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METHOD OF AND ARRANGEMENT FOR WASHING TEXTILES, ESPECIALLY ENDLESS TOWELS

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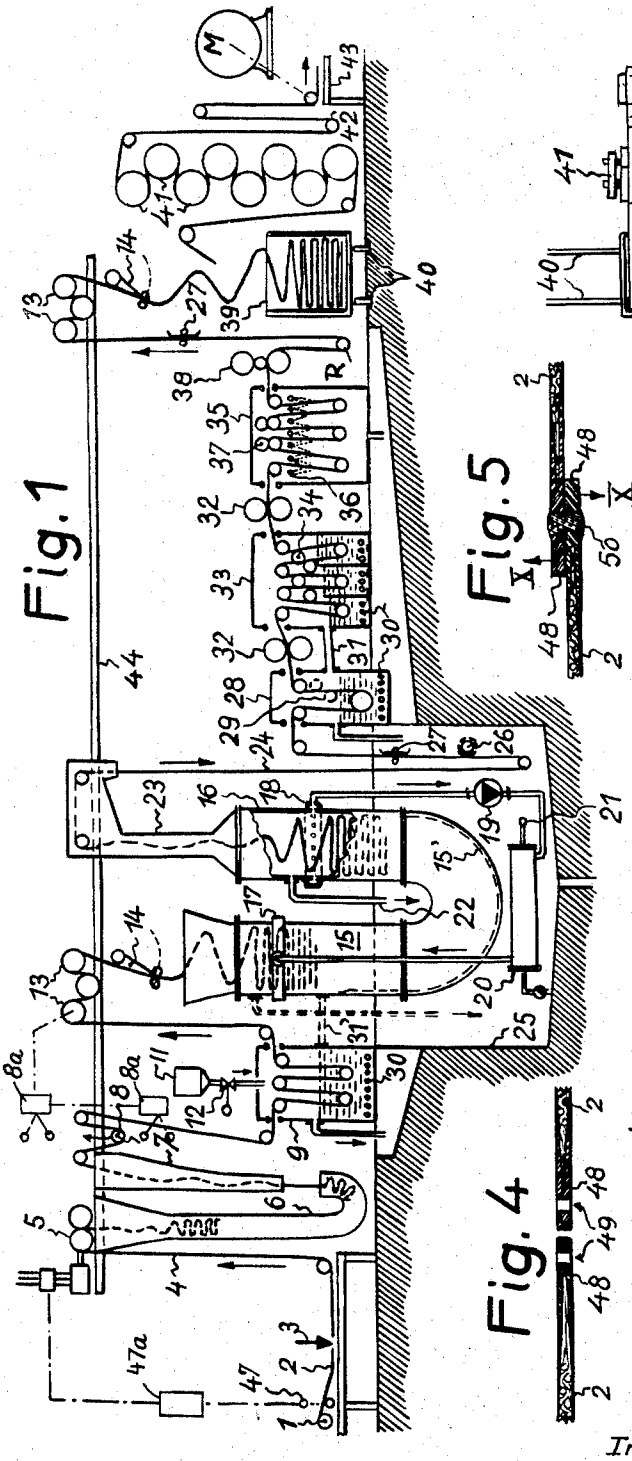


