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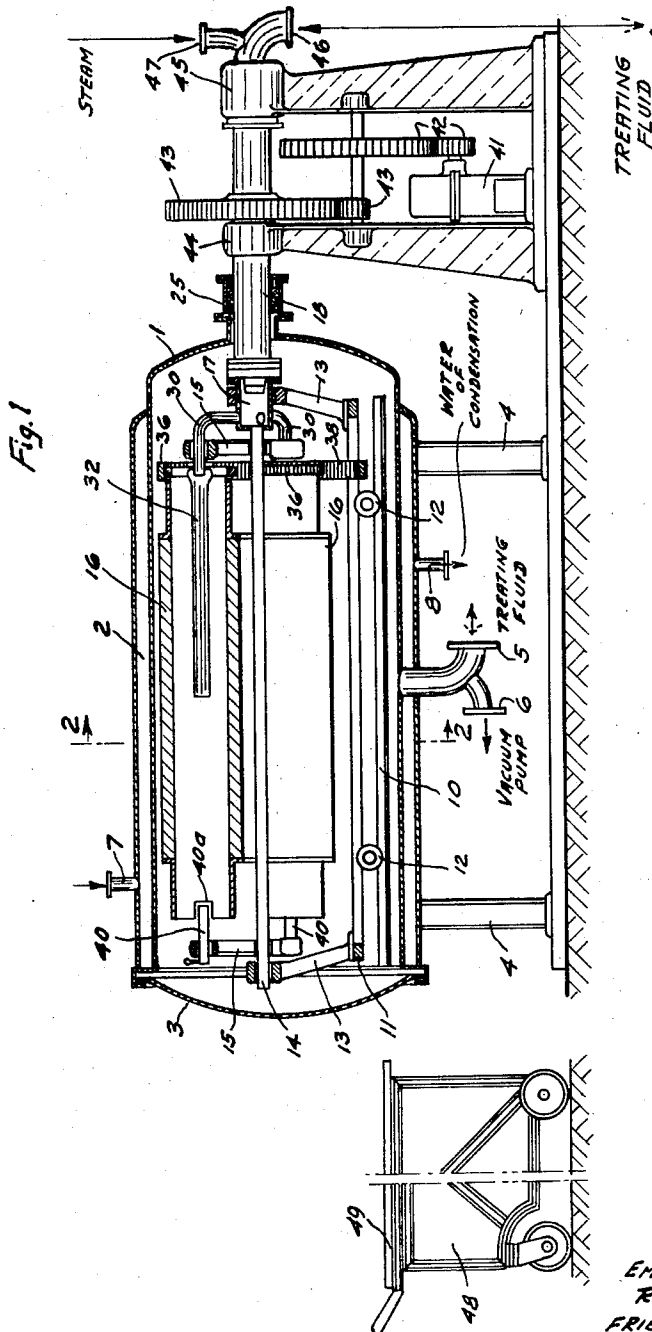
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APPARATUS AND SYSTEMS FOR TREATING TEXTILE MATERIALS

