

Nov. 28, 1961

W. H. RUTTER

3,010,658

SPRAY GUN

Filed Nov. 6, 1959

2 Sheets-Sheet 1

INVENTOR.
WILLIAM H. RUTTER
BY *Howson & Howson*
ATTYS.

1

3,010,658

SPRAY GUN

William H. Rutter, Allentown, Pa., assignor to Electro Chemical Engineering & Mfg. Co., Emmaus, Pa., a corporation of Delaware

Filed Nov. 6, 1959, Ser. No. 851,404

3 Claims. (Cl. 239—399)

The present invention relates to guns for spraying or applying fluid materials for coating purposes and is more particularly directed to an improved, lightweight, easily maneuverable and easily cleaned gun for spraying of non-premixable materials. The spray gun of the present invention, though not limited to a particular use, is especially adapted for applying urethane foams which are formed, for example, by mixing in proper proportions a prepolymer consisting of a resin diisocyanate reaction product and a premix comprising a resin, foaming agent, wetting agent and catalyst.

An object of the present invention is to provide a gun for applying a urethane foam, as referred to above, wherein the components of the spray material are mixed and united together during the spraying action to be in proper condition for coating the surface being coated, and more particularly wherein the prepolymer and premix are mixed and discharged to provide a urethane foam of a fine uniform cell structure.

Another object of the present invention is the provision of a gun which can be easily and completely dismantled so that the parts may be cleaned or replaced when necessary.

A further object of the present invention is to provide a light weight spray gun which is simply constructed and may be operated and manipulated easily and efficiently by a user.

A still further object of the present invention is to provide a spray gun wherein the components of the material are thoroughly commingled so that a foam having a fine, uniform porous cell structure is produced.

These and other objects of the present invention and the various features and details of the operation and construction thereof are hereinafter more fully set forth and described with reference to the accompanying drawings, in which:

FIG. 1 is a perspective view of the spray gun of the present invention;

FIG. 2 is a perspective view of an outer casing member for the spray gun;

FIG. 3 is an enlarged perspective view of the exterior of the premix chamber portion of the present invention;

FIG. 4 is an enlarged perspective view of the prepolymer and air manifold portion of the gun of the present invention with a portion broken away for clarity;

FIG. 5 is a longitudinal sectional view of the gun of the present invention showing the premix, prepolymer and air source connections to the gun;

FIG. 6 is a view taken along line 6—6 of FIG. 5;

FIG. 7 is an enlarged sectional view taken along line 7—7 of FIG. 5 showing the mixing head for the gun;

FIG. 8 is a view taken along line 8—8 of FIG. 7; and

FIG. 9 is a fragmentary sectional view showing another form of mixing chamber for the spray gun of the present invention.

Referring more specifically to the drawings and particu-

2

larly to FIG. 1 thereof, reference numeral 10 designates generally the spray gun of the present invention consisting of a body portion 12 and a nozzle 14 having a discharge portion 15 connected to the body portion 12 by a suitable coupling member 16. A cover 17 in the form of a generally cylindrical casing surrounds the body portion 12. A suspension member in the form of a hook 19 is connected to the body to provide a means for suspending the gun.

With reference to FIG. 5 which is a sectional view of the gun showing in detail the internal components of the body portion thereof, the body 12 comprises a premix chamber 18, a prepolymer chamber 20, a mixing chamber 22 and an air chamber 24. Connected to the air, prepolymer and premix chambers are supply connections 26, 28 and 30 respectively and conduits 32, 34 and 36 respectively which connect the chambers with suitable air, prepolymer and premix supply sources (not shown). The air, prepolymer and premix materials are preferably delivered under pressure through conduits to the chambers from the supply source.

As shown in FIG. 1 the handle 37 portion of the gun is defined by rigid conduit sections 38 and 40 intermediate the prepolymer and premix conduits 34 and 36 and the connections 28 and 30 which are secured together by means of a brace or bracket 42. A hand operated control means or trigger 44 is pivotally mounted on the body portion by means of a pin 46 adjacent the handle 37. The trigger 44 has a lateral extension portion 48 which engages the plunger 50 of an electrical switch 51 which when actuated effects operation of the premix and prepolymer supply sources. As shown in FIG. 6 the plunger 50 is normally urged outwardly by means of a coil spring 52 mounted in the switch housing 54 which is mounted on the handle 37 by means of a bracket 56 and screw 58 arrangement which in turn maintains the trigger 44 in the outward position. When the plunger 50 is actuated rearwardly upon movement of the trigger 44 and electrical connection is established between the contacts 60 and 62 which through the electrical lead 64 is suitably connected to the supply source actuators.

