United States Patent

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[31] **No. 6704889**

[54] **APPARATUS FOR MANUFACTURING A HOSE FOR TAKING AN UNDISTURBED SOIL SAMPLE**
15 Claims, 5 Drawing Figs.

[52] **U.S. Cl.** **118/642,** 118/405
[51] **Int. Cl.** **B05c 3/12**
[50] **Field of Search** ..... 118/404, 405, (P&T Digest), 642, 643; 26/55, 56; 68/(Inquired); 156/466

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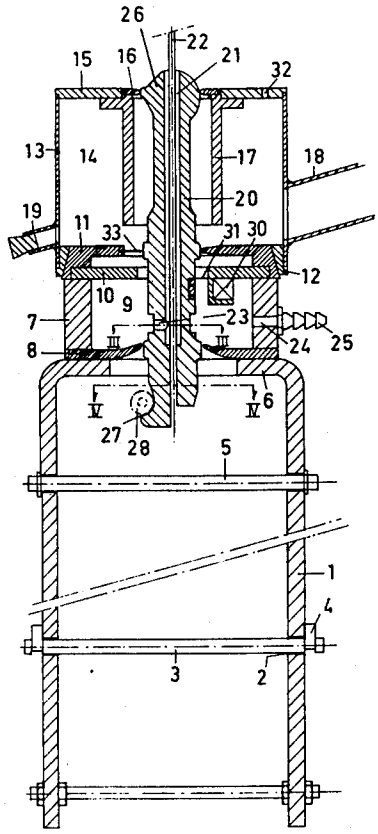
ABSTRACT: An apparatus for manufacturing a coated hose for taking undisturbed soil samples, the hose to be coated is led through a central aperture in a container having the coating substance, and is internally supported by a floating guiding element having a central bore communicating with an air supply chamber below the container. The aperture in the container is provided with a resilient ring closely approaching the hose, the pressure in the air supply chamber prevents leakage of the coating substance, the bore of the guiding element furthermore comprising a coaxial tube for discharging the air blown into the coated part of the hose from the air supply chamber and through the bore of said element, which element is kept centered by means of a wiping ring at the upper side of the container.



