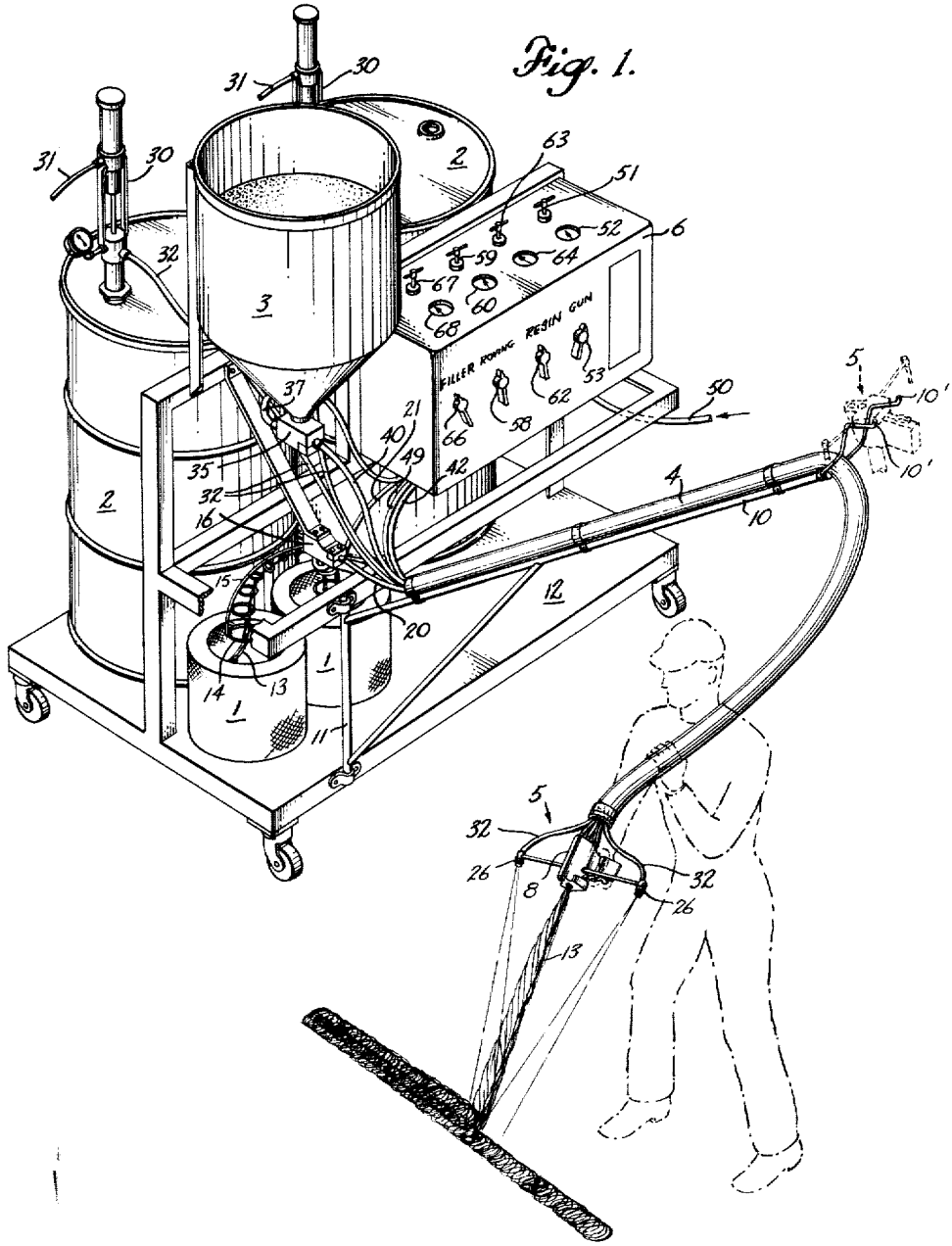
July 2, 1963 M. E. CARR ETAL 3,096,225

APPARATUS AND METHOD FOR DEPOSITING CONTINUOUS STRANDED MATERIAL

Filed May 25, 1959 4 Sheets-Sheet 1

Fig. 1.



INVENTORS.
MARVIN E. CARR
FRANK E. IVES

BY
Reynolds, Beach & Christensen

ATTORNEYS

July 2, 1963 M. E. CARR ETAL 3,096,225

APPARATUS AND METHOD FOR DEPOSITING CONTINUOUS STRANDED MATERIAL

Filed May 25, 1959 4 Sheets-Sheet 2

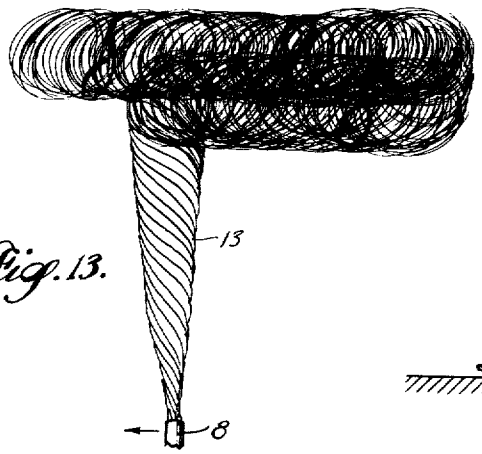


Fig. 13.

