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SPRAY COATING APPARATUS

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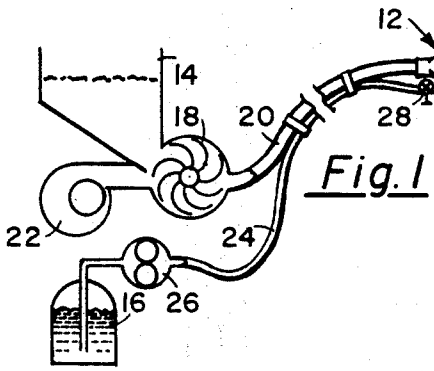

Fig. 1

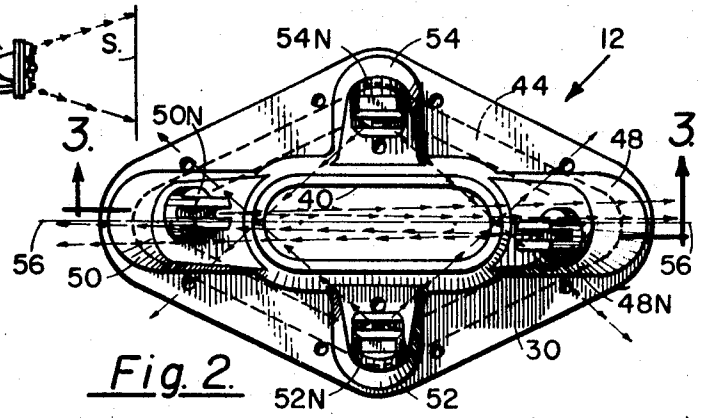

Fig. 2.