Fig. 1

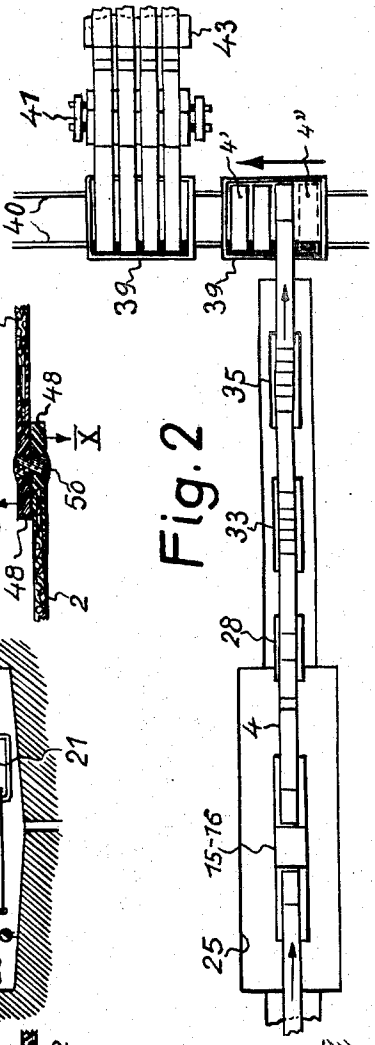


Fig. 2

Fig. 5

Fig. 4

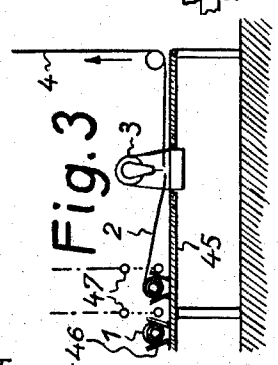


Fig. 3

Inventors:
Erich Schumm
Karl-Peter Lopata
Günter Schiffer

by Walter Becker

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Erich Schumm, Murrhardt, Karl-Peter Lopata, Krefeld-Urdingen, and Günter Schiffer, Krefeld-Bockum, Germany, assignors to Joh. Kleinewefers Sohne, Krefeld, Germany

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ABSTRACT OF THE DISCLOSURE

The method of successively feeding endless hand towels to be washed in the form of wound-up rolls to a connecting station, firmly interconnecting the respective successive ends of the textile material pertaining to successive rolls, feeding the thus interconnected web material sections in unwound condition in a continuous manner through a washing liquor, plaiting the thus washing liquor impregnated web material in superimposed layers over a desired path while at the end of said path in a continuous manner withdrawing the respective adjacent plaits one after the other and in unfolded substantially straightened-out condition and subjecting said withdrawn material on opposite sides to a brushing action, at least once squeezing and hot and cold rinsing the respective brush web sections, drying the thus treated material, separating the dried material sections at their interconnected areas, and finally winding up the separated sections to form individual rolls.

The present invention relates to a method of and arrangement for washing textiles in the shape of relatively wide webs, especially endless towels having a length of approximately 45 yards as they are commonly employed in towel automats. With automats of this type, the actuation of a lever or a push button permits the hanging-out towel loop to be advanced by a section of approximately 10" which is being withdrawn from one roll while at the same time a corresponding section is rolled onto a second roll.

Washing installations for washing in a continuous process textiles of wide web-shaped character are known. With these installation, the goods are in the form of a loop passed through a washing compartment which is filled with washing liquor, in which by shaking and beating movements or vibrations, the soiled pigments are detached from the goods. Thereupon, the goods are treated in hot and cold rinsing compartments where the goods are freed from the washing liquor, and finally the thus washed goods are squeezed in a squeezer to give off 40% and more of its moisture. Between the rinsing compartments, further squeezers may be arranged in order in comformity with the thinning principle to drag less of the soiled rinsing water to the next compartment.

While these heretofore known devices treat exclusively new goods with a width of in excess of 15" with a constant soiling, dye or acid degree, the problem of washing used towels is considerably more difficult to solve because in this last instance the impurifications or the soiling are not uniformly distributed and thus the problem involves the washing out of dirt which varies up to the highest degree of soiling while the soil is distributed in a spot-like manner.

There have been developed specific installations for continuously washing endless towels, which installations, however, have various drawbacks. In this connection, there is to be mentioned primarily that due to the fact that these installations do not provide for a tarrying period

for the goods, the soil cannot be dissolved sufficiently and, furthermore, by means of successive multiple squeezers the soil is pressed again into the goods. Furthermore, the guiding of the goods in the form of strands is disadvantageous with relatively narrow web material and prevents a material passing speed.

The washing of endless towels in washing machines of the laundry trade is, due to the narrow band shape and due to the formation of loops and knots, possible only when such towels are folded to bundles of approximately 1 yard length and are bound together at the ends. This, however, is rather time-consuming and also prevents a proper cleaning at the areas which are bound together.