Filed Nov. 15, 1955

3 Sheets-Sheet 1



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3 Sheets-Sheet 2

Fig. 2

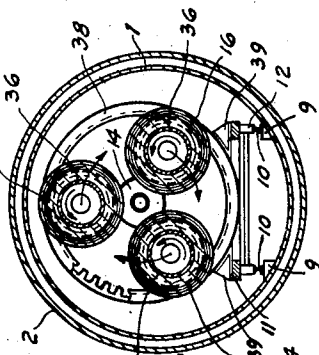
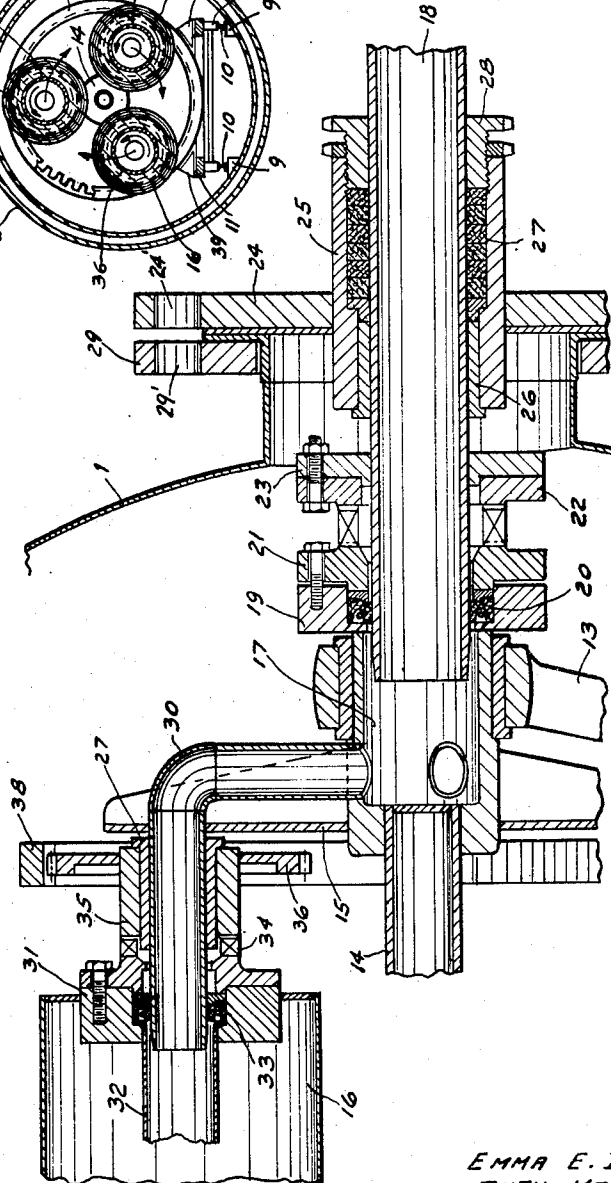


Fig. 3



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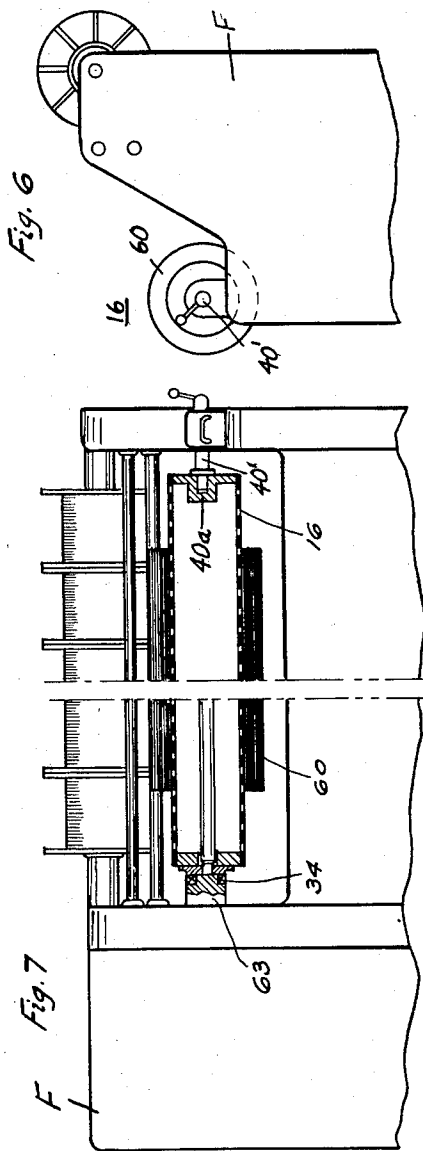
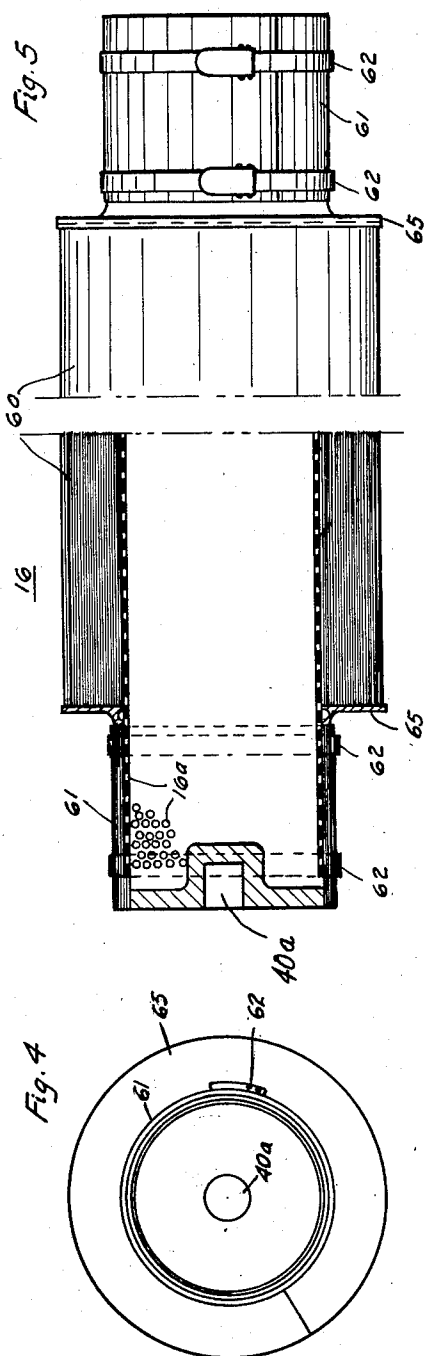
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3 Sheets-Sheet 3



