United States Patent

Winn, Jr.

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[54] **DISPENSING OF FIBROUS MATERIAL**

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[52] **U.S. Cl.**.....**242/129,** 242/54 R, 83/650, 226/97

[51] **Int. Cl.**.....**B65h 49/00**

[58] **Field of Search**.....242/128, 129, 129.62–129.8, 242/147 R, 54 R; 226/97; 83/649, 650

[56] **References Cited**

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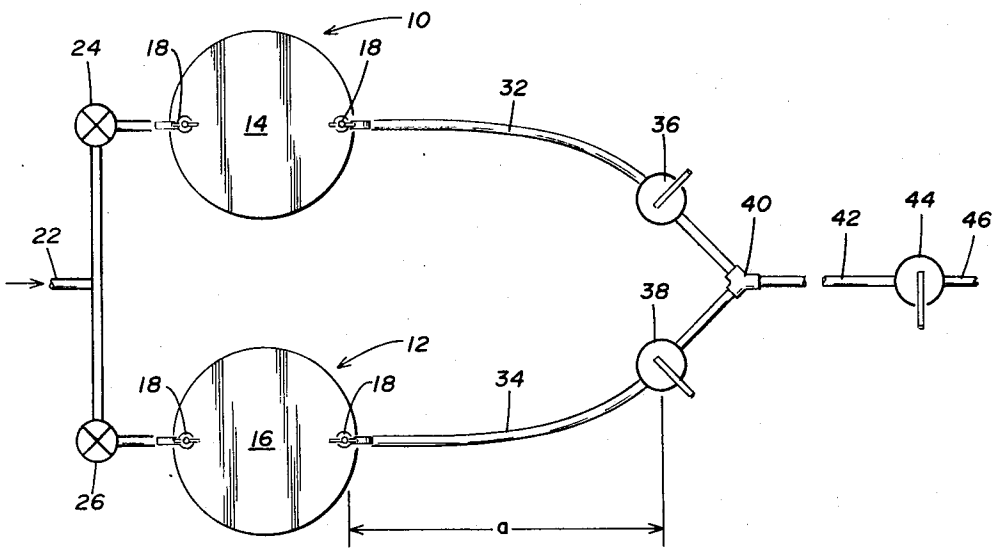
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[57] **ABSTRACT**

An improvement in a system for dispensing fibrous material with random distribution for reinforcing a matrix into which it is placed. The system includes a fiber supply apparatus for continuously feeding fiber to a dispensing gun with little or no down time. The apparatus includes two fiber supply containers, each connected to a source of compressed air. A lead conduit of sufficient length to insure entrainment of fiber by compressed air is in communication with each of the containers and leads to a dispensing conduit. Each of the lead conduits are flow connected to a valve which can simultaneously terminate air flow and cut a fiber being propelled therein, thus stopping fiber feed. The respective containers and lead conduits are used alternatively so that a fiber supply in one container can be replenished while the other container is supplying fiber to the dispensing system, thus eliminating any down time for fiber supply replenishment.

