Feb. 22, 1944. M. ADAIR ET AL 2,342,235

FEEDING AND CONVEYING APPARATUS FOR TEXTILE MATERIALS

Filed Jan. 27, 1942 6 Sheets-Sheet 1

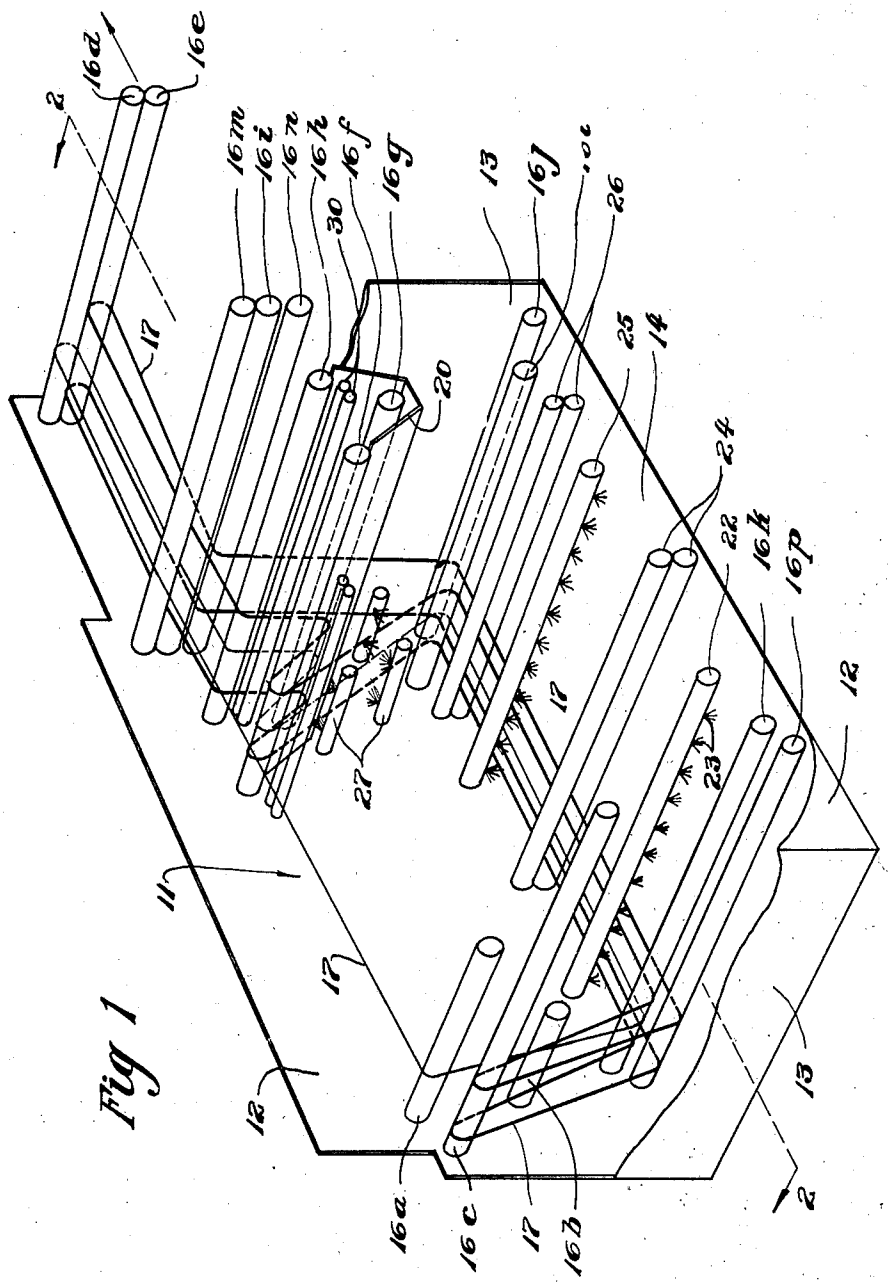


Fig 1

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FEEDING AND CONVEYING APPARATUS FOR TEXTILE MATERIALS

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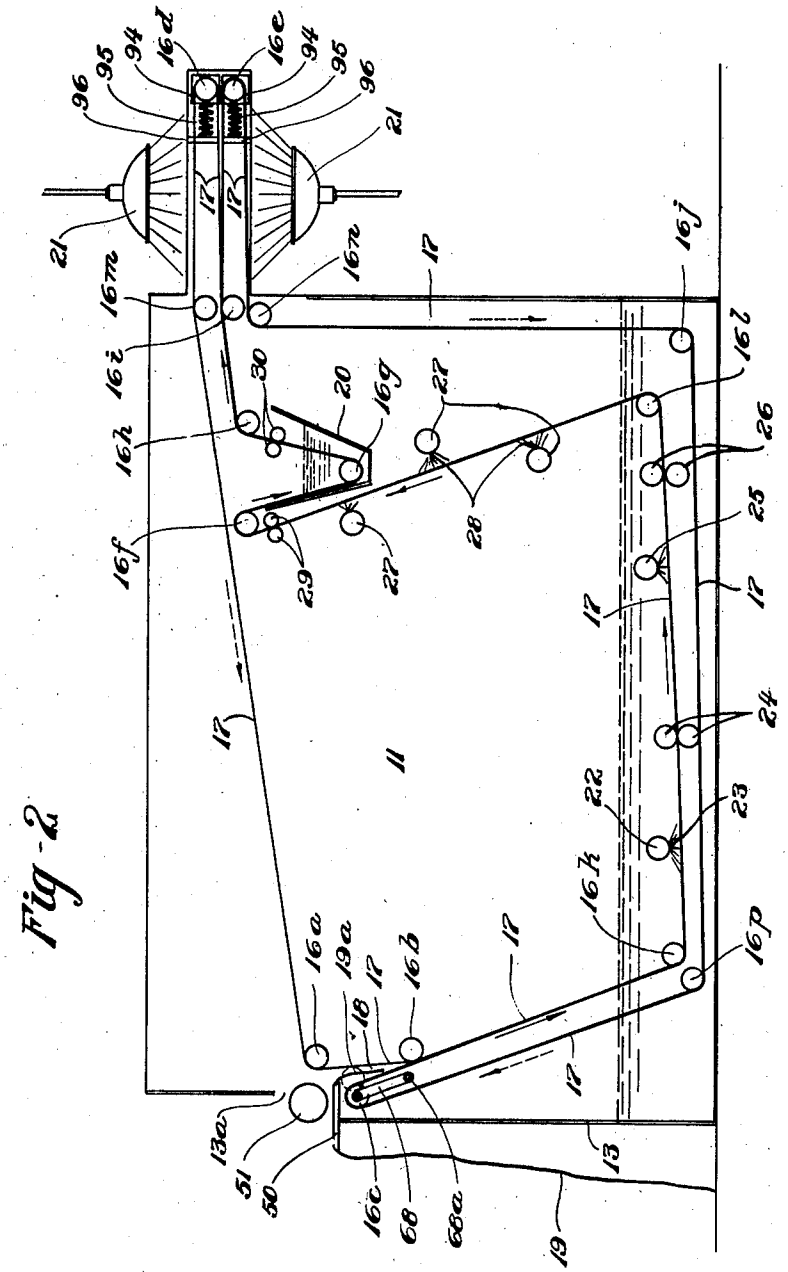


