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3,740,260

DISPENSING GUN FOR FIBER ROVINGS AND CEMENTITIOUS MATERIALS

Original Filed Nov. 30, 1961

2 Sheets-Sheet 1

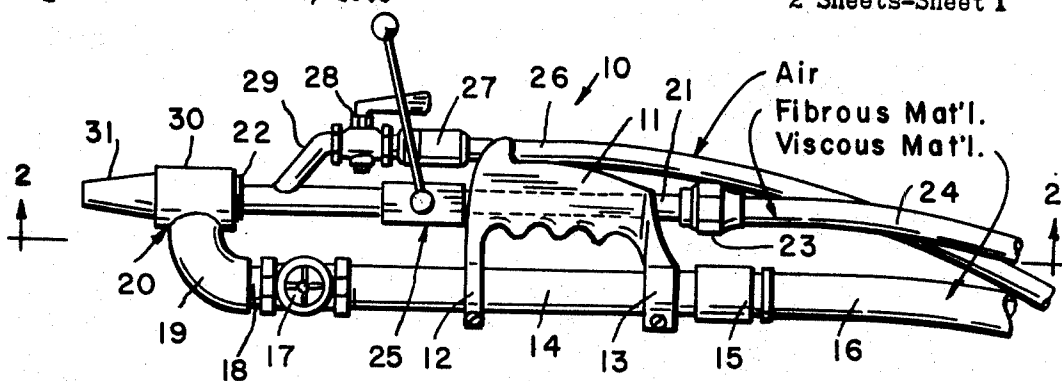


FIG. 1-

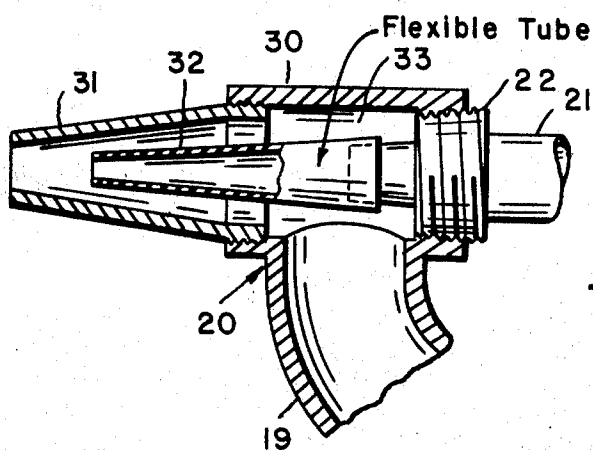


FIG. 3-

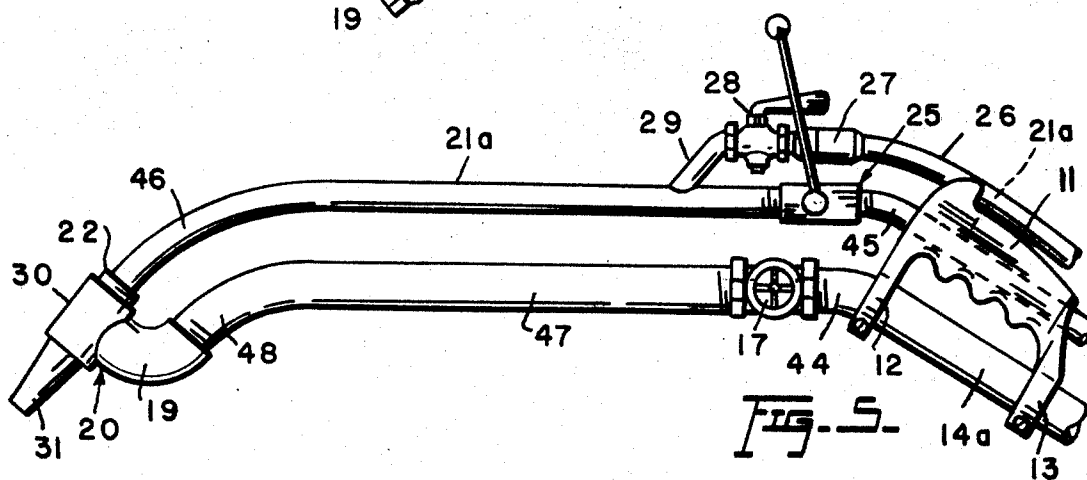