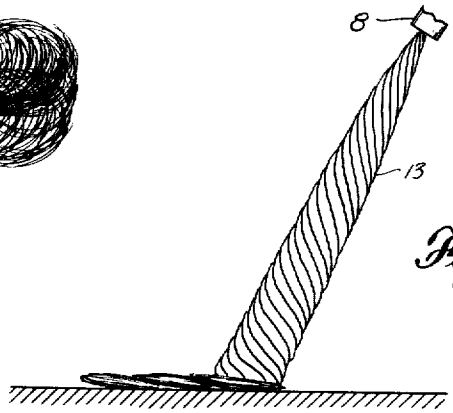


Fig. 14.

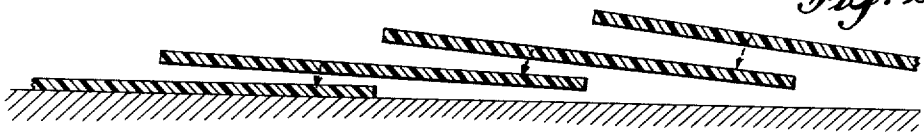
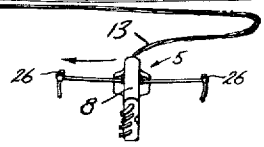


Fig. 15.



Fig. 16.



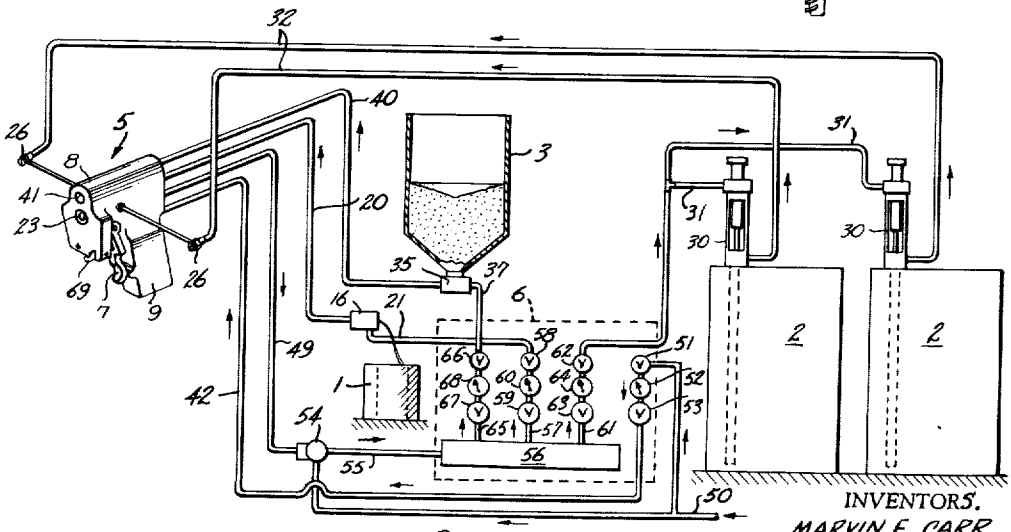


Fig. 2.

INVENTORS.
MARVIN E. CARR
FRANK E. IVES

BY
Reynolds, Beach & Christensen

ATTORNEYS

July 2, 1963 M. E. CARR ETAL 3,096,225

APPARATUS AND METHOD FOR DEPOSITING CONTINUOUS STRANDED MATERIAL

Filed May 25, 1959 4 Sheets-Sheet 3

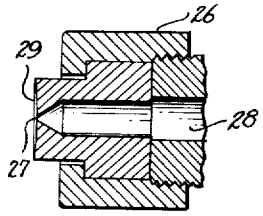


Fig. 8.

Fig. 3.

Fig. 7.

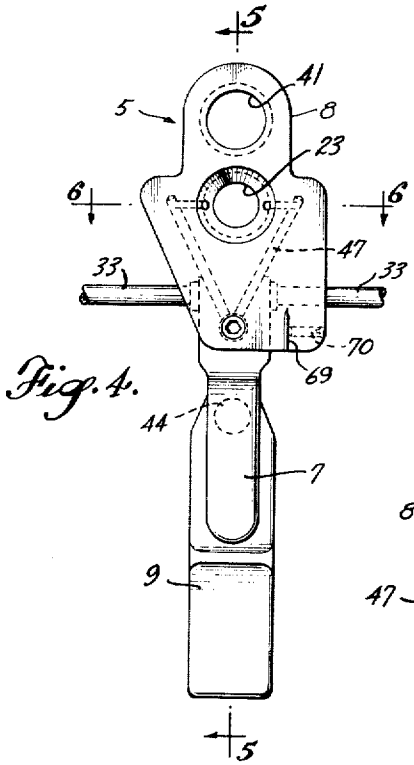


Fig. 4.

