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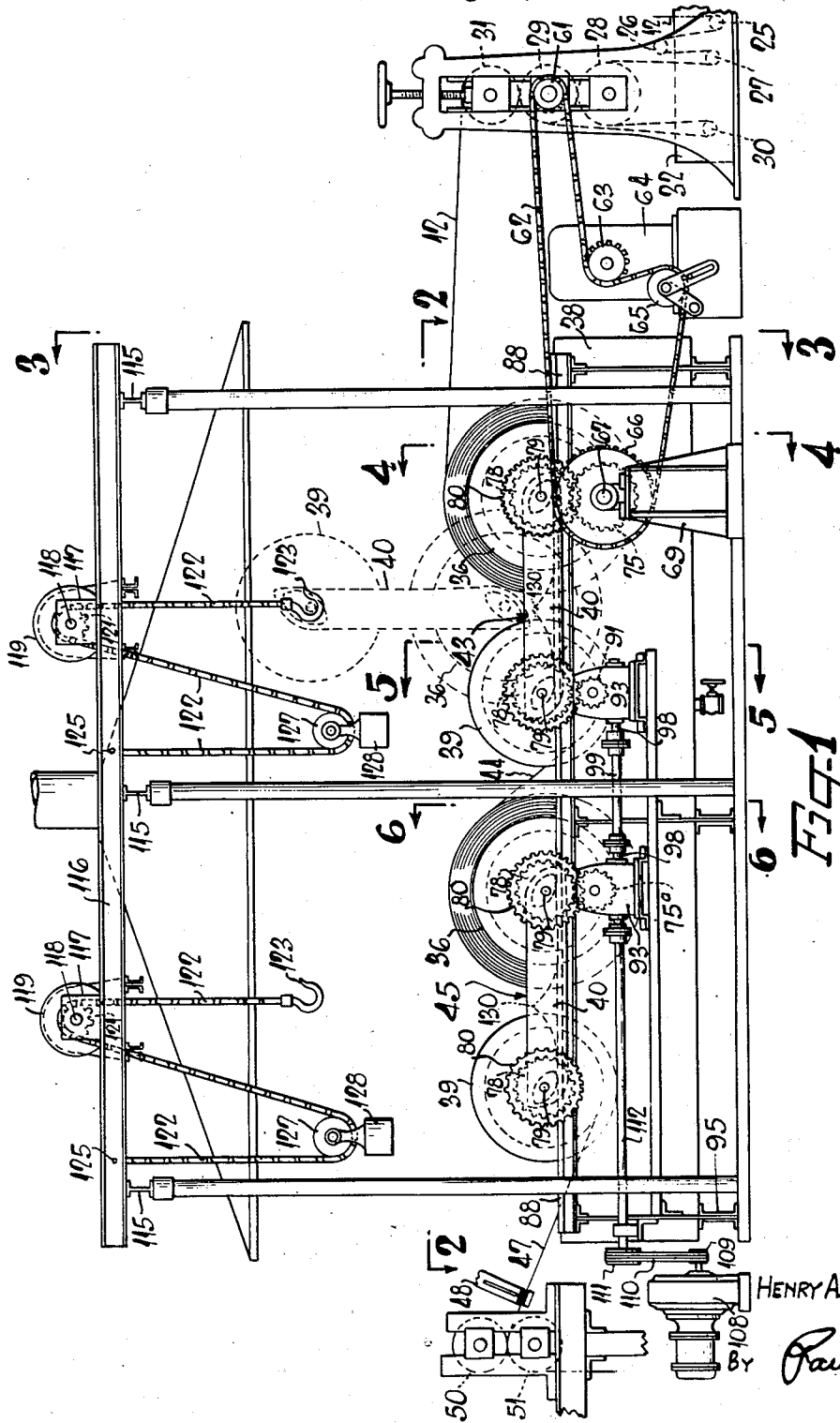
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2,217,534

MEANS FOR TREATING CLOTH

Filed Aug. 29, 1939

6 Sheets-Sheet 1



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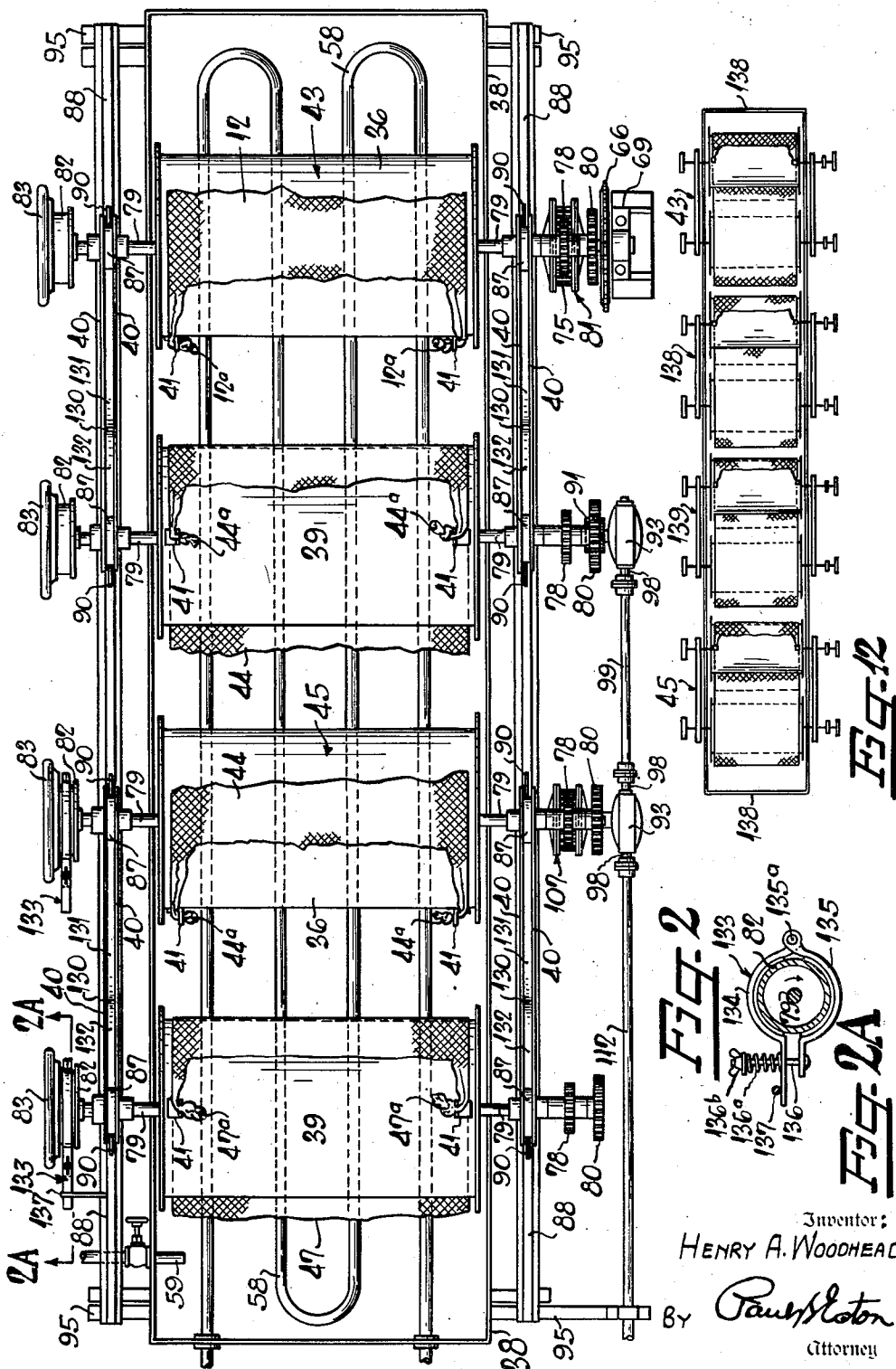
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Filed Aug. 29, 1939