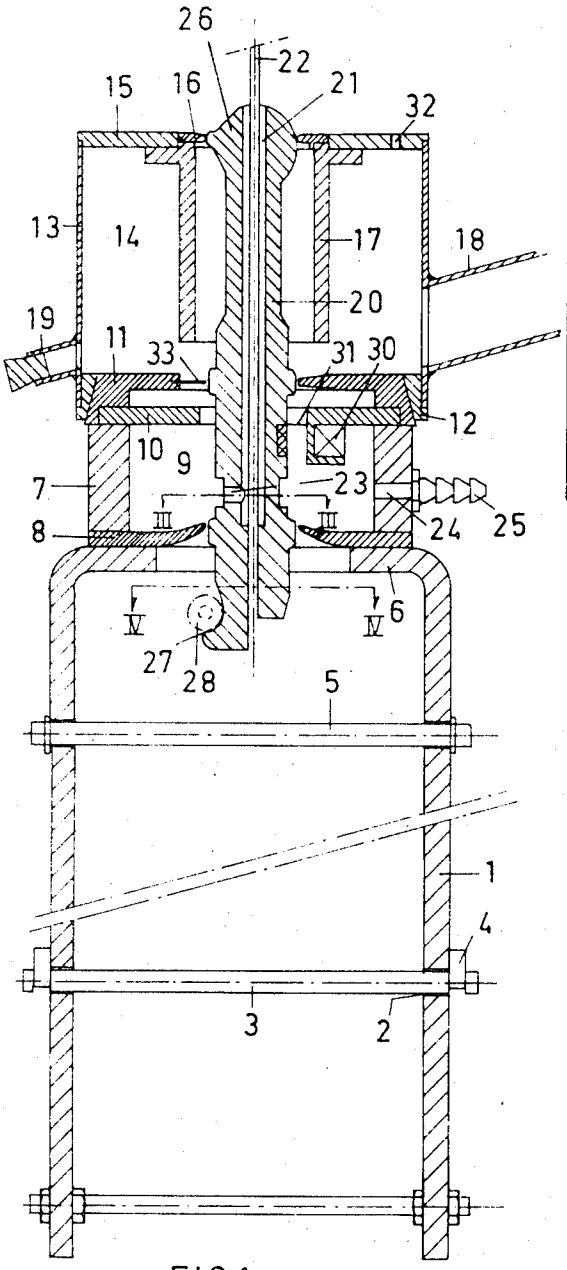


FIG.1

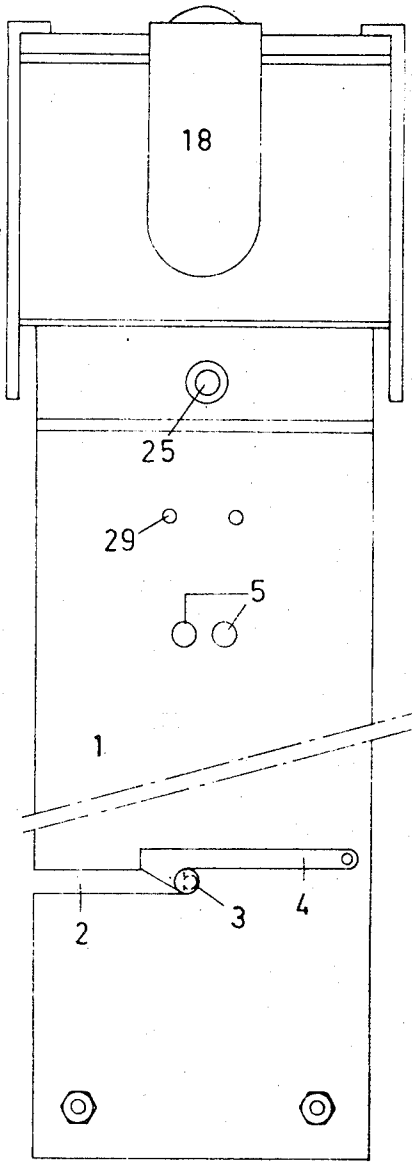


FIG.2

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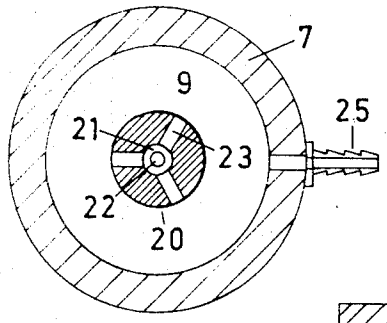