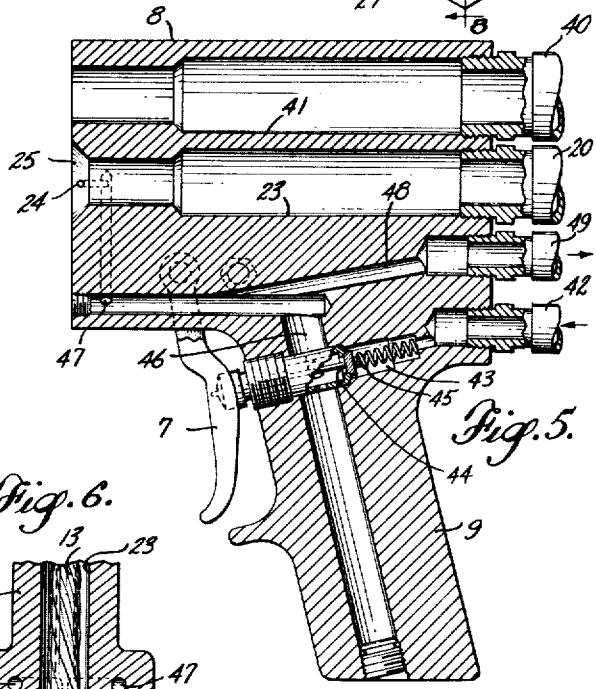
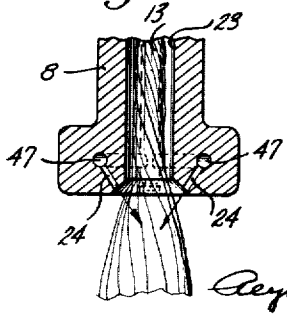


Fig. 5.

Fig. 6.



INVENTORS.
MARVIN E. CARR
FRANK E. IVES

BY

Reynolds, Head & Christensen

ATTORNEYS

July 2, 1963 M. E. CARR ETAL 3,096,225

APPARATUS AND METHOD FOR DEPOSITING CONTINUOUS STRANDED MATERIAL

Filed May 25, 1959 4 Sheets-Sheet 4

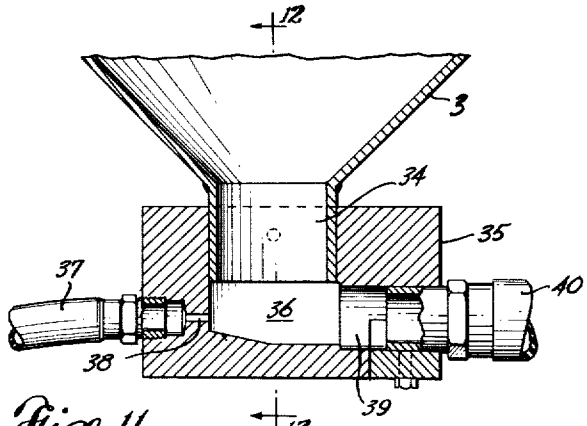


Fig. 11.

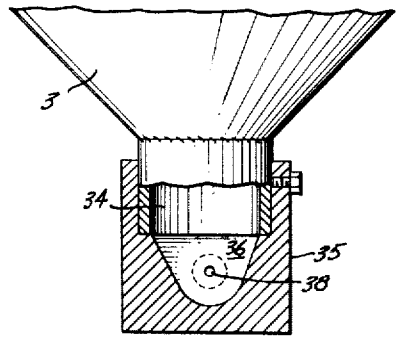


Fig. 12.

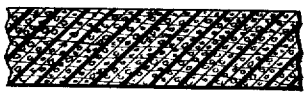


Fig. 17.

Fig. 9.

Fig. 10.

INVENTORS
MARVIN E. CARR
FRANK E. IVES

BY
Reynolds, Bead & Christensen

ATTORNEYS

United States Patent Office

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3,096,225

APPARATUS AND METHOD FOR DEPOSITING CONTINUOUS STRANDED MATERIAL

Marvin E. Carr, Rte. 1, Box 64, Burton, Wash., and Frank E. Ives, 15820 Benson Road, Renton, Wash.

Filed May 25, 1959, Ser. No. 815,716
14 Claims. (Cl. 156—38)

In forming reinforced resin shapes, whether as coatings or in sheet form, it has been customary heretofore to utilize sheets of stranded reinforcing material, such as glass cloth or glass mat, and then impregnate such reinforcing sheet material with settable resin. The resin may be applied to the sheet reinforcing material by dipping it in resin, or by brushing or spraying the resin onto the material. It has been difficult to fabricate complex shapes, and particularly shapes which are concave or convex, with stranded reinforcing material of sheet type.

Also such fabrication is very time consuming, and such sheet material is expensive. Since the sheet material is of uniform thickness and is thin it is difficult to vary the thickness of the shape materially from one part to another or to build up substantial thickness.

The present invention provides a very satisfactory and economical solution to the problem of fabricating resin shapes reinforced with stranded material irrespective of the contour of the shape and the thickness desired within wide limits. By utilizing continuous stranded material as the reinforcing medium and depositing it in convolutions, preferably in chains of loose loops or whorls in partially overlapping relationship, the shape can be formed quickly and when completed will be strongly reinforced. Such loop chains can be laid in partially overlapping successive rows and the degree of overlap can be varied or successive layers can be applied to build up any desired thickness of reinforcing material. Looseness of the loops or strands can be obtained by fluffing the continuous stranded material by blowing one or more air jets against it transversely of its length. If the continuous stranded material is supplied as roving, such an air jet or air jets will spread the strands, and if the roving is twisted it will be laid in loop fashion.