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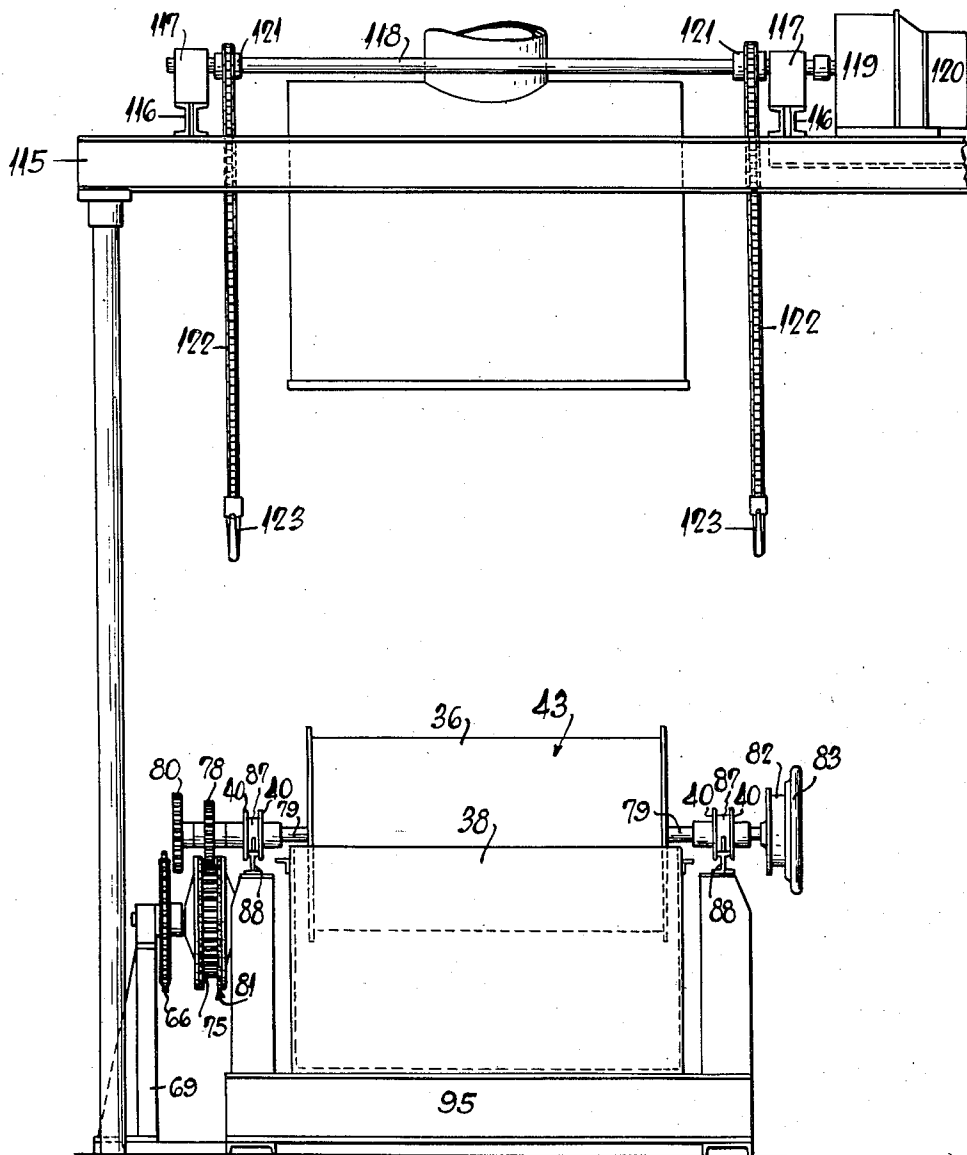


Fig. 3

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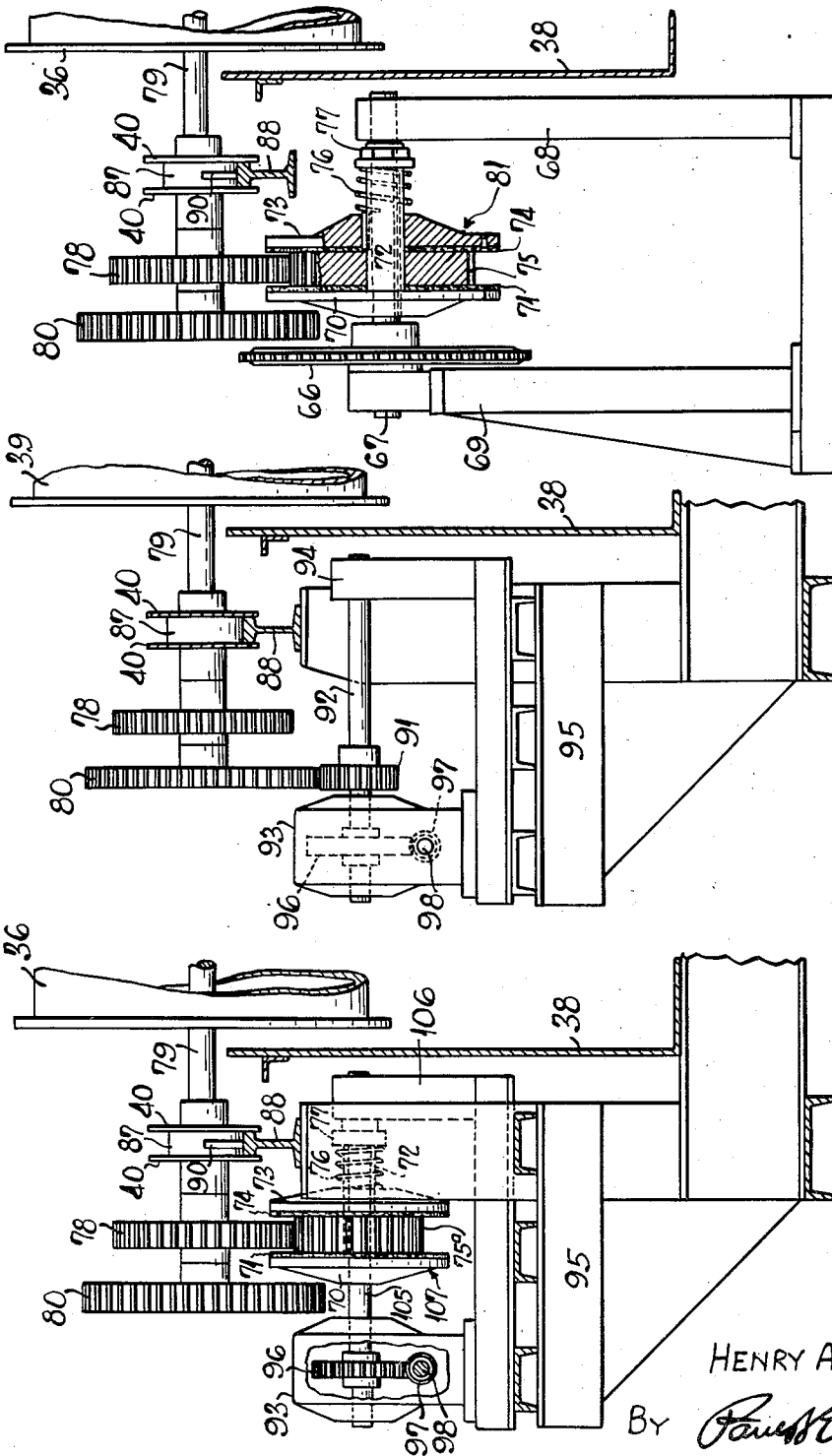