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2,872,802

APPARATUS AND SYSTEMS FOR TREATING
TEXTILE MATERIALS

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Application November 15, 1955, Serial No. 546,934

Claims priority, application Germany May 18, 1955

6 Claims. (Cl. 68—150)

This invention relates to apparatus for treating textile materials, and more particularly for steam treating and dyeing textile materials, and it relates also to systems for treating textiles comprising a plurality of separate apparatus each adapted to perform a separate function.

It is one object of this invention to provide apparatus for fluid treating textiles which are adaptable to perform a great variety of different sequential operations all of which can be performed in one tank without removal of the goods under treatment therefrom.

Another object of this invention is to provide an apparatus for treating textile materials adapted to subject the materials to a relatively complex motion while in the process of being fluid treated, which motion tends to effect complete and even penetration of the goods with the treating fluid.

Another object of the invention is to provide an apparatus which enables to rapidly perform different sequential textile treating processes inside of the same treating chamber or tank.

Still another object of the invention is to provide systems for processing textile materials comprising a plurality of separate apparatus each adapted to perform a separate function wherein the materials under treatment are supported by one and the same support while being sequentially processed in this plurality of apparatus, thus greatly reducing the cost normally involved in handling textile materials in processing systems.

These and other objects and advantages of the invention will become apparent upon consideration of the following detailed description of an embodiment of the invention when taken in connection with the appended drawing, wherein—

Fig. 1 is substantially a longitudinal section of an apparatus for treating textile materials embodying the invention;

Fig. 1 is a section along 2—2 of Fig. 1;

Fig. 3 is a portion of the structure of Fig. 1 shown on a larger scale;

Fig. 4 is an end view, and

Fig. 5 is in part a side elevation and in part a longitudinal section of a detail of Figs. 1 to 3 shown on a larger scale;

Fig. 6 is a side elevation of a knitting apparatus including a support as shown on a larger scale in Figs. 4 and 5, and

Fig. 7 is in part a front view and in part a longitudinal section of the structure of Fig. 6.

Referring now to the drawing, and more particularly to Fig. 1 thereof, reference numeral 1 has been applied to indicate a substantially cylindrical tank for receiving the textile materials or goods to be treated. Tank 1 extends substantially horizontally and the right end thereof—as seen in Fig. 1—is permanently closed. The left end of tank 1 may be opened and closed at will by means of cover or door 3. Tank 1 is provided with a steam jacket 2 for controlling the temperature within tank 1 in the way required for any particular process. The

