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ABRASIVE SPRAY GUN

Filed June 7, 1962

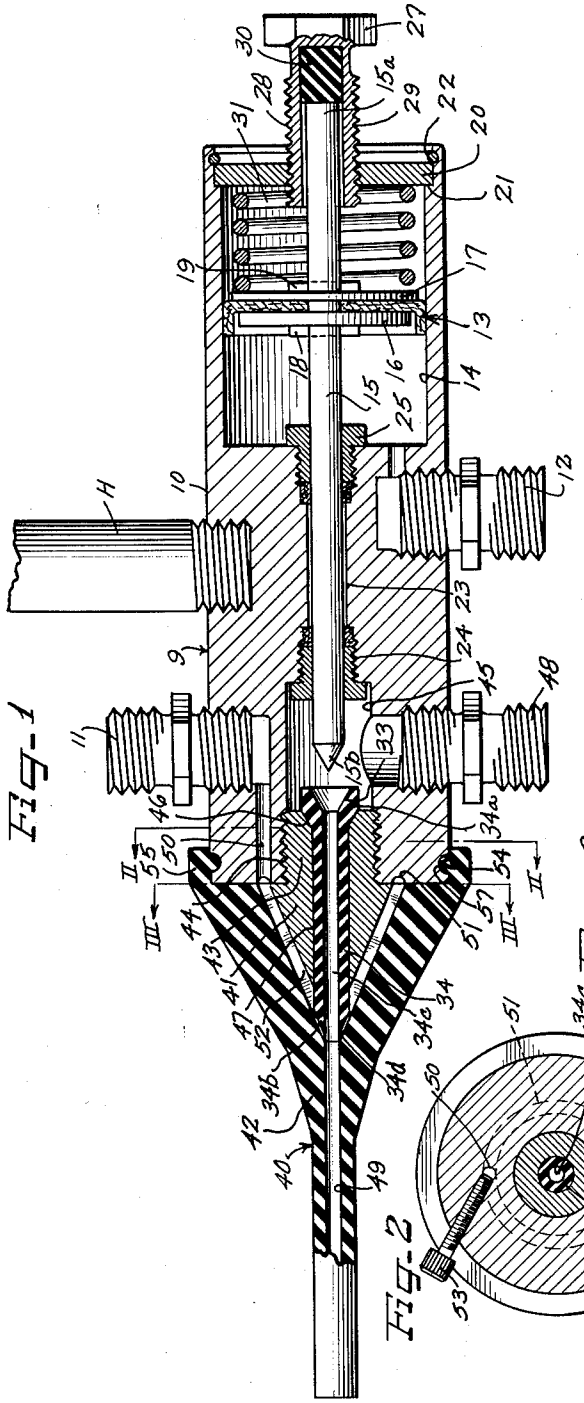


Fig-1

Fig-2

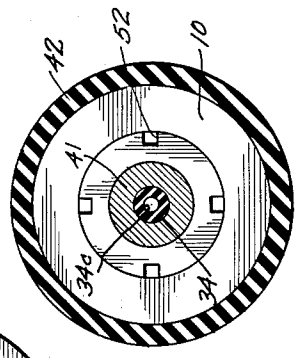


Fig-3

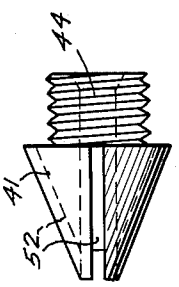


Fig-4

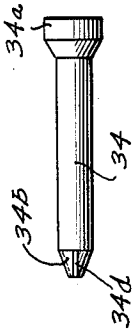


Fig-5

INVENTOR.
Leslie W. Smith
BY
Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

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ABRASIVE SPRAY GUN

Leslie W. Smith, 1722 Larkmoor Blvd., Berkley, Mich.

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This invention relates to a spray gun having nozzle means which is not only capable of resisting the abrasive action of grit and the like contained in buffing compounds, but also which has components which may be more economically manufactured and more economically reconditioned or replaced.

In the use of so-called automatic spray guns for spraying grit containing materials, such as buffing compounds, it has been found that the metallic parts of the nozzle, such as a needle valve when one is used, wear out very rapidly due to the high pressure that is employed in the ejection of the material.

In such guns, as is well konwn, the material is forcibly discharged from a central passageway under the propelling or aspirating effect of high velocity air jets focused in the locale of the material discharge orifice.

