July 13, 1954 E. J. FISHER 2,683,625

SPRAY GUN

Filed May 10, 1951 3 Sheets-Sheet 1

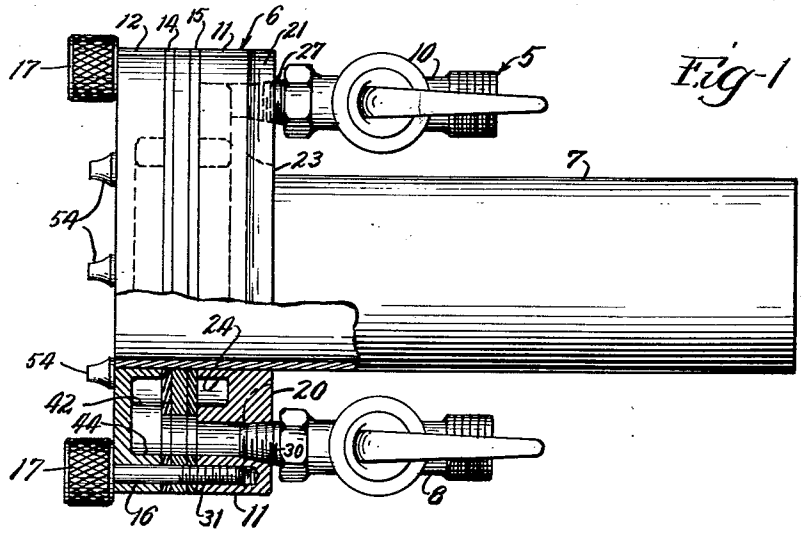


Fig-1

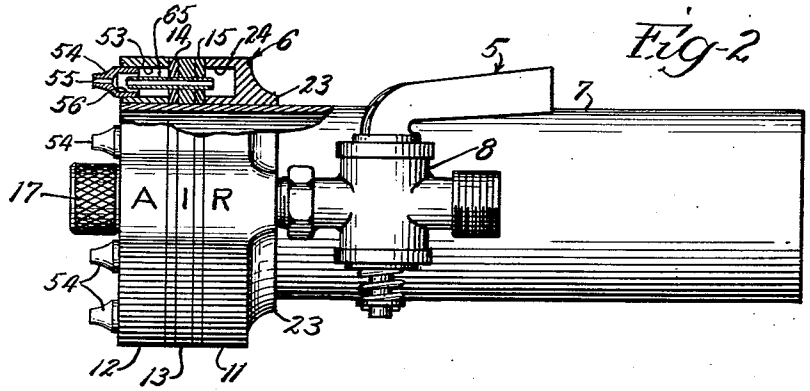


Fig-2

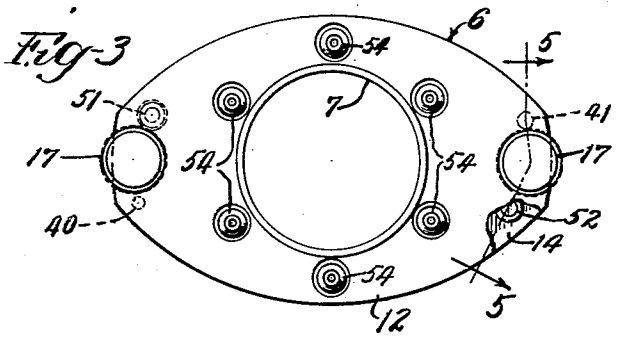