Fig-2

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FEEDING AND CONVEYING APPARATUS FOR TEXTILE MATERIALS

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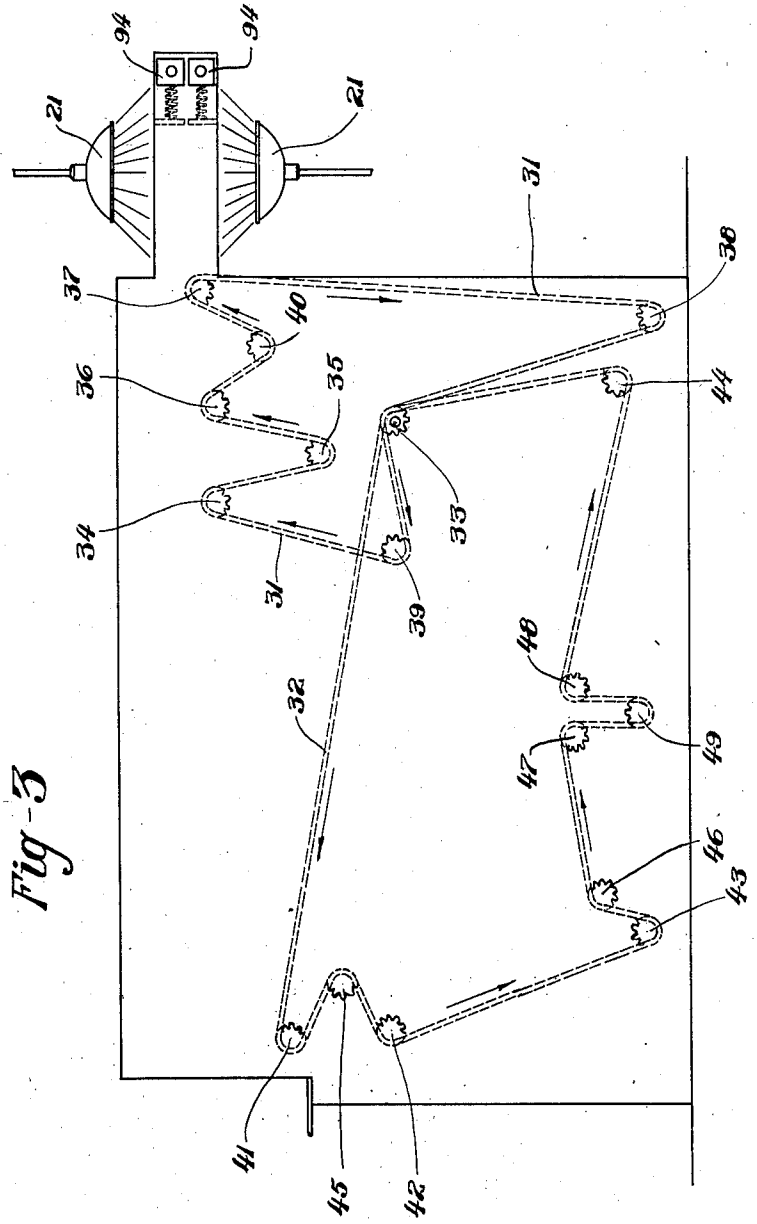


Fig-3

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FEEDING AND CONVEYING APPARATUS FOR TEXTILE MATERIALS

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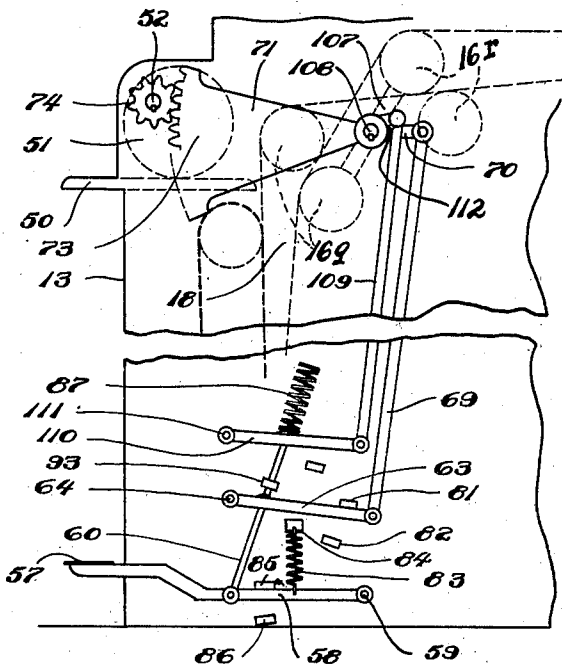


Fig-9

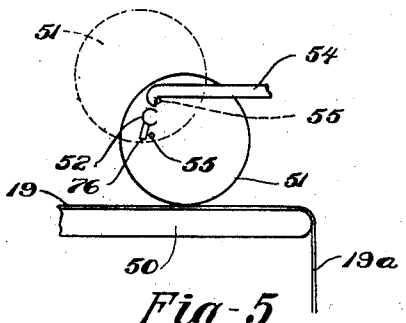


Fig-5

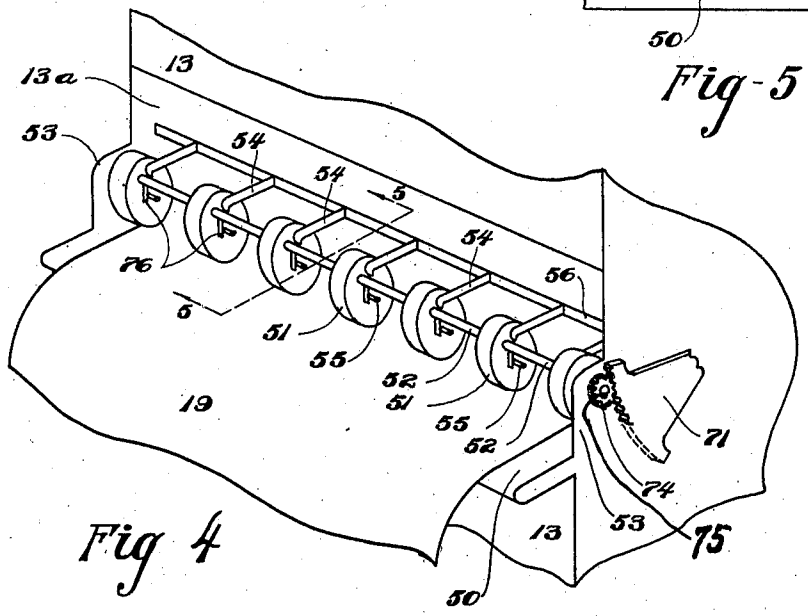


Fig 4

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FEEDING AND CONVEYING APPARATUS FOR TEXTILE MATERIALS

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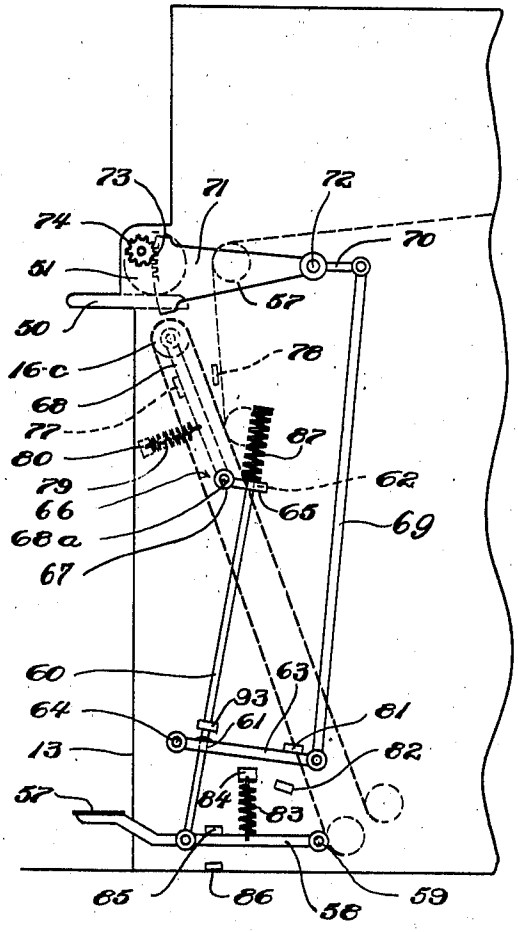