FIG. 4

FIG. 5

FIG. 6

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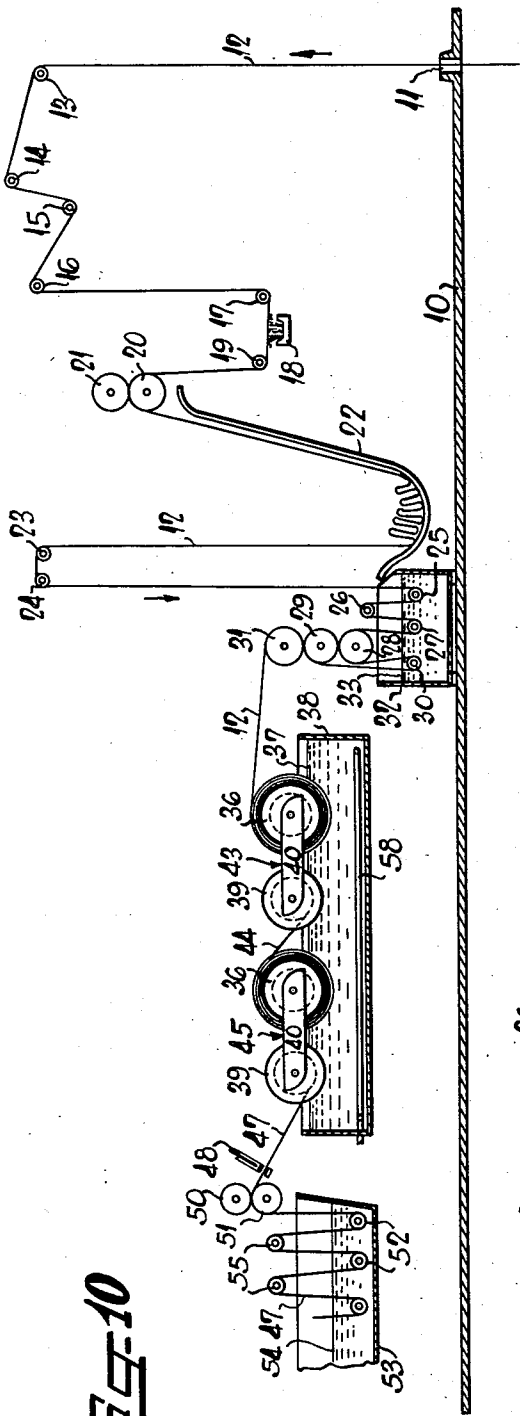
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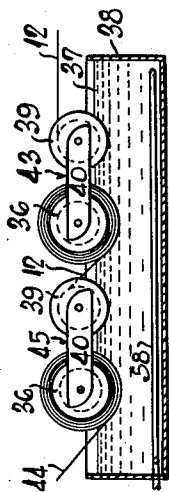
MEANS FOR TREATING CLOTH

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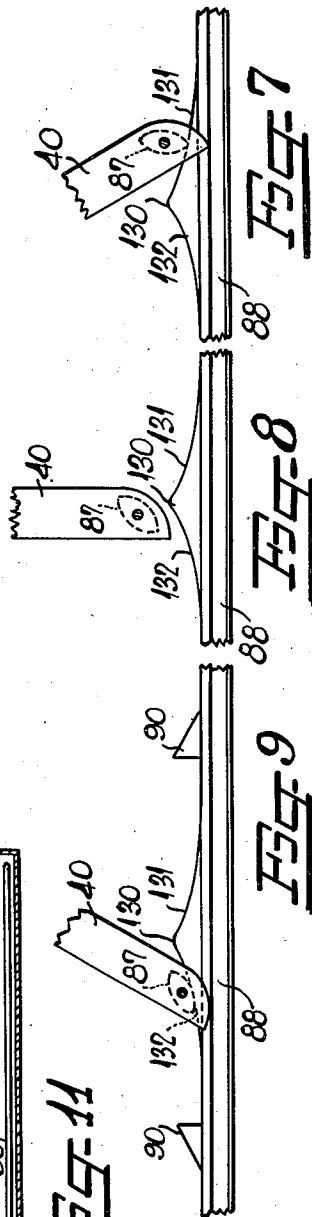
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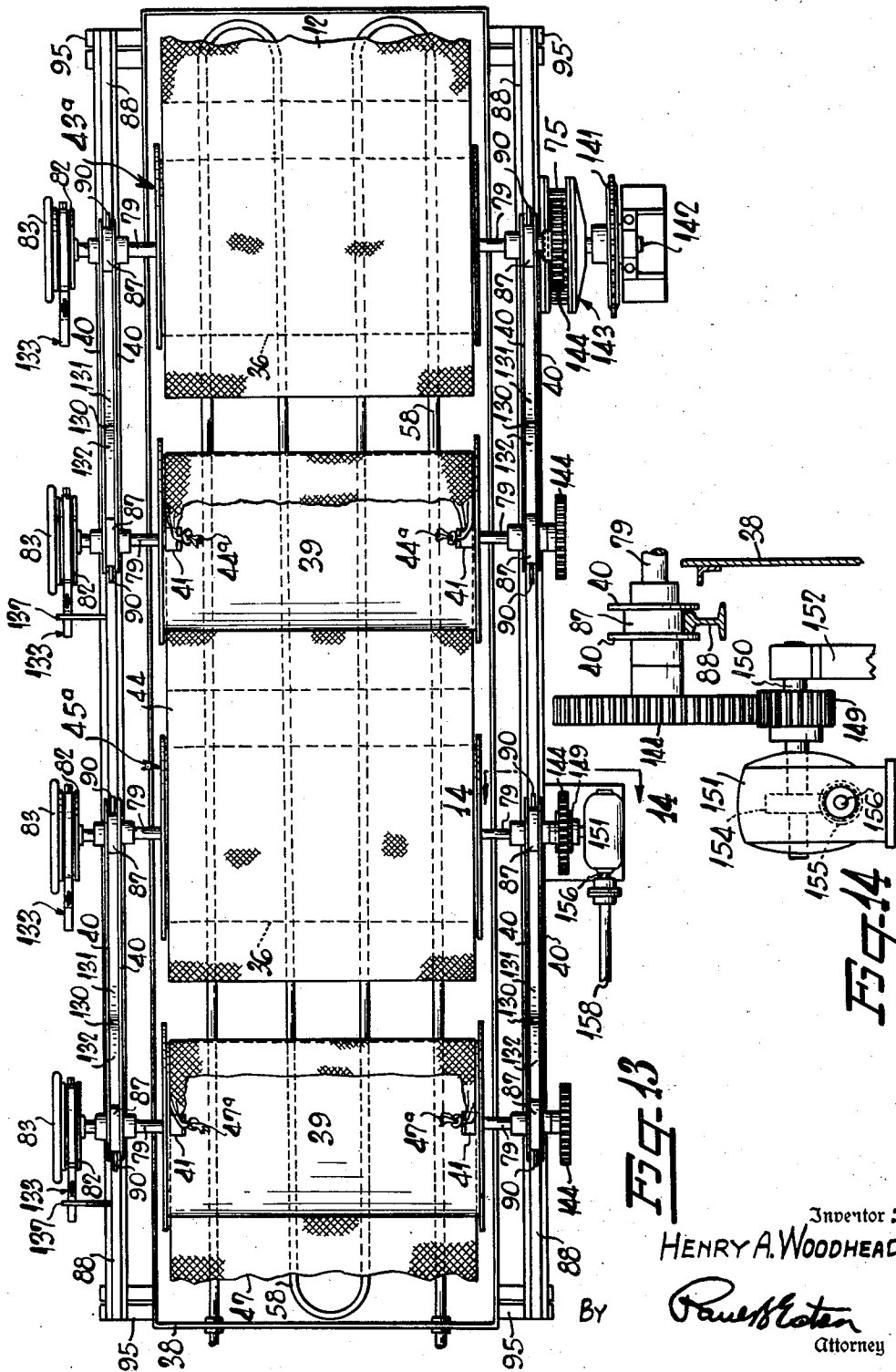
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MEANS FOR TREATING CLOTH