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top of tank 1 carries an intake pipe 7 for admission of steam to steam jacket 2. Tank 1 is mounted on a frame 4 to bring it to the required level. Pipe 5 at the bottom of tank 1 may be used either for admitting treating fluids such as, for instance, dyes to, or for draining such fluids from, tank 1. The branch outlet 6 is intended for attaching a vacuum pump to tank 1. A pair of rails 10 supported by appropriate rail supports 9 is arranged inside of tank 1, making it possible to readily wheel a frame structure 11 on casters or wheels 12 into, and out of, tank 1. Frame structure 11 supports brackets 13, one on each end thereof, which brackets in turn support a pair of bearings for the hollow main or driven shaft 14. Each end of shaft 14 supports a spider structure 15, comprising a plurality of radial arms. These arms support the perforated substantially cylindrical supports 16 for the textile materials to be treated. Supports 16 have been diagrammatically indicated in Figs. 1 to 3, inclusive, and the details thereof have been fully shown in Figs. 4 and 5. The rear end of main or driven shaft 14 is enlarged and bell-shaped, as indicated at 17, and receives the inner end of a pipe 18 which projects from the outside of tank 1 into tank 1. The bell-shaped part 17 is, in effect, a manifold, as will be shown below more in detail. The disc-shaped flanged member 19 forms an integral part of the manifold or bell-shaped rear end 17 of hollow main shaft or driven shaft 14 and houses a flexible sealing ring 20 resting under pressure against pipe 18. Reference numerals 21, 22 have been applied to indicate the two cooperating members of a coupling. Coupling member 21 is screwed to the disc-shaped member 19 and hence rigidly connected to manifold 17 and to main shaft 14. Coupling member 22 is screwed to a disc-shaped flanged member 23 fixedly mounted on pipe 18. Pipe 18 is rotatable and the purpose of coupling 21, 22 is to transmit the rotary motion of pipe 18 to the manifold 17 and to the hollow main shaft 14. As shown in Fig. 3 the rear end of tank 1 is provided with a flanged ring 29 adapted to support a coaxial flanged ring 24 intended to receive tie screws for screwing rings 29 and 24 together. This has not been shown in Fig. 3 except for the holes 29' and 24' in both parts 29 and 24 for receiving the aforementioned tie screws. A stuffing box 25 comprising base element 26, packing 27 and gland 28 provides a fluid-tight passage for pipe 18 from the outside of tank 1 into tank 1.

The bell-shaped end of main shaft 14 or manifold 17 is provided with three tubular arms or fluid distribution pipes 30. Each of these arms 30 has a portion immediately adjacent manifold 17 projecting radially away from the latter and a portion remote from manifold 17 extending parallel to pipe 18 and main shaft 14 and arranged coaxially with respect to one of supports 16. Each of these tubular arms 30 provides jointly with manifold 17 a fluid passage from pipe 18 to one of the supports 16 for the textile materials under treatment. Each support 16 is provided with a terminal or closing element 31 supporting a length of pipe 32 extending from the rear end of the support 16 to about the center region thereof. A flexible sealing ring 33 arranged inside of each of these terminal elements 31 rests against the ends of tubular arms 30 situated remote from manifold 17 of main shaft 14. Reference numerals 34 and 35 have been applied to indicate cooperating members of a mechanical coupling. Each coupling member 34 is screwed to a terminal element 31 and hence rigidly connected to one of the supports 16 for the goods under treatment. Each coupling member 35 is rotatably mounted upon a sleeve or bush 27 fixedly supported by one of the arms 30. Coupling members 35 and spur wheels 36 form unitary structures of which but one has been shown in Fig. 3. The spur wheel 36 of each support 16 meshes with the internal

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teeth of a spur wheel 38. The latter is fixedly mounted on a pair of brackets 39 (see Fig. 2) supported by the frame structure 11 and arranged coaxially with respect to parts 14, 17 and 18.

The front of each support 16 is supported by a shaft or bolt 40, engaging a recess 40a in the respective support 16. Bolts 40 are, in turn, supported by spider structure 15 fixedly mounted upon, and jointly rotating with, main shaft 14. Bolts 40 are adapted to be shifted in a direction longitudinally of supports 16 to enable removal of supports 16 from frame structure or carriage 11, and also adapted to be clamped in position to preclude unintentional shifting thereof. The length of each textile supporting drum 16 is about equal to the spacing between clutch members 35 and bolts 40.

The drive for operating the rotatable parts inside of tank 1 is arranged at the rear of tank 1 between two stands or uprights 44 and 45. This drive includes the transmission 41 and two pairs of spur wheels 42 and 43. Stands or uprights 44 and 45 form bearings to rotatably support pipe or hollow shaft 18. Stand or upright 45 supports also two pipes 46, 47, one being an intake for dyes and other treating liquids, and the other an intake for steam.