Fig-3

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Fig-4

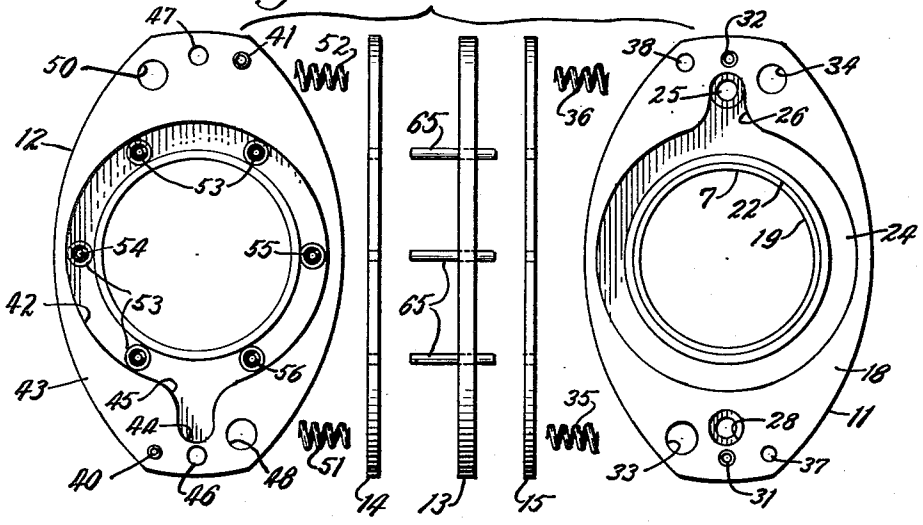


Fig-5

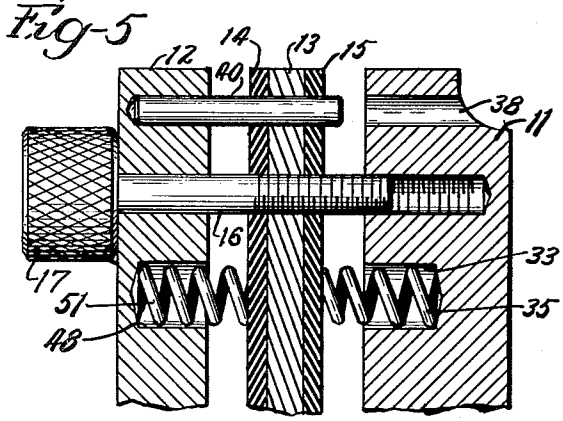
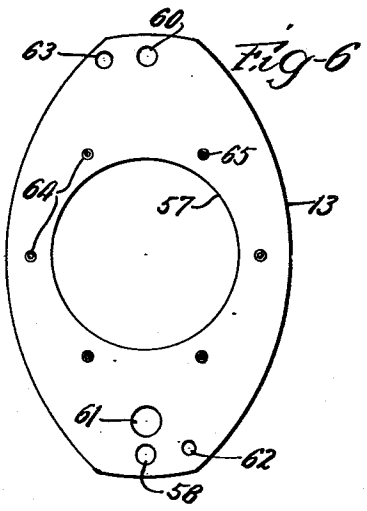