Fig-6

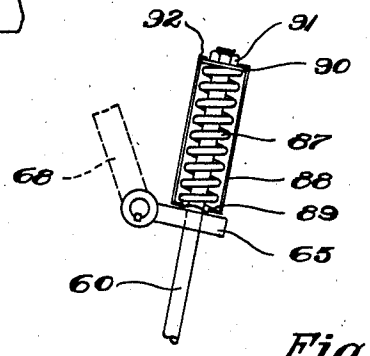


Fig-7

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FEEDING AND CONVEYING APPARATUS FOR TEXTILE MATERIALS

Filed Jan. 27, 1942 6 Sheets-Sheet 6

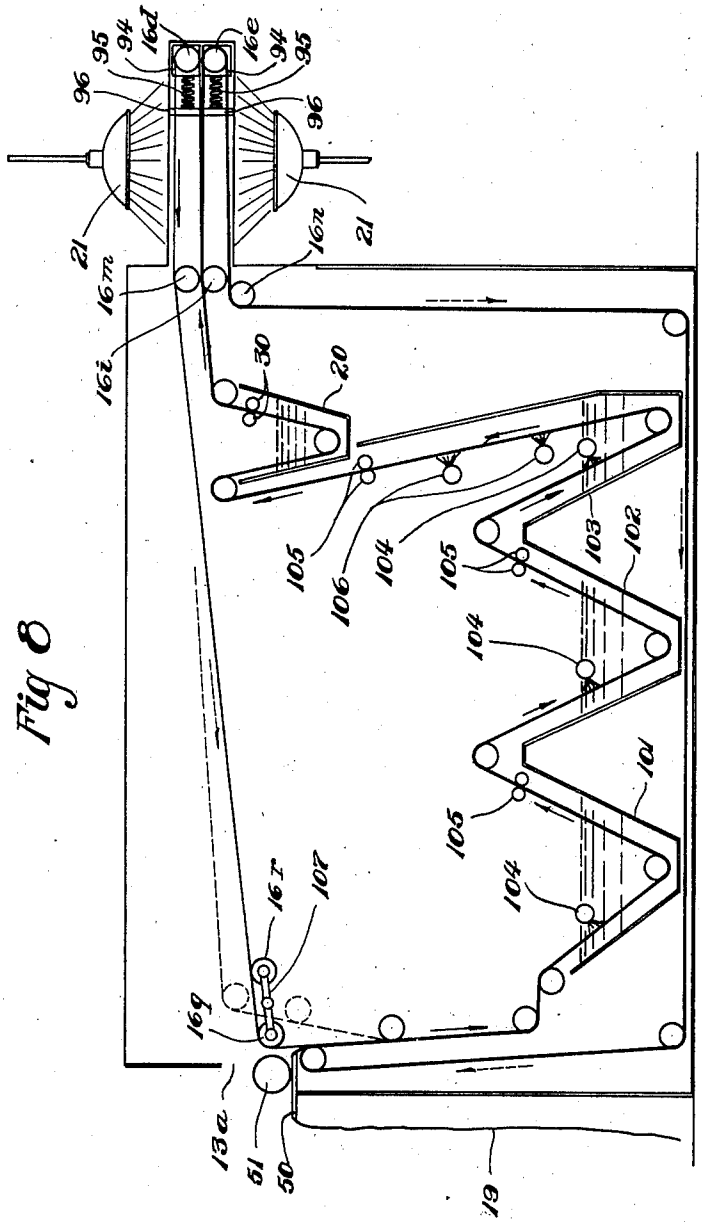


Fig 8

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Patented Feb. 22, 1944

2,342,235

UNITED STATES PATENT OFFICE

2,342,235

FEEDING AND CONVEYING APPARATUS FOR TEXTILE MATERIALS

Montague Adair, Passaic, and Robert Henderson, Rutherford, N. J., assignors, by direct and mesne assignments, of eighty-five hundredths to said Adair and fifteen hundredths to Eugene V. Myers, East Orange, N. J., and Louis E. Giles, New York, N. Y.

Application January 27, 1942, Serial No. 428,362

15 Claims. (Cl. 198—165)

This invention relates to improvements in methods and apparatus for washing textile articles and the like. It should be understood that all reference hereinafter to "washing machines" relates to machines for washing such materials, and reference to "articles" relates to any articles to be washed.

It has been common practice, in washing articles by methods and apparatus heretofore developed, to place a number of articles into a tank or chamber containing a suitable washing solution in which the articles are immersed and to agitate the said articles and the solution within said tank, either by rotating or otherwise moving the latter or by employing agitating devices arranged to move within the tank. In using such washing machines, a number of articles are ordinarily put into the device at one time, and when the washing process is thought to be substantially complete, they are removed and separated for drying or ironing. In such devices it is often necessary to subject the articles to a rinsing process by draining the washing solution from the tank and substituting clear water. In some machines the draining and refilling is performed without any automatic operation, while in other machines provisions are made for automatically drawing off the dirty washing solution and then injecting rinse water into the tank. In any event, when the washing process has been completed, difficulty is encountered in removing the articles from the tank and separating them, for, when they are wet or damp, they have a strong tendency to cling to one another and to a great extent they have become entangled by reason of the agitating action hereinbefore referred to.

According to the present invention, the articles are washed without any intermingling whatsoever. In employing a preferred embodiment of the invention, means in the form of complementary-acting endless conveyor belts may be provided, between which the articles are firmly held and passed through a washing chamber. During the passage of the articles through the said chamber, they may be subjected to the action of a washing solution, a medium for agitating the washing solution, a rinsing solution, a bluing solution (if desired), squeegees or wringing devices functioning at various stages in the washing operation, and to the action of drying lamps; or the articles may be subjected to the action of any one or any combination of the substances or devices just enumerated. Each article may finally be discharged separately from the apparatus in such a condition that it may be fed either automatically or substantially automatically into an ironing machine without interruption of the movement of said article.

An important object of the invention is the provision of an improved method of washing textile articles whereby to avoid manual handling of the articles, during the washing thereof or during or between several stages in the washing thereof.

Another important object of the invention is the provision of a washing machine into which articles may be separately charged and washed and from which they may be separately discharged.

Another important object of the invention is the provision of a washing machine which may positively control the movement of articles therethrough during the washing thereof and which may be employed in conjunction with other machines such as an ironing machine or a folding machine for completely laundering articles according to continuous methods which are highly desirable in commercial practice. In suggesting this object as applied to commercial work, however, it is to be observed that such a device would also be useful in handling household laundering.

