

[54] **APPARATUS FOR THE WET TREATMENT OF TEXTILES**

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[56]

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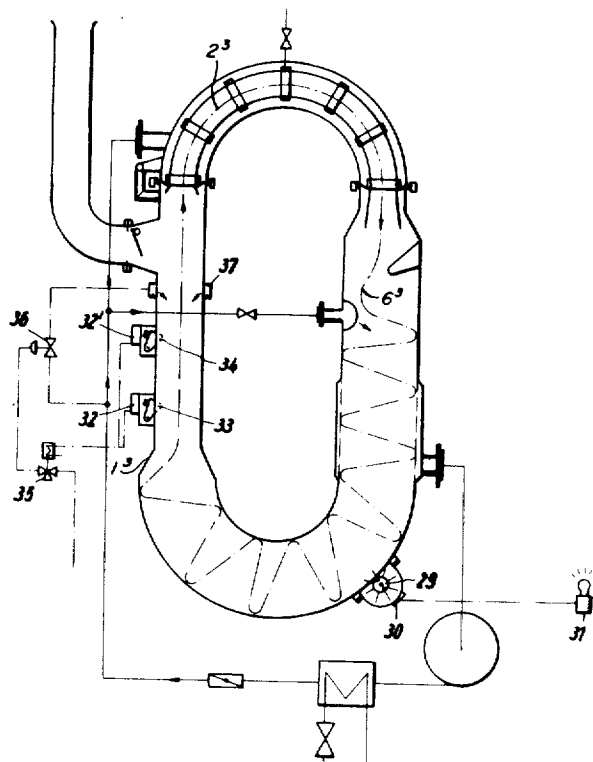
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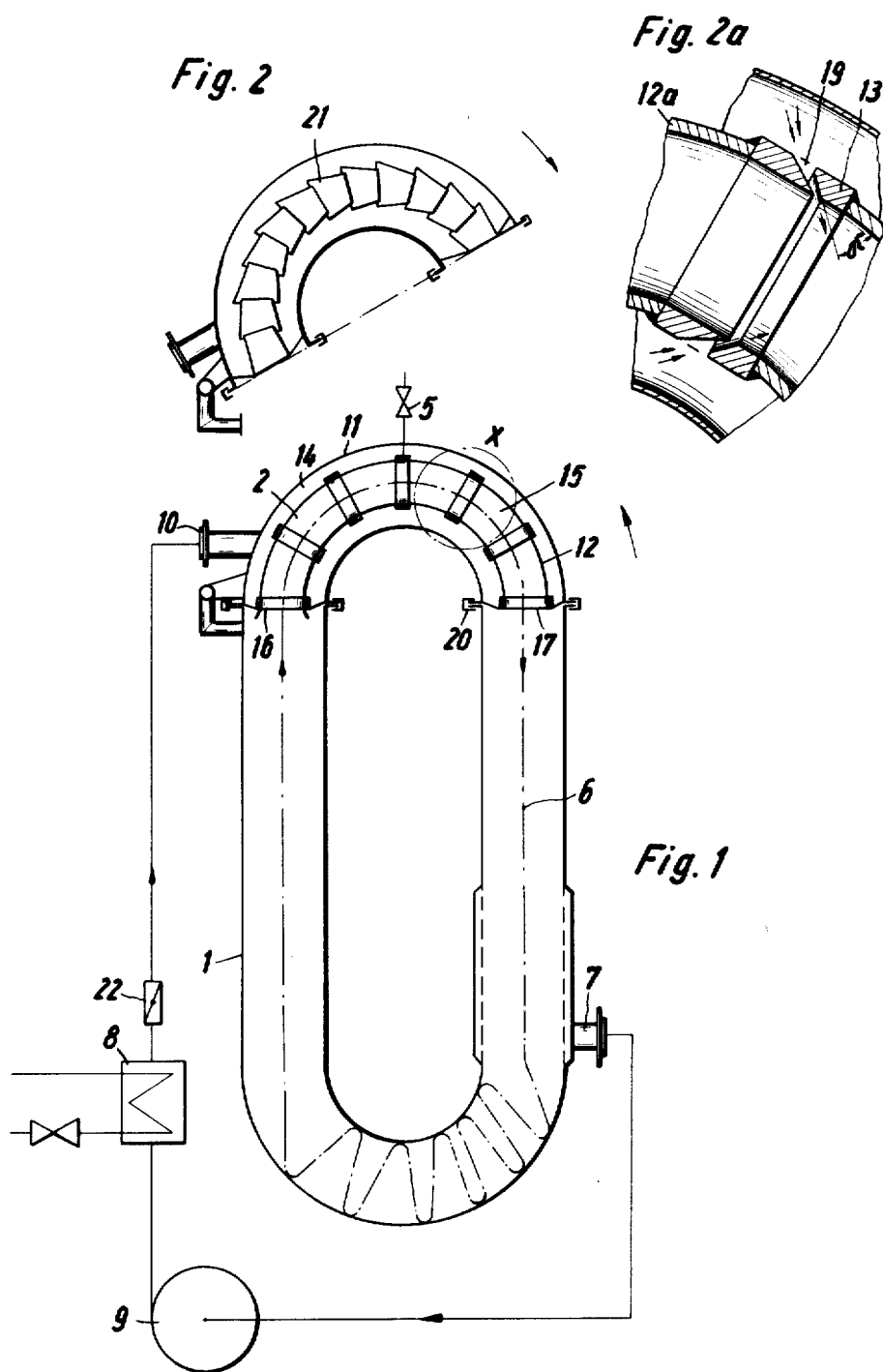
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ABSTRACT