Truck 48 shown in Fig. 1 to the left of tank 1 is provided with a pair of rails 49 having the same level and the same gage as the rails 10 inside of tank 1. When the treatment of the goods in tank 1 is completed, frame or carriage 11 and supports 16 are jointly withdrawn from tank 1 and placed upon truck 48 to be wheeled to any desired place of the production set-up. In like fashion truck 48 may be used to charge tank 1 with a frame structure 11 carrying supports 16 with non-treated material thereon which is intended to be treated.

If dyes or other treating liquids are admitted to tank 1 through pipe 46 on stand 45, the dyes or other treating liquids flow out of pipe 5 on the bottom of tank 1. The liquids admitted to tank 1 flow through pipe 18 to manifold 17, and then through pipes 30 and 32 to the center region of supports 16, where the liquids are released. The liquids then penetrate across the textile materials mounted on supports 16 and collect on the bottom of tank 1. Penetration is greatly enhanced by the centrifugal action inherent in the arrangement of parts shown.

As an alternative, the liquids may be admitted to tank 1 through pipe 5 and removed therefrom through pipes 32, 30 and 18.

Admission of steam should always be effected through pipe 47.

The gears 41, 42 and 43 may be operated while the textile material inside of tank 1 is being liquid and steam treated. Rotation of pipe 18 by gears 41, 42 and 43 results in rotation of hollow main or driven shaft 14. Since supports 16 are mounted on arms 15 the former are caused to rotate about shaft 14 when shaft 14 is caused to rotate. The fact that spur wheels 36 mesh with the stationary spur wheel 38 causes rotation of each support 16 about the longitudinal axis thereof. This dual rotary motion of supports 16, i. e. their rotary motion about main or driven shaft 14 and about their respective longitudinal axis has proved to be of crucial importance. It assures a thorough mixing of the dyes and a thorough penetration of the goods on supports 16 with dyes.

As mentioned before the structure may be used for performing a plurality of sequential treatments such as, for instance, steam treatment of textile materials which may be effected under reduced pressure and be preceded or followed by dyeing, washing, and other operations. Tank 1 may also be used for drying wet goods. To this end hot air or superheated steam may be admitted to tank 1, and the pressure in the latter be reduced below ambient pressure, if desired. The supports 16 for the goods may be rotated at a relatively high speed while drying operations are being performed. In some cases it has been proven desirable to change the direction of the flow of

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fluid through the tank periodically, i. e. fluid is first admitted for some time through pipe 46 and drained off through pipe 5, whereupon fluid is admitted through pipe 5 and drained off through pipe 18, thus reversing the direction of fluid flow. The treatment temperature is being controlled by the temperature of the fluid admitted to tank 1, the amount and temperature of steam admitted to steam jacket 2, etc.

The operation of the apparatus shown will be substantially obvious from the above, yet the following may be added:

Supports 16 may be adapted to cooperate with a machine or apparatus other than that shown in Fig. 1. The operations of that other machine or apparatus may either precede or follow the combined treatment by rotary motion and fluid in tank 1. When textile materials are wound upon supports 16 provided with one part 34 of a coupling as, for instance, a claw coupling or dog clutch, the materials may be subjected to various processes by coupling the aforementioned part 34 with cooperating couplings in various other machines. Considering, for instance, drying of wet-treated textiles, this may be effected in tank 1 upon draining of liquid from the same, admission of superheated steam into it and causing supports 16 to revolve rapidly simultaneously around their own axes and around shaft 14. As an alternative, carriage 11 may be removed from tank 1 and the supports 16 may be removed from carriage 11 preparatory to drying the goods in a separate dryer. If the separate dryer or other machine or apparatus is provided with one part of a coupling corresponding to the part 35 in Fig. 2, all that is needed to integrate the support 16 with the goods thereon into such separate dryer or other apparatus or machine is to engage the respective coupling means of support 16 and of the separate dryer or other machine or apparatus.