FIG. 3

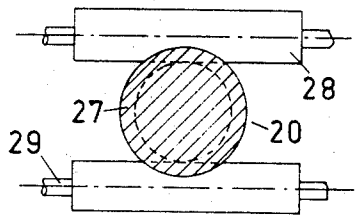

FIG. 4

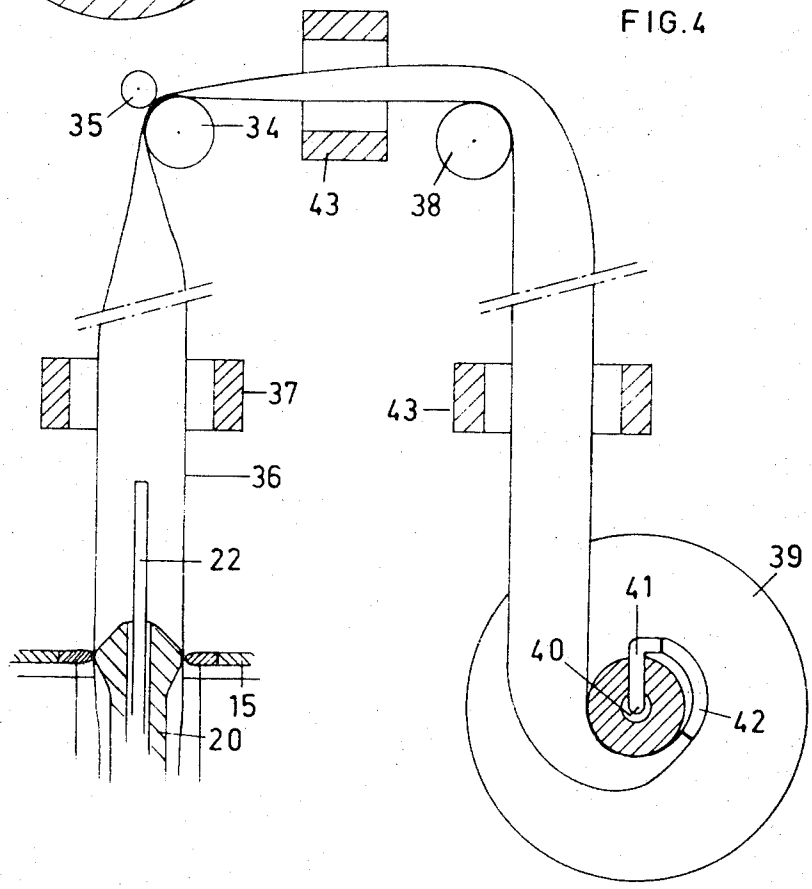

FIG. 5

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APPARATUS FOR MANUFACTURING A HOSE FOR TAKING AN UNDISTURBED SOIL SAMPLE

This invention relates to an improvement of an apparatus for manufacturing a hose intended for taking an undisturbed soil sample, in which apparatus a circularly knitted hose or the like may be coated with a coating liquid, said apparatus consisting of a tray for containing this liquid and provided with a central aperture, a tube extending through said aperture and provided with a discharge opening above the tray, an inner tube disposed inside said tube opening above the end of the first tube, an air supply communicating with the interspace between said tubes and an air discharge communicating with the inner tube, and means for pulling upwards a knitted hose or the like to be coated around the first tube, which hose is fed from the bottom in order to conduct the knitted hose or the like through the coating liquid present in the tray, as described in U.S. Pat. application Ser. No. 542,125, filed Apr. 12, 1966, now U.S. Pat. No. 3,511,324.

The apparatus described in the main application has given full satisfaction, however, it has the drawback that the knitted hose to be coated is to be slipped around the outer tube before the apparatus can be put into operation whereas on said tube there is only room for a limited hose length. As this hose length has been led through the apparatus, the latter's operation must be interrupted, and the air supply and discharge lines have to be disconnected for allowing a further limited length of hose to be slipped over the outer tube.

The invention has for its object to improve said apparatus so that a continuous operation becomes possible, although it still remains possible to operate with separate lengths. In particular it now becomes possible to lead the knitted hose through the apparatus right after the hose has left a circular knitting machine.

For that purpose the improved apparatus is characterized in that the first tube is formed by an element substantially in the form of a solid body of revolution and provided with a central bore, the outer diameter of which element, at least over a portion thereof, being adapted to the desired diameter of the coated hose, whereas the central aperture of the liquid tray is provided with a resilient ring, the inner rim of which lying sufficiently adjacent to the element for preventing the liquid from leaking out of the tray, this however, without hindering the transport of the knitted hose between the element and the rim of the sealing ring.

For achieving the above mentioned continuous operation, the apparatus according to the invention is particularly so designed that the element can be movably placed into the central aperture of the tray, an air supply chamber being provided below the tray, which chamber is formed with a central aperture provided with a resilient ring by which the passage of air along the element is substantially prevented without said ring coming into contact with the hose disposed around the element, which chamber communicates with a source of compressed gas with a rather low pressure, whereas the element is formed with one or more transverse passages opening into the interspace between the inner tube and the inner wall of the longitudinal bore, and, on the other hand, in the operative position of this element communicating with the air supply chamber, the inner tube sealingly communicating below those passages with the lower portion of the element and opening into or near its end face, all this in such a manner that the air supply and discharge take place through the still uncoated portions of the knitted hose.

The ring at the bottom of the tray is particularly of such design that the liquid in the tray is kept in equilibrium in the narrow interspace between the inner rim of said ring and the element by the air pressure in the air supply chamber and the surface tension of the liquid. Preferably the central portion of said ring is made from a thin plate or sheet of a sufficiently rigid synthetic material.

Particularly a hard ring may be provided at the upper side of the tray, which ring may contact the upper end of the element or the hose disposed around said element, and serving as a wiping means and at the same time as a guiding ring for the element.

Furthermore, in case of a freely suspended element, means are provided for holding said element at the desired height inside the tray, which means, in particular, comprise a magnet ring and an armature ring, one of which being fixed and the other being connected to the element, whereas it is also possible to design said means as guiding pins or rollers which are secured to the apparatus and are positioned substantially perpendicularly and symmetrically with respect to the vertical axis of the tray, which pins or rollers may contact an appropriate constriction of the element or the knitted hose disposed around the element at that location.