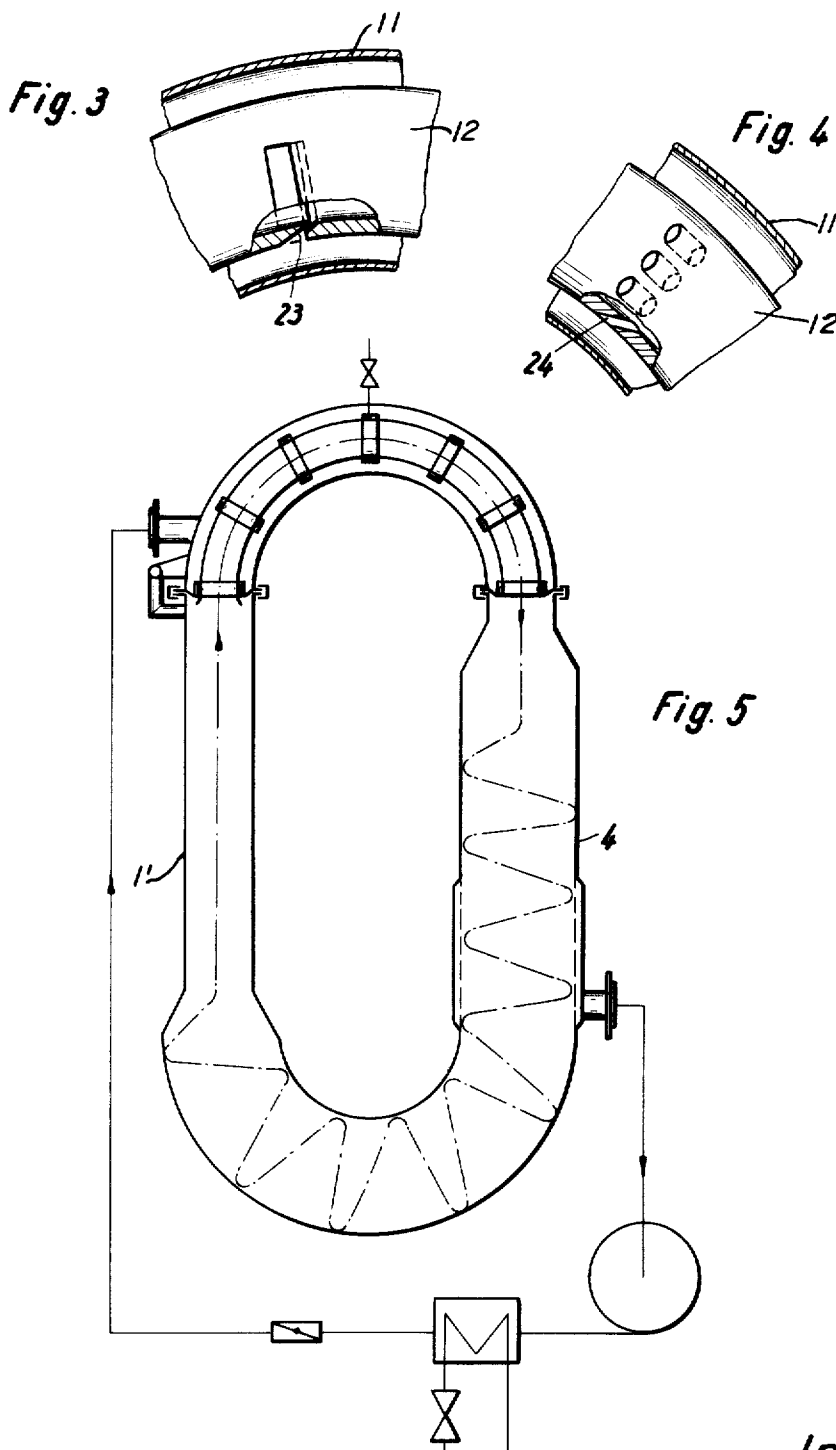
A process of and an apparatus for the wet treatment of textiles in strip or web form which comprises a U-shaped tubular treatment vessel having at least two arms and a semi-circular tubular drive set conveying textiles through the treatment vessel by a treatment liquid and interconnecting the arms.