In my prior U.S. Patent 2,658,312, a spray gun nozzle structure is provided with a yieldable rubber-like tube that is snugly fitted in the grit discharge passage to increase the overall life of the nozzle of the gun as the yieldable material of the tube functions to resist the abrading action of the grit compound to a greater extent than where metal parts are used in contact with the material being sprayed.

The instant spray gun has been developed primarily for spraying abrasive material exclusively and not for use as a paint spray gun. In the past, it has been the practice to manufacture the metering rod or a needle valve from stainless steel and to provide it with an enlarged conical-like head disposed in threaded assembly on the needle. In use, guns of this type break down periodically due to the abrasive action of the spraying compound or grit on the conical-like head. In the past, where the head has become worn, it has been necessary to remove a number of parts at the nozzle end of the gun in order that access may be gained to the conical-like head. Then the conical-like head is unscrewed from the needle and generally replaced. Frequently, it is virtually impossible to remove the conical-like head from the rod because the threads are locked together.

According to important features of the present invention, the conical-like head is formed so as to have a diameter smaller than the diameter of the valve passage enabling the valve and its conical-like head to be withdrawn from the housing at the rear end of the gun so that it is no longer necessary to remove the nozzle structure of the gun in order to service the conical-like head.

According to still other important features of this invention, the conical-like head is formed integral in one piece with the valve from a steel softer than stainless steel so that it can be easily resurfaced and replaced in the gun with a minimum of effort.

According to further important features of this invention, the gun is provided with a metallic nozzle carrying the resilient tube, the tube having an end projecting beyond the nozzle, the periphery of the nozzle and the tube having aligned inclined grooves, and a flexible dispenser cap is disposed over the grooves permitting an air stream to be flowed through the grooves into the stream of buffing compound or grit whereby the construction of the nozzle structure of the spray gun is simplified and can be more economically manufactured.

Still another important object of this invention is to provide a new and improved abrasive spray gun having a urethane foam coating on its exterior to protect the gun from deleterious substances which may be contained in the air field adjacent to a buffing wheel and thereby lengthen the useful life of the spray gun.

Other objects and features of this invention will more fully become apparent from the following detailed description taken in conjunction with the accompanying drawing illustrating a single embodiment, and in which:

FIGURE 1 is a side view partly in section of an automatic spray gun embodying features of my invention;

FIGURE 2 is an enlarged cross-sectional view taken substantially on the line II—II looking in the direction indicated by the arrows, as shown in FIGURE 1;

FIGURE 3 is an enlarged cross-sectional view taken substantially on the line III—III looking in the direction indicated by the arrows, as shown in FIGURE 1;

FIGURE 4 is a side elevation of a nozzle for use in my spray gun; and

FIGURE 5 is a side elevation of a yieldable tube for assembly in the nozzle of my spray gun.

As shown on the drawings:

The reference numeral **9** designates generally an automatic spray gun embodying the features of my invention. The gun **9** includes a housing **10** which is preferably made of a single piece of a suitable material such as brass. The housing **10** includes a threaded nipple **11** for connection to a fluid supply under pressure, such as air, which is adapted to be used in the aspirating and projection of the material from the gun. A similar threaded nipple **12** is provided with a connection to the air supply for delivering air under pressure for actuating a reciprocai piston or diaphragm **13** disposed in the piston housing **14**.

The piston **13** is mounted on a reciprocal or movable needle valve or rod **15** in the piston housing **14**. To this end, a pair of piston rings **16** and **17** are mounted on the valve **15** on axially opposite sides of piston **13**. The piston **13** may be comprised of any suitable material such as leather and the like. In order to hold the piston **13** as well as the plates **16** and **17** in proper position on the rod **15**, a pair of keys **18** and **19** are disposed on opposite sides of the piston rings **16** and **17**.

In order to close the open end of the piston housing **14**, a piston closure plate **20** is engaged against housing shoulder **21** and held in assembly therewith by means of a snap ring retainer **22**.

The needle or valve **15** projects axially forwardly of the piston housing **14** through a housing passage **23** which passage has conventional types of packing glands **24** and **25** disposed at axially opposite ends thereof to permit the piston **15** to be freely moved or reciprocated.

The plate **20** is provided with an adjustment screw **27** which has threads **28** holding the screw **27** in assembly with the plate. The screw **27** has a tubular body **29** and a resilient bumper **30** is disposed within the tubular body along with an end **15***a* of the valve or needle **15**.