Fig-6



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SPRAY GUN

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Fig-7

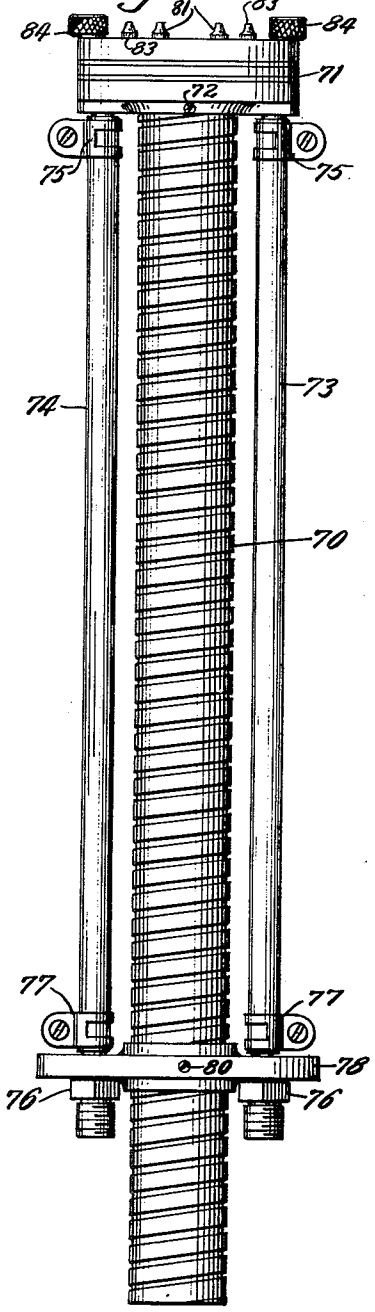


Fig-8

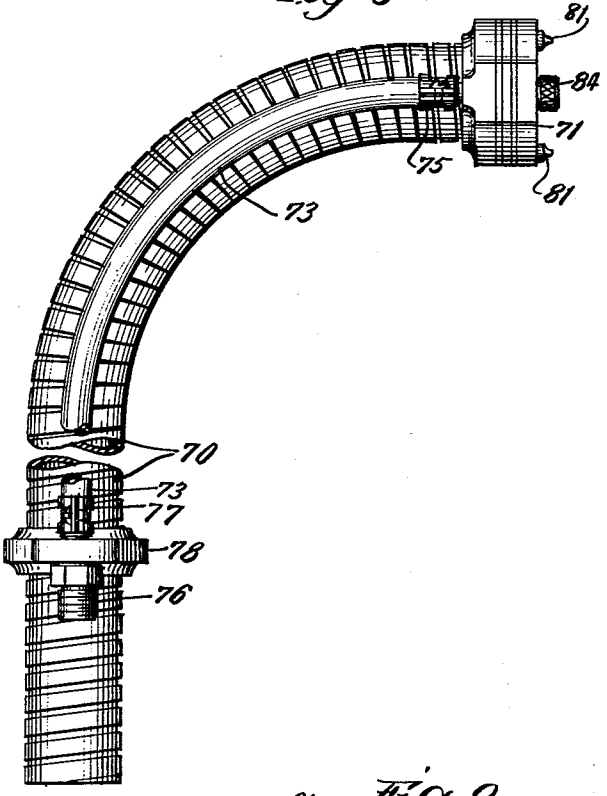
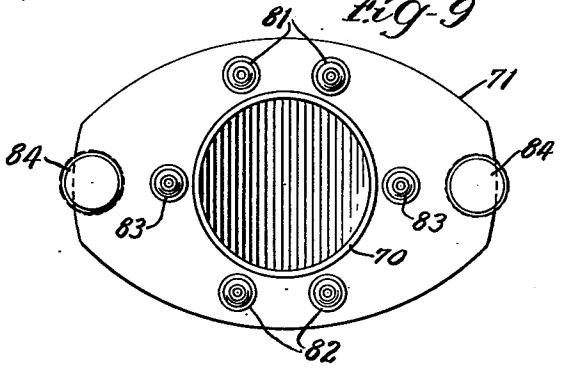


Fig-9



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UNITED STATES PATENT OFFICE

2,683,625

SPRAY GUN

Emery J. Fisher, Chicago, Ill.

Application May 10, 1951, Serial No. 225,495

13 Claims. (Cl. 299—140)

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My present invention relates to guns for spraying comminuted, granular, cellular and fibrous materials and simultaneously spraying a liquid onto a blast of such a material as it leaves the gun. More specifically, the invention relates to innovations and improvements in the general type of spray guns disclosed in Patent No. 2,433,463, issued December 30, 1947, to A. J. Lampe.

This type of spray gun is particularly useful for spraying granular, cellular, fibrous and comminuted insulation materials onto walls or other surfaces. In order for such a material, which may be for either heat or sound insulation, or both, to adhere to the wall surface and form a continuous bonded-on coating or blanket, it is necessary to at least partially coat the individual particles or pieces with a suitable binder or adhesive. This general method or technique of applying and building up such mats or coatings of insulation on surfaces is disclosed in Patents Nos. 1,718,507, 1,888,841, 2,179,679 to Wenzel et al., No. 1,837,422 to Fix, and No. 1,978,125 to Bennett.

The spray gun disclosed in detail in Lampe Patent No. 2,433,463 has proven, through extended experience, to be a satisfactory device for the purpose of applying and building up mats or coatings of insulation by the spray-on technique. However, by means of the present invention, I am able to provide a Lampe type spray gun which from several important practical standpoints is materially superior to the spray gun disclosed in Lampe Patent No. 2,433,463.