10 Claims, 8 Drawing Figures



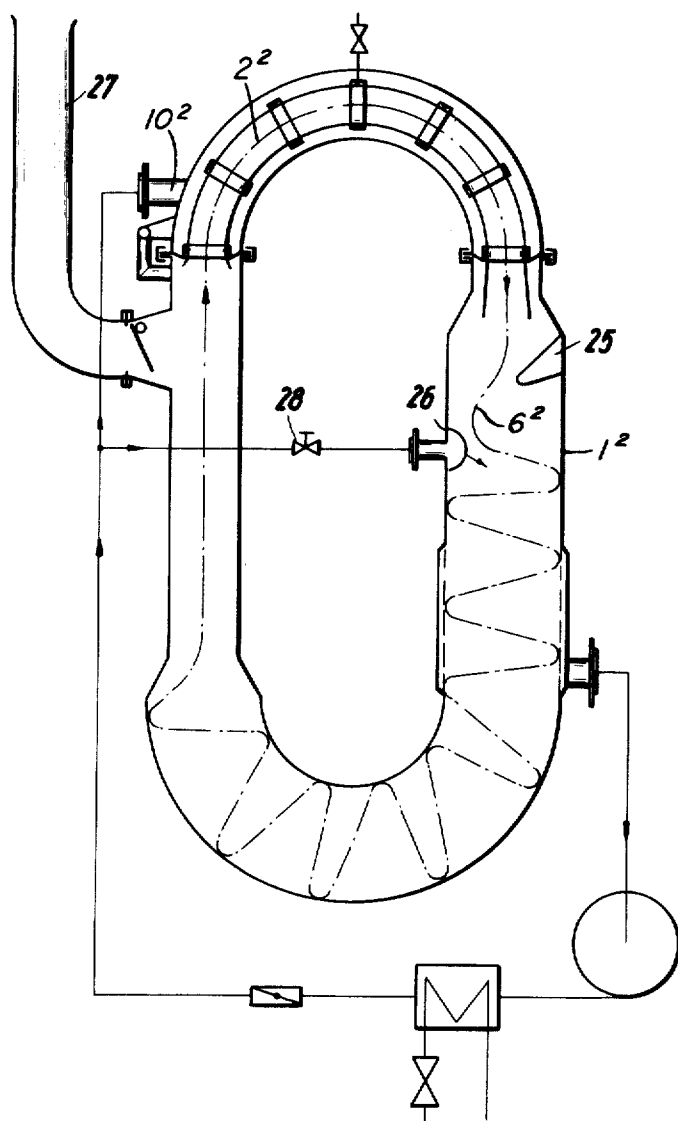


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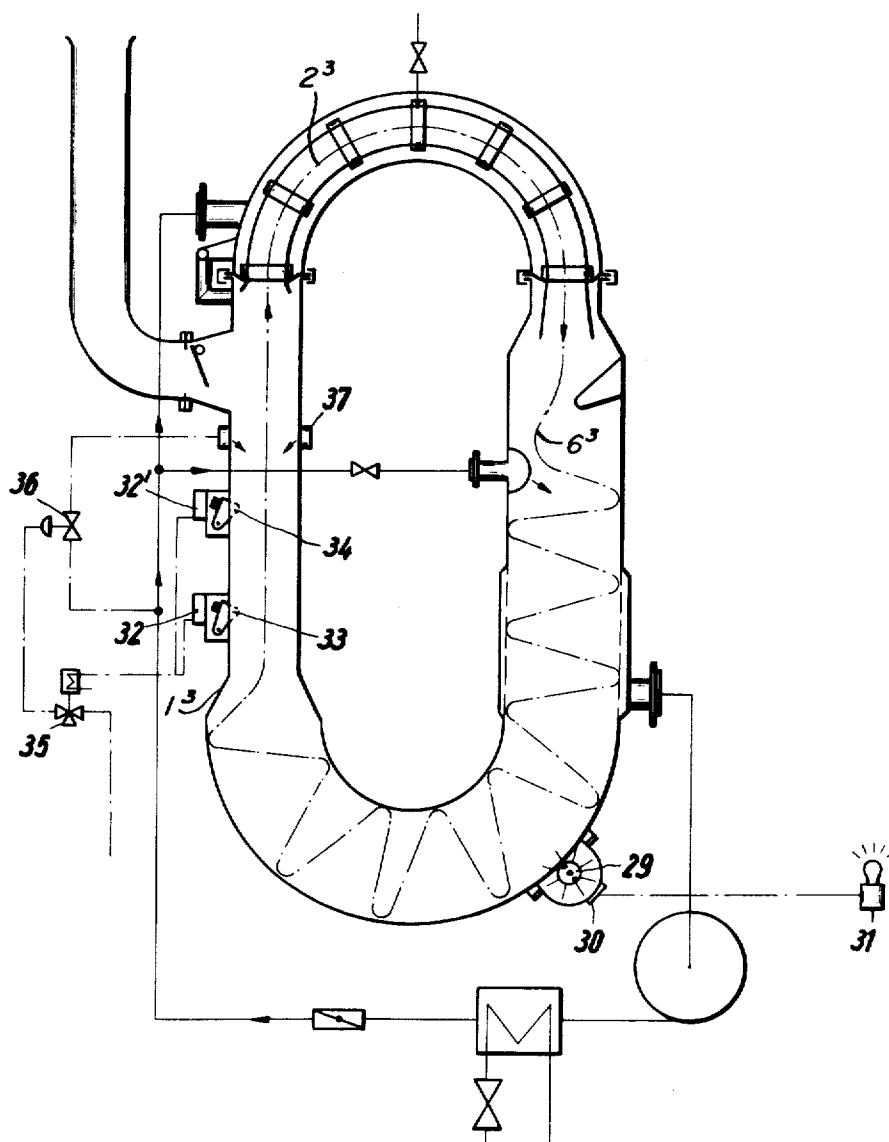
Fig. 6



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Fig. 7



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APPARATUS FOR THE WET TREATMENT OF TEXTILES

The present invention relates to as an apparatus for the wet treatment of textiles in strip or web form which are conveyed by the treatment liquid through a treatment vessel.

Hitherto, the wet treatment of textiles in strip or web form has mainly been performed in air-pressure tanks known as winch vats whose upper halves contain rollers or winches which pass an endless textile material running thereover through the treatment liquid disposed in the bath below. The deflection of the web or strip over the rollers may cause folds in the material, which therefore become less intensively impregnated. Moreover, if the goods are subject to expansion they noticeably become somewhat lengthened.