As the continuous stranded reinforcing material is deposited, it can be impregnated with settable resin simultaneously. A resin suitable for this purpose is polyester resin which can be sprayed onto the stranded reinforcing material adjacent to the location of deposit. Such spray may coincide exactly with the location at which the reinforcing material is deposited or the spray may strike the reinforcing material just prior to it being deposited on a receiving surface or immediately after it has thus been deposited. Conveniently, two resin sprays are directed onto the reinforcing material, one of which will carry accelerator and the other of which will carry catalyst so that when the two resin sprays are mingled the resin will set quite quickly. The setting time may, of course, be varied by altering appropriately the amount of accelerator and/or catalyst used in the resin mixture.

If it is desired to build up a thick walled shape or a slab, filler material of granular form can be supplied at the same time as the continuous stranded reinforcing material and resin. Such filler material may be cork particles, sawdust, sand, or other granular material or a mixture of such materials. It will also be evident that in order to obtain the desired type of wall structure, the ratio of the resin, continuous stranded reinforcing material and filler material can be varied appropriately. All of such materials can be deposited by the multiple nozzle apparatus shown in the drawings.

The equipment of this invention is sufficiently versatile to deposit a variety of types of continuous stranded

material, filler and liquid binder instead of or in addition to those mentioned. The equipment could, for example, deposit continuous strands of glass fiber or other material and a cold asphalt emulsion or hot tar for fabricating roofing. Continuous stranded material, road oil and dirt as a filler could be deposited to make a road surface, an airplane landing strip surface or an irrigation ditch liner.

FIGURE 1 is a top perspective view of apparatus for depositing simultaneously any combination of continuous stranded reinforcing material, liquid binder and filler or any one of such materials. FIGURE 2 is a piping diagram of such apparatus.

FIGURE 3 is a top perspective view of the multiple nozzle head of such apparatus, FIGURE 4 is a front elevation view of such head and FIGURE 5 is a transverse sectional view through the multiple nozzle head taken on line 5—5 of FIGURE 4. FIGURE 6 is a fragmentary section on line 6—6 of FIGURE 4.

FIGURE 7 is a front elevation view of an outboard nozzle of the multiple nozzle head and FIGURE 8 is a fragmentary sectional view through such nozzle taken on line 8—8 of FIGURE 7.

FIGURE 9 is a side elevation view with parts broken away of the continuous stranded reinforcing material dispensing and guiding mechanism, and FIGURE 10 is an enlarged sectional view through a portion of such mechanism.

FIGURE 11 is a sectional view through the filler material dispensing mechanism, and FIGURE 12 is a sectional view through such mechanism taken on line 12—12 of FIGURE 11.

FIGURE 13 is a plan view illustrating the manner in which the continuous stranded reinforcing material is deposited, and FIGURE 14 is an elevation view illustrating such operation. FIGURE 15 is a diagrammatic vertical sectional view through a plurality of layers of resin impregnated continuous stranded reinforcing material illustrating the manner in which successive layers of material can be deposited in shingle-laid fashion.

FIGURE 16 is a plan view showing an alternate manner in which the continuous stranded reinforcing material can be laid with or without being impregnated with binder simultaneously.

FIGURE 17 is a fragmentary transverse sectional view through a slab composed of continuous stranded reinforcing material, interspersed filler material, and binder impregnating the stranded reinforcing material and the filler material and binding them into a unitary structure.

The equipment shown in FIGURE 1 includes the various elements necessary to perform any of the variety of operations discussed above. Principally it includes one or more coils 1 of continuous stranded reinforcing roving, such as of glass fiber, one or more drums 2 of binder and a hopper 3 containing filler material. From these various sources extend conduits through a casing tube 4 to the multiple nozzle head 5. The supply conduits from the several material sources extend through a control box 6 containing controls which can be manipulated to select which of the materials is to be dispensed and to regulate the proportions and rate of deposit of the several materials.

While this same equipment is used for depositing one or more of the several materials mentioned, the particular selection of materials is dispensed simply by pulling the trigger 7 pivotally mounted on the body 8 of the multiple nozzle head 5 after the desired selection has been made by proper setting of the controls on the control box 6. Thus the operator may grasp the grip 9 of the nozzle body 8 to direct it in any desired direction and simultaneously start and stop the flow of material to be dispensed by pressing or releasing the trigger 7. To facili-

tate aiming of the multiple nozzle, most of the weight of the casing tube **4** and its contents is supported by the boom **10** mounted on the pivoted rod **11** to swing through a considerable angle. Preferably, as shown, this boom extends upwardly away from the cart **12** on which the equipment is mounted so that the multiple nozzle is suspended for convenient swinging in different directions on the end portions of the conduits connected to the material sources which depend from the swinging end of the boom. Also, the equipment cart can be rolled readily into various positions to provide additional freedom of movement for the multiple nozzle.