A spring **31** is disposed in the piston housing **14** between the piston **13** and the plate **20** for exerting a force to cause a conical-like head **15***b* to be seated against a countersunk valve seat **33** on a yieldable tube **34**. The resilient bumper **30** provides means for controlling the pressure on the needle **15**.

According to important features of the present invention, the conical-like head **15***b* is smaller in size and diameter at its greatest point, as compared with the diameter of the housing passage **23**, so that the needle **15** as well as the piston **13** can be disassembled from the housing **10** by removing the snap ring **22** and drawing the screw **27** as well as the needle **15** out of assembly with the housing **10**. It will be appreciated that during the operation of the gun **9** that the conical-like head **15***b* frequently becomes worn and that it must be refinished periodically so that the conical-like head may properly

seat on the tube 34. In the past, the practice has been to provide the valve 15 with a replaceable conical-like shaped head which formerly was mounted in threaded assembly on the pin. The conical-shaped head is at a diameter in excess of the diameter of the housing passage 23 so that it has not been possible to draw the needle 15 out of assembly with the housing 10 before removing the conical-shaped head. In the past, in order to remove the conical-shaped head, it has been necessary to detach the nozzle structure on the gun so that the head could be unscrewed from the needle. It has now been found that where the gun 9 is to be used for spraying abrasive materials and not as a paint spray gun, that it is no longer necessary to employ a conical-shaped head comprised of a stainless steel material. It will further be appreciated that in the past, where the gun has been intended to be used for spraying paints as well as grit, that it was necessary for the conical-shaped head to be made from a very hard material.

According to the present invention, it has been found that where the gun is to be used for spraying grit exclusively, that the conical-shaped head may be made from a relatively soft material such as a mild type steel or the like to reduce the cost of the gun. In the past, where the replaceable tips have become worn, it has been necessary to throw the old tip away and mount a new conical-shaped head or tip on the needle. The present needle construction is more economical since the needle 15 can be easily removed from the housing 10 when its conical-shaped head 15*b* becomes worn so that the conical-shaped head 15*b* can be easily refinished and replaced in the housing 10 with a minimum of effort. The technique of rejuvenating the conical-shaped head 15*b* is far simpler, less expensive and can be carried out in a very short time as compared to the practices previously followed. In the past, where the head was threaded on the valve, and where the conical-shaped head became worn, it was frequently very difficult to remove the conical-shaped head and special tools were required to perform this time-consuming task whereby the guns would frequently be shut down for a relatively long period of time.

According to still further features of this invention, the spray gun 9 is provided with a new and improved nozzle structure indicated generally at 40. The nozzle structure 40 includes the tube 34, a nozzle 41 and a removable cap 42. The nozzle 41 is preferably comprised of a hard material such as steel and the like. The yieldable tube 34 is preferably comprised of a resilient or rubber-like material such as rubber and synthetic rubber. The cap 42 is preferably comprised of a flexible material such as a flexible rubber or synthetic rubber.

The nozzle 41 has a reduced end 43 provided with a series of threads 44 secured in threaded assembly with internal threads in an open end of the housing 10 at one end of a material receiving chamber 45. It will further be seen in FIGURE 1 that the nozzle 41 has a frusto-conical seat 46 for backing up an enlarged tube end 34*a* as well as the valve seat 33.

The tube 34 is of a greater length than the nozzle 41 so that the enlarged tube end 34*a* projects axially beyond the threaded portion 44 of the nozzle 41 at one end and so that its tapered opposite end 34*b* extends axially beyond the other end of the nozzle 41 when the tube 34 is mounted with axially extending nozzle passage 47.

The gun 9 is provided with a buffing compound inlet nipple 48 through which buffing compound is urged under pressure and caused to flow through axial tube passage 34*c* and out through material and air discharge cap 49 when the valve 15*b* is unseated.

By providing the gun 9 with the air inlet nipple 11, air can be caused to flow through an axial housing air passageway 50 into annular housing groove 51 through circumferentially spaced peripherally aligned air grooves 52 and 34*d* in the nozzle 41 and the tube 34 and then through the cap discharge passage 49. The air and buffing compound are mixed at the tip end 34*b* of the tube 34 and discharged under pressure from the nozzle structure 40. In order to regulate air flow through housing passage 50 by varying the passage area, a thumb or metering screw 53 (FIGURE 2) is mounted on the gun.

The cap 42 is provided with means for snap-on, pull-off assembly with the housing 10 including an annular rib 54 mounted on the radially inner side of an axially extending annular cap flange 55 for snap-on engagement in housing groove 56.