Filed Aug. 29, 1939

6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

2,217,534

MEANS FOR TREATING CLOTH

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Application August 29, 1939, Serial No. 292,392

13 Claims. (Cl. 68—175)

This invention relates to cloth treating and more especially to a method and means for subjecting cloth or other sheet material to the action of certain fluids while in an open width.

Although the present apparatus is capable of being employed in many different capacities, such as dyeing, bleaching and the like, it will be described in the following specification in connection with what is known as the "boil off" stage in the treatment of cloth. During this stage, the cloth is conditioned for bleaching and dyeing, these steps being performed in subsequent operations. In the preparation of these goods in open width there are several essential requirements, among which are that the goods be exposed to the treating fluid for a sufficient length of time, while in an open width, and that the goods undergoing such treatment, shall be free from wrinkles and creases. Heretofore, kiers have been employed for boiling off cloth not in open width. This is objectionable in that creases and wrinkles in the cloth, while being treated, cause uneven treatment. Jigs have also been employed for treating cloth in open width, but this method is slow and cumbersome.

In the jig process the cloth was unwound from one roll and drawn through a suitable solution and wound again upon another roll. Upon the second roll becoming filled, the direction of the cloth was reversed through the fluid and again wound upon the first roll. This operation was repeated until the cloth was sufficiently treated with the solution. The defect in this type of cloth treating apparatus is obvious since it is impossible to carry on a continuous process due to the fact that when the cloth had been sufficiently treated the rolls had to be removed and other rolls inserted in their place.

The treatment of kiers has been objectionable due to the fact that it is impossible to carry on a continuous process. Also since it is necessary to treat the cloth in rope form, the cloth at the crease lines is subjected to more pressure than at other points, resulting in the uneven absorption of dye in subsequent processes. These crease lines are hard to remove in subsequent operations. The marks due to the excess treatment of fluids at certain points in the cloth often remain despite the fact that the crease may be entirely removed. Therefore, it might be generally stated that the means and methods used heretofore were seriously limited in capacity; they did not perform a continuous operation and an unusually large amount of floor space was occupied.

It is, therefore, an object of this invention to

provide an apparatus and method which will overcome the above mentioned difficulties heretofore encountered. The present apparatus is designed to treat material more rapidly and thoroughly. Also due to its construction, a minimum amount of labor, power and floor space is necessary, with the added advantage of having a practically continuous operation in treating of cloth.

It is another object of this invention to provide an apparatus for subjecting sheet material to fluids comprising a tank with a plurality of parallel pairs of rolls disposed thereover and having a portion of their peripheries normally immersed in the fluid, means for winding a sheet material on the front roll of the first pair while another sheet is being unwound from the adjacent rear roll of the first pair onto the front roll of the second pair and means for exchanging positions of the back and front rolls of each pair when the front roll becomes full and the rear roll becomes empty.

It is a further object of the invention to provide in a cloth treating apparatus, a plurality of sets of two rolls in each set, with means for positively controlling the unwinding of the cloth from one of each set of rolls and for frictionally driving the roll onto which the cloth is being wound.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

Figure 1 is a side elevation of the improved cloth treating apparatus;

Figure 2 is a plan view taken along the line 2—2 in Figure 1;

Figure 2a is a view taken along line 2a—2a in Figure 2;

Figure 3 is an end elevation taken along the line 3—3 in Figure 1;

Figure 4 is a vertical sectional view taken along the line 4—4 in Figure 1, showing the reel-on beam or roll connection;

Figure 5 is a vertical sectional view taken along the line 5—5 in Figure 1 showing the reel-off beam or roll connection;

Figure 6 is a vertical sectional view taken along the line 6—6 in Figure 1, showing another reel-on beam or roll connection;

Figure 7 is a detail view of one end of a roll or beam supporting bar showing it in a position shortly after the exchanging of the positions of the front and rear rolls has begun;

Figure 8 is a view similar to Figure 7 but showing the bar in a farther advanced position;

Figure 9 is a view similar to Figures 7 and 8 but showing the bar in a still farther advanced position;

Figure 10 is a schematic view showing various operations through which the cloth is subjected during the boiling off stage;

Figure 11 is a view similar to the central portion of Figure 10, but showing the beams in an exchanged position;

Figure 12 is a schematic view showing the beam layout when several pairs of beams are employed;

Figure 13 is a plan view similar to Figure 2 but showing a slightly modified form of the invention;

Figure 14 is a vertical sectional view taken along the line 14—14 in Figure 13.

Referring more specifically to the drawings, the numeral 10 denotes the floor of a mill building having an opening 11 therein, (Figure 10). Below the floor 10 is usually disposed a grey room in which cloth 12 is stored in bolts which are sewed together at their ends for forming a continuous length and from these bolts the cloth is drawn upwardly through the opening 11 in open width over suitable sky rolls 13, tension rolls 14 and 15, and another sky roll 16. From the sky roll 16 the cloth 12 is passed downwardly in open width beneath roll 17 and then horizontally over a singeing apparatus 18 and beneath another roll 19. Burners may be provided whereby this singeing apparatus may singe one side or both sides of the cloth, as desired. The cloth then travels upwardly between nip rolls 20 and 21 after which, it is allowed to fall downwardly into scray 22. In the scray, the cloth is allowed to accumulate in substantial quantities so that the subsequent mechanism will not have to be exactly timed with the mechanism just described. In other words, the subsequent machinery can run slightly faster or slower than the machinery just described or the subsequent mechanism can be stopped for a short period of time and then started again without disturbing the parts enumerated by the reference characters 11 to 22 inclusive.