Another important object of the invention is the provision of means for forcing a fluid either in the form of a gas, a vapor, or a liquid, upon or through the fabric of an article, whereby to loosen and remove dirt or other foreign matter therefrom.

Another important object of the invention is the provision of means adapted to aid an operator in feeding articles into the machine, the said means being so designed and arranged that they are automatically reset to handle another article after a first article has come under the control of the means for conveying it through the machine.

Another important object of the invention is the provision of means whereby articles, continuously under the control of the conveying means, may be successively passed through distinct succesive washing stages such as, for example, a stage wherein a strong washing solution may be used, another stage wherein a weaker solution may be employed, and another stage wherein the articles may be rinsed.

The foregoing and other objects, which will be apparent from the following description, may be accomplished according to the present invention, of which, for purposes of illustration, two preferred embodiments are hereinafter described

and illustrated in the accompanying drawings, in which—

Figure 1 is a perspective interior view of a washing chamber of a machine according to a preferred embodiment of the invention (hereinafter referred to as the first embodiment), the near walls of the chamber being omitted and only a few conveyor belts being shown in order that various important features of the machine may be more clearly shown and more easily understood;

Fig. 2 is a vertical, sectional view substantially on the line 2—2 of Fig. 1, including also drying means and portions of a starting mechanism adapted to aid in feeding articles into the machine;

Fig. 3 is a side elevation of the washing chamber of the first embodiment showing means for driving conveyor belts employed therein;

Fig. 4 is a perspective fragmentary view showing holding rolls and other parts of the mentioned starting mechanism;

Fig. 5 is a cross-sectional view on the line 5—5 of Fig. 5;

Fig. 6 is an elevational view of a treadle and connected mechanism for operating certain rocking portions of the conveyor system and for resetting the mentioned holding rolls, after one starting operation, to enable the operator to feed another article into the machine;

Fig. 7 is a view showing a detail of the mechanism illustrated in Fig. 6;

Fig. 8 is a vertical, sectional view, of the same character as Fig. 2, of a machine according to another embodiment of the invention (hereinafter referred to as the second embodiment); and

Fig. 9 is an elevational view of the same character as Fig. 6, illustrating a modified treadle and connected mechanism for operating certain rocking portions of the conveyor system of the second embodiment.

Referring to the first embodiment of the invention, as illustrated in Figs. 1 to 7, inclusive, certain important features of the invention may best be understood from Fig. 1, wherein is illustrated a washing chamber 11 defined by sides 12 (the nearest of which in the drawings is almost entirely broken away to show the interior of the chamber), ends 13 (both of which are substantially broken away), and a bottom 14. A top, not shown, preferably is also provided in applying the invention in practice.

A plurality of parallel guide rolls 16a—16p are mounted crosswisely within the chamber 11 on shafts which are carried in suitable bearings in the sides 12 of the washing chamber, the said rollers being rotatable and being so positioned as to serve as guides for carrying a plurality of endless conveyor belts 17 through certain areas within the said chamber.

Although broad open-mesh conveyor belts may be employed, if desired, the belts 17 disclosed herein are in the form of endless cords, which may be of any suitable material capable of withstanding, for reasonably long periods of time, the action of certain fluids and certain physical conditions to which they may be subjected in the operation of the apparatus. The belts 17 are preferably arranged in two groups which, as they pass through the chamber 11, move at similar lineal speeds and between certain points therein move in complemental courses which are substantially in common lateral planes so that an article may be firmly engaged between the two said groups of belts and carried with the latter through the washing chamber 11 as guided by the several guide rolls 16.

One of the said groups of belts, hereinafter referred to as the upper group and illustrated by the use of relatively light lines in the drawings, engages the top of an article during the greater portion of the passage of the latter through the washing chamber. The belts of the other group engage the under side of such an article and substantially support it during the greater part of its passage through the washing machine. The latter group of conveyor belts is hereinafter referred to as the lower or supporting group, and the belts thereof are illustrated in the drawings by the use of relatively heavy lines.

Where cords are used as belts, as in the present disclosure, it is preferable to employ a substantial number of belts in each group, so that the said belts may grip all sections of an article and carry it through the washing chamber. However, for the purpose of clearness, there are shown in Fig. 1 only two belts of a supporting group and one belt of an upper group. It will be observed that these belts all move in parallel vertical planes extending lengthwise of the washing chamber 11 and that the belts of the two groups are staggered from side to side of the machine, so that the belts of the two said groups engage the article along alternate lines. The rolls 16 are preferably provided with annular grooves (not shown in the drawings) within which the belts 17 are guided as they pass over said rolls; thus the belts are constrained to run at the proper points along said rolls, whereby to maintain the alternate relationship of the belts of the two groups as described and also as illustrated in the drawings.

The course of movement of the belts 17 may best be understood from Fig. 2. Toward the left in that figure are shown guide rolls 16a, 16b, and 16c, the latter of which is movable in a manner and for a purpose hereinafter described. When the said rolls are in their normal positions, indicated in the drawings in full lines, the upper and lower belts 17, as viewed in said figure, form a throat 18 within which a leading end 19a of an article 19 may be placed and gripped by the said two groups of belts to start the said article moving through the machine.

From the said throat the belts of both said groups move through the machine together in the direction and along the course indicated by the solid-line arrows, carrying the article itself along the same course. Pursuing this course, it is seen that the article, carried by said belts, moves downwardly within the washing chamber 11 to a point where it is submerged in water or washing solution, the level of which is indicated in broken lines. After traversing a substantial portion of the length of the washing chamber, the belts may then carry the article upwardly and into a bluing trough 20, after which the article, still actuated by the belts 17, is carried out of the washing chamber 11 into close proximity to drying lamps 21, or other suitable drying means, and thence to a discharge point at the right end of the device, defined by rolls 16d, 16e, where the two groups of belts move apart and pass by the courses shown by broken-line arrows in the drawings back to the throat 18.

As the article moves through the washing solution it is carried in close proximity to a laterally extending tube 22, which is preferably fixed at opposite ends to the opposite sides 12 of the washing chamber and is provided, on the side thereof nearest to the belt course and the article,

with a series of orifices 23 through which a fluid may be discharged directly upon the article, in jets, at high pressure. Suitable means, not shown, may be connected to either or both ends of the tube 22 at a point or points outside the chamber 11, for supplying the fluid under pressure to said tube.

Several effects result from this discharge from the said tube 22. One effect is the agitation of the article in its passage through the solution; another effect is the agitation of the water or washing solution, and another effect is to force fluid from the tube 22 through the fabric of the article, whereby to carry dirt or other foreign matter from it into the washing solution. Another effect of the discharge of fluid from the tube 22 is the forcing of some of the washing solution, in which the article is immersed, through the fabric of the said article. As best seen in Fig. 1, the orifices 23 are preferably quite numerous, so that the effect of the fluid discharge therefrom is applied quite uniformly across the entire article.

After the article passes beyond the tube 22, it may be engaged between a pair of squeegee rollers 24 of rubber or other suitable resilient material, thereby momentarily forcing washing solution from the article. If desired, the article in its passage through the chamber 11 may pass in close proximity to another agitating tube, indentified as 25, which tube may be and function substantially the same as tube 22. After the article passes tube 25 it may be engaged and pressed between another pair of squeegee rollers 26. The orifices in the tube 22 may be staggered relatively to those in the tube 25, thereby increasing the uniformity of the effect of the aggregate discharge of said tubes upon the article.