To obviate these disadvantages, apparatus are known in which the rollers in the air-pressure tank are replaced by a curved conveying line extending over the bath, and referred to hereinafter as the "drive set", whose outlet points downwards towards the bath, a liquid pump being connected to the bath and to the conveying line to pass the liquid in the bath through the line.

The textiles are moved through the bath by the flow of liquid in the pipe. As a rule a number of such drive sets is disposed one beside the other in one boiler.

A large volume of treatment liquid is required to operate these apparatus, the result being considerable costs for chemicals and heating and cooling.

Moreover, if a number of drive sets are used in a bath, the result may be an uneven finishing effect over the width of the bath and the knotting of strands disposed one beside the other as they rotate.

It has also been found that this prior art process has various technical defects caused by the removal of the textiles from the treatment liquid. When introduced by a nozzle into the drive set, the treatment liquid, for instance, the dyeliquor, becomes intensively mixed with air, so that the dyeliquor begins to foam, and this has an extremely disadvantageous effect on the finishing process. Due to the intimate contact between the dyeliquor and the air, there is also a very high consumption of reducing agent.

It is one object of the present invention, to provide an apparatus for the wet treatment of textiles which obviates these disadvantages.

It is still another object of the present invention to provide an apparatus for the wet treatment of textiles in strip or web form which are moved by the treatment liquid through the treatment vessel, wherein the treatment is a U-shaped pipe whose arms are interconnected by a tubular drive set spanning a semicircle.

The apparatus is more particularly suited for the performance of a process according to the invention if an air-discharge valve is disposed at the top of the treatment vessel of the apparatus.

Preferably, the driving set comprises two concentric tubes tightly interconnected at their ends to produce a closed annular space, the outer tube having a spigot connected to the delivery side of a pump, and the inner tube being formed, distributed over its periphery and length, with annular or sickle-shaped slots or bores which extend through the tube at an inclination to its axis and in the direction in which the textiles move.

In one embodiment of the invention the inner tube comprises telescoped frusto-conical sleeves, slots being produced at the places where the sleeves are connected to one another.

In a possible alternative embodiment, the inner tube is formed by individual tube segments whose connecting places have slots extending at an inclination to the tube axis and in the direction in which the textiles move.

Advantageously the driving set is interchangeable.

In a preferred embodiment of the invention a number of apparatuses according to the invention are combined into one unit, each drive set connecting one arm of adjacent U-shaped pipes.

The series of individual treatment vessels can form an open or closed chain. In an open chain, textiles in strip or web form can be treated continuously, whereas in a closed chain an endless ribbon can pass through several times.

The way in which the treatment vessel is arranged is immaterial. The arms of the U-shaped pipe can extend vertically or horizontally, and the plane extending through the axes of the arms can also be vertical or horizontal. Any required intermediate position can also be used.

However, due to the readier introduction of the textiles, the treatment vessel is preferably disposed with its arms extending horizontally. In practical operation it has sometimes been found that the strand of textiles in the drive set may become so strongly compressed that irregularities may occur in the dyeing or other treatment. This disadvantage is reliably obviated by the fact that a deflector plate is disposed beneath the end of the drive set.

The effect of the deflector plate is that the textile strand compressed in the drive set is opened by impinging on the plate. Consequently, the textile strand is prevented from lying in the same folds during its whole passage through the treatment vessel. Another result is a more uniform dyeing or other wet treatment. The effect produced by a deflector plate according to the invention is further enhanced if an injection nozzle is disposed below the deflector plate. It is the purpose of the nozzle further to loosen up the textile strand already opened up by the deflector plate and to deposit the textile strand in an ordered manner in the lower portion (storage space) of the treatment apparatus. The liquid for the injection nozzle is taken from the pressure pipe from the drive set connection spigots. The liquid can be fed to the nozzle via an adjusting member either continuously or intermittently (in pulses).

In the storage space the injected liquid becomes combined with the rest of the treatment dye liquor.

