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CONTINUOUS WASHING MACHINE

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FIG. 1.

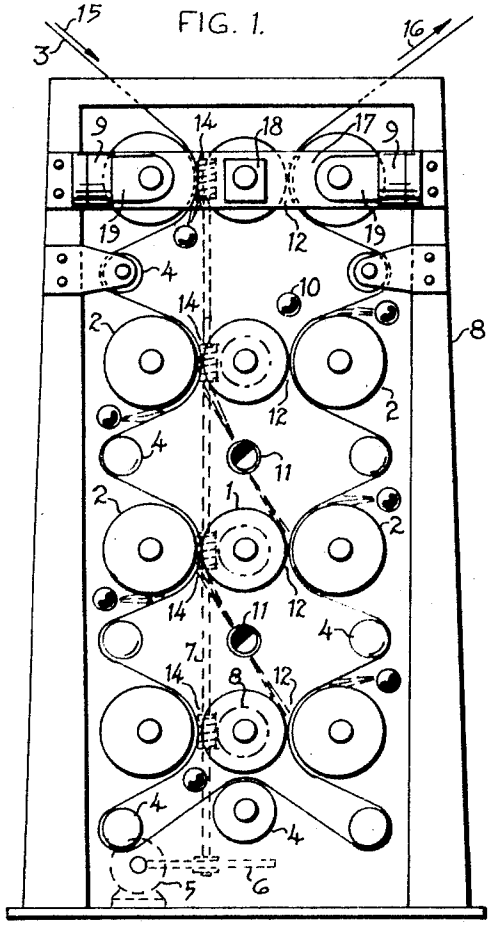
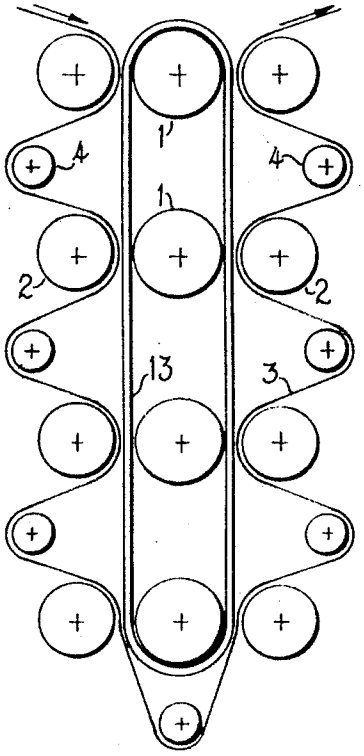


FIG. 2.



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CONTINUOUS WASHING MACHINE

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ABSTRACT OF THE DISCLOSURE

An apparatus for washing flexible materials such as textiles comprising a plurality of squeeze means mounted on a frame with spray nozzles or other means located near the squeeze means to wash textiles being passed through the device. The squeeze means comprise a center roll of some elasticity and two more elastic side rolls positioned in contactual relationship with the center roll whereby a first nip and a second nip are formed. The textile travel through the first nip of each succeeding set of rolls and returns through the second nip in a reversed direction.

The invention

Prior art attempts to develop the newest washing machines have led to developments of machines wherein a plurality of more or less elastic rolls are placed vertically on top of each other and the web of material such as textiles are passed in a back and forth or zigzag movement from the bottom upwards with the use of laterally arranged reverse rollers. The squeeze joints or nips formed by the set of rolls are the points where the textiles are squeezed. The basis for this type of operation is the vigorous squeezing incurred in each nip or joint which presses the chemicals present in the material out of the material. After each pressing or squeezing step, water or other wash chemicals are added by spraying or other means to the fabric to dilute the amount of remaining chemicals or other treating agents, which in turn is then squeezed by the next nip or joint. In a progression of rolls as has been provided, very quick washing of the fabric takes place, leaving only a reltaively insignificant amount of contamination.

In the practice of the prior art operations, some disadvantages have been found which limit the scope of application of such machines. Basically, these disadvantages are caused by the stacking of the rolls. Despite the application of a high hydraulic compression pressure, the roller weights still are a material factor and the gap pressures increase from the top downward. Because of this fact, the squeeze rollers must be elastic due to the different impression phases in the gap. In any event, the various circumferential speeds or rotating speeds of the various rolls result in varying speeds for the several rolls. This variable speed creates tension in the goods, and the resulting friction causes tears and other damages to the goods being processed. Compensation rolls are ineffective in eliminating this drawback, primarily because there is not a sufficient amount of space for a buffer path.

Accordingly, it is an object of this invention to provide a washing machine of continuous nature which obviates the problems of tension, friction and other stresses on goods being subjected to a washing cycle.

Other objects will appear hereinafter.

It has now been discovered that the following invention is admirably suited to the washing of textiles and other flexible materials. The invention involves the use of various squeezing means comprising one center roll of some elasticity and two side rolls or bilaterally spaced

rolls of higher elastic compression. These side rolls are placed in contactual relationship with the center roll to form a first contact nip and a second contact nip. The plurality of squeeze means as described are placed in a spaced apart relationship, either vertically or horizontally, such that the flexible material passes through the first contact nip of each succeeding squeeze means and, after reversal at the last squeeze means, return in the reverse order through the second contact nip of each of the squeeze means. Use of reversing rolls between the squeeze means allows for an extended path of travel. In a preferred embodiment, the center rolls of all of the squeeze means are synchronized by a single driving means, and the center rolls are further manufactured to have a precisely similar diameter.