As the article emerges from the washing solution and moves toward the bluing trough 20, it may pass in proximity to a group of rinsing tubes 27, 27, 27, which may be mounted and supplied similarly to the several other tubes hereinbefore referred to. The tubes 27 are each provided with a plurality of orifices 28, from which jets of clear rinsing water may be dispersed under pressure upon the article. It may be desirable to provide that one or several of said rinsing tubes disperse jets of compressed air upon the article rather than rinsing water. This choice may be determined according to the type of articles being washed and the effect of water or air upon such articles in this stage of the washing operation.

After the article moves beyond the rinsing tubes 27 it preferably passes between another pair of squeegee rollers 29, in order to substantially remove water from the article, and then it moves into the bluing trough 20. The bluing trough 20 is suitably mounted within the chamber 11 and is kept supplied with a bluing solution approximately to the level indicated in broken lines. As the article emerges from the bluing solution, it preferably passes between still another pair of squeegee rollers 30, which are so disposed within the trough 20 that the excess bluing solution squeezed from the article passes back into the solution in the said trough. Thereafter, the article moves in close proximity to or between drying lamps 21, and then emerges from the machine at a point between rollers 16^d and 16^e, completely washed, blued, and substantially dry, in condition to be ironed. By completely controlling the article during the washing thereof, in the manner described, great economies are derived from the avoidance of handling during washing or between washing stages and from the adaptability of such a continuous process and continuously operating apparatus to be coordinated with the operation of other apparatus such as ironing, folding, and stacking machines.

In order to allow for slight stretching or contraction of the belts 17, and to allow for some distortion of said belts caused by an article passing through the machine, the guide rolls 16^d, 16^e may be carried in horizontally slidable bearings 94 which may be urged to the right, as shown in Fig. 2, by compression springs 95 seated upon spring seats 96 fixed upon the machine, whereby to hold the said belts substantially taut.

The upper and lower groups of conveyor belts 17 may be caused to move around their courses at like lineal speeds by any suitable means. This movement of the belts may be achieved conveniently by rotating the guide rolls 16, and it is preferable that all or a substantial number of said rolls be driven by means independent of said belts in order to obviate or minimize wear which might occur on the conveyor belts if the latter were employed as driving means.

The structure of Fig. 3 is illustrative of one of many possible arrangements that may be resorted to for driving most or all of the rolls 16. Under the said arrangement two endless chains 31 and 32 may be driven by two separate sprockets keyed to a main drive shaft 33. The said shaft either may extend from one side of the machine to the other, in which case one of the mentioned chains and its driving sprocket may be located at one side of the machine and the other mentioned chain and its sprocket may be located at the other side of the machine; or the shaft 33 may be a stub shaft suitably mounted upon one side of the machine, under which arrangement both said chains and their said driving sprockets would be located upon one side of the apparatus. A suitable pulley or gear wheel (not shown) may also be keyed to shaft 33 whereby to turn the latter and thereby drive the chains 31 and 32. It will be observed from Fig. 3 that the said chains, moving in the direction indicated by arrows, pass over sprocket wheels which are keyed to shafts upon which certain of the guide rolls 16 are carried and with which the said rolls are constrained to turn. Thus, as may be seen by concurrent reference to Figs. 3 and 2, chain 31 passes over sprockets 34, 35, 36, 37, and 38, which respectively are fixed upon protruding ends of the shafts which carry and turn guide rolls 16^f, 16^g, 16^h, 16^j and 16^j.

There also may be provided at suitable points along the chain 31, idler sprockets 39 and 40 which may be carried by stub shafts fixed to the adjacent side 12 of the machine. By again referring concurrently to Figs. 3 and 2 it may also be seen that chain 32 passes over sprockets 41, 42, 43 and 44, which respectively are fixed upon protruding ends of the shafts which carry and turn guide rolls 16^a, 16^b, 16^k, and 16^l. There also may be provided at suitable points along the chain 32, idler sprockets 45, 46, 47, and 48, which, like the previously mentioned idler sprockets, may be carried by stub shafts fixed to the adjacent side 12 of the machine.

It will also be observed that chain 32, as illustrated, engages a sprocket 49 keyed to a protruding end of the shaft which carries and turns upper squeegee roller 24 whereby to positively drive the said squeegee roller. By keying intermeshing gears upon the shafts carrying and

driving the two squeegee rollers 24, the two said rollers may be driven in unison in opposite directions in a well understood manner. If desired, power may be directly applied at sprockets at several points along the chains 31 and 32, instead of only at the sprockets on shaft 33 as illustrated.

Although the chain 32 has only been shown in the drawings as positively driving one pair of squeegee rollers, it should be apparent that the said chain, as well as chain 31, may, if desired, be arranged to drive one or more sets of squeegee rollers throughout the machine. Likewise it should be apparent that although the chains 31 and 32, as illustrated, are not arranged to drive all the rollers carrying the conveyor belts 17, nevertheless the said chains, if desired, may be arranged to directly drive all said rollers. In actual practice, however, it may suffice to drive some of the guide rolls while leaving other guide rolls to turn freely in response to the movement of the conveyor belts thereover.

Inasmuch as the numerous belts 17 are all in continuous motion when the machine is in operation and as the machine should preferably be at least wide enough to permit a doubled bedsheet to be passed flat therethrough, it will be seen that it is important to provide means whereby the leading edge of such a bedsheet or other article may be started through the machine flat and in a substantially straight line corresponding either to the length or the width of the sheet, depending upon the manner in which it is folded.

If a leading double edge of a sheet, which, in folded condition, may measure three or four feet across, were to be fed into the machine so that only one side of the sheet were to be grasped by the conveyor belts 17 at one side of the machine and started on its course through the washing chamber 11, the other side of the sheet would drag and follow through the machine in a state of disarrangement which not only might unduly strain the conveyor belts, but also would greatly reduce the effectiveness of the various functioning elements in the machine. Therefore, in order to fully derive the advantages of the machine as thus far described, there is provided a starting mechanism by means of which the entire leading edge or edges of an article may be properly presented to the conveyor belts 17 whereby such an article may be carried through the machine in a substantially flat and well arranged condition so that the functioning elements in the apparatus may do their work efficiently.

Such a starting mechanism as illustrated in Figs. 2, 4, 5, 6, and 7 preferably includes a relatively narrow feeding table 50 suitably mounted at a convenient height upon one end 13 of the washing chamber 11 at a rectangular opening 13a therein. This table, as best seen in Fig. 4, preferably extends completely across the said end 13 of the machine and its opposite sides are preferably rounded, as shown in the drawings, so that the article 19 may move freely over it.

Directly above the table 50 are disposed a plurality of holding members in the form of substantially similar holding rolls 51, all freely mounted eccentrically on a rock shaft 52 supported at each end within bearing plates 53 which may be fixed upon the opposite ends of the table 50. The circumferential surfaces of the holding rolls 51 are preferably of friction material such as relatively soft rubber, and the mounting of said rolls on the shaft 52 and in relation to the table 50 is such that the roll may be turned about the shaft 52 between the positions of said roll indicated in Fig. 5 in full line hereinafter referred to as its gripping position, and in broken lines, hereinafter referred to as its non-gripping position.