On the other hand, the heretofore known continuous washing machines of the textile processing industry are not suitable for the washing of endless towels because they are not designed for such strong soiling as is encountered with used endless towels and on the other hand they are built for a considerably greater width of the web material so that this width would be wasted when used for washing endless hand towels. There may furthermore be mentioned that these washing machines cannot be slowed down when due to encountering particularly strongly soiled areas it would be desired to expose such areas to the washing liquid for a period longer than normally. It should also be borne in mind that hand towel washing machines for economical reasons require a higher speed than is the case with washing machines of the textile processing industries or with the heretofore known hand towel washing machines. The manipulation of hand towels furnished in rolls of approximately 40 yards, namely the spreading out, sewing together to an endless web and the separation of the sections following the drying step, as well as the formation of individual rolls, require additional devices in order to be able to carry out the entire washing process in a continuous manner with a minimum of operators.

It is, therefore, an object of the present invention to provide a method of and arrangement for washing textiles of great width, especially endless hand towels, in a continuous manner, which will overcome the above mentioned drawbacks.

It is another object of this invention to provide a method and arrangement as set forth above, in which at high passing speed it will be possible to handle the highest degree of soiling.

It is a further object of this invention to provide a method and arrangement as set forth in the preceding paragraphs, in which the entire washing process from the readying of the supplied hand towel rolls to the winding up of the washed and pressed endless hand towels will be automated to a high degree.

These and other objects and advantages of the invention will appear more clearly from the following specification in connection with the accompanying drawing, in which:

FIG. 1 is a diagrammatic representation of a washing installation according to the invention.

FIG. 2 is a partial top view of the arrangement of FIG. 1.

FIG. 3 diagrammatically illustrates a side view of the sewing installation.

FIG. 4 shows two towel ends provided with a reinforcement of synthetic material and with perforations prior to the sewing-together step.

FIG. 5 diagrammatically shows two towel ends riveted together by synthetic rivets.

The present invention is realized by the fact that the hand towels which are furnished in the form of rolls are sewed together at a sewing station to form an endless web whereupon the towels are passed through a buffet storage device and conveyed to an impregnating compartment for impregnation with a washing liquor which, if desired, may

contain bleaching means. The thus treated goods are then plaited down in a J-box permitting a long tarrying time. Subsequently, the goods are passed over an air passage through a brushing compartment with thinned washing liquor or soda solution and after being squeezed off each time are then rinsed in a manner known per se in hot and cold rinsing compartments. Finally, the goods are dried in a drying machine, smoothed and separated from the endless band and wound up in the form of individual rolls. At the sewing station, the rolls which are deposited in trough-shaped supports, are unwound, and the material is sewed to the preceding towel web. After effected unwinding, the further transport is interrupted and the next roll is wound off for sewing to the web.

The particular feature of the method according to the present invention consists in that for purposes of subjecting the goods to the influence of the washing liquor over a period of time sufficient to assure a detaching of the soil pigments from the goods, the goods impregnated with fresh washing liquor, are over a considerable width plaited down in a J-box-shaped tarrying container. The capacity of such container is so selected that an actuating time of from 30 minutes to 1 hour will dissolve and detach the soil pigments. Such tarrying boxes are known per se in connection with bleaching processes. For pure washing processes, however, they have not been employed heretofore because with new goods which usually have been bucked or boiled before, such long actuating periods for dissolving soil pigments or thinning the acid residues are not required.

A further feature of the present invention consists in that after the actuating period, the goods are not immediately rinsed but are first passed over an air passage for unfolding, straightening and absorbing oxygen and are then brushed at both sides in a brushing compartment which is filled with thinned washing liquor.

It is a further important feature of the present invention that for purposes of more economically taking advantage of the active chemical ingredients of the washing liquor, the fresh liquor is passed from the impregnating compartment to the tarrying box and is withdrawn from and re-introduced several times by pumping while an intermediate heating is effected. Thereupon the chemically used up liquor excess is discharged in a continuous manner through an overflow pipe from the exit leg of the tarrying box.

