of the delivery tube and associated components as will be subsequently described.

In accord with a feature of the invention, a tubular section 27 is rigid with one end inserted or connected to the end of the plastic tubing 18 and its other free end indicated at 28 provided with enlarged means. This enlarged means takes the form of a washer and nut means comprised of a first nut 29, washer 30 and second nut 31 threaded onto external threads provided on the free end 28 of the tubular section 27. The nut 31 is provided with radial channels 32 defining air passages.

The washer 30 is dimensioned to engage a reduced diameter opening 33 in the form of a collar which may be integrally formed as a part of the nozzle support assembly 19 or in the form of an annular ring welded or otherwise fixed to the interior wall of the entrance portion of the support head to define the reduced diameter opening. The purpose for the washer and nuts to define the enlarged means on the free end 28 is to permit shifting of the position of the enlargement in the form of the washer relative to the extreme open end of the tubular section. In this respect, the distance between the extreme end of the tubular section and the washer 30 is indicated by the dimension D1. The longitudinal extent of the external threads on the free end 28 on the other hand is indicated by the dimension D2. Finally, the distance between the extreme end of the tubular section and the orifice 20' of the nozzle 20 is indicated by the dimension D3. It will be evident accordingly that the threaded position of the washer 30 on the external threaded portion of the free end 28 can be changed to thereby effectively change the dimension or distance D3, the reduced diameter collar portion 33 remaining at a fixed distance from the orifice at any given set position of the nozzle. By being able to adjust the dimension D3 by shifting the position of the washer 30, the available space in the forward portion of the nozzle 20 prior to ejection from the orifice 20' for mixing of the spray composition and air is varied thereby enabling a control of the splatter pattern.

Still referring to the forward nozzle support head and nozzle assembly of FIG. 2, it will be noted that the nozzle 20 itself has a cylindrical body which telescopes within the cylindrical portion of the support head 19. A sealing O-ring 34 is provided as shown and the inner end of the nozzle itself terminates in an internal portion 35. This internal or entrance portion 35 of the nozzle 20 serves as a stop or limiting abutment for the enlarged means in the form of the nut 32 on the free end 28 of the tubular section 27 insofar as forward movement of this tubular section is concerned. In other words, the enlarged means in the form of the nut and washer assembly is sandwiched between the reduced diameter opening 33 and the internal portion 35 of the nozzle 20 there being permitted limited longitudinal movement back and forth. This movement is important in that it determines the amount of air from the air chamber 13 that can pass around the washer 30 into the nozzle itself to mix with spray composition from the extreme end of the tubular section.

In accord with another important feature of this invention, there are provided cooperating means on the support head 19 and nozzle 20 providing for limited movement of the longitudinal position of the nozzle in the support head 19. This cooperating means takes the form of a radial pin 36 passing through a helical slot 37 formed in the support head 19 as shown.

Some of the foregoing features can be better understood by reference to FIGS. 3 and 4. For example, FIG. 3 illustrates in enlarged perspective view the nut 31 wherein it will be evident that a plurality of radial channels 32 are provided to permit air to pass into the interior of the nozzle when the free end of the tubular section shifts forwardly to unseat the washer 30 from the reduced diameter portion or collar 33. FIG. 4, on the

other hand, clearly illustrates the pin **36** cooperating with the helical slot **37** wherein it will be clear that swinging movement of the pin will telescope the nozzle **20** in and out of the support head **19.**

With particular reference to FIG. **4** and the dotted line representations of the reduced diameter opening **33** and internal portion **35** of the nozzle, the movement of the nozzle to different longitudinal positions relative to the support head effectively varies the distance between the portions **33** and **35,** the minimum distance being indicated at D1 and the maximum at D2. Thus, if the maximum distance D2 is provided as results when the nozzle **20** is telescoped outwardly, the washer **30** can effectively be further unseated from the reduced diameter opening **33** so that more air can bypass around the enlargement. On the other hand, when the distance is minimum as at D1 resulting when the nozzle **20** is telescoped to its inwardmost position, the amount of air that can pass around the enlargement is restricted to a minimum value.