When the roll 51 is in non-gripping position there is sufficient space between the said roll and the table 50 for the operator's hand to pass under the roll to manipulate the article 19 into feeding position on the table with its leading edge 19a hanging down at the inner side of the table into the throat 18, as shown in Fig. 2. After the portion of the article 19 which is directly under a given roll 51 has been disposed in its proper feeding position, the said roll may be manually rotated by the operator of the machine in a clockwise direction, as viewed in Fig. 5, to its gripping position to prevent unintended withdrawal of the article.

It will be apparent that when the roll 51 is in its gripping position and is resting upon the article 19 which is disposed upon the table 50, the said article may move toward the right, as shown in Fig. 5, but may not move toward the left inasmuch as the gripping surface of the roll 51 and the eccentric action thereof would cause the said roll to more tightly grip the article 19 if it were attempted to move the latter toward the left.

The clockwise movement of the roll 51 to its gripping position is limited by the engagement of the said roll with the table 50 or with an article thereon, and the counter-clockwise movement of the roll 51 to its non-gripping position is limited by the interengagement of a stop 54 and a pin 55. The stop 54 is preferably fixed upon a supporting rod 56 which may be fixed at each end thereof to the bearing plates 53; or, if desired, the ends of said rod may be fixed to the sides 12 of the washing chamber 11. The rod 56 and the stops 54 for the several rolls 51, as best seen in Fig. 5, are preferably mounted below the level of the top of the roll when the latter is in its gripping position, and toward the inside of said rolls, so that the rod 56 and the stops 54 may not in any way interfere with the manipulation of the rolls 51 by the operator of the machine. The pin 55 is preferably fixed in one end of the roll 51 and extends therefrom sufficiently to engage the stop 54 for the mentioned purpose.

Where a plurality of rolls 51 is provided, an operator, desiring to start into the machine a wide articles such as a bedsheet, may first insert one side of said article under one end roll 51, thereupon manually moving said roll from its non-gripping to its gripping position, and then the said operator may successively do likewise with the other rolls 51 across the entire width of the said article so that the latter may lie flat and straight, as indicated in Figs. 4 and 5, preliminary to being conveyed through the washing chamber 11.

As best understood from Figs. 5 and 2, the operator may insert the article far enough into the device that its leading edge 19a suspends substantially from the inner side of the table 50 and extends into the throat 18 formed by the two groups of conveyor belts 17. While the operator is positioning the article 19 on the table 50, the said leading edge will be substantially free of the conveyor belts and hence will not be gripped by the latter. However, after the operator has properly positioned the article 19 upon the table 50, it is necessary that the con-

veyor belts be caused to grip the leading edge 19a of said article and immediately after such gripping it is highly desirable that all the holding rolls 51 be given a resetting rotation which immediately and automatically restores them to their non-gripping positions so that the said rolls may not constitute a drag upon the article in its movement over the table as the conveyor belts draw it into the machine, and also so that the said holding rolls may be in position to permit the operator to start another article into the machine after the first-mentioned article has passed beyond the table 50.

The two said objects—namely, the causing of the conveyor belts to grip the leading edge of the article and the restoration of the holding rolls 51 to their non-gripping positions—may be accomplished by means of an operating mechanism, as illustrated in Fig. 6. This mechanism has not been shown in the other figures illustrating the first embodiment, as to do so would have unduly complicated said figures. However, in Fig. 6 the mechanism has been clearly shown in its relation to the table 50, a holding roll 51, one end 13 of the washing chamber, and related portions of the two groups of conveyor belts. It should be understood that several of the various shafts employed in the operating mechanism and the parts operated thereby may be carried upon one side 12 of the washing chamber or may be duplicated upon both sides thereof, or the said parts may be carried upon separate plates which may be suitably fixed in such positions upon the said sides that they will not interfere with the chains 31 and 32 and the various sprockets upon which the latter operate.

The said operating mechanism includes a treadle 57, which may extend across the entire end 13 of the machine into which the articles are fed, and may be connected to similar treadle levers 58 pivoted at fixed pivot points 59 upon opposite sides of the machine. It may be assumed, for present purposes, that the mechanism operated by the said treadle is provided only upon one side of the machine instead of on both sides thereof.

A pull rod 60, pivotally connected at its lower end to the lever 58 toward the outer end of the latter, extends upwardly through holes or slots 61 and 62 provided respectively in a lever 63, which is pivotally connected at one end thereof to a fixed pivot point 64 upon the side of the machine, and in an arm 65 of a bell crank 66, the hub 67 of which extends through a suitable bearing in the side 12 of the washing chamber 11 and into the interior of the latter. The other arm 68 of the said bell crank is located within the washing chamber 11 and carries at its outer end the shaft upon which guide roll 16c is mounted. A shaft 68a preferably is keyed within the hub 67 and extends completely across the chamber 11 and is keyed, at its other end within a similar hub of a pivoted arm which is similar to the arm 68 and supports the other end of the guide roll 16c. By this arrangement the roll 16c is positively maintained in parallelism to all other guide rolls and may oscillate between its open position indicated in full lines in Fig. 2, in which position the throat 18 is open, and its closed position, indicated in broken lines, in which position the said throat is closed and the conveyor belts defining said throat are closed upon the article whereby to start moving it through the machine.

The swinging end of the lever 63 is pivotally connected by a link 69 to an arm 70 which is fixed to or integrally formed with an oscillating toothed segment 71. The latter is pivotally mounted at fixed point 72 on the side of the machine. The teeth 73 of the said segment mesh with the teeth of a spur gear 74 which is keyed, as at 75 (Fig. 4), to the adjacent end of the rock shaft 52. Radial pins 76 are fixed into the shaft 52, at points thereon adjacent each holding roll 51 and are so located that as the said shaft is rocked in counter-clockwise direction, as viewed in Fig. 5, the pins 76 may engage the pins 55 in each of the rolls 51 and rotate the latter about the shaft 52 to their non-gripping positions. It will be seen from Fig. 5 that, as the shaft 52 turns freely within the rolls 51, the said shaft may then be oscillated in clockwise direction while leaving the said rolls in non-gripping position where they will remain until the operator manually turns them to their gripping positions.

The oscillation of the guide roll 16c is limited by stops 77, 78 which are fixed upon the inner surface of the side 12 of the washing chamber 11 and are arranged to engage the arm 68 at the desired limits of movement of the latter. The said guide roll may be held normally in its open position by a tension coil spring 79 connected between the arm 68 and a bracket 80 fixed upon the inner surface of the side 12 of the washing chamber.

The oscillation of the segment 71 is limited by stops 81, 82 which are fixed upon the outside of the machine and are arranged to engage the lever 63 at the limits of movement thereof corresponding to the desired limits of movement of the segment. The weight of the segment 71 may be such that it will normally assume its lowermost position, or, if desired, a spring arrangement somewhat similar to spring 79 may be employed to hold the segment normally in said position.

The treadle lever 58 may be held normally in its raised position by a tension coil spring 83 connected between said lever and a bracket 84 fixed upon the outside of the machine. The movement of said treadle lever may be limited by stops 85, 86 fixed to the outside of the machine and adapted to engage said lever.