10 Claims, 4 Drawing Figures



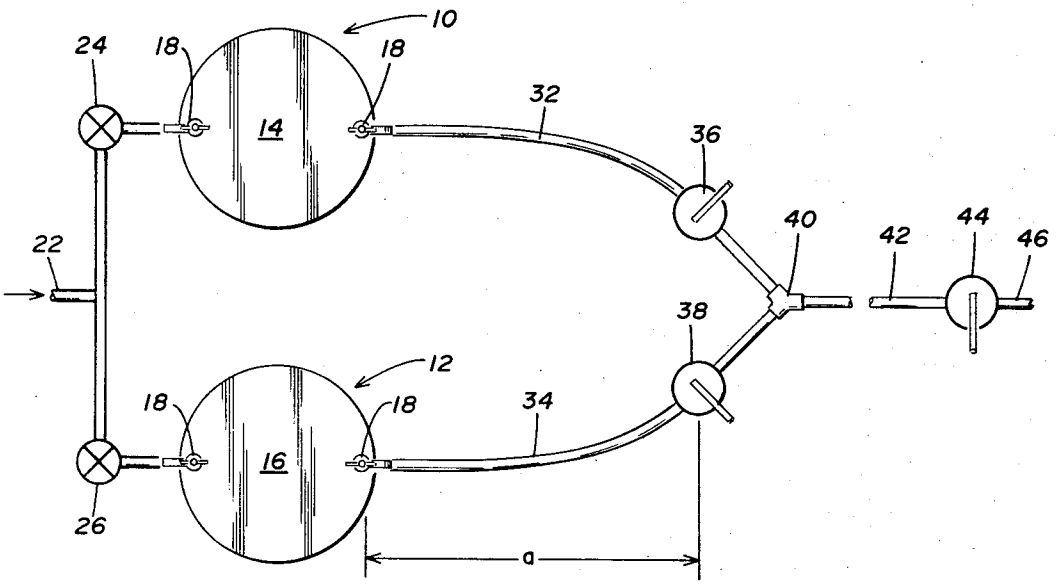


FIG. 1

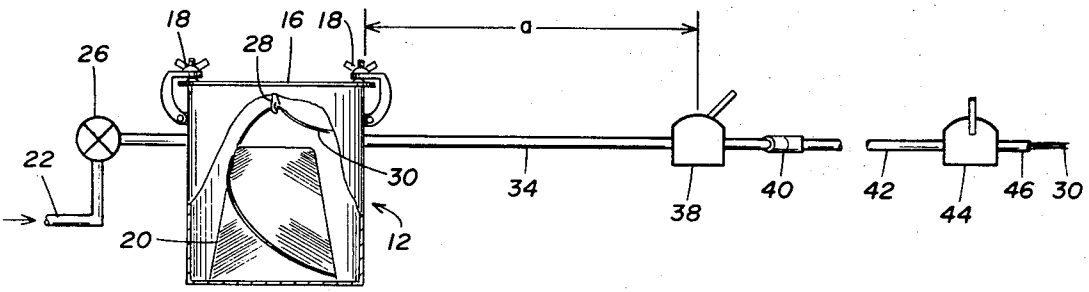


FIG. 2

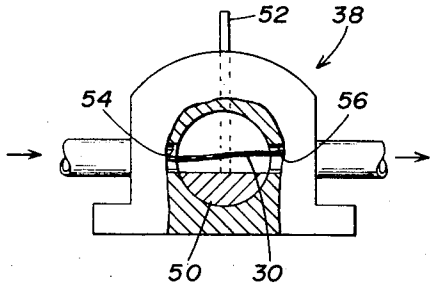


FIG. 3

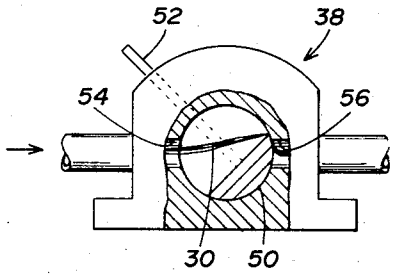


FIG. 4

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DISPENSING OF FIBROUS MATERIAL

BACKGROUND OF THE INVENTION

This invention relates to dispensing and use of fibrous material and more particularly to an apparatus usable with a dispensing system to continuously supply fiber to the dispensing system.

Various systems are known for supplying fiber to a dispensing nozzle to form a matrix in conjunction with, for example, a cementitious material. An exemplary system is the one disclosed and claimed in U.S. Pat. No. 3,111,270 to James B. Winn, Jr., assigned to a common assignee hereof. In that system compressed air is fed to a pressurizable container into which a spool of continuous fibrous roving is placed. A strand of the roving is inserted into an outlet conduit which leads to a dispensing nozzle. The flow of compressed air through the outlet conduit entrains the fiber roving, forces it through the dispensing nozzle and onto a selected surface.

During operation of the system described in the abovecited patent, it has in the past been necessary to cease using the equipment while replenishing the fiber supply. This results in a down time which could otherwise be utilized for productive output. It has been a desire to create a system which can be utilized to reduce the down time of equipment and thus increase the overall efficiency of a system. Various attempts have been made to decrease the down time. Two spools in a single container have been tried as disclosed in the above patent. Two containers coupled in series have been tried. Large containers with large spools of fiber roving have been tried. These systems, however, have proven not completely satisfactory for solving the down time problem.

SUMMARY OF THE INVENTION

The present invention provides apparatus which can be used to continuously supply fiber roving to a dispensing system. The apparatus of the present invention enables continuous operation of a fibrous material dispensing system and eliminates substantially all down time previously attributable to replenishment of fiber supply.