Referring now to FIG. **5,** there is shown a modified nozzle support head and nozzle assembly which would be utilized for more viscous spray compositions and wherein a fine tolerance of splatter pattern control is not as necessary as in the case of providing for finer textured coatings. In FIG. **5,** the nozzle support head **38** includes a reduced diameter portion externally threaded as at **39** for cooperation with an internally threaded nozzle **40.** By this simple thread arrangement, the longitudinal position of the nozzle **40** relative to the support head may be shifted as indicated by the arrow **41.**

An enlarged means **42** is provided on the free end portion of the delivery tube passing through the reduced diameter portion of the support head. In this particular embodiment, there is provided a small port **43** for air to pass from the air chamber into the nozzle, this air being ejected with spray composition out the free end of the delivery tube. Air received through port **43** helps to break up and carry along the more chunky and viscous type compositions used in this embodiment. An internal portion which may take the form of an O-ring **44** in the nozzle **40** may serve as a stop or abutment with respect to the enlarged means **42.** While air would pass through the port **43,** it also passes through small channels **42'** circumferentially surrounding the enlarged portion **42** because of the spacing between the O-ring **44** and the reduced diameter threaded portion of the support head. Thus, as in the case of the embodiment of FIG. **2,** some adjustment of the amount of air mixing with spray composition can be realized. For example as the O-ring is positioned closer to the enlarged portion it tends to close off the channels **42'.** In addition, the longitudinal adjustment of the nozzle on the threaded portion enables a variation in the distance between the extreme free end of the delivery tube and the orifice for the nozzle as indicated at **45.** Again, as in the case of the embodiment of FIG. **2,** a variation in this distance varies the available room in the nozzle for mixing of air spray composition which will control the splatter pattern.

FIG. **6** shows additional nozzles such as **46** and **47** which have identical outside dimensions to the nozzle **20** but which are provided with different sized orifices as indicated at **46'** and **47'.** These other nozzles are illustrated merely to indicate that an interchanging of nozzles can readily be effected to provide for different sized orifices and thus again enable a control of the splatter pattern. With respect to interchanging of the nozzles, the pin **36** passing through the helical slot **3** may be removed by providing a threaded hole for receiving the pin thus permitting the nozzle **20** to be readily slid out of the support head **19.**

OPERATION

The operation of the spray gun of this invention will be evident from the foregoing description. Initially, with the container **16** of FIG. **1** unthreaded from the cap **14,** and the nozzle **20** removed from the end of the support head **19,** the delivery tube section **27** may be urged forwardly to expose out of the end of the support head **19** the enlarged means in the form of the washer **30** and associated nuts **29** and **31.** The threaded position of these nuts and washer may be adjusted as desired over the range of the threaded free end portion **28** of the tubular section **27.** The washer **33** prevents complete retraction of the delivery tube into the air chamber **13** as a consequence of its abutment against the reduced diameter opening in the form of the collar **33.** As stated heretofore, the adjustment of the position of the enlarged means in the form of the washer will in effect adjust the dimension D3; that is, the spacing of the extreme free end of the delivery tube from the orifice **20'** of the nozzle thereby defining the available space between the end of the delivery tube and the outlet of the nozzle for mixing.

After the foregoing adjustment has been made, the nozzle **20** may be telescoped into the support head **19** and the small pin **36** then passed through the helical slot and threaded in the tapped opening of the nozzle.

Spray composition **17** may then be poured into the container **16** and the container then threaded to the cap **14.** It will be noted that the delivery tube **18** which, as stated, is flexible and of plastic material is dimensioned to have its lower free end as close as possible to a lower corner of the container **16** so that maximum use of the composition **17** will result.

If now the piston **21** is hand pumped by the handle **12,** compressed air will be forced into the air chamber **13.** This increased air pressure will pass through the opening **26** and act on top of the spray composition **17** in the container **16** urging the spray composition downwardly to force it up through the delivery tube **18.** This same air pressure in the air chamber **13** will pass through the reduced diameter portion **33** and around the washer **30,** the pressure itself causing a shifting of the free end of the tubular section and the enlargements thereon forwardly until the nut **32** abuts against the internal portion **35** of the nozzle **20.** The air passing around the washer into the central portion of the nozzle **20** will mix with the spray composition ejected from the end of the delivery tube, the mixture itself being ejected from the orifice **20'** of the nozzle **20.**

By swinging the radial pin **36** to thereby shift the longitudinal position of the nozzle **20** in the support head **19,** the amount of air passing about the washer **30** can be controlled. Thus, as stated, inward movement of the nozzle will limit the amount of unseating of the washer **30** from the collar portion **33** and thus limit the amount of air that can bypass around this washer. In this event, a fairly course splatter pattern would result since the major portion of the ejected spray constitutes the spray material itself with a minimum amount of air mixed in. When the nozzle is telescoped outwardly to increase

the spacing shown as d in FIG. 2, greater travel of the washer away from the reduced diameter portion 33 is permitted thereby permitting more air to bypass around the washer and finally resulting in a finer splatter pattern.