In the drawings:

FIGURE 1 shows the present invention arranged in a vertical position with the various squeeze means superimposed; and

FIGURE 2 shows an alternative embodiment, wherein an entrainment belt of elastic material surrounds the center rolls of an apparatus similar to that shown in FIGURE 1.

As shown in FIGURE 1, a plurality of squeeze means are mounted on the frame **8**. Each of these squeeze means comprise a center roll **1** and two side rolls **2** positioned in contactual relationship with the center roll to form a first contact nip **14** and a second contact nip **12**. The textile or other flexible material **3** enters the device in the direction shown by arrow **15** and passes through the first contact nip **14** formed by the center roll **1** and one of the side rolls **2**. The textile **3** passes through each succeeding first nip **14** of each of the squeeze means, and after reversal of direction, the textile **3** passes through the second contact nip **12** of each squeeze means in a reverse order and leaves the device in the direction shown by arrow **16**. To increase the length of travel, and the time for treatment, reversing rollers **4** are placed in the gaps between the squeeze means.

As the textile or other flexible material passes through the device, it is maintained essentially tension free due to the fact that the center rolls **1** are constructed with essentially identical diameters. These center rolls are driven by a single drive means **5** which causes a single shaft **7** to turn each of the center rolls **1** through transmission wheels **8** at a uniform and constant rate. Finally, the gap pressures for the first contact nip **14** and second contact nip **12** are maintained constant by pressure elements **9**. Thus the circumferential speed in the nips and the nip pressures are constant, resulting in a tension free travel of path for the textile **3**.

Following each squeezing through each of the contact nips, the material is sprayed with a washing fluid by means of spray nozzles **10** which, in this case, are tubes or pipes arranged parallel to the rolls. It is a preferred practice to locate these spray pipes **10** on that side where the goods are discharged from a contact nip, thereby affording the washing fluid sufficient time to diffuse into the goods to pick up any residual contamination prior to squeezing in the next succeeding contact nip.

In a preferred embodiment, as shown in this figure, the squeeze means are located vertically. The advantage of this arrangement is that the washing fluids which have been squeezed from the material flow downward by the force of gravity. A portion of this washing fluid is introduced into the textile or other flexible material prior to the material **3** entering into the first nips **14**, thereby acting as a pre-wash. As the flexible material **3** leaves the device, upon passing through the various second contact nips **12**, it is less likely to encounter overflow wash fluids

as it approaches the exit of the device and therefore recontamination is minimized.

Additional spray means **11** may also be provided.

Each of the three part squeeze means are positioned on horizontal cross beams **17**. The center rolls **1** are mounted on the cross beam **17** by a mounting **18**. The side rolls **2** are attached to mountings **19** which cooperate with pressure elements **9** which are attached to frame **8**.

In a preferred embodiment, the center rolls **1** are manufactured from a relatively elastic material. The side rolls **2** are constructed of a material which is more elastic than the material used as a covering or coating for the center roll **1**. This is done to maintain a close tolerance of the relationship between the various center rolls and is additionally important in providing a uniform direction of the travel of the wash water, since it is known that the passage of a flexible material through a nip formed by two rolls of differing elasticity will cause the fluids contained therein to pass through the material in a direction toward the more flexible roll.

A further preferred embodiment of the present invention is to mount a circulating and loose compression belt as shown in FIGURE 2 by belt **13** around the center rolls **1**. This may be done to permit the manufacture of the center rolls **1** from a relatively hard material suuh as metal which permits accurate construction of close tolerances. The side rolls **2** may then be coated with a more elastic material to provide the relationship of greater elasticity in the side rolls **2** as described above.

Further embodiments of the invention will become apparent such as where the plurality of squeeze means are positioned horizontally with respect to each other, and it is intended that the scope of the invention shall be limited only by the claims appended herein.

What is claimed is:

1. An apparatus for washing flexible materials such as textiles comprising:

a plurality of squeeze means in spaced apart relationship, a frame supporting said squeeze means, drive means for passing said textile through said squeeze means, and spray means positioned near squeeze means and mounted on said frame, said squeeze means comprising a relatively elastic center roll and two relatively more elastic side rolls positioned in contactual relationship with said center roll to form a first contact nip and a second contact nip, whereby a path of travel for said material is defined, such that said material passes through said first contact nip of each succeeding set of rolls and returns through the second contact nip of each set of rolls in reverse order.

2. The apparatus of claim **1** wherein said drive means comprises a single drive adapted to synchronize the rotation of each center roll.

3. The apparatus of claim **1** wherein said spray means are positioned at the discharge end of each contact nip.

4. The apparatus of claim **1** which further contains guide rolls positioned between said squeeze means to lengthen the path of travel of said flexible material.

5. The apparatus of claim **1** wherein said squeeze means are positioned in a vertical relationship with respect to each other.

6. The apparatus of claim **1** which further contains an entrainment belt embracing all of said center rolls, said entrainment belt being of less elasticity than said second roll.

7. The apparatus of claim **1** wherein said squeeze means contain pressure elements to vary the pressure between said side rolls and said center rolls.

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