FIGURE 1 illustrates a typical operation in which both continuous stranded reinforcing material and resin is being deposited and FIGURE 3 shows filler or aggregate material being dispensed in addition. Because the continuous stranded reinforcing material will be dispensed either first or in conjunction with resin in most instances, the construction and operation of the mechanism for dispensing such material may be considered first. While two coils or roving **1** are shown in FIGURE 1, ordinarily roving would be supplied from only one coil at a time, the other being a spare from which the supply of roving would be continued when the first coil is exhausted. Alternatively, however, if in some particular instance an unusually heavy resin reinforcing were required, roving could be dispensed from both coils simultaneously.

As shown in FIGURE 1, but shown best in FIGURE 9, roving **13** is led from a coil **1** upward through ring guides **14** mounted on rod **15** to the block **16** housing the roving propelling mechanism. The ring guides **14** preferably are of graduated size, the lowermost ring being the largest and the rings above it being progressively smaller so that the roving can be led from any location within the interior of coil **1** without binding, yet the roving will be located quite accurately at the entrance to the roving propelling mechanism.

As shown in FIGURE 9, but to better advantage in FIGURE 10, the roving **13** passes into the interior of block **16** through a smoothly rounded bushing **17** which preferably is removable so that it can be replaced readily if it becomes roughened or worn. This bushing is located at the entrance of a duct **18** which is in communication with the entering end of a Venturi tube **19**, the discharge end of which communicates with the roving conveying conduit **20**. The roving is propelled through the Venturi tube and the conduit connected to it by an air jet discharged from the compressed air supply hose **21** through the small duct **22** discharging into the throat of the Venturi tube from a position offset from the roving supply passage **18**.

From the block **16** the roving conveying conduit **20** extends through the casing tube **4** by which it is supported to the nozzle body **8** shown in FIGURES 3 and 5. Such conduit is connected to the body for communication with the nozzle passage **23** in the body. The roving will be floated and propelled through the conduit **20** and nozzle passage **23** by the air supplied under pressure to the Venturi tube from the hose **1** through the duct **22**. As thus discharged, the roving would be in essentially the same condition as it is in passing from the coil **1** into the ring guides **14** as shown in FIGURE 9. Roving of this character is shown being discharged from the nozzle body in FIGURE 16.

To be most effective as reinforcing for resin, however, it is preferred that the roving be deposited in fluffed condition with the strands considerably loosened from their relationship as supplied in the roving coil **1**. It is, therefore, desirable to untwist the roving somewhat and spread the strands apart in the process of depositing the roving. Such fluffing action, as well as additional propulsive action, can be accomplished by providing one or more strand spreading air jets **24** located at and directed outward beyond the discharge end of the nozzle duct **23**. Two of these jet passages in diametrically spaced relationship are shown in FIGURES 5 and 6 which open into opposite sides of the flared discharge end **25** of passage **23**, to spread the strands whether the roving is twisted or not.

The passages **24** are shown in FIGURE 6 as being directed convergently into a portion of the roving **13** moving through the air free from confinement within the nozzle **23** so that they intersect and create a turbulent area within the roving which forces the strands apart into a fluffy cluster greatly expanded in cross-sectional area as shown in FIGURE 3. The directions of the jets discharged from passages **24** have components extending in the direction of movement of the roving as well as opposed components prependicular to the direction of movement of the roving. Consequently, the air projected from passages **24** will assist in propelling the roving from the nozzle for deposit.

The effect of the air jets issuing from the passages **24** is to cause the roving to be partially untwisted and fluffed progressively in the manner shown in FIGURES 1, 3, 6, 13 and 14 whether the roving is dispensed alone or in conjunction with resin. As the fluffed roving is laid, therefore, in the manner indicated in FIGURES 1, 13 and 14, it will form a chain of loose whorls or loops as the nozzle is moved or swung slowly laterally in the direction indicated by the arrow in FIGURE 13. The degree to which the roving is loosened or fluffed will depend upon its speed of linear travel, the amount of air discharged into the roving from the passages **24**, the direction of such passages relative to the path of travel of the roving and the distance from the nozzle body to the surface on which the roving is deposited.

In FIGURE 13 it is indicated that the nozzle body **8** will be traversed relative to the surface on which the roving is deposited, and the speed of such traversing movement, as well as the looseness of the roving at the point of deposit, will determine the size of the loops and their degree of overlap. For the most part, the successive loops are circular but at intervals a loop of figure **8** shape will be thrown as indicated in FIGURE 13. The smaller the degree of overlap of the loops in the chain the less will be the total thickness of the reinforcing layer, of course, and the greater the overlap the thicker will be the layer. The thickness of the reinforcing material can thus be varied instantaneously at the will of the operator by altering the distance between the nozzle body **8** and the surface on which the material is deposited and by altering the speed with which the nozzle is traversed laterally.

While the stranded reinforcing material can, of course, be deposited at random on a receiving surface, it is usually desirable to lay it according to some definite pattern in order that it will be of approximately uniform thickness distributed over the receiving surface. An effective procedure to accomplish this purpose is to deposit successive rows of chains of loops in shingle-lap fashion such that the overlap of adjacent rows is approximately one-half. Such a lap relationship is shown in FIGURES 13 and 14 and more clearly in diagrammatic fashion in FIGURE 15. Again, the thickness of the reinforcing material can be altered by changing the degree of overlap at will.