Referring now to the drawing in detail, FIGS. 1 and 2 illustrate an arrangement according to the present invention showing the towels **2** which are furnished in the form of rolls **1** and are unwound and sewed to the endless web **4** which will run ahead of the roll being unwound. This sewing is effected on special sewing machines or on other corresponding devices **3**. The endless web is then passed upwardly by conveyor rollers **5** and conveyed to a buffer box **6** in a dried condition. This buffer box or buffer is necessary in order to create a compensation between the continuous movement of the goods on the right-hand side (with regard to the drawing) of said buffer and the discontinuous feeding of goods on the left-hand side of said buffer. From buffer box **6** the goods pass through a quieting funnel **7** and over a pendlulum roller **8** to the impregnating compartment **9**. The pendulum roller **8** regulates the continuous movement of the goods and interrupts the movement of the goods when the buffer becomes empty, through the intervention of two limit switches **8***a*. In said impregnating compartment **9**, the goods are impregnated with a fresh washing liquor which passes from a mixing container **11** through a metering arrangement **12** into the impregnating compartment **9**. The washing liquor is heated by heating coils or a radiator **30**.

From the impregnating compartment **9**, the goods pass over a transport roller mechanism **13** and a plaiting down device **14** to the tarrying box **15** in which they are plaited down in considerable width. The tarrying box is so designed that its discharge leg **16** has substantially the same height as the entrance leg **16***a* so that the goods will, due to their own weight, be moved as high as possible in the discharge leg **16**. In order to assure a good sliding movement of the pile of goods in box **15**, the box has its inside of the outer bent sections advantageously lined with a coating or foil **15'** of a synthetic material with a good sliding property, as for instance a fluorized tetrapolyethylene such as Teflon.

In view of the oncoming impregnated goods, the tarrying box **15** will in the manner of a communicating vessel have both legs filled with washing liquor while gradually an excess will form which is discharged through an overflow pipe **22** in the discharge leg **16**. In special instances, it is also possible to return the used liquor through a conduit **31'** entirely or partially into the impregnating compartment **9**. In order to aid the chemical reaction and the detachment of soil pigments, it is necessary to maintain the temperature of the washing liquor substantially constant. This temperature should for purposes of killing all bacteria be close to the boiling point of the water. The heating of the liquor is effected by passing the liquor discharged from the discharging leg **16** through an overflow **18** by means of a pump **19** through or by a heat exchanger **20** and pumping the thus heated liquor into the entrance leg of tarrying box **15**. The feeding nozzle line **17** of the entrance leg is located higher than the overflow **18**. The heat exchanger **20** may be heated in any convenient manner, preferably by steam which is conveyed thereto by a steam feeding line **21**.

From the discharge leg **16**, the goods pass through a vapor hood **23** and over upper deviating rollers to an air passage **24** extending from said deviating rollers to the lower portion of the working pit **25**. Here the goods are deviated and passed over one or more beater rollers **26** for eliminating folds and over edge-guiding means **27** to a brushing compartment **28**. According to the invention, the arrangement of this brushing compartment behind the tarrying box **15** without the otherwise customary interposition of a squeezer mechanism is of foremost importance for the desired effect. In this connection it may be pointed out that it has been found that when a squeezer mechanism is interposed, the loosened soil pigments which are located on a gell layer on the surface of the goods will again be pressed into the interior of the goods when the goods are subjected to a squeezing operation. By omitting the squeezer mechanism and by immediately brushing on both sides of the goods by brushing rollers **29**, the soil is removed from the surface and thrown out. In order to aid the throwing off of the soil pigments, the goods in the brushing compartment pass through a thinned washing liquor which flows to the brushing compartment through a conduit **31** from the subsequent rinsing compartment **33**. By means of heating coils or a register **30**, the liquor in the brushing compartment as well as the rinsing water of the hot rinsing compartment will be heated.