Particularly the element may be designed so that the knitted hose contacts the outer surface of the element only at the location of the sealing and guiding rings and the supporting rollers or pins in order to keep the friction as low as possible.

Furthermore such an apparatus, which also comprises a winding reel for the coated hose, may be provided with a guiding roller mounted above the tray and spaced apart therefrom, which guiding roller is adapted to divert to the winding reel the substantially dried hose pulled upward from the tray, the guiding surface of said roller at least approximately being tangent to the vertical central axis of the tray. Furthermore a pinching roller may be provided which may be pressed against the guiding surface of said guiding roller.

In the shaft of the winding reel an air supply line may be disposed which may be connected to the end of the hose to be wound for keeping the reeled hose portion under some interior overpressure.

Finally heating elements may be disposed at various points around the hose for drying the latter and promoting the setting of the coating.

In the following the invention will be explained in detail by reference to a drawing, in which:

FIG. 1 shows a section through a preferential embodiment of the coating apparatus proper of the invention without the winding means for the coated hose, in which two embodiments of the holding means for a guiding element and two embodiments of said element are represented;

FIG. 2 a side view of the apparatus of FIG. 1;

FIG. 3 a section on the line III–III of FIG. 1;

FIG. 4 a section on the line IV–IV of one embodiment of the element of FIG. 1; and

FIG. 5 a schematic representation of the winding means for the coated hose.

The apparatus shown in the drawing comprises a base consisting of two parallel side plates 1. In grooves 2 of said plates a pin having hinged hooks 4 formed on it may be secured. A bobbin or roll of knitted nylon hose or the like may be mounted on said pin. The hose reeled therefrom is led between two guiding pins 5 lying close together and being either rotatably fixed in the plates 1 or provided with rotatable sheaths. At their upper sides the plates 1 are interconnected by a transverse bridge element formed with a central aperture, or they consist of a single strip bent in the form of a U.

Mounted on the bridge element 6 is an annular casing 7 which defines an air supply chamber 9. Between this casing and the bridge element 6 a guiding ring of a resilient material 8 is clamped which forms a second central aperture that is disposed below the tray 14. For clearness' sake the fixing means serving for this purpose are not shown.

At its upper side the chamber 9 is closed by a partition 10 provided with a central aperture, on which partition a sealing ring 11 is disposed, said ring being clamped by a clamping ring 12. A ring shaped casing 13, defining a tray 14 to be filled with the coating liquid, is supported by said clamping ring.

At its upper side said tray is closed by a cover 15, in a central aperture of which a centering and wiping ring 16 of a hard synthetic material or the like is secured. Further a downwardly directed tube 17 is disposed around said central aperture, said tube extending over a substantial portion of the height of the tray 14. A slanting filling tube 18 is connected to the casing

13, said filling tube opening into the tray 14 near its bottom and extending beyond the cover 15. If necessary, a closable discharge pipe 19 opening near the bottom of the tray 14 may be disposed at the opposite side.

The rings 8, 11 and 16 are formed with coaxial apertures wherein a guiding element 20 may be arranged, so that the rims of these rings remain at a small distance from the element as the latter is disposed in the centre of the apertures. The element 20 is a solid body of revolution having a continuous axial bore 21 narrowed at its lower portion, in which latter portion a coaxial inner tube is closely fitted. The remaining portion of said bore forms together with the inner tube an annular passage. Said inner tube extends over a small height beyond the end of the element 20 as shown in FIG. 5.

Transverse bores 23 have been drilled in the element 20 near the lower side of the widest portion of the bore 21 which transverse bores in the position shown end into the chamber 9, the latter being more or less sealed by the rings 8 and 11.

In the casing 7 an aperture 24 is provided to which an air supply line may be connected by means of a coupling piece 25.

The element 20 extends upwards through the tray 14 and the casing 17 and ends in a rounded head 26 the largest transverse diameter of which is slightly larger than the desired diameter of the coated hose. The rim of the ring 16 is spaced at a small distance from the widest portion of said head so that the superfluous liquid may be wiped off the coated hose with it, and simultaneously, the head is centered by it.