With reference to FIGS. 3 and 5, the premix chamber 18 is defined by a generally cylindrical tube 70 which is threaded at its outer end to removably mount a closure cap 72. The inner or discharge end of the tube 70 tapers slightly inwardly at 74 and has a plurality of guide and spacer members 76 spaced about its outer periphery. An outwardly extending peripheral flange 78 is provided on the tube intermediate the inner end of the tube and the material connection 30. A threaded coupling nut 80 having a threaded stem 82 is slidably positioned on tube 70 between the flange 78 and the connection 30. The premix chamber 18 is mounted in the prepolymer chamber 20 and is spaced from the inner peripheral wall thereof substantially along the entire length of the prepolymer chamber 20.

The prepolymer chamber which is defined by a generally cylindrical housing 84 has an inwardly extending shoulder or flange 86 proximate its outer end adjacent the flange 78 and which end is internally threaded to receive the coupling nut 80. The coupling nut 80 is threaded into the threaded portion of the prepolymer housing 84 in engagement with the outwardly extending circumferential flange 78 to position the prepolymer and premix

chambers with respect to each other. Nut 80 is tightened after the tube 70 and housing 84 are secured at connections 28 and 30 to their respective conduits 38 and 40 by means of couplings 90 and 92. The abutment of the nut 80 on the flange 78 with a gasket 81, and the threaded connection to the housing 84 preclude leakage of prepolymer from the chamber. The forward end of the housing 84 has an inwardly extending rib portion 94 with an opening 96 within which the tapered end 74 of the tube 70 is so inserted that the annular protrusions 76 engage the inner peripheral surface of the opening 96 in the housing 84. Accordingly, a restricted discharge opening 98 is defined intermediate the outer peripheral wall of the tube 70 and the inner peripheral wall of the portion 94. The air chamber 24 is defined by an annular opening in the housing 84 at the discharge end, extending axially thereof adjacent its outer peripheral edge. As shown in FIG. 5 the air conduit 32 is connected to the annular air chamber 24 by means of a coupling 102.

In accordance with the present invention means are provided for mixing the prepolymer and the premix and discharging the mixed fluid through the discharge portion 15 of the nozzle. To this end a mixing head 104 is provided which is mounted intermediate the discharge portions or ends of the prepolymer and premix chambers and the nozzle 14. The mixing head as shown in FIG. 8 is provided with a recessed socket portion 106 which is positioned adjacent the discharge openings of the chambers and defines a mixing chamber 22. A plurality of axially extending bores 108 are formed in the outer periphery of the mixing head 104 which are aligned with the annular air passage way or chamber 24 in the housing 84. Extending outwardly from the socket 106 through the mixing head are a plurality of bores 110 which are spirally arranged and inclined outwardly at an angle with the longitudinal axis as shown in FIG. 7, so that the material passing therethrough from the mixing chamber 22 is discharged toward the inner peripheral wall of the nozzle. The spiral outwardly inclined openings 110 effect a cutting of the material and a further mixing thereof after an initial mixing in the chamber 22. Air which is supplied to the annular air passage way through the conduit 32 continuously passes through the axially extending bores 108 of the mixing head, and engages the material in the nozzle adjacent the mixing head and discharges it through the discharge portion of the nozzle in a fine spray.

The mixing head 104 is preferably formed of fluorothylene polymer which has excellent anti-stick properties and makes cleaning very simple. Additionally the internal portion of the nozzle as well as some of the other elements of the gun may be coated with fluorothylene polymer so that they also may be easily cleaned when desired.

FIG. 9 illustrates another form or arrangement of mixing chamber constructed in accordance with the present invention. In this embodiment a series of mixing heads are employed for the purpose of providing for a more thorough mixing of a prepolymer and premix and also for the purpose of providing for pouring of the mixed materials as opposed to spraying thereof. As shown in FIG. 9, an annular spacer 116 is provided which engages over a shoulder 118 formed on the forward end of the mixing head 104 and supports at its outer end another mixing head 120. The second mixing head 120 is similar to the first 104 except that there are no air openings provided in the outer periphery thereof. A sleeve 122 having an intumed flange 124 at one end which engages over the shoulder 123 formed on the nozzle 125 is secured to the forward portion of the body by the coupling 16 which engages over a shoulder 126 on the opposite end of the sleeve.