The object of the present invention is the provision of a spray gun of the type shown and described in Lampe Patent No. 2,433,463, which in comparison with the Lampe type structure is: (1) considerably smaller and lighter and has a much greater efficiency and capacity for the same size; (2) easier and cheaper to build; (3) has a more trouble-free construction; (4) is flexible so as to fit around objects and into spaces where a non-flexible gun could not be used; (5) has increased versatility by reason of easy interchange of parts (i. e. cover sections and central blast pipes) whereby one gun can be rapidly and conveniently modified to meet different requirements and handle different type materials; and (6) is easier to handle because of its compactness and lightness so that with less fatigue of the operator it can be used around ducts, beams, pipes and other obstacles where a Lampe type gun would not fit due to its much greater size and non-flexibility.

Certain other objects of the invention will, in part, be obvious and will, in part, appear hereinafter.

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For a more complete understanding of the nature and scope of my invention, reference may now be had to the following detailed description thereof taken in connection with the accompanying drawings, wherein:

Fig. 1 is a top plan view, partially broken away and in section, of a spray gun lying in the horizontal position and forming one embodiment of the present invention;

Fig. 2 is a side elevational view, partly broken away and in section, of the spray gun shown in Fig. 1;

Fig. 3 is a front elevational view, partly broken away, of the spray gun shown in Fig. 1;

Fig. 4 is a bracketed view showing the opposing faces of the cover and base sections of the spray gun of Fig. 1 with the intermediate section, gaskets and separating springs shown in edge elevation in the proper order for assembly;

Fig. 5 is a magnified fragmentary sectional view taken on line 5—5 of Fig. 3;

Fig. 6 is a front elevational view of the intermediate section of the spray gun which interfits between the base and cover sections;

Fig. 7 is a plan view of another embodiment of the invention lying in a straight horizontal position;

Fig. 8 is a fragmentary side elevational view of the spray gun of Fig. 7 flexed in one direction; and

Fig. 9 is a front elevational view of the spray head of the spray gun shown in Figs. 7 and 8.

In Figs. 1 and 2 a spray gun is indicated generally at 5 comprising a spray head indicated generally at 6 which fits over one end of a relatively large diameter central pipe 7. The spray head 6 is provided on the rear side with diametrically opposed conduit connecting means or fittings 8 and 10 which may suitably take the form of check valves or petcocks. In operation comminuted, granular, cellular or fibrous insulating material is blown through the central pipe 7 while adhesive is admitted under pressure through the fitting 10 and compressed air is supplied through fitting 8.

The spray head 6 includes a base section 11, a cover section 12 and an intermediate section or separator 13. Preferably, a gasket 14 is inserted between the cover section 12 and the intermediate section 13 while another gasket 15 is inserted between the base section 11 and the section 13. The several sections and parts of the spring head 6 are held together by means of a pair of bolts 16—16 having knurled thumb heads

17—17. The sections 11, 12 and 13 and the gaskets 14 and 15 are generally oval in shape since this reduces the width or over-all dimension of the spray head 6 to a minimum in one direction and facilitates the insertion of the spray gun 5 in between adjoining pipes, ducts, etc. which would be inaccessible with a wider spray head.

The base section 11 has a smooth, flat face 18. The rear face is also flat and has thickened portions 20 and 21 for receiving the valves 8 and 10 respectively. The base section 11 is also thickened around the central opening 22 so as to form an integral annular ring 23 on the back side which fits around the central pipe 7. An annular recess 24 of rectangular cross section is formed in the front base 18 of the base section 11. This recess 24 serves as a header for the distribution of the incoming adhesive supplied through the valve connection 10. A transverse bore or opening 25 extends through one end of the base section 11 and the front of the opening 25 communicates or merges with the annular recess or chamber 24 through the flared side opening 26 therein. The rear end of the opening 25 is internally threaded as indicated at 27 (Fig. 1) for receiving the threaded nipple of the conduit connection 10. The base section 11 is also provided with a second transverse opening 28 located on the end diametrically opposite the transverse opening 25. The opening 28 extends to the front face 18 of the base section 11 and at the rear side is tapped or threaded as indicated at 30 in Fig. 1 for receiving the threaded nipple of the conduit connection 8. It will be noted that the opening 28 does not communicate with or lead into the annular recess 24.