In accord with the present invention there is provided an apparatus for dispensing a continuous fiber roving comprising a first pressurizable container means for receiving a spool of said roving, a first entrainment conduit in fluid communication with the first container means capable of receiving a strand of the roving, the entrainment conduit having a predetermined length sufficient to insure entrainment of the roving by a fluid stream passing through the first entrainment conduit, a first valve means operably connected in fluid communication with the first entrainment conduit for terminating flow therethrough and for severing the roving passing therethrough, the first valve means positioned at a distance from the first container means not less than the predetermined length. A second pressurizable container means for receiving a spool of the roving is also provided and includes a second entrainment conduit in fluid communication with the second container means capable of receiving a strand of the roving, the second entrainment conduit having a predetermined length sufficient to insure entrainment of a strand of the roving by a fluid stream passing through the second entrainment conduit, a second valve means operably connected in fluid communication with the second entrainment conduit for terminating flow therethrough and for severing the roving passing therethrough, the second valve means positioned at a distance from the second container means not less than the predetermined length, and a discharge conduit in fluid communication with the outlet of the first and second valve means.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be better understood by reading the ensuing specification in conjunction with the accompanying drawings, wherein:

FIG. **1** is a schematic top view of the apparatus of the present invention;

FIG. **2** is a schematic elevation view of the apparatus of the present invention shown in FIG. **1**; and

FIGS. **3** and **4** are schematic diagrams in partial cross-section of the fiber-fluid valves of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

The present invention will be described in relation to a preferred embodiment. It is of course to be understood that various alterations, modifications, substitution of equivalents and other changes can be made without departing from the original concept of the invention. It is intended that the invention be limited only by the definition contained in the appended claims. Where appropriate for clarity and simplicity, like numerals will be utilized in the various figures to indicate the same or similar structure.

Referring now to FIGS. **1** and **2**, the apparatus for continuously supplying material to a dispensing nozzle is schematically illustrated. The apparatus includes a first container **10** and a second container **12**. The containers or pots **10** and **12** have removable lids **14** and **16** which are removably sealed by fasteners **18** to the bottom portions of the containers **10** and **12**. The containers **10** and **12** are sized to receive a spool of continuous fiber roving such as that indicated by numeral **20** in FIG. **2**. Each of the containers **10** and **12** is connected to a source of pressurized fluid; such as compressed air, from a source (not shown) by way of conduit **22**. Air valves **24** and **26** are provided to enable individual control of the supply of compressed air to the containers **10** and **12**.

The free end **30** of roving from the spools such as **20** is threaded through a loop **28** provided in the containers **10** and **12** and into outlet or conduits **32** and **34**. Valves **36** and **38** are positioned in the conduits **32** and **34** upstream from the containers **10** and **12**. These valves will be more completely described in conjunction with FIGS. **3** and **4**. The outlets of valves **36** and **38** are connected via a Y connection **40** to a dispensing conduit **42** which is in turn connected through a valve **44**, similar to valves **36** and **38**, and to a dispensing nozzle **46**.

The length of the lead conduits **32** and **34** indicated as *a* is critical. For a given roving size, conduit diameter, fluid pressure and fluid velocity in the lead conduits **32** and **34**, a length *a* necessary to insure entrainment of a fiber roving **30** in the conduits **32** and **34** can be precalculated. If the length of lead conduits **32** and **34**

is less than the length *a*, fiber roving present in the lead conduits **32** and **34** will not be entrained and, thus will not advance into the dispensing conduit **42** when the valves **36** or **38** are opened.

With the apparatus disclosed in the above cited United States Patent and utilizing the preferred form of continuous fiber rovings (as disclosed in an application entitled "Control of Continuous Fiber Rovings," Ser. no. 206,504, filed June 29, 1962), a length of about three to four feet is preferred. The length *a* for almost any combination of the variables described above is usually about three feet or greater.

As mentioned above, the valves **36** and **38** are similar and operate in the same manner. A schematic illustration of valve **38** is shown in FIGS. **3** and **4**. Valve **38** is of the rotary type, including a segment shaped valve member **50** which is rotated by a suitable valve handle **52**. The segment shaped member **50** clears the inlet and outlet ports **54** and **56** when in an open position as shown in FIG. **3**. When the valve is closed as shown in FIG. **4**, the member **50** covers the outlet port **56** and prevents the passage of fibrous material and compressed air through the valve to the Y connection **40** and dispensing conduit **42** (FIGS. **1** and **2**). In this manner the valve **38** functions not only to control the flow of material and air, but also provides a cutting or severing means for the fibrous material.

The valve indicated as **44** is flow connected to the dispensing nozzle **46**. It operates in substantially the same manner as do the valves **36** and **38**. A more complete understanding of the continuous fiber roving dispensing system with which the present invention is conjunctive can be derived from the above cited U.S. Pat. No. 3,111,270.

The continuous roving feed apparatus of the present invention operates by opening the valves on one side of the parallel container-lead conduit system, for example valves **26** and **38**. The valves **24** and **36** on the other side of the system are closed. Thus roving from the spool **20** in container **12** will be fed through lead conduit **34** to the dispensing conduit **42**. The tail end of the continuous roving should either be knotted so that it will not pass through guide loop **28**, or should be fastened to a separate tie down means (not shown).