FIG. 5-

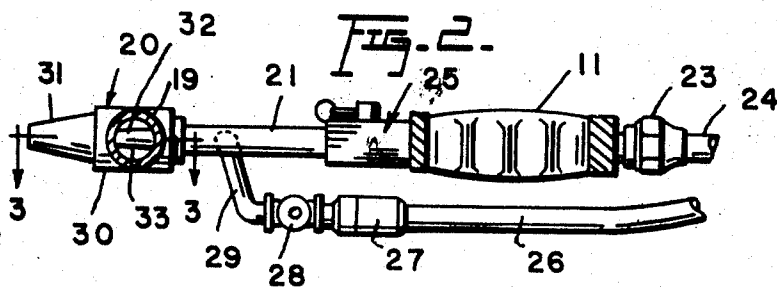


FIG. 2-

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2 Sheets-Sheet 2

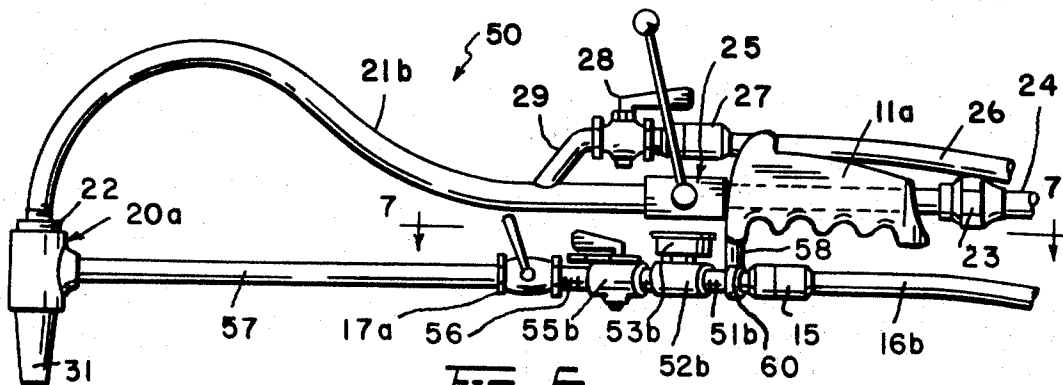


FIG. 6.

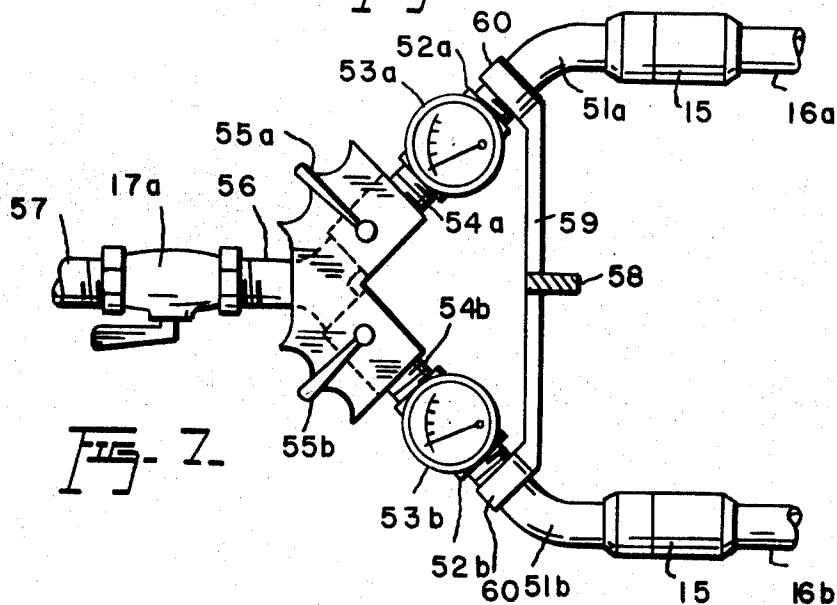


FIG. 7.

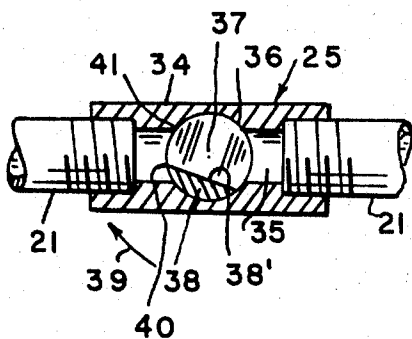


FIG. 4.