In one sense, the splatter pattern can be controlled between first and second limits of courseness and fineness by the simple nozzle positioning control in the form of the pin and helical slot. However, if the variation in wall texture or splatter pattern is not sufficient to enable a matching with an initially applied texture on the wall, another range of courseness to fineness of the texture can be effected by shifting the position of the enlargement in the form of the washer 30 on the end of the delivery tube section 27, shifting of this enlargement, as stated, changing the dimension D3 between the extreme end of the delivery tube and the orifice of the nozzle and thus changing the available mixing space for air and spray composition in the nozzle. With a new setting of the enlargement, a new range of textures is established and swinging movement of the pin to shift the nozzle will vary the pattern throughout this range. In essence, there are thus provided two major adjustments that can be made to control the splatter pattern.

In addition to the foregoing, and as mentioned heretofore, the splatter pattern can be controlled by the size of the orifice in the nozzle and this size can be changed by substituting one of the other nozzles shown in FIG. 6. Of course there is also some control over the splatter pattern by the amount of air pressure involved and by the original viscosity of the spray composition in the container 16. Also, of course, the distance that the end of the nozzle is held from the interior wall or other object to be sprayed will in some degree control the splatter pattern. These latter variations can be held substantially constant by the operator of the spray gun so that the desired fine degree of splatter pattern control can be effected by the nozzle adjustments described.

With respect to the operation of the modified embodiment of FIG. 5, the threaded adjustment of the nozzle will vary the splatter pattern in substantially the same manner as that described in FIG. 2, the only difference being that there is not ready means for shifting the position of the enlargement 42 on the delivery tube. However, and as also stated heretofore, the embodiment of FIG. 5 would be used for much more viscous spray compositions where splatter pattern control is not as critical.

From the foregoing description, it will be evident that the present invention has provided a greatly improved portable type spray gun whose best application is patching up initially textured interior walls with a pattern that precisely matches the texture of the initially applied coating. It will be noted that no springs whatsoever are involved so that long life and maintenance free operation is assured.

It should also be understood that the consequence of the construction of the support head and nozzle assembly that the various components can very easily be disassembled for cleaning purposes.

While the invention has been described with respect to the spraying of interior walls, it should be understood that the spray gun can be utilized for spraying any types of composition wherein a control of the splatter gun is desired.

What is claimed is:

1. In a spray gun including an air chamber, means for providing air under pressure into said chamber, a container for a spray composition to be sprayed from the gun having an open upper end communicating with said air chamber and a flexible spray composition delivery tube passing from the lower portion of the container through the open upper end thereof into the air chamber, an improved head and nozzle assembly communicating with the air chamber for controlling the splatter pattern of the spray composition, said improved head and nozzle assembly comprising, in combination:

a. a nozzle support head defining an annular reduced diameter opening communicating with said air chamber;

b. a rigid tubular section having one end connected to the end of the spray composition delivery tube passing into the air chamber, and a free end longitudinally movable through the reduced diameter opening;

c. enlarged means on said free end dimensioned to engage the reduced diameter opening so that rearward movement of the said free end of the tubular section is blocked from complete retraction back into the air chamber;

d. a cylindrical nozzle having one end closed except for a central outlet orifice of given size held on the support head in a position coaxial with the said free end of the tubular section and said reduced diameter opening, said nozzle having an internal portion adapted to engage said enlarged means on said tubular section to limit the forward movement thereof; and,

e. cooperating means on the support head and nozzle providing for limited movement of the nozzle to change the longitudinal spacing between said reduced diameter opening on the support head and said internal portion of the nozzle such that the degree of forward and rearward movement of said free end of the tubular section is controllable, said reduced diameter portion being in the form of an internal collar spaced rearwardly of the open end of the support head, said free end of the tubular element being externally threaded over a given longitudinal distance, said enlarged means comprising a washer and nut means threaded on the external threads for securing the washer at a given spacing from the extreme end of the free end of the tubular section, whereby the maximum spacing between said extreme open end and the orifice of the nozzle is fixed by the position of the washer, said given spacing being adjustable by changing the threaded position of the washer and nut means so that the maximum spacing between the extreme end of the tubular section and nozzle orifice is adjustable, the control of the degree of forward and rearward movement of the said free end by said cooperating means enabling adjustment of the amount of air that can flow about said washer from the air chamber to mix with spray composition passing from said extreme end of the tubular section, and the adjusted spacing of said extreme free end relative to the orifice in the nozzle controlling the degree of mixing of air and the spray composition prior to ejection from the nozzle whereby the splatter pattern from the spray gun is controllable.

2. The subject matter of claim 1, in which said nozzle is telescopically received in a cylindrical end portion of said support head, said cooperating means including a helical slot in said cylindrical portion of the support head and a radially projecting pin from the nozzle passing through the slots so that swinging movement of the pin adjusts the longitudinal extent of telescoping of the nozzle.

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