While the roving supply in container **12** is being replenished valves **26** and **38** will be closed and valves **24** and **36** opened, thus feeding roving from a spool in container **10** through conduit **32** and to dispensing nozzle **46**. The fiber supply in container **12** is replenished by connecting the free end of a new spool of roving to the tail end of the previously consumed spool. This tail end of course extends through conduit **34** to valve **38** where it has been severed. The tail end therefore supplies a sufficient leader of length *a* or greater to enable entrainment thereof when valves **26** and **38** are reopened after the roving supply from container **10** is consumed. This feature of the present invention eliminates threading of the new spool in the conduit **34**.

The fiber supply apparatus of the present invention is capable of continuously feeding a fiber roving to a dispensing system. The present system thus substantially reduces down time. The present apparatus also can be quickly replenished with a new roving supply since no threading of the free end of a new spool into the leader conduit is required. Other advantages will be apparent to one of ordinary skill in the art.

What is claimed is:

1. In a system for dispensing and controlling the flow of continuous fiber rovings including:

a sealed pressurized container adapted to receive therein a supply of continuous fibrous material,

means flow connected to said container for introducing compressed air into said container, and

first conduit means leading from said container for entraining and conveying said fibrous material in a stream of compressed air traveling through said container and said conduit means,

further structure for continuously operating said system comprising:

a second sealed pressurized container adapted to receive therein a supply of continuous fibrous material,

second means flow connected to said second container for introducing compressed air into said second container,

second conduit means leading from said second container for entraining and conveying said continuous fibrous material in a stream of compressed air traveling through said second container and said second conduit means, and

a dispensing conduit flow connected to said first and second conduit means.

2. The system of claim **1** further comprising:

a first valve means for terminating the flow of compressed air and for cutting said continuous fibrous material flow connected between said first conduit means and said dispensing conduit,

second valve means for terminating the flow of compressed air and for cutting said continuous fibrous material flow connected between said second conduit means and said dispensing conduit.

3. The system of claim **2** wherein said first and second conduit means have a length greater than about 3 feet.

4. An apparatus for dispensing a continuous fiber roving comprising:

a first pressurizable container means for receiving a spool of said roving,

a first entrainment conduit in fluid communication with said first container means capable of receiving a strand of said roving, said entrainment conduit having a predetermined length sufficient to insure entrainment of said roving by a fluid stream passing through said first entrainment conduit,

a first valve means operably connected in fluid communication with said first entrainment conduit for terminating flow therethrough and for severing said roving passing therethrough said valve means positioned at a distance from said first container means not less than said predetermined length,

a second pressurizable container means for receiving a spool of said roving,

a second entrainment conduit in fluid communication with said second container means capable of receiving a strand of said roving, said entrainment conduit having a predetermined length sufficient to insure entrainment of said roving by a fluid stream passing through said second entrainment conduit,

a second valve means operably connected in fluid communication with said second entrainment conduit for terminating flow therethrough and for

severing said roving passing therethrough, said second valve means positioned at a distance from said container means not less than said predetermined length,

a discharge conduit in fluid communication with the outlet of said first and second valve means.

5. The apparatus of claim **4** further comprising:

a first fluid supply conduit in fluid communication with said first container means having a fluid valve therein,

second fluid supply conduit in fluid communication with said second container means having a fluid valve therein.

6. The apparatus of claim **4** wherein said predetermined length is about 3 feet.

7. The apparatus of claim **4** wherein said predetermined length is at least about 3 feet.

8. The apparatus of claim **7** wherein said length is in the range of about 3 feet to about 4 feet.

9. A method for continuously feeding multi-strand continuous fiber rovings through a channel to a discharge means from supply spools comprising:

maintaining a first spool in a first zone in which the pressure is substantially in excess of atmospheric pressure,

maintaining a first flow channel extending from said first zone to said discharge means at an elevated pressure,

opening said discharge means to move said rovings from said first spool through said flow channel by entrainment in air flowing from said first zone to said discharge means,

retaining the tail end of said rovings on said spool in said first zone,

simultaneously replenishing the supply of fiber rovings in a second pressurizable zone by placing a spool in said zone,

connecting the free end of a second spool to the tail end of a previously depleted spool,

when said first spool is depleted, pressurizing said second spool in said second zone at a pressure substantially in excess of atmospheric pressure, maintaining a second flow channel extending from said second zone to a second discharge means at an elevated pressure, and opening said second discharge means to move said rovings from said second spool through said second flow channel by entrainment of said rovings in air flowing from said second zone to said discharge means,

thereafter replenishing the supply of fiber rovings in said first zone and thereafter alternating feeding from one zone and replenishing the fiber roving supply in another zone.

10. The method of claim **9** wherein said flow channel means has a length of at least about 3 feet.

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