Assuming the textile materials to be treated in tank 1 to come from another machine or apparatus already wound on supports 16 fitted with parts 34 of a coupling, three such supports 16 will then be assembled on a carriage 11 by moving them in a direction longitudinally of shaft 14, thus causing engagement of the mechanical couplings 34, 35 and establishing substantially fluid-tight seals between pipes 32 inside of supports 16 and distribution pipes 30. Pins 40 are then inserted into recesses 40a and the former clamped in position to firmly hold supports 16 in their operating position. Thereupon the carriage 11 is placed on a truck 48 and wheeled to the door of tank 1. When carriage 11 is wheeled from truck 48 into tank 1 mechanical coupling 21, 23 engages, thus establishing a positive connection between hollow driving shaft 18 and manifold 17 and driven shaft 14, respectively. Wheeling of carriage 11 into tank 1 establishes also a substantially fluid-tight seal between hollow driving shaft 18 and manifold 17. Now the movable parts inside of tank 1 are mechanically coupled with the source of mechanical power outside of tank 1, and connected to the source, or the sources, of treating fluid outside of tank 1. Upon completion of all the operations which can be sequentially effected in tank 1, all fluid is being drained therefrom and then door 3 is opened and carriage 11 wheeled out upon truck 48. When carriage 11 is being wheeled out of tank 1 mechanical coupling 21, 23 is automatically disengaged, and the fluid seal which had been established between parts 17 and 18 is broken. The supports 16 with the treated textile materials thereon may then be removed from carriage 11, if desired.

It will be noted that the gear means for driving supports 16 include a system of sun and planet wheels, wheel 38 being a sun wheel and wheels 36 being planet wheels.

It is important to force the treating fluids admitted through pipes 32 to drum-shaped supports 16 through the textile materials wound thereon, and to preclude any treating fluid from by-passing the textile materials under treatment, and to escape through some other passage. How this can be achieved is shown in Figs. 4 and 5 illus-

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trating the structural details of drum-shaped support 16, which details have been omitted in Figs. 1 to 3 (these figures being only diagrammatic, as far as support 16 is concerned).

As shown in Figs. 4 and 5 support 16 is in effect a large spool which carries on the center portion thereof some textile materials 60, e. g. yarn, intended for treatment. The body of support 16 is formed by a perforated cylindrical sheet of metal and the perforations 16a thereof have been clearly shown in Fig. 5. It will be noted that yarn 60 is held in place between a pair of flanges 65 and that the surface of support 16 not occupied by yarn 60 is covered by sheets 61 wrapped around support 16 and held in position by means of straps 62. Plates 61 minimize the escape of treating fluid from points of the surface of drum 16 other than those covered by yarn 60. The coupling element on support 16 cooperating with coupling element 35 is situated on the right of Fig. 5 but cannot be seen because covered by plates 61.

Figs. 6 and 7 illustrate a knitting machine the details of which are not pertinent to the present invention except for the fact that it is adapted to receive identical supports 16 as the fluid treating apparatus illustrated in Figs. 1 to 3. Referring now to Figs. 6 and 7, it will be seen that the frame F of the knitting machine supports a rotatable coupling element 63. Element 63 is identical to element 35 shown in Fig. 3. Support 16 carries the yarn 60 wound thereon and is provided on one side thereof with coupling element 34 cooperating with coupling element 63. Recess 40a provided in the base of support 16 opposite to coupling element 34 is engaged by a pin or short length of shaft 40'. Pin 40' can be shifted manually from left to right—as seen in Fig. 7—to permit insertion of support 16 into frame F, whereupon pin 40' is shifted from right to left into recess 40a and clamped in position by appropriate clamping means (not shown). It will be apparent that the spacing of coupling element 35 from pin 40 (see Figs. 1 to 3) is the same as the spacing of coupling element 63 from pin 40' which is a requirement for the interchangeability of support 16.

While in accordance with the patent statutes, we have disclosed the specific details of one embodiment of this invention, it is to be understood that these details are merely illustrative and that variations in their precise form will not only be desirable but necessary in certain instances.

We claim the following:

1. In a treating apparatus for textile materials the combination of a tank defining a treating chamber, a stuffing box on said tank, a hollow driving shaft projecting through said stuffing box from the outside of said tank to the inside thereof, rails arranged inside of said tank, a carriage on wheels supported by said rails, a driven shaft mounted on said carriage, means for selectively coupling said driven shaft with said driving shaft and uncoupling said driven shaft from said driving shaft, a plurality of substantially drum-shaped supports for textile materials arranged with the longitudinal axes thereof parallel to said driven shaft and angularly displaced from each other, each of said plurality of supports comprising means for the passage of fluid from the inside to the outside thereof, said plurality of supports being mounted on said driven shaft in spaced relation therefrom for joint rotation therewith, means arranged outside of said tank for introducing fluid from the outside of said tank through said hollow shaft into said tank, a manifold fixedly mounted on said driven shaft supplied with fluid from said hollow driving shaft, a system of fluid distribution pipes connected to and supported by said manifold each extending radially outwardly from said driven shaft and each supplying fluid from said manifold to one of said plurality of supports, a plurality of gears each attached to one of said plurality of supports in coaxial relation thereto, and an internally toothed gear fixedly mounted on said carriage in coaxial relation

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to said driven shaft meshing with said plurality of gears to impart rotary motions to each of said plurality of supports about said longitudinal axis thereof.