After the goods have left the brushing compartment, they are squeezed in a squeezer **32** whereupon the rinsing process proper begins. First a hot pre-rinsing is effected in a hot rinsing compartment **33** of any desired type. In the specific example illustrated, a rinsing compartment with counter flowing rinsing liquor is employed. The rinsing liquor strongly enriched with washing ingredients is, as described above, conveyed to the brushing compartment through conduit **31**.

According to a further feature of the present invention, the hot rinsing compartment is supplemented by beaters or brushing rollers **34** known per se for acting upon both sides of the surface of the goods. After leaving the hot rinsing compartment, the goods are squeezed by a squeezer mechanism **32** and then passed into a rinsing compartment operating according to the thinning principle, in which compartment first hot and then cold clean water is sprayed from the nozzle pipes **36** onto the loops of the goods. This rinsing water is freely discharged and may in areas where there is a scarcity of water or where higher water

costs prevail be pumped into the hot rinsing compartment **33**. For the same reasons, it is also possible to convey the waste water obtained from the last rinsing compartment **35** into the impregnating compartment **9** for use in connection with the washing liquor. In the said rinsing compartment, between each loop a squeezing is effected either by a squeezer mechanism or by squeezing rollers **37** freely resting on the upper deviating rollers. When leaving the cold rinsing compartment, the goods are squeezed by means of a high output squeezer **38** to the lowest moisture content and then pass over a floating jockey roller R, edge guiding means **27** and an upper transport roller mechanism **13** through a plaiting member **14** for final deposit in a transport carriage **39** adapted to be moved on rails in the direction of the arrow Z. The plaiting in a transport carriage in the illustrated embodiment has been selected in order to permit taking full advantage of the succeeding cylindrical drying mechanism **41** of customary design. Inasmuch as this drying mechanism rotates considerably slower than the advance of the goods, it is necessary to introduce a plurality of webs of goods, in the illustrated Example 4 webs, into said drying mechanism. The goods leaving the last rinsing compartment are therefore plaited in carriage **39** into four sections **4'**, the not yet covered area being designated with **4''**. After the transport carriage has been filled, the latter is displaced in the direction of the arrow Z and moved in front of the cylindrical drying mechanism **41**. The arrangement may, of course, also be such that a drying machine of a special design provided with a plurality of drums may be employed which has the same speed as the advancing speed of the goods or that a hot air drier without drums be employed as drying mechanism. In the last mentioned both instances, it would, of course, not be necessary to divide the goods **4** into piles or sections **4'**, and the goods could be passed from the last squeezer **38** directly into the drying machine.

After the goods have left the drier **41**, they are passed over a floating jockey roller **42** or are conveyed into a compensating J-box and from there to a working table **43** where the endless goods are separated into individual towel sections **2** which are then rolled to rollers ready for use.

It is, of course, also within the concept of the present invention to combine the individual machines to larger units or to increase the individual stages as to their passage time or to repeat the individual stages. In special cases it may be necessary to enlarge the soiling detaching stage. This may be effected, for instance, by effecting a post-impregnation with fresh liquor after the goods have passed through the tarrying box **15**, and to provide a second tarrying box.

The compartments of the washing train which work with moisture, and the tarrying J-box are advantageously mounted above a working pit **25** which will collect all moisture, whereas the higher located driving elements, the floating jockey rollers and the plaiting means are supported by a frame **44**.

FIG. 3 shows some details of a sewing station. More specifically, at least two trough-shaped supports **46** are mounted on a work table **45**. The furnished hand towel rolls **1** to be washed are deposited in said trough-shaped supports **46** and it is from here that the towels **2** are unwound and by means of a sewing machine **3** have their ends sewed to the respective endless web **4** at the instant the latter is at a standstill. After releasing a push button control, the transport rollers **5** again start to rotate whereby the towel in the respective support **46** will be unwound. It is now necessary that the end of the unwound towel will be held in a position in which the next following towel can be sewed thereto. According to a further development of the present invention, this is effected photoelectrically or by a feeler which when the end of the towel in the respective support **46** is leaving the latter, initiates the emission of an impulse stopping the driving mechanism for the web **4**. In the particular embodiment shown in the drawing, this is effected by a photoelectric cell control **47** which when the unwinding towel end has moved past the electric eye permits the light beam to act upon a control mechanism for the transport rollers **5** so that the latter will come to a standstill. As soon as this occurs, the next hand towel roller deposited in the respective support **46** will be unwound so as to sew its foremost end to the towel end ahead thereof and the cycle is repeated.