The element 20 may be kept in its operative position in different ways. As shown in the left part of FIG. 1 and in the cross section of FIG. 4, a circular constriction 27 may be provided in the lower side of the element, two rollers 28 on both sides engaging this constriction, which rollers are rotatably supported by shafts 29. These shafts are firmly secured to the base 1, with one of the rollers being shown in FIG. 1 in phantom lines as turned over 90°.

At the right side of FIG. 1 other supporting means are shown, comprising a magnet coil 30 fixed to the partition 10, and a magnetic ring 31 sunk into the element 20, opposite said coil, which ring will be attracted to the center of the coil as the latter is energized. Permanent magnets will also suit this purpose.

This apparatus operates in the following manner. A bobbin of round knitted nylon hose is placed on the pin 3 and its end is fed between the pins 5. Then the element 20 is inserted into the hose and through the apertures in the rings 8, 11 and 16. Thereafter the element is secured by the rollers 28 or the magnet coil 32. For example the shafts 29 may be designed so that at least one of them can be detached for applying the element therebetween. Thus the rollers 28 contact the hose in the constriction 27 with as little friction as possible.

The tray 14 is completely filled with coating liquid, and air under slight overpressure is fed to the chamber 9. Then the pinched end of the hose is raised with the liquid from the tray remaining on its surface, and the excess liquid is wiped off by the rim of the ring 16. The tube 17 prevents air bubbles from reaching the liquid around the hose, which should be avoided since any possible air or vapor accumulation around the hose may lead to premature setting of the coating layer. Preferably an air vent 32 is provided in the cover 15, moreover, if desired, a fine-meshed wire grid may be placed in the tube 18 for stopping air bubbles carried along. The air from the chamber 9 flows through the bores 23 and the shaft bore 21 to the interior of the already coated hose, thus maintaining the desired diameter of this hose after having left the head 26. The air can flow back through the inner tube 22 and is passed through the uncoated hose below the element 20.

The element 20 is formed in such a manner that the hose will contact this element as little as possible, as may appear from FIG. 1. Instead of the spherical head 26 shown at the right-hand side of FIG. 1, preferably a head as shown at the left-hand side of FIG. 1 is used, having a circular rim of the desired diameter in order to prevent the still moist hose from sticking to the spherical head 26. There is no need for the ring 8 to form a seal with the hose since air leakage from the chamber 9 is not objected to. The ring 11 should only prevent the liquid from the tray 14 from flowing away and air bubbles from the chamber 9 from rising into the liquid. As shown at the left-hand side of FIG. 1, this ring is preferably provided with an inner ring 33 made of a thin Teflon foil or the like, the inner rim of which just fails to contact the hose disposed around the element. In the narrow interspace the air pressure in the chamber 9 together with the surface tension of the liquid keep this liquid in equilibrium.

FIG. 5 shows a schematic cross section through the means for winding up the coated hose as it leaves the upper portion of the structure described above. Superposed at a certain height with respect to the cover 15 a first guiding roller 34 is arranged, the guiding surface of which being approximately tangent to the axis of the element 20. A resiliently supported pinching roller 35 contacts this surface. Therefore the overpressure in the coated hose below said rollers cannot extend beyond said rollers. Between the roller 34 and the cover 15 a heating element 37, schematically shown, is disposed around the coated hose 36, by which the hose is dried prior to being fed between the rollers 34 and 35. Thereafter the hose is diverted downwards by a second guiding roller 38 to a winding reel 39. A coaxial air supply line 40 is disposed in the hub of said reel, said air supply line communicating with a transverse tube 41 at the end of which a short piece of flexible tube 42 is fixed to which the beginning of the hose 36 is fastened. So the hose portion between said beginning and the rollers 34 and 35 can be blown up. If required, accessory heating means 43 may be applied between the rollers 34 and 38 and/or the roller 38 and the winding reel 39, if this is desired for promoting the eventual setting of the coating.

Obviously, the embodiments described above may be varied in many ways. Furthermore the apparatus may be directly connected with a circular knitting machine, provided said knitting machine is of the type in which the knitted hose is stationary and the knitting elements are rotated.