The cloth 12 is adapted to be drawn upwardly from the scray over sky rolls 23 and 24 from whence it passes downwardly under a roll 25 then upwardly over a roll 26, again downwardly beneath a roll 27 and then upwardly between pad rolls 28 and 29. The rolls 25, 27, and 30 are immersed in a chemical bath in a vat 32 where it is treated with a liquid bath 33 of chemicals or dyestuffs or any other desired substances. The cloth after leaving pad rolls 28 and 29, passes downwardly beneath a roll 30 and then upwardly between the upper side of the roll 29 and below a roll 31. The rolls 25 to 31, cooperating with vat 32 furnish the necessary chemicals to the cloth and impregnate the water in vat 58 with the desired chemicals. The rolls 25 to 31 thoroughly impregnate the cloth with the chemicals in vat 32 and give a regulated amount of the chemicals in the cloth. Each time a set of rolls in the units in vat 58 are exchanged, a measured amount of water is admitted to vat 58 through pipe 59.

From the top of the pad roll 31 the cloth 12 is wound onto a beam or roll 36, said beam having its lower periphery partially immersed in a solution 37 of vat 38. Beam 36 is connected to another beam 39 by means of suitable longitudinal bars 40. The beams 36 and 39 comprise unit 43. It will be noted by observing Figure 2 that the beams 36 and 39 have suitable lug angles 41

welded to the periphery thereof. The upstanding leg of each of these angles has a suitable notch therein into which an end of the cloth 12 is placed and a suitable knot 12a is tied in the cloth at a point beyond the angle so that any tension applied to the cloth will be exerted upon the knot and the knot in turn will be pulled against the side of the upstanding leg of the angle 41. Simultaneously with the winding of the cloth 12 upon the beam 36 of the first unit 43 a second layer or sheet of cloth 44 is being unwound from the rear beam 39 of unit 43 upon the forward beam 36 of a second unit 45. The units 43 and 45 are identical and like reference characters will apply to like parts. The manner in which the ends of the layer of cloth 44 are connected to the beams 39 and 36 is identical to that method of securing the end of layer 12 to the beam 36 of the first unit 43. Also at the same time, the cloth is being wound upon the forward roll 36 of unit 45, a third sheet of cloth 47 is being unwound from the rear roll 39 of unit 45 from whence it passes into a washing mechanism. It is evident that as many pairs as desired could be used in carrying out this process. Figure 12 schematically shows an arrangement where several additional pairs of rolls are employed. Of course, the addition of each pair would necessitate an additional length of cloth and the number of pairs used would be determined primarily by the length of time it is desired to keep the cloth in the solution and the production desired by the machine. When the cloth passes from the rear roll 39 of unit 45 and out of the vat or tank 38, it is then necessary to sew the various lengths together to again make the cloth into a continuous sheet. This sewing process is carried out by a sewing apparatus which is schematically shown and designated by the reference character 48 in Figures 1 and 10. After sewing the ends of layers of cloth together, the cloth then passes beneath nip rolls 50 and 51, thence downwardly beneath rolls 52 to wash box 53. This box contains a suitable solution 54 for washing the cloth after it has been treated with a solution 37 in vat 38. The cloth then passes upwardly over a roll 55 and then downwardly into the solution 54 beneath another roll 52. This zig-zag course of the cloth is repeated until it has been washed a sufficient amount.

The cloth 12 enters the vat 38 and is wound onto the forward roll or beam 36 of unit 43. When it has built up a predetermined amount upon this forward roll or beam 36, the cloth is then severed adjacent the roll. The winding of the beams is so arranged that when this beam 36 of the first unit 43 has become full, the rear beam 39 of the same unit will have become empty. Also, when the beam 39 of unit 43 becomes empty, the forward beam 36 of the second unit 45 will become full and the rear beam 39 of the second unit 45 will have become empty. Upon the severing of the cloth 12 and upon the release of the trailing ends of the layers of cloth 44 and 47 from the rear beam 39 of the first unit 43, and the rear beam 39 of unit 45, respectively, the units 43 and 45 will be capsized, that is, the beams 39 and 36 will exchange positions, so that an empty beam will be in a forward position for the layer of cloth 12 to be wound thereon and the full beams will be positioned in rearmost positions ready to be unwound.

Figure 11 shows the units in a capsized position, that is, it shows the beams 39 and 36 with their positions reversed. It is here seen that the

cloth 12 is being wound from a full beam 36 of the first unit 43 onto an empty adjacent beam 39 of the second pair 45. Also the cloth from the trailing beam 36 of the second unit 45 is being unwound from whence it will pass between the nip rolls 50 and 51. By providing a process of this type, the winding and treating of cloth is practically a continuous operation. It is only necessary to stop the machine a few moments so that the trailing ends of the layers of cloth may be transferred to adjacent beams and so that the units may be capsized so that the full and empty beams will occupy the proper positions for winding and unwinding.

In the treating of cloth, a suitable solution is used in the vat 38, the chemicals for said solution being supplied by vat 32 as heretofore explained, and it is necessary to employ a suitable heating means such as a coiled pipe 58 in the bottom of the vat. Also in order to dilute the solution 37 in the vat from time to time a suitable water pipe 59 is provided (Figure 2). It is well known that the cloth prior to passing through the vat 38 has been subjected to a much more concentrated solution than is normally used in the vat; consequently, as the cloth passes through this vat during a treating process, the solution 37 becomes more concentrated, and therefore it is necessary to introduce a solution such as water to dilute the same from time to time.

Especial attention is called to the arrangement of the rolls within the vat 38. It will be noted that either in the position shown in Figure 10 or in capsized position as shown in Figure 11, the rolls are very close together; consequently, the rolls from which the cloth is reeled will at all times be close to the beam upon which the cloth is placed. This will necessitate only a very short length of cloth between the beams, thereby affording very little chance for wrinkles to be created in the cloth while passing from one roll to the other.

It is a well known fact that the greater the distance the cloth is drawn in an unsupported manner, the greater the likelihood for creases to occur in the cloth, and therefore when it is wound upon a beam the cloth at the crease line will be bruised or distorted more than the other portions of the cloth. Also by having a short length of cloth between the beams, it is possible to wind the cloth on another beam in a manner so that the ends of the wound cloth roll will be comparatively smooth and even.

The following paragraphs will be devoted to the driving mechanism for the beams in the units designated by the reference characters 43 and 45. By observing Figure 1 it will be noted that a sprocket 61 is provided on the end of roller 29. Upon this sprocket, a chain 62 is mounted, which chain also passes over motor sprocket 63 of motor 64. The sprocket chain 62 passes beneath a tightener pulley 65 and around another sprocket 66 (see Figure 4). The sprocket 66 is fixedly secured around a shaft 67, said shaft having its ends journaled in suitable bearings in the upper ends of supports 68 and 69. The intermediate portion of the shaft 67 has a disk 70 keyed thereon and this disk has a friction lining 71 secured to one face thereof. Also a sleeve 72 is integral with the disk 70 and this sleeve is likewise keyed to the shaft. Slidably keyed upon the sleeve 72 is a second disk 73 which has a friction lining 74 secured to its inner face. This disk 73 is normally pressed against a gear 75 which is disposed beneath the linings 71 and 74 by means of a com-

pression spring 76, said spring being confined upon the sleeve by means of a nut 77. The gear 75 is adapted to mesh with another gear 78 on beam shaft 79. The beam shaft 79 has beam 36 of unit 43 secured to its intermediate portion and the end of this shaft 79 also has a larger gear 80 fixedly secured thereon. The clutch assembly, formed by the parts 70 to 77 inclusive is broadly designated by reference character 81. The sprocket 66 is driven from the motor 64 and the beam 36, in turn, is driven through the slip clutch 81. Whenever excessive resistance is offered to turning of the beam 36, the gear 75 will slip between the clutch linings 74 to thereby allow the sprocket 66 to be driven at a constant speed and the beam 36 to be driven at a variable speed. It is evident that as the size of the beam 36 of unit 43 builds up (see Figure 1), that the beam 36 will gradually rotate slower; consequently, a slippage must take place between the constantly driven motor 64 and this variable speed beam 36. It is to be noted that rolls 28, 29 and 31 are driven in timed relation to the roll 36 in unit 43; hence the proper amount of chemicals will always be applied to the cloth.