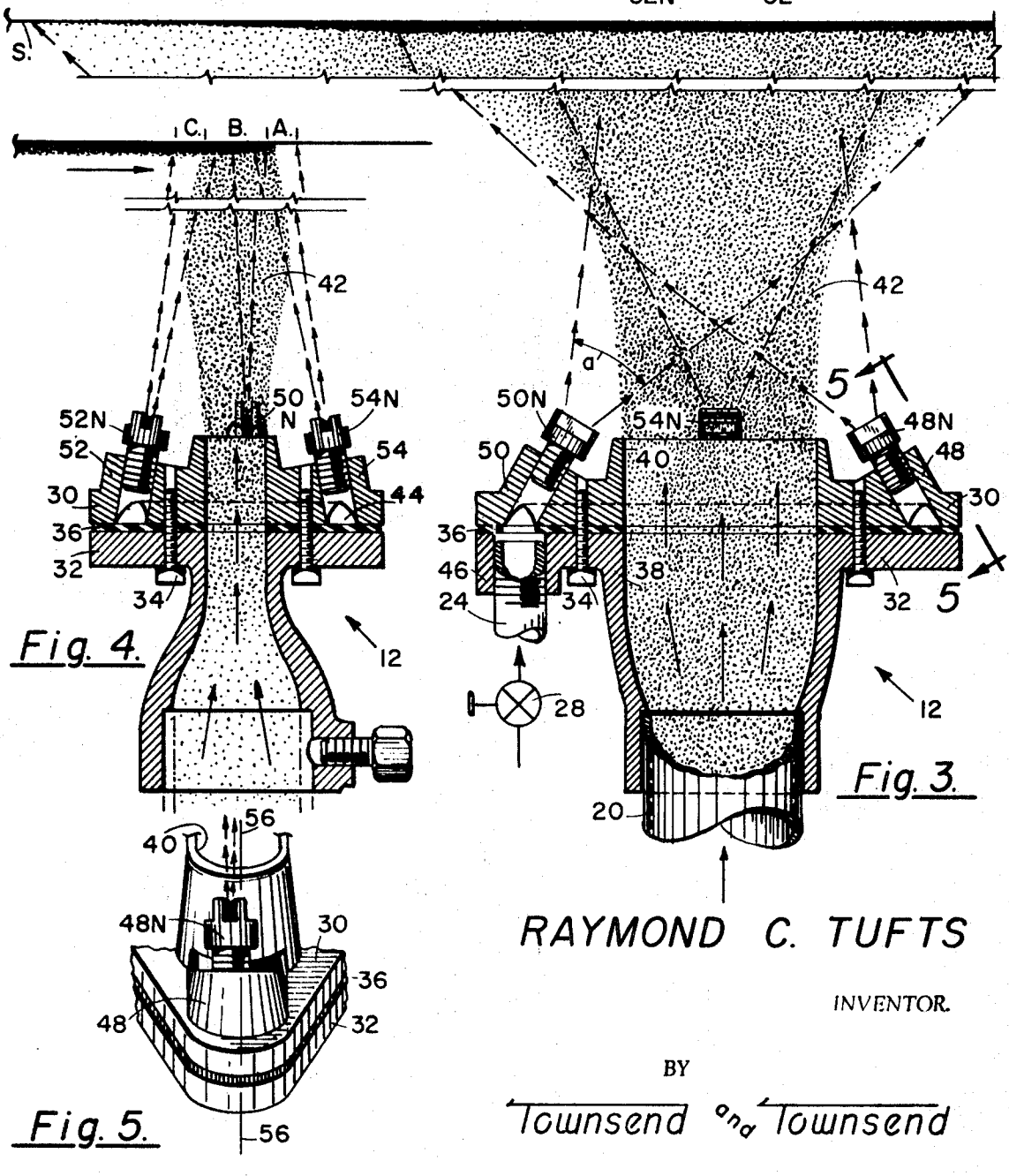

Fig. 4.

Fig. 5.

Fig. 3.

RAYMOND C. TUFTS

INVENTOR.

BY

Townsend and Townsend

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SPRAY COATING APPARATUS

Raymond C. Tufts, Walnut Creek, Calif., assignor to Mono-Therm Insulation Systems, Inc., San Francisco, Calif.

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ABSTRACT OF THE DISCLOSURE

A gun having a center orifice for delivering a course of dry particulate material and plural nozzle tips adjacent the orifice. The nozzle tips are adapted to form flat fan-shaped streams of adhesive. Each of a pair of such tips is located in diametric opposition to the other and such nozzle tips are so oriented that the flat fan-shaped streams slice through the course of dry material to spread out the dry material and to coat the dry material with adhesive so that the adhesive will adhere to a surface. A pair of auxiliary nozzle tips are provided in quadrature with the tips previously mentioned and contribute to the shaping of the course of dry material and the application of adhesive to the dry material and to the surface being coated.

This invention relates to apparatus in the form of a gun or nozzle for spraying a mixture of dry particulate material and adhesive onto a surface. The invention is particularly useful in applying thermal insulative material to building walls, but is not limited to such use.

Many prior art devices for the above stated purpose of which I am aware include one or more air outlets which are used either for forming the dry material into an appropriate shaped course or for accelerating the material toward a surface during application. Such prior art systems, because of their employment of air, cause waste of up to 50% of the dry material, since the dry material is not adequately coated or impregnated with adhesive. Other prior art devices include a series of adhesive nozzles that surround or envelop the dry material course to guide it toward the work surface; such devices do not afford an adequate adhesive coating on the dry material in the center of the course. Uncoated dry material falls from the work surface and is wasted.

The present invention has operated consistently at a waste rate of less than 10%. The present invention achieves such improved mode of operation by providing means for forming a moving airborne stream or course of dry particulate material and means for directing streams of fluid adhesive in converging relation to and radially of the course of particulate material such that the adhesive streams slice through the dry material course. According to the present invention, two generally flattened or planar fan-shaped streams of adhesive are directed radially at the course of dry material by a pair of main jets, the planes of the streams being parallel, but being oriented so that the streams do not intersect one another. This relationship not only influences the pattern of the dry material, but it also assures that the particles of dry material will be more nearly uniformly coated with adhesive. The non-intersection relationship of the two streams fans out the dry particulate material without the necessity of auxiliary high pressure air jets as in the prior art devices.