2. In a treating apparatus for textile materials the combination of a tank defining a treating chamber, a stuffing box on said tank, a hollow driving shaft projecting through said stuffing box from the outside of said tank into said tank and providing a means for admitting fluid into said tank, a carriage arranged inside said tank, a plurality of supports for textile materials, each provided with means for receiving fluid and transmitting fluid to textile materials supported thereon, an additional rotatable shaft mounted on said carriage supporting said plurality of supports, a manifold arranged coaxially to and supported by said additional shaft and connected to said hollow shaft to receive fluid discharged therefrom, a plurality of rotatable fluid distribution pipes each extending from said manifold to one of said plurality of supports, a mechanical coupling for coupling said manifold selectively with said hollow driving shaft and for uncoupling said manifold from said hollow driving shaft, a substantially fluid-tight sealing means combined with said coupling for establishing selectively a substantially fluid-tight seal between said manifold and said hollow driving shaft and for breaking said seal, a plurality of gears each for rotating one of said plurality of supports, each of said plurality of gears being rotatably mounted on one of said plurality of fluid distribution pipes, a plurality of mechanical couplings for coupling each of said plurality of supports selectively with one of said plurality of gears and uncoupling each of said plurality of supports from one of said plurality of gears, a plurality of substantially fluid-tight sealing means each combined with one of said plurality of couplings for establishing selectively substantially fluid-tight seals between said plurality of fluid distribution pipes and said plurality of supports and for breaking said seals, and an internally toothed gear arranged in coaxial relation to said hollow driving shaft and to said additional shaft meshing with said plurality of gears to cause rotation of each of said plurality of supports about the axis of one of said plurality of gears.

3. In a treating apparatus for textile materials the combination of a tank defining a treating chamber, a stuffing box on said tank, a hollow driving shaft projecting through said stuffing box into said tank and connected to a source of treating fluid, a carriage arranged inside of said tank, a driven shaft mounted on said carriage in coaxial relation to said hollow driving shaft, a plurality of perforated substantially drum-shaped supports for textile materials arranged with the axes thereof parallel to said driven shaft and rotatably supported by said driven shaft at the end thereof remote from said hollow driving shaft, manifold means adapted to be supplied with fluid from said hollow driving shaft attached to said driven shaft at the end thereof adjacent said hollow driving shaft, a plurality of fluid distribution pipes each projecting radially outwardly from said manifold means and each having a portion remote from said manifold means arranged coaxially with respect to one of said plurality of supports, a mechanical coupling for coupling said manifold means selectively with said hollow driving shaft and uncoupling said manifold means from said hollow driving shaft, a substantially fluid-tight sealing means for establishing selectively a substantially fluid-tight seal between said manifold means and said hollow driving shaft and for breaking said seal, a plurality of gears each rotatably mounted on one of said plurality of distribution pipes at said portion thereof arranged coaxially with respect to one of said plurality of supports, a plurality of mechanical couplings for coupling each of said plurality of supports selectively with one of said plurality of gears and for uncoupling each of said plurality of supports from one of said plurality of gears, a plurality of substantially fluid-tight sealing means for establishing selec-

tively substantially fluid-tight seals between said plurality of fluid distribution pipes and said plurality of supports and for breaking said seals, and an internally toothed gear fixedly mounted on said carriage in coaxial relation to said hollow driving shaft and to said driven shaft meshing with said plurality of gears to rotate each of said plurality of supports about the longitudinal axis thereof.