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1

3,740,260

DISPENSING GUN FOR FIBER ROVINGS AND CEMENTITIOUS MATERIALS

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Continuation of application Ser. No. 660,149, July 17, 1967, which is a continuation of application Ser. No. 155,948, Nov. 30, 1961, both now abandoned. This application Apr. 1, 1971, Ser. No. 130,480

Int. Cl. B44d 1/02

U.S. Cl. 117-104 R

4 Claims

ABSTRACT OF THE DISCLOSURE

Glass fiber strands are deposited on a receiving surface coated with a cementitious material by forcefully projecting the fluid coating material from a projection source while entraining the continuous fiber strand in the coating material from within the material and propelling the strand and the coating material onto the receiving surface.

This invention relates to a new and useful method for spraying fiber reinforced viscous materials, and in particular the invention concerns itself with the method disclosed in my copending earlier patent applications hereunder identified, of which this application is a continuation: Ser. No. 155,948 filed Nov. 30, 1961, now abandoned; and Ser. No. 660,149 filed July 17, 1967, now abandoned.

This application also relates to application Ser. No. 774,556, filed on Sept. 6, 1968, now U.S. Pat. No. 3,478,963, which is a divisional application to application Ser. No. 155,948 mentioned above.

My above-mentioned earlier applications disclose method and apparatus for dispensing various viscous materials such as cement slurry, plastic resins, etc., in the form of a spray and simultaneously dispensing fibrous material such as fiber glass in continuous thread roving or in chopped form, for intermixing with the viscous spray, so as to form fiber reinforced structures in situ when the viscous material sets. The viscous and fibrous materials are conveyed under pressure through separate conduits and discharged through separate nozzles so that intermixing thereof takes place as the spray is deposited on the work.

The invention may be generally described as a method for depositing a fluid coating material with a continuous fiber strand dispersed and embedded therein upon a receiving surface by:

- (a) Establishing a stream of fluid coating material;
- (b) Delivering at least one continuous fibrous strand into said stream from within said stream; and
- (c) Directing said fluid coating material and the fibrous strand embedded therein onto a receiving surface to deposit the strand in merged relation with said coating material upon the surface.

The invention will be understood from the following description taken in conjunction with the accompanying drawings, wherein like characters of reference are used to designate like parts, and wherein:

FIG. 1 is a side elevational view of the dispensing gun which may be used in connection with the present invention;

FIG. 2 is a longitudinal sectional view, taken substantially in the plane of the line 2-2 in FIG. 1;

FIG. 3 is an enlarged sectional view of the mixing and dispensing nozzle, taken substantially in the plane of the line 3-3 in FIG. 2;

FIG. 4 is an enlarged longitudinal sectional view of the fibrous material shut off valve;

2

FIG. 5 is a side elevational view, similar to that shown in FIG. 1 but illustrating a modified arrangement of the gun;

FIG. 6 is a side elevational view showing another modified arrangement; and

FIG. 7 is a fragmentary sectional view on an enlarged scale, taken substantially in the plane of the line 7-7 in FIG. 6.

Referring now to the accompanying drawings in detail, particularly to FIGS. 1-4, the dispensing gun in accordance with the invention is designated generally by the reference numeral 10 and is in the form of a portable entity which may be easily and conveniently carried, manipulated and oriented by means of a suitable handle 11.

The handle 11 is provided with clamp members 12, 13 whereby it is secured to a pipe or conduit 14, one end of the latter being separably connected by coupling means 15 to a flexible hose 16 whereby viscous material such as cement slurry, plastic resin, or the like, is delivered under pressure to the gun. The other or front end of the pipe 14 is provided with a flow control valve 17 which is connected by a nipple 18 to an elbow 19 of a combined mixing and dispensing nozzle 20.

The handle 11 is also mounted on a tube or conduit 21 which extends longitudinally through the handle in upwardly spaced parallel relation to the pipe 14, the front end of the tube 21 being connected by an adapter bushing 22 to the nozzle 20. The rear end of the tube 21 is separably connected by coupling means 23 to a flexible hose 24 whereby fibrous material in continuous fiber form is delivered under pressure to the gun, preferably from a pressurized, sealed container such as is disclosed in my application Ser. No. 722,678, filed Mar. 20, 1958, and now abandoned. The intermediate portion of the tube 21 immediately in front of the handle 11 is equipped with a fiber shut off valve 25, which will be hereinafter more fully described and which is similar to that also disclosed in my application Ser. No. 722,678 and now abandoned, as well as Ser. No. 87,629, filed Feb. 7, 1961, now Pat. No. 3,091,404.