In a further improvement of the treatment apparatus a charging sluice in the form of an inlet spigot is disposed below the start of the drive set, the filling aperture of the sluice being higher than the highest portion of the apparatus carrying dye liquor.

Due to this device the apparatus can be filled with the treatment liquor before the textiles are charged. The textile web is drawn into the apparatus through the filling sluice. The drawing of the textile web through the filling sluice means that no air can enter the apparatus, thus preventing any disadvantageous effects of air such as frequently occur in dyeing processes. Since after the addition of the dyestuff to the water-filled treatment vessel such a strong clouding often occurs that the goods inside the apparatus cannot be observed by an observation glass, according to a further improvement, the apparatus according to the invention is characterized by an apparatus comprising an impellerlike rotor disposed in the lower portion of the U-shaped pipe and having magnets, a magnetic switch connected to an optical indicating device or the like being disposed outside the U-shaped pipe in the zone of the magnetic field. The impeller is rotated by the movement of the strand of textiles, such rotation making the indicator wink, the succession of winks indicating the speed of the strand of textiles moving inside the apparatus.

An even more important improvement of the apparatus according to the invention is characterized by a device for preventing the drive set from getting stopped up by the textiles. The textiles become accumulated in the lower portion of the U-shaped pipe in such a way that it becomes clogged. There is a risk that on the inlet side of the drive set the textiles will not be conveyed by the treatment liquid in the form of a strand or ribbon, but that the resulting plug will be forced by the flow against the inlet aperture of the drive set, thus clogging the apparatus. To obviate this disadvantage, two magnetic switches having switch levers disposed inside the U-shaped pipe and actuated by the resulting plug are disposed at various heights on the U-shaped pipe on the inlet side of the drive set. If the plug is entrained it actuates the top switching

lever, so that a magnetic valve is actuated to open a pneumatic valve and allow thoroughly free passage. In this way treatment liquid is introduced from the pump delivery line through a backing-up ring into the treatment vessel and forces the plug back. As soon as the plug of textiles passes the bottom of one of the aforementioned magnetic switches, the latter delivers a pulse which closes the valves first actuated. The fact, that the dyeliquor is supplied alternately to the backing-up ring means that the textiles compressed to form a plug can move only between the two inner switching levers — i.e. is unable to clog the inlet of the drive set.

With these and other objects in view, which will become apparent in the following detailed description, the present invention, which is shown by example only, will be clearly understood in connection with the accompanying drawings, in which;

FIG. 1 is a section through the apparatus, the drive set having annular slots;

FIG. 2 is a diagrammatic elevation of a drive set consisting of frusto-conical sleeves;

FIG. 2a is a fragmentary section of a detail of FIG. 1 at an enlarged scale;

FIG. 3 is a fragmentary elevation, partly in section of a sickle-shaped slot in the inner pipe of the drive set;

FIG. 4 is a fragmentary elevation, partly in section, of a number of bores in the inner tube of the drive set;

FIG. 5 is a section, corresponding to the apparatus shown in FIG. 1 of the U-shaped pipe having a portion of widened diameter;

FIG. 6 is a section through a further embodiment of the apparatus according to the present invention; and

FIG. 7 is a section of a further embodiment of the apparatus according to the invention with extra devices.

Referring now to the drawings and in particular to FIG. 1, a treatment vessel completely filled with treatment liquid comprises a U-shaped pipe 1 and a drive set 2, which connects the arms of the U-shaped pipe 1 and in which textiles 6 circulate for treatment. To make sure that during the filling of the treatment vessel with treatment liquid all the air is expelled, an air-discharge valve 5 is disposed at the top of the vessel. One arm of the U-shaped pipe 1 has a liquid outlet 7 connected to the intake side of a pump 9. By means of a heat exchanger 8, the pump 9 forces liquid into a spigot 10 of a tube 11 which spans a semicircle and connects the arms of the U-shaped pipe 1. Concentrically disposed in the tube 11, to produce the drive set 2 is a tube 12 comprising tube segments 12a and slot rings 13 (FIG. 2a). At their ends the two tubes 11 and 12 are closed off from one another, so as to produce an annular space 14 therebetween. In an interchangeable drive set 2, guides 16 and 17 are also provided for the textiles, the guide 16 being disposed at the inlet side of the drive set 2 and pointing towards the latter, while the guide 17 is disposed at the outlet side of the drive set 2 and points away from the latter. An adjusting member 22 is provided to control the delivery of the pump 9 and therefore the speed of circulation of the textiles.