The housing 10 is further provided with a handle H to assist in the holding of the gun 9 during its use.

By reason of the use of the tube 34, the overall life of the nozzle 40 of the gun may be increased since the yieldable material of this tube will resist the abrading action of the material to a greater extent than is true in the case where metal parts are used in contact with the material. The tube may be made from any suitable rubber-like material or a suitable synthetic substitute, depending, of course, on the character of the material being sprayed. For illustration, in spraying some types of material it might be desirable to use a synthetic material such as neoprene, although excellent results may be obtained by making the tube from rubber tubular stock.

Furthermore, the yieldable characteristic of the tube enables it to sealingly engage the valve head 15*b* when the valve is closed, thus effectively shutting off the supply of buffing material. In addition, the yieldable characteristic of the material of the tube permits the tube to be pre-adjusted for rate of flow by the simple expedient of turning the adjustment screw 27. Also, the tube 34 is easily replaceable when no longer usable.

The nozzle structure 40 has been simplified, since the nozzle 41 and the tube 34 are provided with inclined aligned air grooves 52 and 34*d* rather than internal bores or the like. The cap 42 is adapted to fit over the inclined grooves to form partial closures for them and to assist in controlling air flow to the cap discharge passage 49.

The novel construction of the needle valve 15 enables the gun 9 to be more readily serviced with a minimum of effort and expense.

According to still another important feature of the present invention, I have found that it is desirable to encase the gun 9 with a styrofoam or urethane foam coating to keep the gun from becoming compound covered while in use whereby the useful life of the gun may be extended. The provision of the urethane foam coating is an optional feature and when applied to the gun, it provides means for protecting the external surfaces of the gun from becoming abraded during the buffing operation.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. In a spray gun,
a housing having a nozzle provided with an elongated tubular passage,
a yieldable tube of a resilient material of the class consisting of rubber and synthetic rubber,
said tube being snugly fitted in the passage with one end positioned to discharge material therefrom,
a material supply passageway in said housing communicating with the other end of said tube,
a valve passage in said housing coaxial with said tubular passage,
a movable valve mounted in said valve passage and cooperable with the other end of the tube to open and close it in communication with said material supply passageway,
said other end of said rubber tube having a countersunk valve seat about the bore of the tube and

said valve having a conical-like head cooperable with said countersunk seat with said other end of said tube being resiliently engageable with said valve head when the valve is in a closed position,

said conical-like head having a diameter smaller than the diameter of said valve passage enabling said valve and said conical-like head to be withdrawn from the housing in a direction axially away from said yieldable tube.

2. In a spray gun,

a housing having a nozzle provided with an elongated tubular passage,

a yieldable tube of a resilient material of the class consisting of rubber and synthetic rubber, said tube being snugly fitted in the passage with one end positioned to discharge material therefrom,

a material supply passageway in said housing communicating with the other end of said tube,

a valve passage in said housing coaxial with said tubular passage,

a movable valve mounted in said valve passage comprising a rod having a conical-like head formed integral on its forward end cooperable with the other end of the tube to open and close it in communication with said material supply passageway,

said other end of said tube having a countersunk valve seat about the bore of the tube and with said conical-like head being cooperable with said countersunk seat with said other end of said tube being resiliently engageable with said valve head when the valve is in a closed position,

said conical-like head having a diameter smaller than the diameter of said valve passage enabling said valve and said conical-like head to be withdrawn from the housing in a direction axially away from said yieldable tube to permit said conical-like head to be readily refinished and replaced in assembly with the gun.

3. In a spray gun,

a housing having a nozzle provided with an elongated tubular passage,

a yieldable tube of a resilient material of the class consisting of rubber and synthetic rubber,

said tube being snugly fitted in the passage with one end positioned to discharge material therefrom,

a material supply passageway in said housing communicating with the other end of said tube,

a valve passage in said housing coaxial with said tubular passage,

a movable valve mounted in said valve passage and cooperable with the other end of the tube to open and close it in communication with said material supply passageway,

said other end of said rubber tube having a countersunk valve seat about the bore of the tube and said valve having a conical-like head cooperable with said countersunk seat with said other end of said tube being resiliently engageable with said valve head when the valve is in a closed position,

said conical-like head having a diameter smaller than the diameter of said valve passage enabling said valve and said conical-like head to be withdrawn from the housing in a direction axially away from said yieldable tube, and

a frusto-conical cap of a flexible rubberlike material having a dispensing nozzle portion at one end and means for snap-on, pull-off assembly with said housing at an opposite end for securing the cap in protective relation over said nozzle.