Compressed air is delivered to the gun by a flexible hose 26 which is separably connected by coupling means 27 to a valve 28, the latter in turn communicating with a short tube 29 which discharges into the tube 21 at a point between the valve 25 and the nozzle 20.

The tube 29 is angulated to offset the valve 28 laterally from the tube 21 as is best shown in FIG. 2, so that the hose 26 does not interfere with the handle 11. It will be also noted that the controls of the several valves 17, 25 and 28 are disposed adjacent the handle 11, for convenient manipulation.

The mixing and dispensing nozzle 20 comprises a hollow cylindrical body 30 having the aforementioned elbow 19 in lateral communication therewith and the aforementioned adapter bushing 22 screw-threaded into the rear end thereof. The front end of the body 30 has screw-threaded thereinto a forwardly projecting, tapered nozzle members or outlet spout 31, the interior of which constitutes a forwardly tapered extension of the interior of the body 30. A tapered flexible tube 32 of rubber, plastic, or the like is connected to the adapter bushing 22 in communication with the tube 21 and extends longitudinally in the body 30 into the nozzle member 31, so that an annular chamber 33 is formed in the body 30 and nozzle member 31 around the tube 32, in communication with the elbow 19, as is clearly shown in FIG. 3.

The fiber valve 25, shown in detail in FIG. 4, comprises a body 34 having a longitudinal bore or passage 35 to receive adjacent ends of the tube 21, the bore 35 inter-

secting a transverse cylindrical valve chamber 36 in which is mounted a rotary valve plug 37. A portion of the plug 37 is alignment with the bore 35 is recessed so that it is of a reduced cross-section as indicated at 38, and it will be apparent from the foregoing that by turning the plug in the chamber 36, the valve may be moved from a fully open position (wherein the surface 38' of the plug portion 38 is parallel to the axis of the bore 35) to a fully closed position (wherein the surface 38' is transverse to the bore axis), as well as to any partially open or partially closed position therebetween. Moreover, it will be noted that during closing of the valve, for example in the direction shown by the arrow 39, an edge 40 of the plug portion 38 will slide past an edge 41 existing in the housing 34 at the junction of the bore 35 with the chamber 36. This movement of the edge 40 past the edge 41 will provide a shearing action which will positively sever the continuous fiber travelling through the valve, so that the continuous fiber is cut off as the valve is closed.

In operation, the fibrous material is delivered under pressure through the hose 24 and the tube 21 to the nozzle 20 where it passes through the flexible tube 32 into the outlet spout 31, the rate of fiber flow being regulated by the valve 25. Compressed air may be introduced into the fiber stream through the hose 26 and tube 29 under control of the valve 28 to assist in propelling the fiber and also to blow the fiber out of the nozzle 20 after the fiber supply is cut off by the valve 25. The viscous material delivered under pressure through the hose 10 and pipe 14 under control of the valve 17 is forced into the chamber 33 through the elbow 19, where it surrounds the tube 32. The fiber stream is forced through the tube 32 at a greater pressure than that of the viscous material in the chamber 33 and thus becomes saturated into the viscous material at a controlled rate, as the mixture is discharged through the outlet spout 31. The flexible tube 32 develops a reed-like action under pressure, which enhance a rapid dispersment of the fiber into the viscous mixture.

The action of the spray discharged from the outlet spout 31 is not of a conventional atomizing nature, but rather, the spray assumes the form of a fluffy cotton candy mass of extrusion. However, the apparatus may be operated in an atomizing manner by simply closing the fiber stream control valve 25 to stop the fiber flow and opening the compressed air valve 28.

The apparatus shown in FIG. 1 is especially well suited for work in a vertical plane, but the same may be readily converted for work in a horizontal plane, as for example, on a flat roof.

Such a conversion is illustrated in FIG. 5 wherein the handle 11 is mounted by the clamps 12, 13 on a pipe 14a having a curved front end portion 44 connected to the valve 17, while the fiber tube 21a passing through the handle also has a curved front end portion 45 connected to the valve 25. The portion of the tube 21a forwardly of the valve 25 is downturned as at 46 for connection to the adapter bushing 22 of the nozzle 20, while a pipe extension 47 with a downturned front end portion 48, is provided between the valve 17 and the nozzle elbow 19, as shown. It will be observed that the curvature of the various pipes and tubes is such that the handle 11 slopes downwardly and rearwardly for convenient handling, while the nozzle 20 slopes downwardly and forwardly to discharge onto substantially horizontal work.