Referring now to FIG. 2, the inner tube 12 of the drive set comprises frusto-conical and telescoped sleeves 21. The telescoping produces a slot between two adjacent frusto-conical apertures. The size and nature of the drive set depend on the textiles to be treated.

The embodiment of the drive set 2 illustrated in FIG. 3 differs from that shown in FIG. 2a by the feature that slots 23 which do not extend around the full circumference of the tube 12, are sickle-shaped, and extend at an inclination to the tube axis which are provided instead of the annular slots 19 (FIG. 3).

Referring now to FIG. 4, the slots in the drive set are replaced by bores 24 extending at an inclination to the tube axis and distributed over the periphery of the tube 12.

In all embodiments the tube 12 of the drive set 2 can be disposed interchangeable in the tube 11, to enable the apparatus to be readily adapted to the requirements of each particular case.

FIG. 5 also shows a wet treatment apparatus in which the U-shaped pipe 1' has a portion 4 of widened diameter.

Referring now to FIG. 6, a deflector plate 25 is provided below the end of the drive set 2', the strand 6' of textiles impinging on the plate 25, so as to be loosened and opened up.

For further loosening up and improving depositing of the textile strand, an injection nozzle 26 is disposed in the U-shaped pipe 1' below the deflector plate 25. The liquid for the nozzle 26 is taken from the connecting spigot 10' for the drive set 2'. The liquid can be fed to the nozzle 26 by means of an adjusting member 28 either continuously or intermittently (in pulses).

The head of the injection nozzle 26 preferably takes the form of a hemisphere having a number of radiating, downwardly pointing nozzle bores. (not shown)

For the introduction of the textile strand a filling spigot 27 is provided which has a sluice and whose aperture is higher than the highest portion of the apparatus carrying dyeliquor. Consequently, the apparatus can be completely filled with the treatment liquid before the goods are charged. The textile strand 6' is pulled through the filling sluice by means of the drive set 2' into the apparatus, so that no air can get into the apparatus together with the goods.

The embodiment of the apparatus according to the invention in FIG. 7 has extra devices for observing the course of the textiles and preventing the drive set from getting clogged.

The main members for checking the course of the textiles are an impeller-like rotor 29 disposed in the U-shaped pipe 1' and having magnets, and a magnetic switch 30 which is disposed outside the U-shaped pipe in the zone of the magnetic field and is connected to an optical indicating device 31.

The blades of the rotor 29 of the system for checking the course of the textiles extend into the treatment vessel 1' and are rotated by the conveyance of the textiles 6'. The rotary movement of the rotor 29 brings the magnets into and out of the switching zone of the magnetic switch 30, so that the device 31 flashes at predetermined intervals of time. The intervals between the flashes also indicate the speed at which the textiles 6 are moving in the vessel.

The system for preventing the drive set from getting clogged comprises the following members:

Magnetic switches 32 and 32', with their switch levers 33 and 34, are so connected to one another in the arm of the U-shaped pipe, below the inlet to the drive set 2', that the textiles 6' pass over the switch lever 33. When the switch lever 34 which has a magnet therein is moved toward the magnetic switches as a result of a clogging of the pipe 1' adjacent the lever, it delivers a signal which actuates a magnetic valve 35 and opens up the way for the compressed air to a pneumatic valve 36. The opening of the valve 36 feeds dye liquor from the pump delivery line to a backing-up ring 37. The dye liquor fed exerts a counterpressure on the textiles 6' and forces them down backwards in the arm of the vessel. If the textiles are forced back further than the switch lever 33, the latter delivers a signal which closes the valves 35 and 36, so that the textiles can again be conveyed by the flow of treatment liquid. The dye liquor alternately fed to the backing-up ring causes the "plug" of textiles 6' to move backwards and forwards between the two switch levers 33 and 34, so that the "plug" does not arrive at the inlet to the drive set.