Especial attention is called to the fact that the shafts 78 of each of the rolls 36 and 39 of each unit has the gears 80 and 79 thereon. The rolls, when in right hand position in Figure 1, are driven by gear 78 engaging the gear 75a of the slip clutch mechanism. When the units are capsized the said rolls are driven by their gears 80 engaging gears 91, thus imparting to the rolls a positive drive. At the same time, the other rolls of each unit are driven by their gears 78 engaging the gear 75a of the slip clutch mechanism. This gives a positive drive to the let-off rolls and a friction drive to the take-up rolls.

The end of the shaft 79, remote from the end upon which the gears 78 and 80 are mounted, has a friction drum 82 and a hand wheel 83 mounted therein, the function of which will be presently described, however, it might be stated that the friction drum 82 is only used in case the unit 43 is transferred to the position now occupied by unit 45.

At a point adjacent each of the heads of the beam 36 and 39, the shaft 79 is rotatably mounted in an oval shaped block 87 (Figures 1, 4, 5, and 6). This block 87 is secured to bars 40, said bars being penetrated by shaft 79. The oval shaped members 87 normally rest upon rails 88 which are mounted with their top surfaces substantially at the same elevation as the top edge of the vat 38. When the beams 36 and 39 are in normal position the lower edges of bars 40 are adapted to be disposed upon each side of the upper portion of the rails 88, thereby affording a guiding means to insure that the beams 36 and 39 will remain on the rails. The top of the rails 88 have suitable spaced stops 90 secured thereto, which are adapted to fit against the remote ends of oval members 87 to thereby hold the units 43 and 45 in their proper positions lengthwise upon the rails.

The trailing beam 39 of unit 43 (Figures 1 and 2) is positively driven by a separate source of power. Figure 5 shows a detailed view of the gearing arrangement and the position of parts at this point. It is here seen that the larger gear 80 on shaft 79 is adapted to mesh with a pinion 91, said pinion being fixedly secured upon a shaft 92 and this shaft has its ends rotatably mounted in housing 93 and upstanding bearing 94. The last named parts are adapted to be supported by a suitable framework 95.

This framework 95 also supports the vat 38 as well as other parts to be hereinafter described.

Also mounted upon the shaft 92 and within the housing 93 is a worm gear 96 which meshes with a suitable worm 97 on longitudinally disposed shaft 98. The shaft 98 extends from the housing and is coupled to an intermediate shaft 99, the other end of which is coupled to another shaft 98 in another housing 93. The parts associated with the second housing are identical to that which has been previously described and hence like reference characters will apply. The details of the last-named housing, however, are fully shown in Figures 1 and 6. The mechanism 15 shown in Figure 6 is adapted to drive the forward beam 36 of the unit 45.

It should be kept in mind that the forward beam 36 of the unit 45 in Figure 1 is driven at a variable rate to unwind layer of cloth 44 from the rear beam 39 of unit 43. However, when the units have been capsized, then the beam 39 of unit 45 will be driven to draw the cloth from the beam 36 of the unit 43 as shown in Figure 11.

Again referring to Figure 6, it is seen that the worm gear 96 within the housing 93 is fixedly secured upon a shaft 105, said shaft having its ends rotatably mounted in housing 93 and in an upstanding bracket 106. The shaft 105 has a suitable slip clutch mechanism which is broadly designated by the reference character 107. The parts in this slip clutch mechanism are identical to the parts shown in the slip clutch mechanism 81 (Figure 4) and operate to drive the forward beam in unit 45 at a variable rate. Therefore, like reference characters will apply to like parts and another description will not be made. It might be stated, however, that as the forward beam of the unit 45 rotates, the periphery builds up and consequently its R. P. M. must gradually decrease, because the beam 39 of the unit 43, from which the cloth 44 is wound, is driven at a constant speed through the mechanism previously described in connection with Figure 5.

The mechanism incorporated in the last-named housing 93 (Figure 6) serves to drive the foremost beam of unit 45 at a variable rate of speed through the slip clutch arrangement 107; whereas the mechanism in the first-named housing (Figure 5) serves to positively drive the rear-most let-off beam of unit 43 at a constant rate. The rear beam of unit 43 and the foremost beam of unit 45 are driven by a suitable motor 108, said motor having a pulley 109 upon which is mounted a belt 110, this belt being also mounted upon another pulley 111 on the end of shaft 112. The shaft 112 is coupled with the shaft 98 which extends from the adjacent housing 93.

Especial attention is called to the fact that the trailing let-off beam of unit 43 is driven at a constant rate and the forward take-up beam of the unit 45 is driven at a variable speed. Since the slip clutch arrangement 107 is interposed between the housing 93 and the forward take-up beam of the unit 45, this beam will cease to turn when a predetermined resistance has been offered by the intermediate layer of cloth 44. At the beginning of the winding from the let-off beam of unit 43 onto the forward take-up beam of unit 45, the let-off beam is filled and the forward beam is empty; consequently, there is a greater tension upon the intermediate layer of cloth during the initial convolution or winds upon the take up beam of unit 45 than it is as the diameter increases. The speed of the take up roll of the rear unit is about five per cent faster

than the speed of the positively driven let-off roll of the foremost unit when winding begins. This will cause the beam of cloth to be more compact near the center of the beam than it is as the diameter increases, thereby creating a very much desired result because there will be very little tendency for the initial convolutions to slip longitudinally of the beam when it is wound in this manner.

As heretofore stated, it is necessary to capsize the units and exchange positions of the beams of each unit when the forward beams become filled and the rear beams become empty. The lifting mechanism for performing this function is clearly shown in Figures 1 and 3. A framework 115 is provided upon which is mounted longitudinally disposed channel members 116. These channel members support bearings 117 in which are journaled the ends of a suitable shaft 118. The shaft 118 is driven by a conventional reversible motor 119 with a brake 120 therein. The motor may be operated by a reversing switch if desired. Fixedly secured to the shaft 118 and between the bearings 117 are sprockets 121. Upon these sprockets 121 chains 122 are mounted and the lower end of each of the chains has a hook 123 secured thereto. The other ends of the sprocket chains 122 are anchored as at 125 to the channel members 116.