The modified embodiment of the gun shown in FIGS. 6 and 7 and designated generally by the numeral 50 is similar to that shown in my aforementioned application Ser. No. 87,629, with the main exception that the embodiment 50 utilizes a single nozzle 20a for mixing and discharging the viscous and fibrous materials. The embodiment 50 is particularly well adapted for handling heavy viscous cements from two separate sources of supply through flexible hoses 16a, 16b which are separably connected by the coupling means 15 to respective elbows 51a, 51b. The latter communicate with connectors 52a, 52b

provided with pressure gauges 53a, 53b and are connected by nipples 54a, 54b to flow control valves 55a, 55b joined to a Y-coupling 56. The latter communicates with a valve 17a on a tube 57 which is connected laterally to the body of the nozzle 20a. The nozzle 20a is of the same construction as the nozzle 20 except that it does not utilize the elbow 19.

The fibrous material is delivered to the nozzle 20a by a tube 21b on which the handle 11a is mounted, the handle having a depending portion 58 provided with a cross piece 59 and clamp means 60 at the ends of the cross piece to supportably engage the elbows 51a, 51b.

The flow of the viscous material from separate sources through hoses 16a, 16b may be regulated by the respective valves 55a, 55b in any desired proportion, it being understood of course that physical properties and composition of the viscous material from the two separate sources may be different, so that the proportional mixing facility afforded by the valves 55a, 55b provides a viscous mixture of the desired type, consistency and physical character by the time the viscous material reaches the Y-coupling 56 and the valve 17a for delivery to the nozzle 20a through the tube 57. The valve 17a, of course, is utilized to control the proportion of the viscous mixture in relation to the fiber stream flowing through the conduit 21b to the nozzle, as already explained in connection with the embodiment 10.

The arrangement of the invention is such that the fibrous material may be saturated by the viscous material while both are travelling at a high rate of speed through the mixing and discharging nozzle (20 or 20a), the fibrous material being delivered in a continuous, uncomminuted stream, so as to form an interwoven reinforcing membrane upon setting of the viscous material which may be of any desired density, for example, for 5 lbs. per cubic foot to 200 lbs. per cubic foot. Moreover, a variation in the density of the material may be regulated by the operator during the operation of the gun itself, through the facilities of the control valves which are provided.

It will be also noted that the entire apparatus is simple in construction, light in weight, easily portable, quickly connectable to and disconnectable from its material and air supply hoses, easy to keep clean, and otherwise well adapted for the purpose for which it is intended.

While in the foregoing there have been described and shown the preferred embodiments of apparatus for performing the method of the present invention, various other suitable apparatus may be apparent to those skilled in the art to which the invention relates. Accordingly, it is not desired to limit the invention to this disclosure and various modifications and equivalents may be resorted to, falling within the spirit and scope of the invention as claimed.

What is claimed is:

1. The method of depositing a fluid coating material and a continuous fibrous strand embedded therein upon a receiving surface, which comprises:

- (a) establishing a stream of fluid coating material;
- (b) delivering at least one continuous fibrous strand into said stream from within said stream; and
- (c) directing said fluid coating material and the fibrous strand embedded therein onto a receiving surface to deposit the strand in merged relation with said coating material upon the surface.

2. A method of depositing a fluid coating material with a continuous fiber strand dispersed and embedded therein upon a receiving surface which comprises:

- (a) delivering, under pressure, a supply of a fluid coating material to a mixing zone;
- (b) introducing continuous fibrous strands into said fluid coating material in said mixing zone, at a pressure which exceeds the pressure of said coating material, said strands being introduced into said fluid coating material from within said material; and
- (c) directing said fluid coating material and the fi-

5

brous strand embedded therein onto a receiving surface to deposit the strand in merged relation with said coating material upon the surface.

3. The method of claim 2, wherein:

the strands are introduced into the fluid coating material through a vibrating member to thoroughly disperse the strands throughout the material.

4. The method of spraying a mixture of continuous fiber rovings and bonding material which comprises:

(a) flowing a relatively low velocity stream of cementitious bonding material in liquid form into a mixing zone from which there extends an output nozzle,

(b) agitating said cementitious material in said zone by directing a high velocity air stream thereinto with progressively decreasing cross section and increasing velocity as it approaches the discharge point into said zone,

(c) variably positioning the injection point of said discharge point in said cementitious material, and

(d) entraining continuous reinforcing fiber strands in

6

said air stream for discharge throughout said cementitious material in its travel through said zone to said output nozzle.

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117—105.5, DIG. 8; 156—71; 161—175; 239—8

20