The pull rod 60 is adapted, when pulled downwardly by the treadle lever 58, to first move the arm 68 and the guide roll 16c toward the right, as viewed in Fig. 6, to close the throat 18, and then to move the segment 71 upwardly to turn the holding rolls 51 to their non-gripping position, both these reactions being accomplished by a single downstroke of the pull rod 60. This sequence of operations is accomplished by means on or associated with the said rod at two points thereon. Toward the upper end thereof, the rod 60 carries a compression coil spring 87, which, as best shown in Fig. 7, is held preloaded or partially compressed within a cage 88 disposed about said spring and rod. Subject to the hereinafter-described action of the spring 87, the rod 60 is free to slide within the said cage. The lower end of the spring 87 presses against an inturned flange 89 upon the lower end of the cage 88, and a disk 90, held upon the upper end of the rod 60 by a nut 91, is pressed between the upper end of the said spring and an inturned flange 92 formed upon the upper end of said cage.

When the treadle 57 is pressed and the rod 60 commences its downward movement, the lower end of the cage 88 engages the arm 65, and as the spring 87 has been designed so that its preload is

sufficient to more than counteract the tension of the spring 79 and any other opposing forces, the arm 65 and consequently the arm 68 and the guide roll 16c are turned to effect closing of the throat 18 so that the continuously moving conveyor belts defining said throat will grip the article 19 and start it moving through the machine, this being accomplished without any compression of the spring 87 beyond the preload thereof.

When the throat 18 is closed the stop 78 terminates the described movement of the bell crank 66 and the outer arm 65 thereof. Thereafter, the continued downward movement of the rod 60 is possible because of the facility of the spring 87 to compress further within the cage 88. At about the point at which the pull rod 60, in its downward movement, completes the closing of the throat 18, a lug or shoulder 93 formed integrally or fixed upon rod 60 engages the lever 63 and, upon continued downward movement of said rod, presses the said lever downwardly, and the latter, through the link 69 and the arm 70, moves the segment 71 upwardly, thereby turning the rock shaft 52 and restoring the holding rolls 51 to their non-gripping position so that another article may be inserted into the machine.

A cycle of operation of the machine may be considered as commencing with the rolls 51 in their non-gripping positions. An operator may fold in half a soiled article such as a sheet, then insert one side of a leading edge thereof under the roll 51 at the corresponding side of the machine, and turn that roll to its gripping position. The operator may then do likewise with the other rolls 51 all along the said leading edge, so that the article is held straight with respect to the machine and the leading edge hangs down into the throat 18.

The treadle 57 is then pressed to first cause the leading edge of the article to be gripped by the conveyor belts and the article to be started moving through the machine, and to then reset the rolls 51 in their non-gripping positions. The conveyor belts, with the said article held between them, then carry the article through areas of the washing chamber wherein, as already explained, the article is subjected to the action of the washing fluid in said chamber, the bluing fluid in the trough 20, the jets emitted from the several tubes 22, 25, and 27, and the squeegee rolls 24, 26, 29, and 30; and just before emerging from the machine, the article is subjected to the drying effect of the drying lamps 21 or other drying means. After the article has been started through the machine, the treadle 57 is released, thus reopening the throat 18.

Although large articles such as bedsheets may be folded in half before passing them through the machine, smaller articles may be passed through the machine unfolded as the jets referred to are probably more effective upon a single ply of textile material.

The various parts of the machine may, of course, be of any material suitable for yielding the mentioned results.

The second embodiment of the invention, as illustrated in Fig. 8, differs from the first embodiment chiefly in the provision of a plurality of separate troughs 101, 102, and 103 through which an article may be successively passed before it reaches the bluing trough 20. In each of said troughs orificed tubes 104 may be arranged to emit jets of any of the hereinbefore-mentioned fluids upon the article and, at points above the liquid level in said troughs (indicated in broken lines), squeegee rolls 105 may be arranged to engage the article after it emerges from the liquid whereby to squeeze excess liquid therefrom, and permit it to run back into the related trough. Orificed rinse tubes 106 may be arranged to emit jets of rinsing water upon the article after it emerges from the liquid in the tank 103. The various rolls in the second embodiment may be driven by means somewhat similar to those disclosed in Fig. 3 or by any other suitable means.

The starting mechanism illustrated in Fig. 9 may be employed with either the first or second embodiment of the invention by a simple revision of the arrangement of guide rolls at the feed end of the machine. Instead of providing for the oscillation of a guide roll carrying the supporting or lower group of conveyor belts, two guide rolls 16q, 16r, carrying the upper group of said belts, may be mounted upon rockers 107 pivotally mounted upon opposite inside surfaces of the two sides 12 of the washing chamber 11. The rockers 107 are both keyed to a cross-rod 108 to constrain the said rockers and the guide rolls 16q, 16r carried thereby, to oscillate in unison and to maintain the parallelism of said rolls with respect to each other and other rolls in the machine.

The movement of the rockers 107 is controlled by a link 109 which is pivotally connected at its upper end to a crank 112, keyed to a protruding end of cross-rod 108, and at its lower end to the outer end of a lever 110 which pivots about a fixed pivot point 111 at the side of the machine. The pull rod 60, and the caged spring 87 thereon, co-act with the lever 110 similarly to the co-action of the corresponding rod and spring with the arm 65 in the structure illustrated in Fig. 6. The result of rocking the rolls 16q, 16r, shown in Fig. 9, is similar to the result of oscillating the roll 16c shown in Fig. 6—namely, to close the throat 18 to start the article moving through the machine.

Under the arrangement illustrated in Fig. 9, the rolls 16q, 16r are preferably in contact with their related conveyor belt at all times, and it may be noted that the said arrangement of Fig. 9 is such that the tendency of the movement of one of guide rolls 16q, 16r to shorten or lengthen the related conveyor belts is compensated by the simultaneous movement of the other of said rolls. The segment 71 may turn freely on the protruding end of cross-rod 108 or a separate shaft at a different pivoting point may be provided to carry the said segment. Except as just explained, the starting mechanism illustrated in Fig. 9 is similar to the mechanism illustrated in Fig. 6, and it is similarly operated and yields similar results in the operation of the machine.

It will be understood that in either embodiment one or more of orificed tubes employed before the rinsing stage may be disposed slightly above the level of the washing fluid if desired. It may also be understood that in the second embodiment the trough 101 may be kept supplied with a strong washing solution, and the troughs 102 and 103 may be supplied with weaker solutions. In either adaptation of the invention it may be observed that stronger and more effective washing solutions may be employed than in machines heretofore developed, for the reason that the article is carried through the present machine at such a speed that a strong solution may yield its effective results but be

thoroughly rinsed from the fabric of the article before it could do any damage thereto.

Although the present method and apparatus are described herein as applied to the washing of textile materials, the invention is not limited to its use for such purposes, but includes the within described and claimed methods and means as applied to the washing of any articles or materials which may respond to the described treatment.

The embodiments disclosed and suggested herein are only illustrative of the invention, which, obviously, may be employed in numerous other ways without departing from the spirit of the invention as defined in the accompanying claims.

What we claim is:

1. Conveying apparatus for use in washing textile articles and the like, comprising a pair of coacting belts adapted to move together and to engage and carry an article along a defined washing course, a plurality of guide rolls disposed near a starting point on said course and adapted to carry and guide the two belts of said pair along converging belt courses defining a throat adapted to receive a leading edge of the article, a rocker member pivotally mounted at an intermediate part thereof at a fixed point on said apparatus, a pair of guide rolls comprising a throat closing roll and a compensating roll, carried upon the opposite ends of said rocker member and adapted to engage and guide a shiftable one of said pair of belts, and means for rocking said rocker member, the said throat closing roll being adapted, when the rocker member is rocked, to move the shiftable belt toward and away from the other belt to close and open the said throat and the said compensating roll being adapted to substantially compensate for the shortening and lengthening effect of the said movement of the throat closing roll.