A suitable tightening device comprising a pulley 127 and a weight 128 is mounted upon each chain 122 at a point between the sprocket 121 and the anchoring point 125. This tightening mechanism normally holds the chain upon the sprocket 121 at all times. When the forward beam of unit 43, for example, has become filled and the rear beam has become empty substantially as shown in Figure 1, then the hooks 123 are lowered to a point where they can engage the shaft 79 at a point adjacent the heads of the rear empty beam. It is preferable for these hooks to be secured to the empty rearmost beam so that the empty beam will be uppermost and a minimum amount of weight will have to be lifted. After these hooks are placed in position, the motor 119 is placed in operation and the unit 43 is lifted, first to the position shown in Figure 7 and then to the position shown in Figure 8, which corresponds to dotted line position shown in Figure 1. It should be noted that a cam 130 is positioned on rails 88 at a point substantially midway between the beams of each unit, said cams having concave upper surfaces 131 and 132. As the motor lifts the light end of the unit the oval members 87 on the heavy end of the unit will drag first upon the concave surfaces 131 in the manner shown in Figure 7 until the unit assumes substantially an upright position as shown in Figure 8. The motor 119 is then reversed to lower the unit and at this time the oval shaped members 87 will slide downwardly upon the upper side of concave surface 132 and upon further lowering the unit will assume the position as shown in Figures 9 and 11. After the units have been capsized, it is then necessary to connect the trailing ends of the filled beam to the adjacent empty take-up beam and proceed with the winding operation as before. When the units have been capsized, the forward beam of each unit will be driven at a variable rate of speed, whereas the trailing beam of the forward unit will be let off at a positive rate of speed.

The trailing beam of the unit 45 has a friction device 133 mounted over its associated drum 82 (Figures 2 and 2a). This device comprises 75

a pair of brake shoes 134 and 135 pivoted together as at 135a. The free ends of the shoes are penetrated by a bolt 136, said bolt having a compression spring 136a mounted therearound and being disposed adjacent the free end of shoe 134. In order to vary the amount of compression in this spring, and thereby vary the friction between the shoes and the drum 82, a wing nut 136b is threadably secured on bolt 136. A pin 137 extends from rail 88 into the path of the free end of brake shoe 134 so that when the trailing beam of unit 45 begins to rotate the brake shoes will be held stationary. This friction device is only used on the trailing beam of unit 45; however, a similar device is shown in the forward beam of this same unit so that when the unit is flipped, a friction device will be in the proper position for restraining the let-off of the cloth.

The friction device 133 is omitted from the drums 82 of the foremost unit 43 because it is only when a unit is operating where the unit 45 is shown that it is necessary to have these devices. Neither is it necessary to have friction drums 82 in connection with the forward unit 43, but in order to make units 43 and 45 interchangeable, these drums are provided. In case the units were interchanged it would be necessary to add friction devices to their drums 82.

Figure 12 is a schematic view showing a very much larger vat and a greater number of beam units for carrying out the same process. This showing is made merely to illustrate, that the length of the vat and the number of the beam units may vary to suit a particular condition. The driving mechanism, the principle employed in capsizing and reversing the beam units, end for end as well as for positively driving the let-off beam of one unit and driving the reel-on beam of another unit at a variable rate, is essentially the same as in the preceding form. In this form a vat 138 is shown with the units 43 and 45 disposed at each end thereof. Additional units 139 and 140 are disposed between the units 43 and 45. Cloth is wound successively from one unit on to the adjacent unit until it progresses the entire length of the vat.

Figures 13 and 14 show a slightly modified form of the invention in which like reference characters will apply to like parts, but a description will be made of the parts differing from that of the form shown in Figures 1 to 11 inclusive.

In this form of the invention, the units 43a and 45a are provided. The leading unit 43a is driven from the motor 64 by way of sprocket 141, said sprocket being fixedly secured upon a shaft 142. This shaft has a slip clutch 143 secured therein, the details of which are identical in all respects to the slip clutch arrangements 81 and 107, which are shown and described in connection with the preceding form and which are shown in Figures 4 and 6. The slip clutch arrangement 143 has an intermediate gear 75 meshing with a gear 144 on the end of shaft 79 of the unit 43a. The trailing beam of the unit 43 is identical to that of the forward beam and the gear 144 on its corresponding shaft 79 remains inactive while it is in rearmost position. However, when it is capsized, it will mesh with the gear 75 of the slip clutch arrangement 143. Bars 40 are used to connect the foremost and rearmost beams of the units 43a and 45a. Each of the beams of the units 43a and 45a are adapted to have a friction device 133 associated therewith; however, the friction device must be adjacent a stop pin 137

before it will retard the rotation of the beam. Pins 137 are disposed adjacent the rearmost beams of each unit.

The foremost beam in the unit 45a is identical to the other beams and its gear 144 is adapted to mesh with a pinion 149 therebelow. The pinion 149 is fixedly secured upon a shaft 150, said shaft having its ends rotatably mounted in housing 151 and upright 152. The shaft 150 also has mounted thereon and within housing 151 is a suitable worm gear 154 and this worm gear meshes with a worm 155 which is disposed upon a shaft 156. The shaft 156 extends to the exterior of the housing as shown in Figure 13 and is shown coupled to a shaft 158 which furnishes the driving power for rotating the take-up beam on the unit 45a. In this form of the invention, the foremost take-up beam of the rear unit 45a is positively driven, whereas the let-off beam of the forward unit 43a is caused to rotate to correspond with the surface speed of the pick-up beam through the connecting layer of cloth 44. The method of securing the ends of the fabric to the beam is identical to that shown in the preceding case. The rearmost beam of the rear unit 45a has a friction let-off similar in all respects to the friction let-off used in conjunction with the rearmost beam of unit 43a which has just been described.

While in many instances, it is desirable to use an arrangement of this sort for carrying out a continuous cloth treating process, it is not considered as the preferred form of the invention simply because the friction applied to the let-off beam remains constant throughout the unwinding of the same; consequently, the greater the diameter of the reel on the beam, the greater the tension in the layer of cloth, and the tighter the beam will be wound. This results in the beam being wound comparatively loose at the beginning and rather taut at the finish, which in many instances is objectionable.

However, the simplicity of such a design shown in Figures 13 and 14 frequently demands that this be used, although the beams might not be wound as efficiently and there might be more power consumed in the winding process.

Where it is desired that each section of cloth have its leading and trailing ends in an unreversed position when leaving the vat, it is essential that an even number of units be provided. Otherwise, if an odd number of units is used the sections of cloth will be reversed, end for end, and therefore the first end of each section to enter the vat will be the last end to leave it.

In the drawings and specification there has been set forth a preferred embodiment of the invention and although specific terms have been employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being set forth in the appended claims.

I claim:

1. Apparatus for subjecting a plurality of sheets of material to the action of a fluid comprising a vat for holding said fluid, with a plurality of connected parallel pairs of rollers mounted thereon, means for winding one sheet of material on the front roll of the first pair, means for simultaneously unwinding a second sheet from the adjacent back roll of the first pair and onto the front roll of the second pair, and means for exchanging the positions of the back and front rolls of each pair, when the front rolls become full and the back rolls become empty.

2. Cloth treating apparatus for subjecting sheets of cloth to fluids, comprising a vat, a framework disposed above said vat, and a pair of rolls rotatably mounted in the framework, means for winding a sheet of material upon one roll, means for simultaneously unwinding another sheet of material from the other roll, and means for capsizing said framework in said rolls when the first-named roll becomes full and the other roll becomes empty to cause said rolls to exchange positions.