Inasmuch as the towel ends, in view of the frequent sewing together and separation from each other, might be worn and the frayed ends have to be trimmed from time to time and sewed, it is suggested to permeate the towel ends with an elastic and flexible synthetic material as, for instance, tri-isocyanate, sold under the trademarks "Desmophen" and "Desmodur." Moreover, said towel ends are advantageously reinforced and provided with a perforation which by means of a special machine is sewed end to end or the ends are overlapped and riveted together by rivets of synthetic material such as a polyamide, for instance, nylon. However, if desired, the ends may also be provided with hot sealing strips which are glued together by applying heat. FIG. 4 illustrates how the fabric ends of the towels, which have been permeated with a tri-isocyanate, have pressed thereon a layer **48** of synthetic materials such as polyvinyl acetate or butyl caoutchouc, and have riveting holes **49** punched therein.

FIG. 5 shows another possibility according to which the thus reinforced ends are overlapped and riveted together by rivets **50** of synthetic material, such as a polyamide. The separation of the sewed connection is effected by a knife, whereas the rivet connection is undone by pulling the ends in the direction of the arrows X.

It is, of course, to be understood that the present invention is, by no means, limited to the particular arrangement shown in the drawing but also comprises any modifications within the scope of the appended claims. Thus, if the economy will justify it, it is possible to make the sewing process fully automatic. Such automatic machinery for this purpose is well known in the wrapping industry.

The composition of a washing liquor may, of course, vary in wide limits and will be selected to suit the particular material involved. Merely by way of example, a washing liquor may be selected which contains per kilogram liquor 5 grams of laundry soap, 3–5 grams of soda ($NaCO_3$) and 1–2 grams of a 35% hydrogen peroxide solution as oxygen carrier in order to maintain the whiteness of the textile material.

What we claim is:

1. A method of washing textile material having a relatively wide surface, especially endless hand towels, which includes the steps of: successively feeding the textile material to be washed in the form of wound-up rolls to a connecting station, firmly interconnecting the respective successive ends of the textile material pertaining to successive rolls, feeding the thus interconnected web material sections in unwound condition in a continuous manner through a washing liquor, plaiting the thus washing liquor impregnated web material in superimposed layers over a desired path while at the end of said path in a continuous manner withdrawing the respective adjacent plaits one after the other and in unfolded substantially straightened-out condition and subjecting said withdrawn material on opposite sides to a brushing action, at least once squeezing and hot and cold rinsing the respective brushed web sections, drying the thus treated material, separating the dried material sections at their interconnected areas, and finally winding up the separated sections to form individual rolls.

2. A method according to claim **1**, which includes the step of following the brushing step and prior to the drying step again plaiting the web material.

3. A method according to claim 1, which includes the step of: after the brushing step and prior to the drying step once more passing the material through washing liquor, and subsequently rinsing the material.

4. A method according to claim 1, which includes the steps of: collecting the washing liquor dripping off from the web material during the plaiting operation, heating the thus collected washing liquor, and returning said collected washing liquor to the washing liquor through which the web material is passed prior to being plaited.

5. A method according to claim 1, which includes the step of providing the respective ends of the web material to be connected to each other prior to the washing operation with reinforcements of synthetic material and with a perforation for interconnecting the respective adjacent ends of adjacent web material sections by sewing.

6. A method according to claim 1, in which the respective adjacent ends of adjacent web sections are interconnected by over-lapping said ends and riveting the same together by synthetic rivets.

7. A method according to claim 1, in which the respective ends of adjacent web sections are interconnected by heat and boiling resistant adhesive strips.

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WILLIAM I. PRICE, *Primary Examiner.*