In addition to the two jets mentioned above, which cover a substantial portion of the dry particulate material with adhesive, the present invention provides two auxiliary adhesive jets that tend to flatten the fan-shaped pattern; such auxiliary jets are mounted in quadrature with the main jets and form adhesive streams that are parallel to

the streams formed by the main jets. The latter adhesive streams serve to confine the dry material into a flat fan-shaped course. The latter jets also apply an adhesive coating directly to the surface to be coated so as to enhance the likelihood that dry material subsequently sprayed thereon will adhere to the surface.

The objects, features and advantages of the present invention will be more apparent after referring to the following specification and accompanying drawings in which:

FIG. 1 is a diagrammatic view of a surface coating system employing the present invention;

FIG. 2 is a view of a gun according to the present invention looking straight into the barrel thereof;

FIG. 3 is a side view in cross section of a gun according to the present invention;

FIG. 4 is a top view in cross section of the gun; and

FIG. 5 is a fragmentary view taken along line 5—5 of FIG. 3.

Referring more particularly to the drawing, a gun **12** is shown in FIG. 1 aimed at a surface S which can be a wall surface in a building such as a sheet steel building. As will appear hereinafter, gun **12** is adapted to apply to surface S a mixture of dry particulate material from a tank **14** and adhesive from a tank **16**. Particulate material is broken into particles of uniform size by a flail or the like **18**, and such particles of material are conducted through a hose **20** to gun **12** by an air stream from a blower **22**. Adhesive from tank **16** is pumped through a hose **24** by a pump **26**. The flow of adhesive is controlled by a valve **28** that is accessible to the holder of the gun **12**.

Gun **12** includes a forward section **30** and a rearward section **32** that are retained in operative relation by through bolts **34**, a gasket **36** being provided between the two sections to seal them together. Sections **30** and **32** centrally thereof define a dry material passage **38** that terminates in an orifice **40**, which in the embodiment shown in the drawing is generally oval-shaped. Such shape is not critical, however, to the practice of the invention. Suffice it to say for the present disclosure, the cooperative effect of orifice **40**, blower **22** and flail **18** is to produce an airborne course **42** of dry particulate material such as cellulosic material, asbestos, fiber glass, and the like.

In the inner face of section **30** is formed a channel **44** that circumscribes the section and forms an adhesive passage. Section **32** includes a fitting **46** that communicates adhesive from hose **24** to channel **44**. Section **30** has an upper boss **48**, a lower boss **50**, and side bosses **52** and **54**. In each of the bosses is formed a hole that communicates with adhesive channel **44**, as can be seen in FIGS. 3 and 4, and the outer portion of each hole is threaded to receive a nozzle tip, **48N**, **50N**, **52N**, and **54N**, respectively. The nozzle tips per se are not novel; the nozzle tips produce a generally fan-shaped stream that spreads the adhesive at an angle *a* (see FIG. 3). Viewed at a position 90° from that at which FIG. 3 is taken (see FIG. 4), the adhesive stream is substantially flat or planar. Thus, the denomination of the adhesive streams produced by the nozzle tips as "generally planar fan-shaped streams" is accurate. A specific nozzle tip found satisfactory in practicing this invention is distributed by the Spraying Systems Company of Bellwood, Ill., and designated No. 4502.

Nozzle tips **48N** and **50N** can be considered the main adhesive jets because they contribute most to the practice of the present invention. As can be seen in FIG. 3, the center lines of the fan-shaped streams are slanted inwardly toward course **42** at an angle of approximately 30° so that the adhesive converges with and intersects the dry material in the course. As can be seen in FIG. 2, the planes of the streams produced by nozzles **48N** and **50N** are approximately parallel with one another and with a diameter of orifice **40** and course **42**. The streams

produced by nozzle tips 48N and 50N are offset from alignment with a diameter or center line of course 42, indicated at 56 in FIG. 2, so that the two streams do not intersect but closely approach one another. As can be seen in FIG. 2, the generally planar fan-shaped stream from nozzle tips 48N and 50N slices through course 42 and spreads the course out to a fan-shaped configuration. Moreover, a substantial portion of the dry particulate material in the course is wet by the adhesive. Because the adhesive has a substantial component of momentum in the direction of course 42, the energy in the adhesive streams assists in propelling the dry particulate material toward the surface S. By way of example, one device designed according to the present invention produces a course 42 that is approximately 2¼" wide as the course egresses from orifice 40; the spreading or diverging action of the fan-shaped adhesive streams emanating from nozzle tip 48N and 50N spreads the course to a width in excess of two feet at a distance of about two feet away from orifice 40.