3. Apparatus for subjecting sheets of material to fluids comprising a vat, a reel-on roll and a reel-off roll, disposed above said tank, means for positively driving said reel-off roll at a constant speed and means for driving said reel-on roll to cause the sheet material to be wound thereon from the reel-off roll, and a slip clutch disposed between the reel-on roll and its corresponding driving means whereby the surface speed of the reel-on roll can be maintained substantially the same as the surface speed of the positively driven reel-off roll.

4. Apparatus for treating cloth comprising an elongated vat, a pair of parallel tracks disposed along the upper edges of the side walls of the vat, a plurality of units of rolls on said tracks, each unit of rolls comprising a pair of rolls having their axes connected at each end by a suitable member, means for frictionally driving one of the rolls of each unit, means for positively driving the other of the rolls of each unit, means for capsizing the units of rolls and thus causing one end of the members connecting the axes of the rolls to move along the tracks to reverse the position of the rolls of each unit with respect to the vat, and means on the axes of each roll for engaging said driving means when the rolls are in operative position.

5. Apparatus for subjecting cloth to a liquid treating agent, comprising a rectangular vat for holding the liquid, a plurality of pairs of rolls mounted for rotation in the vat, a trackway disposed along each of the upper side edges of the vat, members connecting the axes of each pair of rolls together, driving means for imparting rotation to the rolls of each unit, means for raising one of the rolls of a unit to capsize the unit to cause the rolls to be in superposed relation, and means on the trackway for guiding the lower ends of the members connecting the rolls so that when the uppermost roll is lowered, it will complete its movement to occupy the position formerly occupied by the lowermost roll to thereby reverse the positions of the rolls in the vat, and whereby the reversed rolls will automatically engage said driving means.

6. Apparatus for subjecting cloth to a liquid bath while winding the same from one roll to another comprising a vat, a plurality of pairs of rolls mounted for rotation along the upper edge of the vat so that a portion of the cloth in the rolls will be submerged in the liquid in the vat, a frame member at each end of the rolls connecting the pairs of rolls together for rotation in spaced relation, means disposed along one of the side walls of the vat for driving the rolls, means on the end of each of the rolls for engaging said driving means, a trackway disposed along the upper edge of each of the longitudinal side walls of the vat, means on the axis of each roll for guiding the rolls along the trackway, means for reversing the position the rolls of the unit occupy with relation to the front and rear ends of the vat, comprising means for

lifting one of the rolls to cause the other roll to move rearwardly of the vat along the trackway until the rolls are in superposed relation and means on the trackway and said members for guiding the lowermost roll rearwardly to cause the uppermost roll when lowered to continue its movement to occupy the position formerly occupied by the lowermost roll to thereby reverse the position of the units of each roll with relation to the ends of the vat, and means on the axis of each roll for engaging said driving means.

7. Apparatus for simultaneously subjecting a plurality of sheets of material to the action of a fluid comprising an elongated tank for holding the fluid, a plurality of pairs of rolls mounted on the upper edge of the vat, a trackway for supporting said rolls, a member disposed on each end of the rolls and rotatably connecting the axes of each pair of rolls together, means for driving the rolls of each pair to wind the cloth from one roll onto another roll, and means for reversing the position of the rolls of each pair in the vat when the material has been wound from one roll on to the other of a pair.

8. Apparatus for subjecting a plurality of sheets of cloth simultaneously to the action of a bath of treating material comprising an elongated rectangular vat, means for supporting a plurality of pairs of rolls on the upper edge of the vat, means connecting the pairs of rolls to form a plurality of units of two rolls each, means for driving the rolls to wind the cloth from one roll onto the other and means for reversing the position of the rolls when the cloth has been wound from one roll to the other and to cause said rolls to engage said driving means, whereby the empty roll can receive a new sheet of material while the full roll can be unwound onto the first roll of the next succeeding pair.

9. Apparatus for subjecting a plurality of sheets of cloth to a liquid bath, comprising a vat, a plurality of pairs of rolls connected together in spaced relation to each other and mounted on the upper edge of the vat and having a portion of the cloth on some of the rolls submerged in the liquid in the vat, means for frictionally driving the first roll of each pair, means for positively driving the second roll of each pair, and means for reversing the position of the rolls of the pair with relation to the ends of the vat.

10. Apparatus for subjecting a plurality of sheets of material to the action of a liquid treating bath comprising an elongated rectangular vat, a trackway disposed along the upper edge of each side of the vat, a plurality of rolls, a plurality of members mounted on each of the trackways and having the axes of adjacent pairs of rolls mounted for rotation therein for holding the rolls in spaced relation, driving means disposed along one side of the vat, a pinion disposed on each end of the rolls for engaging the driving means when the rolls are in operative position, means for raising one end of said members to raise one of the rolls of a unit and to cause the other roll to move forwardly in the vat along the trackway and means on the trackway for guiding the lower ends of said member when the members are raised to vertical position to cause the lower end of said members to move farther along the trackway and to cause the lower roll to continue its movement in the same direction as it initially proceeded to thereby reverse the positions of the rolls of each pair and whereby

the pinions on the rolls will engage the driving means when the rolls are in reversed position.

11. Apparatus for treating cloth comprising a plurality of rolls, a vat for holding a liquid and in which at least a portion of the rolls are submerged, means for driving the rolls whereby the cloth is unwound from one roll onto an adjacent roll, rigid means for connecting the rolls together in pairs, means for raising one end of the rigid connecting means, means for guiding the lower ends of the connecting means longitudinally of the vat, whereby when the cloth has been wound from the second roll of the first pair to the first roll of the second pair, the pairs can be reversed by raising the empty roll and advancing the full roll longitudinally of the vat and thereby reversing the position of the rolls so that the full roll will be disposed adjacent an empty roll and can have the cloth wound therefrom onto the empty roll of the next succeeding pair while the empty roll of the first pair has cloth wound thereon.

12. Apparatus for scouring cloth, comprising an elongated vat rectangular in plan, a plurality of pairs of units divided into pairs of rolls, mounted along the upper edge of the vat and projecting into the vat, rigid means slidably supported along the upper side edges of the vat connecting the ends of the rolls together to form a

plurality of units of the two rolls each, means for raising one end of the rigid connecting means and one of the rolls of a pair, means located along one side of the vat for imparting rotation to all of the rolls to wind cloth from one roll to the other, means for guiding the lower end of the rigid means when the front roll of a unit is raised above the rear roll, means for reversing the position of the rolls of each pair by raising one roll of each unit upwardly and over its companion roll whereby said rigid members will direct the first roll of each unit into the position occupied by the second roll of each unit and whereby the second roll of each unit will occupy the position formerly occupied by the first roll of each unit, and at the same time the respective rolls will engage the driving means when in reversed position.

13. Apparatus for simultaneously treating a plurality of lengths of cloth comprising a vat, a plurality of pairs of rolls mounted in spaced relation in the vat, means for driving the rolls to wind the lengths of cloth from one roll onto the other and means for reversing the position of the rolls of each pair to progressively wind the lengths of cloth from one roll to the other in each pair and from one roll of one pair to a roll of the next succeeding pair of rolls.

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