A pair of holes 31 and 32 are tapped into the base section 11 on opposite ends from the front face for receiving the threaded ends of the clamping bolts 16—16. Diametrically opposed holes 33 and 34 are also bored into the base section 11 from the front face side to serve as recesses for retaining a pair of separating springs 35 and 36, respectively. On the opposite sides of the center line from the spring receiving recesses 33 and 34 a pair of diametrically opposed pin receiving holes 37 and 38 are bored from the face 18 for receiving aligning pins 40 and 41, respectively, which are carried by the cover section 12. Preferably, one of the pins 40 or 41, e. g. 40, is slightly larger than the other and likewise the appropriate receiving hole 38 is slightly larger than the hole 37 thereby insuring proper orientation of the cover section 12 on the base section 11. While the pins 40 and 41 facilitate the proper assembly of the parts of the spray gun, they are not essential and may be omitted.

The cover section 12 is flat on both front and rear faces and an annular recess 42 is formed from the rear face 43 which is turned toward the front surface 18 of the base section 11. The annular recess 42 preferably has a rectangular cross section and preferably corresponds in dimensions to the annular recess 24 in the base section 11. A hole 44 is bored into the rear face 43 of the section 12 so as to register with the transverse opening 28 through the base section 11. The hole 44 is drilled to a depth equal to that of the recess 42 and opens into the annular recess 42 at the flared side opening indicated at 45. On opposite ends of the cover section 12 diametrically opposed holes 46 and 47 are bored completely through the thickness of the cover section 12 so as to receive the clamping bolts 16—16. The smooth holes 46 and 47 register

with the tapped holes 31 and 32, respectively, in the base section 11. The diametrically opposed pins 40 and 41 lie on opposite sides of the longer center line of the cover section 12 and are seated in holes bored therefor. The pins 40 and 41 are maintained in the holes by means of a friction or forced fit. Diametrically opposed spring receiving recesses 48 and 50 are bored into the face 43 for receiving the separating springs 51 and 52, respectively.

Six equispaced holes 53—53 are drilled through the cover section 12 so as to extend between the bottom of the annular recess 42 and the front face of the cover section 12. Into each of these holes 53 a nozzle 54 is press-fitted, one of these being shown in cross section in Fig. 2. Each of the nozzles 54 has a small diameter bore 55 in the projecting end thereof and is counterbored from the rear side so as to form an enlarged bore or recess 56. The holes 53—53 are so formed that the nozzles 54 converge in front of the spray head 6. If desired, the nozzles may be made to converge at different points or pairs of the nozzles may be formed to converge at different points, thereby giving a better distribution of the adhesive onto the blast of insulation material issuing from the end of the central pipe 7 during operation.

The intermediate section or separator 13 has a shape which conforms to that of the base section 11 and cover section 12 and is provided with a central opening 57 for receiving the pipe 7. On opposite ends the intermediate section 13 is provided with diametrically opposed holes 58 and 60 for receiving the clamping bolts 16. On one end the section 13 is also provided with a transverse opening 61 which registers with the transverse opening 26 in base section 11 and the recess 44 in the cover section 12 so as to establish communication between the same. The intermediate section 13 is also provided with diametrically opposed transverse holes 62 and 63 lying on opposite sides of the center line and which register with the holes 37 and 38, respectively, in the base section 11 for receiving the aligning pins or dowels 40 and 41, respectively, carried by the cover section 12.

The intermediate section 13 is also provided with six equispaced holes 64—64 which are arranged around the central opening 57 so as to register with the holes 53—53 in the cover section 12. Into each of the holes 64 a duct or pipe 65 is press-fitted. Referring to Fig. 2 it will be seen that each of the ducts 65 on one side of the separator 13 projects into the enlarged rear recess 56 of one of the nozzles 54. On the opposite end each of the ducts 65 projects a short distance into the annular recess 24 in the base section 11.

The gaskets 14 and 15 are provided for sealing the joints between the base section 11 and the cover section 12 and the opposite sides of the intermediate section 13. Each of these gaskets 14 and 15 has a shape corresponding to that of the sections 11, 12 and 13 and each is provided with openings which correspond to the openings formed in the intermediate section 13.