4. In a treating apparatus for textile materials the combination of a substantially cylindrical tank extending substantially horizontally defining a treating chamber, a hollow driving shaft projecting through said tank into the inside thereof and adapted to admit treating fluid into said tank, a carriage on wheels inside of said tank, a plurality of substantially cylindrical perforated supports for textile materials rotatably supported by said carriage inside of said tank and arranged with the axes thereof parallel to said hollow driving shaft, a system of wheels comprising a sun wheel and planet wheels arranged on said carriage, said sun wheel being fixedly mounted on said carriage in coaxial relation to said hollow driving shaft and each of said planet wheels being arranged in coaxial relation to one of said plurality of supports and adapted to be coupled with one of said plurality of supports, means on said hollow driving shaft for driving said sun wheel, and a plurality of hollow shafts each supporting one of said planet wheels, each of said plurality of hollow shafts being connected to said hollow driving shaft to form a passage for delivering fluid from said hollow driving shaft into each of said plurality of supports.

5. In a treating apparatus for textile materials the combination of a substantially cylindrical tank having a lateral surface and front and rear surfaces, said tank extending substantially horizontally and defining a treating chamber, a stuffing box on one of said surfaces, a hollow driving shaft projecting through said stuffing box into said tank and providing a means for admitting fluid into said tank, the other of said surfaces being in the form of a door adapted to open and to close said tank, a carriage on wheels adapted to be moved through said door into said tank and out of said tank, a driven shaft mounted on said carriage in coaxial relation to said hollow driving shaft, a plurality of substantially drum-shaped perforated supports for textile materials arranged with the axes thereof parallel to said driven shaft, means on one end of said driven shaft remote from said hollow driving shaft for rotatably supporting said plurality of supports, manifold means adapted to be supplied with fluid from said hollow driving shaft arranged between adjacent ends of said hollow driving shaft and said driven shaft and forming an integral part of said driven shaft, a plurality of fluid distribution pipes each projecting from said manifold means and each comprising a portion remote from said manifold means arranged coaxially with respect to one of said supports, mechanical coupling means coupling said manifold means to said hollow driving shaft upon wheeling of said carriage into said tank and uncoupling said manifold means from said hollow driving shaft upon wheeling of said carriage out of said tank, substantially fluid-tight sealing means for establishing selectively a substantially fluid-tight seal between said hollow driving shaft and said manifold means upon wheeling of said carriage into said tank and breaking said seal

upon wheeling said carriage out of said tank, a plurality of gears each rotatably mounted on one of said plurality of distribution pipes at said portion thereof arranged coaxially with respect to one of said plurality of supports, a plurality of mechanical coupling means for coupling each of said plurality of supports selectively with one of said plurality of gears and uncoupling each of said plurality of supports from said one of said plurality of gears by relative movement in a direction longitudinally of said driven shaft, a plurality of substantially fluid-tight sealing means for establishing selectively substantially fluid-tight seals between said plurality of fluid distribution pipes and said plurality of supports and for breaking said seals by relative movement in a direction longitudinally of said driven shaft, and an internally toothed gear fixedly mounted on said carriage in coaxial relation to said hollow driving shaft and to said driven shaft meshing with said plurality of gears to impart to each of said plurality of supports a rotary motion about the longitudinal axis thereof.

6. In a treating apparatus for textile materials the combination of a tank having a lateral surface and front and rear surfaces and defining a substantially cylindrical treating chamber, a stuffing box in one of said surfaces, a hollow driving shaft projecting through said stuffing box into said tank, the other of said surfaces being in the form of a door adapted to open and to close said tank, a carriage adapted to be moved through said door into said tank and out of said tank, a driven shaft mounted on said carriage, means to drive said driven shaft by said driving shaft, a perforated substantially drum-shaped support for textile materials arranged in spaced relation from said driven shaft, means on said driven shaft for mounting said support thereon for joint rotation therewith, manifold means forming an integral part of said driven shaft and adapted to be supplied with fluid through said hollow driving shaft, a distribution pipe projecting from said manifold means and comprising a portion remote from said manifold means arranged parallel to said driven shaft, an extension on said portion of said distribution pipe projecting inside said support, mechanical coupling means operative upon moving said carriage into said tank to couple said hollow driving shaft to said driven shaft, annular fluid-seal means operative upon moving of said carriage into said tank to establish a substantially fluid-tight connection between said hollow driving shaft and said manifold means, an externally toothed gear rotatably mounted on said portion of said distribution pipe arranged parallel to said driven shaft, means for coupling said support to said gear, and an internally toothed gear fixedly mounted inside of said tank in coaxial relation to said driven shaft meshing with said externally toothed gear.

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