While, as stated above, the looseness of the stranded reinforcing material coils deposited can be controlled in some degree by varying the distance of the nozzle body **8** from the depositing surface, it is desirable to maintain such distance approximately constant if resin is deposited at the same time as the stranded reinforcing material. In such case it is preferable for the resin to be projected onto the roving at or slightly ahead of the roving depositing location. The resin may therefore be sprayed onto the roving by one or more sprays converging to meet the roving at or slightly ahead of the depositing location. Two of such converging resin streams are shown in FIGURES 1 and 3.

In spraying the resin onto the roving, it is desirable

to obtain a thorough coating or impregnation of the roving by the resin. Consequently, it is desirable for the width of the resin sprays to correspond approximately to the width of the fluffed or expanded roving. In order to produce such streams of resin, they may be projected from nozzles **26** located sufficiently outboard from the nozzle body **8** so that they can be turned to an effective angle of convergence relative to the path of the roving while the resin streams will intersect such roving path at a considerable distance, such as two or three feet, from the nozzle body. Preferably the resin sprays are of flat fan shape in planes perpendicular to a plane passing through the resin nozzles **26**. Resin jets of this shape can be produced by nozzles having an aperture **27** opening from the resin passage **28** into the bottom of a groove **29** tapering in depth and width away from such aperture, as shown in FIGURES 7 and 8.

When polyester resin is used as the binder, it is convenient to provide two sources of such resin, one including accelerator such as cobalt naphthenate in desired proportions and the other including catalyst such as methyl ethyl ketone peroxide in proper proportions. Until the resin containing the accelerator and the resin containing the catalyst are mixed, setting of the resin will be delayed almost indefinitely. Upon mixing such resin materials, however, the settting of the resin will proceed quite rapidly depending upon the amount of accelerator and catalyst included with the resin. Such technique of proportioning the accelerator and the catalyst in accordance with the setting time desired is well known to those familiar with polyester resin fabrication techniques.

For the purpose of the present invention, therefore, one of the drums **2** will contain resin with a desired amount of accelerator and the other drum will contain resin with a desired amount of catalyst. Resin is dispensed from these drums by conventional air piston pumps **30** to which air is supplied under pressure by hoses **31**. The resin is discharged from the respective drums **2** through resin conveying conduits **32** which pass through the casing tube **4**. Emerging from the depending end of such casing tube such conduits are spread as shown in FIGURE 1 and connected one to each of the nozzles **26**, which are supported in their proper positions outboard from the nozzle body **8** by rods **33** so that such nozzle body and the outboard resin nozzles are integrated to form the multiple nozzle head **5**.

In fabricating thick walled shapes, such as a slab of the type shown in FIGURE 17, for example, it is desirable to include a filler or aggregate with the binder and stranded reinforcing material to furnish bulk. Such filler may be of granular character such as sand, pearlite, ground cork, sawdust or vermiculite, for example. Such material is stored in the hopper **3** shown in FIGURES 1, 11 and 12 from which the material is fed by gravity to an aperture **34** in the upper side of block **35**. This aperture communicates with a central cavity **36** in the block to one side of which air under pressure is supplied from a hose **37** through the aperture **38**. From the opposite side of cavity **36** extends the aperture **39** communicating with the filler conveying conduit **40**.

Conduit **40** is shown in FIGURE 1 as extending into the casing tube **4** and the portion of such conduit emerging from the depending end of the casing tube is connected to the nozzle body **8** as shown in FIGURES 3 and 5 to communicate with an upper nozzle passage **41**. Such nozzle passage extends substantially parallel to the passage **23** as shown in FIGURES 4 and 5. These nozzle passages are located sufficiently close together so that filler or aggregate material discharged from the passage **41** will mingle with the continuous stranded material projected from passage **23** as the strands of such stranded material are spread in being fluffed by the air jets projected from the passages **24**. These jets will also assist in mixing the filler with the stranded material so that the stranded material, filler and liquid binder will constitute a substantially homogeneous mixture when these several ingredients are deposited on the receiving surface.

As has been mentioned above, dispensing of the material or materials from the multiple nozzle head can be started and stopped at will by the operator by pressing or releasing trigger **7**. Such control is effected by starting and stopping the flow of air to the dispensing mechanisms of the various devices which have been described above by controlling from the multiple nozzle head the flow of air from the main source of air under pressure to the individual dispensing mechanisms. Such control can be effected pneumatically by connecting to the nozzle body **8** an air supply conduit **42**.

The air supply conduit **42** communicates with a passage **43** in the nozzle body **8**, the opening through which is controlled by the valve **44** normally pressed against its seat by a compression spring **45**. The stem of this valve bears against the trigger **7** so that pulling of the trigger will displace the valve from its seat to enable air to move from passage **43** to passage **46**. From this passage air is distributed to ducts **47** which feed air to the jets **24** and to the passage **48** communicating with the conduit **49** passing back through the casing tube **4**.

The supply of air to the air jet passages **24** and control of the dispensing of the several materials collectively by operation of the trigger **7** may be adjusted by regulating the supply of air through conduit **42** to the nozzle body **8**. The main compressed air supply conduit **50** enters the control box **6** and is connected to a pressure regulating valve **51** which may be manipulated to vary the pressure to be supplied to conduit **42** as indicated by the pressure gauge **52**. Complete shut-off of the apparatus can be assured by closing the valve **53**, whereupon the multiple nozzle head **5** can be hung on the hooks **10'** shown in FIGURE 1 while not in use. Opening of valve **53** conditions the apparatus for operation by manipulation of trigger **7**.