In operation, when the user desires to use the gun, the trigger 44 is actuated rearwardly to engage the stem 50 which in turn effects, through the electrical switch 51,

actuation of the prepolymer and premix supply sources. The premix and prepolymer enter the body portion of the gun through the conduits 38 and 40 and move toward the socket 106 in the mixing head defining an initial mixing chamber 22 wherein the prepolymer and premix are comingled. Thereafter the mixed materials are forced through the spiral holes 110 in the mixing head which causes further mixing of the material. As the material is discharged from the mixing head into the forward portion of the nozzle, air supplied through the annular chamber 24 in the housing 84 engages the mixed material which results in further mixing and pushes it through the discharge end of the nozzle and breaks it up into a very fine spray. The material as a result of the thorough mixing is characterized by a uniform, porous cell structure. In the embodiment illustrated in FIG. 9, as the material leaves the first mixing chamber, it passes through the chamber defined by the spacer through the second mixing chamber by means of the air jet as well as the material behind it pushing it. The material is discharged into another chamber 125 in a solid stream as opposed to a fine spray. Of course, any number of mixing heads may be used in the embodiment of FIG. 9.

From the foregoing, it is apparent that the present invention provides an improved spray gun which is composed of comparatively few parts which may be easily disassembled for cleaning purposes and rapidly reassembled for use. Additionally, the spray gun of the present invention is extremely light and may be maneuvered about by a user without much difficulty. Further the particular arrangement of the internal portions of the gun, as for example the mixing head, provide for a thorough mixing of materials which is necessary to obtain the fine uniform cell structure when mixing the components forming a urethane foam material.

While a particular embodiment of the present invention has been illustrated and described herein, it is not intended to limit the invention to such disclosure and changes and modifications may be made therein within the scope of the following claims.

I claim:

1. A spray gun for mixing plural liquid components of a material to be sprayed into a foam and applying the mixed material; comprising, a body portion, a nozzle at the forward end of said body portion, means defining a generally cylindrical first chamber in said body having a discharge portion, inlet means connected to said first chamber through which one of said liquid components passes into said first chamber, means defining an annular second chamber in said body spaced radially from and concentric with said first chamber and having a discharge portion, inlet means connected to said second chamber through which another of said liquid components passes into said second chamber, said discharge portions having a common discharge point, a mixing head positioned intermediate the discharge portions of said first and second chambers and the nozzle, means defining a socket in said mixing head adjacent the discharge portions of the chambers constituting an initial mixing chamber into which components are discharged at the common discharge point, said mixing head having a plurality of discharge openings therethrough defining secondary mixing means and connecting said mixing chamber with said nozzle, and air discharge means operable to discharge air under pressure into said nozzle into intimate contact with said mixed material only subsequent to its passage out of the secondary mixing means for forcibly ejecting the mixed material through said nozzle.

2. Apparatus in accordance with claim 1 including a plurality of axially extending bores in said mixing head intermediate the outer peripheral wall thereof and the socket portion, said bores communicating with the air discharge means.

3. Apparatus in accordance with claim 2, wherein said plurality of discharge openings in said mixing head com-

5

prises a plurality of generally cylindrical spaced bore openings directed outwardly from the longitudinal axis of said mixing head from said socket portion to said nozzle whereby a liquid flow from said socket portion through said bore openings is directed into the air flow from said air discharge means.

5

References Cited in the file of this patent

UNITED STATES PATENTS

1,757,023 Smith ----- May 6, 1930 10 516,724

2,143,817
2,447,123
2,504,116
2,551,276
2,635,010
2,788,337
2,813,750

6

Longdin et al. ----- Jan. 10, 1939
Jones ----- Aug. 17, 1948
Downs ----- Apr. 18, 1950
McMahan ----- May 1, 1951
Sanders et al. ----- Apr. 14, 1953
Preiswerk et al. ----- Apr. 9, 1957
Marantz ----- Nov. 19, 1957

FOREIGN PATENTS

Great Britain ----- Jan. 10, 1940