2. Conveying apparatus for use in laundering textile articles and the like, comprising a relatively wide throat defined by conveyor belts adapted to carry an article, in substantially open condition, along a defined laundering course through said apparatus, and mechanically releasable holding means adapted to engage an article at plural points across one dimension thereof and hold the said article substantially open with its leading edge extending into said throat.

3. Apparatus according to claim 2, the said holding means comprising a support disposed adjacent said throat, a plurality of mechanically releasable gripping members disposed above said support along a line parallel to the width of said throat and adapted to rest upon an article on said support, the portions of said gripping members in engagement with said article being movable toward said throat but restrained against material movement in the opposite direction, whereby to permit movement of the article into said throat and to prevent movement of said article in the opposition direction.

4. Apparatus according to claim 2, the said holding means comprising a table disposed adjacent said throat, a plurality of mechanically releasable gripping members pivotally mounted over said table along a line parallel to the width of said throat and adapted to depend angularly toward said throat into engagement with an article disposed upon said table, the said angular engagement of said gripping members constraining the said article to unidirectional movement toward the said throat.

5. Apparatus according to claim 2, the said holding means comprising a table disposed adjacent said throat, a plurality of mechanically releasable holding rolls pivotally and eccentrically mounted over said table along a line parallel to the width of said throat and adapted, in their gripping positions, to rest upon an article disposed upon the said table with their diameters, intersecting their said pivotal mounting points, extending angularly downwardly toward the said throat, the said angular disposition of said holding rolls constraining the article to unidirectional movement over the table toward the said throat.

6. Apparatus for washing textile materials and the like, comprising a throat, a table disposed adjacent said throat, one or more holding members pivotally mounted above said table and, when in their gripping positions, extending angularly downwardly toward said throat into engagement with an article on said table whereby to constrain the article to uni-directional movement over the table toward said throat, the said holding members being pivotally movable upwardly from their said gripping positions to positions wherein they are disengaged from said article, the said apparatus further comprising with respect to one holding member, an abutment on said member, and a rotatable member having a portion adapted, when the latter member is rotated, to engage said abutment and rotate said holding member from its gripping position to a position wherein it is disengaged from said article.

7. Apparatus for washing textile materials and the like, comprising a throat, a table disposed adjacent said throat, one or more holding members pivotally mounted above said table and, when in their gripping positions, extending angularly downwardly toward said throat into engagement with an article on said table whereby to constrain the article to uni-directional movement over the table toward said throat, the said holding members being pivotally movable upwardly from their said gripping positions to positions wherein they are disengaged from said article, the said apparatus further comprising a rotatable shaft about which a holding member is adapted to freely pivot, an abutment on said holding member, and a portion of said shaft adapted when the latter is rotated, to engage said abutment and turn said holding member, with the shaft, from gripping position to a position wherein said holding member is disengaged from said article.

8. Apparatus for washing textile materials and the like, comprising a throat, a table disposed adjacent said throat, one or more holding members pivotally mounted above said table and, when in their gripping positions, extending angularly downwardly toward said throat into engagement with an article on said table whereby to constrain the article to uni-directional movement over the table toward said throat, the said holding members being pivotally movable upwardly from their said gripping positions to positions wherein they are disengaged from said article, the said apparatus further comprising a rock shaft about which a holding member is adapted to freely pivot; coacting portions of said rock shaft and holding member, constraining the two to rotate together from a gripping position of said holding member to a position thereof wherein it is disengaged from said article; and means for imparting such rotation to said rock shaft comprising a gear wheel mounted upon said shaft and constrained to turn therewith, a gear

coacting with said gear wheel whereby to drive the latter, a crank on said gear for turning it, a link connected to said crank, and a lever connected to said link and adapted when moved to turn said gears and impart the mentioned rotation to the rock shaft and holding member.

9. Conveying apparatus for use in washing textile articles and the like, comprising a throat for receiving a leading edge of an article, a movable throat operating member adapted to open and close said throat, a holding mechanism adapted to hold an article with its leading edge disposed in said throat, a movable operating member adapted to operate said mechanism, to release the article therefrom, a movable control member having one portion adapted, upon commencement of movement of said control member, to engage and actuate the throat operating member whereby to close said throat, and, upon continuance of such movement, to engage and actuate the operating member for the holding mechanism whereby to release the hold of said mechanism upon said article.

10. Apparatus according to claim 9, further comprising a lever connected to and adapted to actuate said control member.

11. Apparatus according to claim 9, further comprising a pre-compressed spring, mounted upon and movable with said control member, the said spring being adapted to coact with the throat operating member to move the latter to one of its limits of movement without further compressing said spring, the said spring however being adapted to become further compressed whereby to permit the mentioned continuance of movement to operate the holding mechanism.

12. Apparatus according to claim 9, further comprising a spring, movable with said control member and adapted to coact with the throat operating member to move the latter to one of its limits of movement without being flexed to its flexing limit, the said spring being adapted to become further flexed whereby to permit the mentioned continuance of movement to operate the holding mechanism.

13. Apparatus for feeding textile articles and the like into a device for laundering or otherwise treating such articles, the said apparatus comprising a table-like support disposed adjacent a receiving portion of such device; and one or more holding members pivotally mounted above said table and, when in their gripping positions, extending angularly downwardly toward a common side of said support into engagement with an article thereon whereby to restrain the article to uni-directional movement over the support; the said holding members being pivotally movable upwardly, from their said engaging positions, to inactive positions wherein they are disengaged from the article, the said apparatus further comprising, with respect to one holding member, an abutment on said member, and a rotatable member having a portion adapted, when the latter member is rotated, to engage said abutment and rotate said holding member from its article-engaging position to its inactive position.

14. Apparatus for feeding textile articles and the like into a device for laundering or otherwise treating such articles, the said apparatus comprising a table-like support disposed adjacent a receiving portion of such device; and one or more holding members pivotally mounted above said table and, when in their gripping positions, extending angularly downwardly toward a common side of said support into engagement with an article thereon whereby to restrain the article to uni-directional movement over the support; the said holding members being pivotally movable upwardly, from their said engaging positions, to inactive positions wherein they are disengaged from the article, the said apparatus further comprising a rotatable shaft about which a holding member is adapted to pivot, an abutment on said holding member, and a portion of said shaft adapted, when the latter is rotated, to engage said abutment and pivotally move said holding member from its article-engaging position to its inactive position.

15. Apparatus for feeding textile articles and the like into a device for laundering or otherwise treating such articles, the said apparatus comprising a table-like support disposed adjacent a receiving portion of such device; and one or more holding members pivotally mounted above said table and, when in their gripping positions, extending angularly downwardly toward a common side of said support into engagement with an article thereon whereby to restrain the article to uni-directional movement over the support; the said holding members being pivotally movable upwardly, from their said engaging positions, to inactive positions wherein they are disengaged from the article, the said apparatus further comprising a rock shaft about which a holding member is adapted to pivot; coacting portions of said rock shaft and holding member, constraining the two to rotate together from an article-engaging position of the holding member to an inactive position of the latter; and means for imparting such rotation to said rock shaft comprising a gear wheel mounted upon said shaft and constrained to turn therewith, a gear coacting with said gear wheel whereby to drive the latter, and a lever mechanism coacting with said gear whereby to impart the mentioned rotation to the rock shaft and the holding member.

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