4. In a spray gun,

a housing having a nozzle provided with an elongated tubular passage,

a yieldable tube of a resilient material of the class consisting of rubber and synthetic rubber,

said tube being snugly fitted in the elongated tubular passage with one tube end positioned to discharge material therefrom,

a material supply passageway in said housing communicating with the other end of said tube,

a valve passage in said housing coaxial with said tubular passage,

a movable valve mounted in said valve passage and cooperable with the other end of the tube to open and close it in communication with said material supply passageway,

said other end of said tube having a countersunk valve seat about the bore of the tube and said valve having a conical-like head cooperable with said countersunk seat with said other end of said tube being resiliently engageable with said valve head when the valve is in a closed position,

said conical-like head having a diameter smaller than the diameter of said valve passage enabling said valve and said conical-like head to be withdrawn from the housing in a direction axially away from said yieldable tube,

said nozzle and said one tube end having a series of inclined peripheral air grooves for connection with an air supply, and

a frusto-conical cap of a flexible rubber-like material having a dispensing nozzle portion with a dispensing passage at one end in communication with said air grooves and said tube and means for securing the cap in snap-on, pull-off assembly with said housing at an opposite end in protective relation over said nozzles and for enclosing said grooves.

5. In a spray gun,

a housing having a nozzle provided with an elongated tubular passage,

a yieldable tube of a resilient material of the class consisting of rubber and synthetic rubber,

said tube being snugly fitted in the elongated tubular passage with one tube end positioned to discharge material therefrom,

a material supply passageway in said housing communicating with the other end of said tube,

a valve passage in said housing coaxial with said tubular passage,

a movable valve mounted in said valve passage and cooperable with the other end of the tube to open and close it in communication with said material supply passageway,

said other end of said tube having a countersunk valve seat about the bore of the tube and said valve having a conical-like head cooperable with said countersunk seat with said other end of said tube being resiliently engageable with said valve head when the valve is in a closed position,

said nozzle and said one tube and having a series of inclined peripheral air grooves for connection with an air supply, and

a frusto-conical cap of a flexible rubber-like material having a dispensing nozzle portion with a dispensing passage at one end in communication with said air grooves and said tube and means for securing the cap in snap-on, pull-off assembly with said housing at an opposite end in protective relation over said nozzles and for enclosing said grooves.

6. In a spray gun,

a housing having a discharge end provided with a passage,

a yieldable tube of a resilient rubber-like material,

said tube being snugly fitted in the tubular passage with one end positioned to discharge material therefrom,

a material supply passageway in said said housing communicating with the other end of said tube,

a valve passage in said housing coaxial with said tubular passage,

a movable valve mounted in said valve passage and

cooperable with the other end of the tube to open and close it in communication with said material supply passageway,

said other end of said yieldable tube having a countersunk valve seat about the bore of the tube and said valve having a conical-like head cooperable with said countersunk seat with said other end of said tube being resiliently engageable with said valve head when the valve is in a closed position,

said conical-like head having a diameter smaller than the diameter of said valve passage enabling said valve and said conical-like head to be withdrawn from the housing in a direction axially away from said yieldable tube, and

reciprocal means connected to said valve for securing the valve head in said valve seat and releasible for disengaging the valve head from said valve seat.

7. In a spray gun,

a housing having a discharge end provided with a passage,

a yieldable tube of a resilient rubber-like material,

said tube being snugly fitted in the tubular passage with one end positioned to discharge material therefrom,

a material supply passageway in said housing communicating with the other end of said tube,

a valve passage in said housing coaxial with said tubular passage,

a movable valve mounted in said valve passage and cooperable with the other end of the tube to open and close it in communication with said material supply passageway,

said other end of said yieldable tube having a countersunk valve seat about the bore of the tube and said valve having a conical-like head cooperable with said countersunk seat with said other end of said tube being resiliently engageable with said valve head when the valve is in a closed position,

said conical-like head having a diameter smaller than the diameter of said valve passage enabling said valve and said conical-like head to be withdrawn from the housing in a direction axially away from said yieldable tube,

reciprocal means connected to said valve for securing the valve head in said valve seat and releasible for disengaging the valve head from said valve seat, and

a urethane foam coating on the exterior of said gun.