In assembling the spray heads 6 onto the central pipe 7 the base section 11 is first pushed over the end of the central pipe 7. The central opening 19 in the base section 11 is so dimensioned that a snug fit is obtained between the base section 11 and the pipe 7. The separating springs 35 and 36 are next dropped into the holes 33 and 34 provided therefor in the base section 11.

If desired, the separating springs 35 and 36 as well as 51 and 52 may be permanently secured in place in the respective holes provided therefor. The gaskets 14 and 15 are applied to opposite sides of the intermediate section 13 and this is placed over the end of the central pipe 7 and pushed up adjacent the face 18 of the base section 11. The separator springs 51 and 52 are then placed in the holes 48 and 50 provided therefor in the rear face of the cover section 12 and it is slipped over the front end of the pipe 7 and pushed against the intermediate section so that the aligning pins 40 and 41 fit through the openings 62 and 63, respectively, and 37 and 38, respectively, provided therefor in the intermediate section 13 and the base section 11, respectively. The clamping bolts 16 are now placed in the holes 46 and 47 in the cover section 12 and pushed in until the threaded ends thereof engage in the tapped holes 31 and 32 provided therefor in the base section 11. The clamping bolts are then tightened so as to draw the parts together and compress the gaskets 12 and 15.

In using the gun the particulate insulating materials are blown through the central pipe 7. Adhesive under pressure is admitted through the conduit connection 10 and flows in through the transverse openings 25 and spreads around in the annular recess 24. The adhesive discharges from the recess 24 through the ducts 65 which discharge the adhesive into the enlarged rear openings 56 in the nozzles 54. Compressed air introduced in through the conduit connection 8 passes through the opening 28 in the base section 11, the opening 61 in the intermediate section 13 and into the opening 44 in the cover section 12 where it spreads out and flows into the annular recess 42 and outwardly through the nozzles 54.

As the compressed air passes out through the nozzles 54 it aspirates and nebulizes the adhesive discharged through the ducts 65 so as to efficiently and intimately spray the adhesive onto the comminuted material in advance of the spray gun.

Except for the gaskets 14 and 15, the spray head 6 is preferably formed of metal such as aluminum, brass or steel. The various operations which are necessary to form the sections 11, 12 and 13 are of a simple nature such as drilling, boring, grinding and machining. These parts are adapted to be made on a quantity production basis so as to minimize unit cost.

The spray head 6 has numerous advantages over the prior art devices as typified by the Lampe spray head shown in Lampe Patent No. 2,433,463. The spray head of the present invention is much lighter and smaller thereby making for greater maneuverability and ease in handling. The spray head is easy to take down and clean, the taking apart being facilitated by means of the spreading springs which are used. Since the air pressure is delivered evenly and directly into the spray nozzles 55 from the adhesive ducts 65, a much more uniform and efficient atomization of the binder and adhesive is obtained. The nozzles of the present spray head are much simpler and cheaper than those used in the Lampe spray gun and are easier to keep clean and service. Furthermore, because of the reduced size of the nozzles for the same capacity, it is possible to get the nozzles closer to the periphery of the central pipe 7 and thereby direct the adhesive onto the particles of insulation at a very close distance to the discharge end of the central pipe 7.

In Figs. 7, 8 and 9 of the drawings a modified spray gun is shown wherein the central blast pipe 70 is flexible and may be of a construction such as is used for armored electrical cable but of a correspondingly larger size so as to have an inner diameter of from, say, one to three inches although this is not a critical dimension. A spray head 71 is secured in position over the front end of the pipe 70 by means of a set screw 72 (Fig. 7). A pair of flexible rubber or composition hoses 73 and 74 are clamped to the nipples projecting from the back side of the head 71 and are firmly tightened or clamped to the nipples by means of the clamps 75—75. At the opposite ends, the hoses 73 and 74 are clamped to nipples of a pair of adapters 76—76 by means of the clamps 77—77. The adapters 76 are mounted at diametrically opposite points in a support member 78 which fits over the blast pipe 70 and is locked in place by means of a set screw 80. Compressed air is delivered to the spray head 71 through one of the hoses 73 or 74 while adhesive under pressure is delivered through the other hose to the spray head.