The backing-up ring 37 preferably takes the form of a ring which encloses the treatment vessel 1' below the inlet to the drive set 2'. Inside the backing-up ring 37, the treatment vessel 1' is formed on a line extending right round it with a number of downwardly pointing bores (not shown).

The operation of the apparatus according to the present invention will now be briefly described:

The U-shaped pipe 1 and the drive set 2 are completely filled with the textiles 6 for treatment and the treatment liquid, with the air discharge valve 5 opened. The pump 9 sucks the treatment liquid via the treatment outlet 7 out of one arm of the U-shaped pipe 1 and delivers it through the heat exchanger 8 and by means of the spigot 10 into the annular

space 14 of the drive set 2. The treatment liquid then emerges at an angle through the annular slots 19 into the space 15 inside the tube 12 and drives the textiles from the left-hand branch of the U-shaped pipe 1 into the right-hand branch. The textiles 6, in the form, for instance, of a web, can be inserted into the guide 16 of the drive set 2 when the latter is hinged up. The curvature of the drive set and of the flow produced by the slots steers the textiles in the required direction. For a required length of the web, the two ends can be sewn together to form an endless web, so that the web of textiles can be circulated in the treatment liquid.

In dependence on the capacity of the factory, a number of the apparatus according to the present invention can be connected in parallel or in series and driven by one or more pumps 9.

While we have disclosed several embodiments of the present invention, it is to be understood that these embodiments are given by example only and not in a limiting sense.

We claim:

1. An apparatus for the wet treatment of textiles in strip or web form comprising
 - a U-shaped tubular treatment vessel,
 - a semi-circular tubular drive set conveying textiles through said treatment vessel by a treatment liquid and interconnecting the arms of said U-shaped vessel,
 - an air-discharge valve disposed at the top of said drive set,
 - said drive set comprising two concentric tubes, including an outer tube and an inner tube interconnected at their ends to define therebetween a closed annular space,
 - a pump including a delivery side,
 - said outer tube having a spigot connected to the delivery of said pump, and
 - said inner tube is formed with perforations distributed over the surface of the inner tube which extend through the wall of said inner tube at an inclination to its axis and in the direction of movement of said textiles.
2. The apparatus, as set forth in claim 1, wherein said inner tube comprises a plurality of telescoped frusto-conical sleeves, and said sleeves are telescoped to one another and define a slot between each pair of adjacent sleeves.

3. The apparatus, as set forth in claim 1, wherein said inner tube comprises a plurality of interconnected individual tube segments, and the connections of each pair of adjacent tube segments define slots extending at an inclination to the tube axis and in the direction of movement of said textiles.
4. The apparatus, as set forth in claim 3, wherein said drive set is removably disposed in said treatment vessel.
5. The apparatus, as set forth in claim 4, wherein said treatment vessel includes at least one portion of widened diameter.
6. The apparatus, as set forth in claim 5, which includes a deflector plate disposed adjacent the outlet end of said drive set.
7. The apparatus, as set forth in claim 6, which includes an injection nozzle disposed downstream of said deflector plate.
8. The apparatus, as set forth in claim 7, which includes a charging sluice having a filling aperture and comprising an inlet spigot disposed adjacent the inlet end of said drive set.
9. The apparatus, as set forth in claim 8, which includes means for checking the movement of said textiles through said treatment vessel, said means comprises an impeller-like rotor including magnets and disposed in said treatment vessel, a magnetic switch is disposed outside of said treatment vessel and actuated by said magnets, and an indicating device operatively connected with and actuated by said magnetic switch.
10. The apparatus, as set forth in claim 9, which includes means for preventing clogging said drive set by said textiles circulating therein, said preventing means comprise two magnetic switches disposed one beneath the other on said treatment vessel below the inlet to said drive set and including switching levers disposed in said treatment vessel, and said switches control the flow of said treatment liquid in a direction opposite to the direction of conveyance of said textiles.

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