We claim:

1. Improvement of an apparatus for manufacturing a hose for taking an undisturbed soil sample wherein a circularly knitted hose or the like may be coated with a coating liquid, this apparatus consisting of a tray containing this liquid and provided with a central aperture, a first tube operable to serve as a guiding element extending through said aperture and provided with a longitudinal bore having a discharge opening above the tray, an inner tube disposed coaxially and spaced from said first tube and opening above the end of the first tube, an air supply communicating with the interspace between said tubes and a lower opening in said inner tube, and means for pulling upwards a knitted hose or the like to be coated around the first tube which hose is fed from the bottom in order to conduct the knitted hose or the like through the coating liquid present in the tray, said improvement being characterized in that the first tube is formed by an element substantially in the form of a solid body of revolution and provided with a central bore, the outer diameter of which element, at least over a portion thereof, having been adapted to the desired diameter of the coated hose whereas the central aperture of the liquid tray is provided with a resilient sealing ring, the inner rim of which lying sufficiently adjacent to the element for preventing the liquid from leaking out of the tray, this, however, without hindering the transport of the knitted hose between the element and the rim of the sealing ring.

2. Apparatus according to claim 1, intended for continuously coating any length of the knitted hose, characterized in that the guiding element is movably placed into the central aperture of the tray, said air supply comprising an air supply chamber being provided below the tray, which chamber is formed with a second central aperture provided with a resilient sealing ring by which the passage of air along the element is substantially prevented without said ring coming into contact with the hose disposed around the element, which

chamber communicates with a source of compressed gas with a rather low pressure, whereas the element is formed with one or more transverse passages opening into the interspace between the inner tube and the inner wall of the longitudinal bore, and on the other hand, in the operative position of this element communicating with the air supply chamber, the inner tube sealingly communicating below these passages with the lower portion of the element, and the bore of said inner tube opening into or near the end face of the element, all this in such a manner that the air supply and discharge take place through the still uncoated portions of the knitted hose.

3. Apparatus according to claim 2, characterized in that the sealing ring at the bottom of the tray is of such design that the liquid in the tray is kept in equilibrium in the narrow interspace between the inner rim of said ring and the element by the air pressure in the air supply chamber and the surface tension of the liquid.

4. Apparatus according to claim 3, characterized in that the central portion of said bottom ring is made from a thin plate or sheet of a sufficiently rigid synthetic material.

5. Apparatus according to claim 1, characterized in that a hard upper ring is provided at the upper side of the tray, which ring may contact the upper end of the element or the hose disposed around said element, and serving as a wiping means and at the same time as a guiding ring for the element.

6. Apparatus according to claim 1, characterized in that means are provided for holding said element at the desired height inside the tray.

7. Apparatus according to claim 6, characterized in that these means comprise a magnet ring and an armature ring, one of which being fixed and the other being connected to the element.

8. Apparatus according to claim 6, characterized in that these means comprise first guiding pins or rollers which are secured to the apparatus and are positioned substantially perpendicularly and symmetrically with respect to the vertical axis of the tray, which pins or rollers may contact an appropriate constriction of the element or the knitted hose disposed around the element at that location.

9. Apparatus according to claim 8, characterized in that at least one of the first guiding pins or rollers is removable.

10. Apparatus according to claim 8, characterized in that the element is designed so that the knitted hose contacts the outer surface of the element only at the location of the sealing and first guiding rings, and the supporting rollers or pins, at the upper end a rounded head being formed, the largest diameter of which being slightly larger than the desired diameter of the coated hose.

11. Apparatus according to claim 10, characterized in that the rounded head is formed with a projecting rim lying in a plane perpendicular to the axis of the element, the diameter of which being adapted to the diameter of the hose.

12. Apparatus according to claim 8, provided with a winding reel for the coated hose, characterized by a second guiding roller mounted above the tray and spaced apart therefrom, which second guiding roller is adapted to divert to the winding reel the substantially dried hose pulled upward from the tray, the guiding surface of said second guiding roller at least approximately being tangent to the vertical central axis of the tray.

13. Apparatus according to claim 12, characterized in that a pinching roller resiliently contacts the guiding surface of the guiding roller.

14. Apparatus according to claim 12, characterized by an air supply line disposed within the shaft of the winding reel, to which line the end of a hose to be reeled may be connected.

15. Apparatus according to claim 12, characterized by heating elements applied at various points around the coated hose for drying this hose and promoting the setting of the coating.