The spray head 71 has a construction which follows or is substantially identical with that of the spray head 6 shown and described above in connection with Figs. 1–6. However, it is preferable to rearrange the adhesive discharge nozzles in the manner shown in Fig. 9. When the blast pipe 70 is bent or flexed as shown in Fig. 8 and is employed in this curved condition, the particles of insulating material passing through the curved blast pipe 70 tend to hug or be thrown out to the outside of this pipe so that when they leave the front end thereof, the density of the particles is not uniform but is crowded or denser on the side of the opening in line with the outside curve of the pipe 70. In order to insure that an adequate amount of the adhesive will reach and be applied to this denser concentration of the particles of insulation, two nozzles 81—81 are placed or positioned close together on that side of the spray head 71. A corresponding pair of nozzles 82—82 are similarly placed close together on a diametrically opposite position so as to compensate for the same increase in density when the spray gun is flexed in the opposite direction. Side spray nozzles 83—83 are positioned along the diameter which passes through the thumb screws 84—84. The flexible spray gun shown in Figs. 7–9 permits the operator to work in otherwise inaccessible locations. For example, the flexible gun may be used to spray around corners and around pipes and ducts and in between partitions and other objects which could not otherwise be reached at all or could not be reached easily.

It will be understood that the flexible spray gun may also be used in the straight condition or in any degree of flexing. The operator can easily and readily convert the spray head 71 over to the spray head 6 or a similar spray head by replacing the cover section and separator section of the spray head 71 with the cover section 12 and separator section 13 of the spray head 6. In fact, the operator can be supplied with a number of different types of cover sections and corresponding separator sections with different numbers and positions of nozzles and with nozzles of different pitches. This increases the flexibility of the spray guns to take care of different conditions such as different distances from the surfaces to be sprayed, differences in materials, etc.

It will be understood that certain changes and modifications may be made in the preferred embodiment of the invention described above and shown in the accompanying drawings without departing from the spirit and scope of the invention.

Having fully described the invention and a preferred embodiment thereof, what is claimed as new is:

1. A spray head adapted for use on a gun for blowing particulate insulating material onto a surface area and simultaneously spraying a liquid adhesive onto the blast of insulating material as it discharges from the gun, said gun having a relatively large central pipe through which the insulating material is blown and over the discharge end of which said spray head fits and said gun having conduit connecting means for separately supplying to said spray head liquid adhesive and air under pressure, said spray head comprising: a base section having a transverse central opening therein shaped to receive said central pipe of the gun and having a flat front face in which there is an annular chamber extending around said central opening, a first transverse passageway in said base section leading into said annular chamber and opening to the rear side of said base section for connection with one of said conduit connecting means of the gun, a second transverse passageway in said base section extending from the front face to the rear face thereof and adapted to be connected at the rear with the other one of said conduit connecting means of the gun; a cover section having a central opening therein shaped to receive said central pipe of the gun and having a flat rear face wherein there is an annular chamber which extends around said central opening, said cover section having a plurality of spray nozzle openings arranged around said central opening therein with each spray nozzle opening communicating between said annular chamber in said cover section and the front side of said cover section; an intermediate section having flat front and rear faces and adapted to fit in between said base section and said cover section and to separate said annular chambers from each other, said intermediate section having a central opening therein shaped to receive said central pipe of the gun, a transverse opening therethrough registering with said second transverse opening in said base section and opening into said annular chamber in said cover section and a plurality of transverse openings in said intermediate section equal in number and registering with said spray nozzle openings in said cover section; a plurality of tubes mounted in said openings in said intermediate section and projecting into said spray nozzle openings in said cover section; and fastening means for securing said base section, cover section and intermediate section together.

2. The spray head called for in claim 1 wherein spray nozzles are disposed in said spray outlet openings in said cover section.

3. The spray head called for in claim 1 wherein rubber gaskets are disposed on the opposite sides of said intermediate section.