The supply of air to the dispensing mechanisms for the several materials is obtained from the main air supply conduit **50** passing through the control valve **54** and the conduit **55** to the header **56** shown in FIGURE 2. Selection of the material or materials to be deposited and of the ratio of such materials is made possible by providing separate regulating valves for their individual dispensing mechanisms in the control box **6**.

To the manifold **56** are connected the air supply pipes for the roving dispensing mechanism, the resin dispensing mechanism and the filler dispensing mechanism. Air supplied to the roving dispensing mechanism passes from the manifold through conduit **57**, flow through which is controlled by the shut-off valve **58** and the pressure regulating valve **59**. The effective pressure supplied to the conduit **21** is indicated by the gauge **60**. Air passing to the resin pump supply pipes **31** flows through the conduit **61**, the shut-off valve **62** and the pressure regulating valve **63**. Again, the effective pressure supplied to the resin pipes is indicated by the pressure gauge **64**. Air under pressure is supplied to the conduit **37** connected to the filler dispensing mechanism through conduit **65** and the passage of such air is controlled by the shut-off valve **66** and the pressure regulating valve **67**. The effective pressure in this line is indicated by the pressure gauge **68**.

When the trigger **7** is pulled to open valve **44**, therefore, the pneumatically controlled valve **54** in the main air pressure supply line will be opened correspondingly to admit air to the conduit **55** supplying the manifold to the extent that the valve **54** is opened by actuation of the trigger **7**. In addition, of course, such manipulation of the trigger will supply air from the conduit **42** to the nozzle body passages **47** for discharge from the jet passages **24**.

It will now be evident that if stranded reinforcing material alone is to be deposited, the binder shut-off valve **62** and the filler shut-off valve **66** will be closed so that, as the trigger **7** is pulled to cause the pressure in

conduit **49** to effect opening of valve **54**, the only air discharged will be through the roving dispensing supply conduits **21** and **20** and through the apertures **24** of the nozzle body. If the stranded reinforcing material has been deposited previously and it is desired to dispense only resin, shut-off valve **62** will be opened and valves **58** and **66** will be closed. If roving and resin are to be dispensed simultaneously without filler, then both valves **58** and **62** will be opened and shut-off valve **66** will be closed. All three types of material will be dispensed if all three valves **58**, **62** and **66** are open. Pressure regulating valves **59** for the roving, **63** for the resin and **67** for the filler can be adjusted independently to the desired value and then left unchanged as long as the same type of dispensing operation for each material is desired even though shut-off valves **58**, **62** and **66** may be opened and closed selectively depending upon the type of material or types of materials to be dispensed.

At the end of any particular depositing operation including the depositing of stranded reinforcing material, when the trigger **7** has been released, the reinforcing material can be severed conveniently at the nozzle head by drawing the roving across the sharpened cutter **69** projecting from the end of the nozzle body **8**. The cutter end is received in a slot in the end of the body and held in place by the set screw **70**. When a coil of roving has been nearly exhausted the end of the next coil may be twisted about the roving being fed so that the roving end from such next coil will be drawn through the feeding mechanism shown in FIGURE 9 and the tube **20** to provide a short length of double thickness roving but to avoid any interruption in dispensing roving material in the manner described.

After the binder and the material to be bound by it have been deposited by the apparatus in the manner described above, it is usually necessary to compact the mass by a supplemental operation in order to obtain a smooth, uniform structure. Particularly where polyester resin is employed as the binder, it is desirable to work the air out of the mass. Such compacting operation can be effected in any of various ways, such as by directly rolling the deposited mass or stippling it with a brush. Alternatively, an impervious sheet can be laid over the mass and the space beneath the sheet evacuated to press the sheet onto the mass, or the sheet can be smoothed by a squeegee drawn over its surface.

We claim as our invention:

1. Dispensing apparatus for continuous stranded material, comprising conduit means for movement of continuous stranded material therethrough in a direction lengthwise of such material, a portable body connected to the discharge end of said conduit means, air supply means communicating with said conduit means at a location remote from said body for supplying air under pressure to said conduit means to propel the continuous stranded material through said conduit means, and manual control means carried by said body and connected to said air supply means for controlling the supply of air thereby to said conduit means.

2. Dispensing apparatus for continuous stranded material, comprising conduit means for movement of continuous stranded material therethrough in a direction lengthwise of such material, a portable body connected to the discharge end of said conduit means, air supply means communicating with said conduit means at a location remote from said body for supplying air under pressure to said conduit means to propel the continuous stranded material through said conduit means, a control valve in said air supply means remote from said body controlling the supplying air thereby to said conduit means, and pneumatically operable manual control means carried by said body and including a conduit connected to said control valve for varying the position thereof in response to manipulation of said manual control.