8. A nozzle structure for attachment on a housing of a spray gun having a needle valve therein comprising

a yieldable tube of a resilient rubber-like material having centrally located tube passage through which material can flow,

a nozzle having an elongated tubular passage with said tube mounted therein,

said nozzle having threads for securing said nozzle to a housing,

an axially inner end of said tube having a countersunk valve seat about the bore of the tube for receipt of a conical-like valve head,

adjacent ends of said nozzle and said tube having a series of inclined peripherally aligned air grooves for connection with an air supply,

a frusto-conical cap of a flexible rubber-like material having a dispensing nozzle portion with a material and air discharge passage,

said cap being mounted over said adjacent ends of said nozzle and said tube and providing a partial closure for said peripherally aligned air grooves for controlling air flow through said grooves into said material and air discharge passage in said cap, and

an annular flexible rib mounted on one end of said cap for securing the cap in snap-on, pull-off assembly with a housing.

9. A nozzle structure for attachment on a housing of a spray gun having a needle valve therein comprising

a yieldable tube of a resilient rubber-like material having centrally located tube passage through which material can flow,

a nozzle having an elongated tubular passage with said tube mounted therein,

an axially inner end of said tube having a countersunk valve seat about the bore of the tube for receipt of a conical-like valve head,

adjacent ends of said nozzle and said tube having a series of inclined peripherally aligned air grooves for connection with an air supply,

a frusto-conical cap of a flexible rubber-like material having a dispensing nozzle portion with a material and air discharge passage,

said cap being mounted over said adjacent ends of said nozzle and said tube and providing a partial closure for said peripherally aligned air grooves for controlling air flow through said grooves into said material and air discharge passage in said cap, and

means mounted on one end of said cap for securing the cap in snap-on, pull-off assembly with a housing.

10. In a nozzle structure for attachment on a housing of a spray gun having a needle valve therein,

a yieldable tube of a resilient rubber-like material having centrally located tube passage through which material can flow,

a nozzle having an elongated tubular passage with said tube mounted therein,

an axially inner end of said tube having a valve seat about the bore of the tube for receipt of a valve head,

adjacent ends of said nozzle and said tube having a series of inclined peripherally aligned air grooves for connection with an air supply, and

a cap of a flexible rubber-like material having a dispensing nozzle portion with a material and air discharge passage,

said cap being mounted over said adjacent ends of said nozzle and said tube and providing a partial closure for said peripherally aligned air grooves for controlling air flow through said grooves into said material and air discharge passage in said cap.

11. In a spray gun,

a housing block having axially opening buffing compound and air chambers at its opposite ends joined together by an axially extending valve passage,

a movable valve in said valve passage and extended into said chambers,

a nozzle on said housing forming a closure for said buffing compound chamber and having a yieldable rubber-like tube mounted in its bore providing a valve seat for said valve,

a piston mounted on said movable valve in said air chamber,

a closure plate mounted in said air chamber,

a snap ring retainer holding the plate in assembly with the housing,

a valve adjustment screw mounted on said plate and having a tubular bore with an end of said valve engaged therein,

a resilient bumper disposed in said bore in said adjustment screw providing a cushioned valve stop,

a spring between said closure plate and said piston for urging said piston and said valve in a direction toward the valve seat,

and air and buffing compound nipples on said housing operatively connected with said chambers,

the air nipple enabling air to be flowed into the air chamber to force the piston toward said ring to unseat said valve to permit buffing compound to be discharged through said tube.

12. The gun of claim 11 further characterized by said valve having a conical-like head having a maximum diameter smaller than a diameter of said axially extending valve passage so the valve may be withdrawn from the gun after the snap ring retainer is detached from the housing.

13. The gun of claim 11 further characterized by said housing having a rubber-like abrasive discharge cap engaged over said nozzle and provided with means for snap-on, pull-off engagement with said housing.

14. The gun of claim 13 further characterized by said tube and said nozzle having inclined peripherally aligned

air grooves and by said housing having air supply passages for flowing air through said air grooves for coaxial mingling with the abrasive being discharged through said cap.

References Cited in the file of this patent

UNITED STATES PATENTS

1,459,975	Fleming-Williams	June 26, 1923
2,071,472	Pletcher	Feb. 23, 1937
2,107,084	Pletcher	Feb. 1, 1938
2,901,183	Kohl	Aug. 25, 1959
3,066,874	Becker	Dec. 4, 1962