Auxiliary nozzles 52N and 54N form generally planar fan-shaped streams that converge into course 42 at a very small angle, e.g., less than 15°. As viewed in FIG. 4, wherein the gun 12 is moved toward the right, the adhesive stream from nozzle tip 54N preliminarily wets surface S with adhesive and the adhesive stream from nozzle tip 52N applies a coating of adhesive upon the dry materal previously applied to surface S. The degree to which the nozzles 52N and 54N function as described next above depends on the distance between gun 12 and surface S.

Main nozzle tips 48N and 50N fan the dry material out in the plane of the drawing as viewed in FIG. 3 and the streams from nozzle tips 52N and 54N tend to flatten the fan-shaped pattern still further. One gun designed according to the present invention forms a pattern that is approximately one inch wide at the center and tapers down to a point at the ends when the gun is held approximately 1½–2 feet from surface S. Because the pattern tapers or comes to a point at the ends thereof, the blendinug of one strip of work with a previously applied strip of work without forming a visible overlap zone is possible.

In coating surfaces by using the gun of the present invention, the procedure followed is similar to that followed with prior art guns of similar types. As can be seen in FIG. 4, the gun is moved in a direction transversely of the direction of elongation of the pattern formed on surface S and the gun is held at a distance from surface S such that the surface is pre-coated with adhesive at a zone designated A in FIG. 4. As the gun is moved rightwardly as seen in FIG. 4, the adhesive-coated dry material is applied to the previously coated surface, indicated at B, and finally, a layer of adhesive is applied upon the layer of dry material. Waste rates of less than 10% are readily achievable with the present invention because of the thorough mixture of the adhesive and the dry material. Particularly important in assuring thorough blending of the adhesives and dry material is the fact that the adhesive streams formed by nozzle tips 48N and 50N slice through the course of dry material. Because the two streams are spaced from one another, the energy contained in the streams is not wasted, but is partially transferred to dry material so that the dry material is formed into a pattern suitable for efficient coating.

Because nozzle tips 48N, 50N, 52N and 54N are threaded into gun 12, the nozzles are removable for cleaning or for replacement by nozzles having a different angle of divergence and a different size adhesive orifice. It is important in installing nozzle tips 48N and 50N that the orientation of the tips be such that the streams slice through the dry material course but do not intersect one another.

Although one embodiment of the present invention has been shown and described, it will be obvious that other adaptations and modifications can be made without departing from the true spirit and scope of the invention.

What is claimed is:

1. A spray gun comprising a body, said body having a generally oval shaped dry material outlet orifice centrally thereof, said oval shape having a relatively long major axis, and a relatively short minor axis normal to said major axis, means for supplying dry material for ejection through said orifice, first and second spray tips mounted on said body adjacent and offset from said major axis of said orifice and at diametrically opposite sides thereof, means for applying a fluid adhesive to said spray tips, said spray tips each being adapted to form a flat fan-shaped stream of adhesive, said spray tips being oriented relative to one another such that the plane of the fan-shaped stream of said first spray tip is parallel and spaced from the plane of the fan-shaped stream of said second spray tip, said spray tips being oriented so that the streams produced thereby are parallel to said major axis and slice through the path of egressing dry material from said orifice to form a long narrow mixture of dry material coated with adhesive in front of said gun.

2. A method for blending a liquid adhesive with a dry material that is moving along an airborne course comprising the steps of confining the dry material to a path having an oval shaped cross section that has a maximum cross sectional dimension along a major axis, providing a source of liquid adhesive under pressure, forming the adhesive into at least first and second generally planar fan-shaped streams, said streams being parallel to said major axis and to one another, said streams emanating from points adjacent to but spaced from opposite extremities of said major axis, and directing said streams in slicing relation through the dry material course so as to form a long narrow mixture of dry material coated with adhesive.

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LLOYD L. KING, Primary Examiner

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