3. Dispensing apparatus for continuous stranded material, comprising flexible conduit means for conveying therethrough such continuous stranded material in a direction lengthwise of such material, a portable nozzle body having a nozzle aperture therethrough connected to the discharge end of said conduit means for communication of said conduit means with said nozzle aperture of said nozzle body, air supply means communicating with said flexible conduit means at a location remote from said nozzle body for supplying air under pressure to said conduit means to propel the continuous stranded material through said conduit means and nozzle aperture, and air jet means located at and directed outward beyond the discharge end of said nozzle body aperture to intersect a portion of such continuous stranded material moving through the air free from confinement within said nozzle body for supplying air under pressure in a stream to spread apart the strands of such material into a fluffy cluster greatly expanded in cross-sectional area.

4. The dispensing apparatus defined in claim 3, including manual valve means carried by the nozzle body and operable to control the supply of air to the conduit means by the air supply means.

5. The dispensing apparatus defined in claim 3, and manual valve means carried by the nozzle body and operable to control the supply of air to the air jet means.

6. The dispensing apparatus defined in claim 3, and manual valve means carried by the nozzle body and operable to control the supply of air by the air supply means to the conduit means and the supply of air to the air jet means.

7. Depositing apparatus comprising a portable nozzle head having a plurality of nozzle apertures, solid reinforcing material supply conduits connected respectively to said nozzle apertures, air-operated dispensing mechanisms connected to each of said conduits at a location remote from said nozzle head, common air supply means connected to all of said dispensing mechanisms, and manual control means carried by said portable nozzle head and connected to said common air supply means for controlling the supply of air from said common air supply means to said dispensing mechanisms.

8. The depositing mechanism defined in claim 7, in which the manual control means includes control valve means carried by the portable nozzle head, and conduit means interconnecting said control valve means and the common air supply means.

9. The depositing apparatus defined in claim 7, and independent regulating valves connected, respectively, between the individual dispensing mechanism and the common air supplying means.

10. Dispensing apparatus for continuous stranded material, comprising a multiple nozzle head including a nozzle body having an aperture for discharge of such continuous stranded material therefrom, air jet means disposed adjacent to the discharge end of said nozzle body aperture directed to intersect the path of movement of such continuous stranded material at a location beyond said nozzle body for supplying air under pressure in a stream to spread apart the strands of such material, two outboard nozzles having spray apertures, and means supporting said outboard nozzles disposed at opposite sides of said nozzle body in positions with their spray apertures converging toward the path of movement of such continuous stranded material at a location beyond the intersection of the air jet from said air jet means with the path of such continuous stranded material, for spraying binder liquid on the spread strands of such stranded material.

11. Dispensing apparatus for continuous stranded material comprising flexible conduit means for conveying therethrough such continuous stranded material in a direction lengthwise of such material, a portable multiple-nozzle head including a nozzle body having a nozzle aperture therethrough and connected to the discharge end of said flexible conduit means for communication with

such nozzle aperture, air supply means communicating with said flexible conduit means at a location remote from said nozzle body for supplying air under pressure to said conduit means to propel the continuous stranded material through said conduit means and nozzle aperture, air jet means disposed adjacent to the discharge end of said nozzle body aperture, directed to intersect the path of movement of such continuous stranded material at a location beyond said nozzle body for supplying air under pressure in a stream to spread apart the strands of such material, two outboard nozzles, means supporting said outboard nozzles from said nozzle body disposed at opposite sides of said nozzle body and having their spray apertures converging toward alignment with the discharge direction of such nozzle body aperture at a location beyond the intersection of the air jet from said air jet means with the path of movement of such continuous stranded material from such nozzle body aperture, for spraying binder liquid on the spread strands of such stranded material, and manually operable valve means carried by said nozzle body and operable to control the supply of air from said air supply means to said flexible conduit means to interrupt at will the supply of continuous stranded material and dispensing of such material from the nozzle body aperture.

12. Dispensing apparatus for continuous stranded material, comprising conduit means for conveying therethrough such continuous stranded material in a direction lengthwise of such material, and air jet means located at and directed outward beyond the discharge end of said conduit means to intersect a portion of such continuous stranded material moving through the air free from confinement within said conduit means for supplying air under pressure in a stream to spread apart the strands of such material into a fluffy cluster greatly expanded in cross-sectional area.

13. The method of depositing continuous stranded material, which comprises projecting a roving of such continuous stranded material lengthwise, projecting onto such continuous stranded material, from opposite sides and in directions transversely of the roving's lengthwise movement, air jets which intersect a portion of such material moving through the air free from confinement within a tubular passage and thereby spreading apart the strands of such material into a fluffy cluster greatly expanded in cross-sectional area, and laying such cluster of strands in convoluted rows onto a surface in the form of an unconfined mat with successive rows forming at least partially overlapping layers of such material.

14. The method of making a mat of bonded continuous stranded material on a surface, which comprises projecting a roving of such continuous stranded material lengthwise and thereby depositing the strands of such roving as an unconfined mat on such surface, projecting onto such continuous stranded material, from opposite sides and in directions transversely of the roving's lengthwise movement, air jets which intersect a portion of such material moving through the air free from confinement within a tubular passage and thereby spreading apart the strands of such material into a fluffy cluster greatly expanded in cross-sectional area, for deposition on such surface, and spraying binder onto such strands after they have been spread into a fluffy cluster by such air jets and before they are deposited on such surface.

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