4. The spray head called for in claim 1 wherein said base, cover and intermediate sections have a generally oval shape and said central openings therein have a diameter constituting the major portion of the width of said spray head in its short dimension.

5. The spray head called for in claim 1 wherein at least one pair of springs is compressed between said base section and said intermediate section at diametrically opposed locations, and at least one pair of springs is compressed between said cover section and said intermediate section at diametrically opposed locations, said springs serving to spread said base section, cover section and intermediate section upon release of said fastening means.

6. The spray head called for in claim 1 wherein one of said base, cover or intermediate sections carries an aligning pin which is long enough to extend into at least one of the other two sections and at least one of said other two sections has a hole provided therein for receiving said pin.

7. The spray head called for in claim 1 wherein said cover section has two diametrically opposed aligning pins projecting from the rear face thereof and of sufficient length to project through said intermediate section and into said base section, and said intermediate and base sections having registering sets of holes for receiving said aligning pins.

8. The spray head called for in claim 7 wherein one of said aligning pins and said set of registering holes therefor is larger than the other of said pins and said set of registering holes therefor.

9. A spray head adapted for use on a gun for blowing particulate insulation material onto a surface area and simultaneously spraying a liquid adhesive onto the blast of insulation material as it discharges from the gun, said gun having a relatively large central pipe through which the comminuted material is blown and over the discharge end of which said spray head fits and said gun having conduit connecting means for separately supplying to said spray head liquid adhesive and air under pressure, said spray head comprising: a base section having a transverse central opening therein shaped to receive said central pipe of the gun and having a flat front face in which there is an annular chamber extending around said central opening; a cover section having a central opening therein shaped to receive said central pipe of the gun and having a flat rear face wherein there is an annular chamber which extends around said central opening and registers with said annular chamber in said base section; and an intermediate section disposed between said base and cover sections and separating said annular chambers from each other.

10. The spray head called for in claim 1 wherein said spray gun has a flexible central pipe, and a plurality of said spray outlet openings is concentrated at least at one location so that when said flexible central pipe is curved in a direction that brings said concentration of spray outlet openings on the outer periphery of the curve in operation of said spray gun a greater concentration of the adhesive will be delivered to the denser concentration of insulating material discharging from said pipe adjacent said concentration of spray outlet openings.

11. A spray gun of the class described comprising a flexible central pipe through which particulate insulating material is blown, and a liquid adhesive spray head secured over the discharge end of said pipe for spraying liquid adhesive onto the blast of insulating material as it discharges from the gun.

12. A spray head adapted for use on a gun for blowing particulate insulation material onto a surface area and simultaneously spraying a liquid adhesive onto the blast of insulation material as it discharges from the gun, said gun having a

relatively large central pipe through which the insulation material is blown and over the discharge end of which said spray head fits and said gun having conduit connecting means for separately supplying to said spray head liquid adhesive and air under pressure, said spray head comprising: a base section having a transverse central opening therein shaped to receive said central pipe of the gun and having a flat front face in which there is an annular chamber extending around said central opening; a cover section having a central opening therein shaped to receive said central pipe of the gun and having a flat rear face wherein there is an annular chamber which extends around said central opening and registers with said annular chamber in said base section; and an intermediate section disposed between said base and cover sections and separating said annular chambers from each other, said cover section having a plurality of discharge nozzle openings arranged around the front face thereof and communicating with said annular chamber therein, and said intermediate section having a plurality of openings therein communicating between said annular chambers and each being coaxially aligned with one of said nozzle openings.

13. A spray head for spraying a liquid from a ring of nozzles, comprising, a rear base section having an annular chamber formed in the front face thereof, an inlet port in said rear base section communicating with said annular chamber therein, a front cover section adapted to mate with said rear base section and having an annular chamber formed in the rear face thereof which registers with said annular chamber in said base section, said cover section having an inlet opening into said annular chamber therein and having a plurality of nozzle-receiving discharge openings arranged around the front face thereof and each opening communicating at the rear with said annular chamber therein, and a separator section disposed between the opposing faces of said rear base and front cover sections so as to close off and separate said registering annular chambers therein, and a plurality of openings in said separator section providing paths of communication between said annular chambers.

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