April 9, 1940. A. O. HURXTHAL 2,196,921

WEB HANDLING APPARATUS

Filed Oct. 29, 1938 2 Sheets-Sheet 1

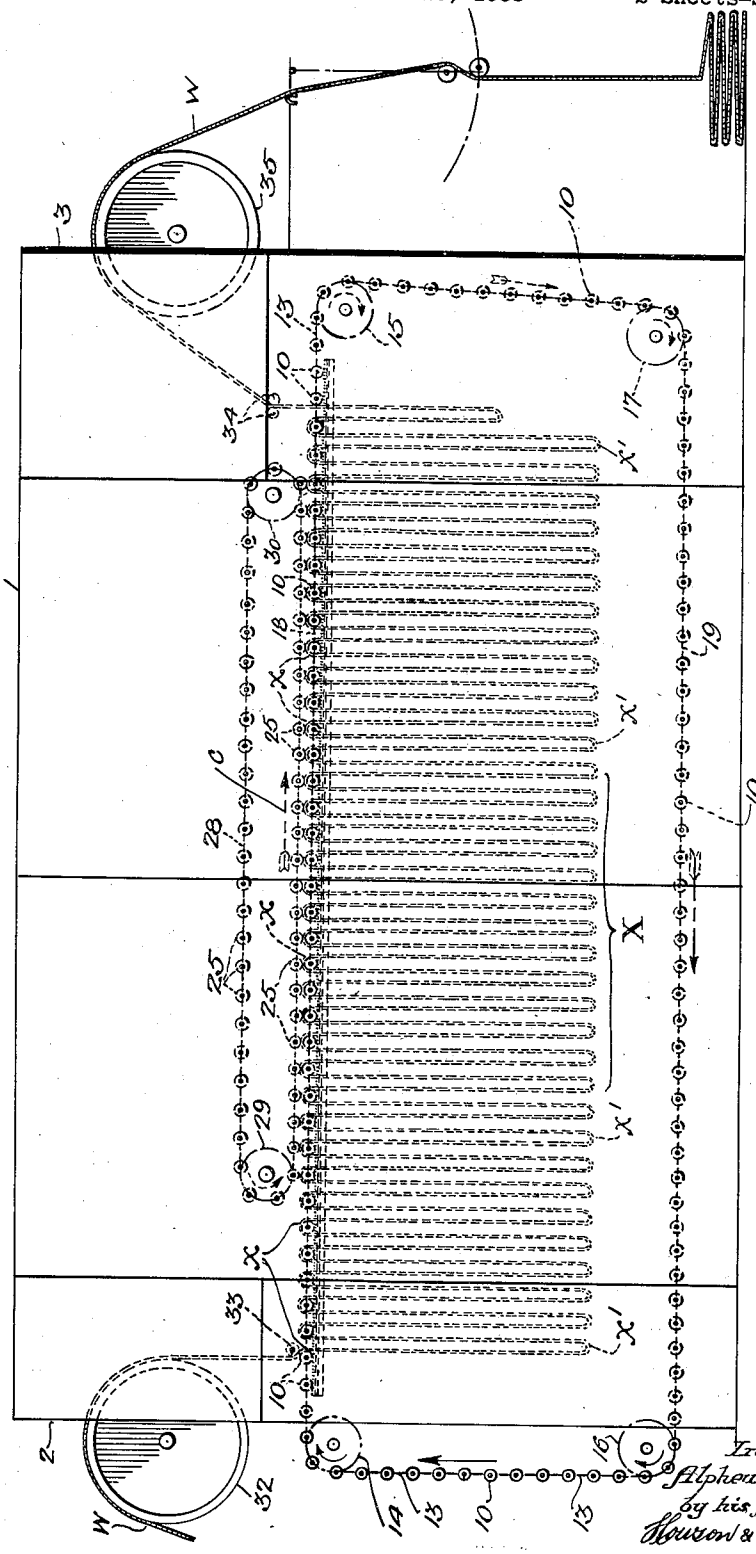


Fig. 1.

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Fig. 2.

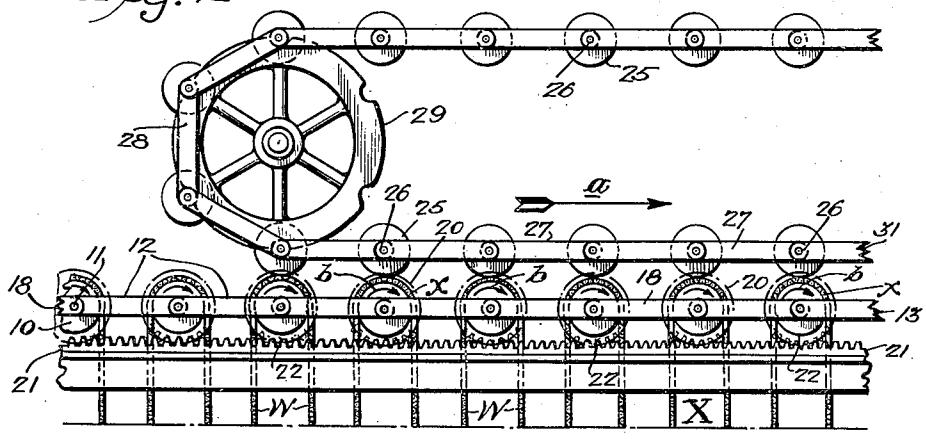


Fig. 4.

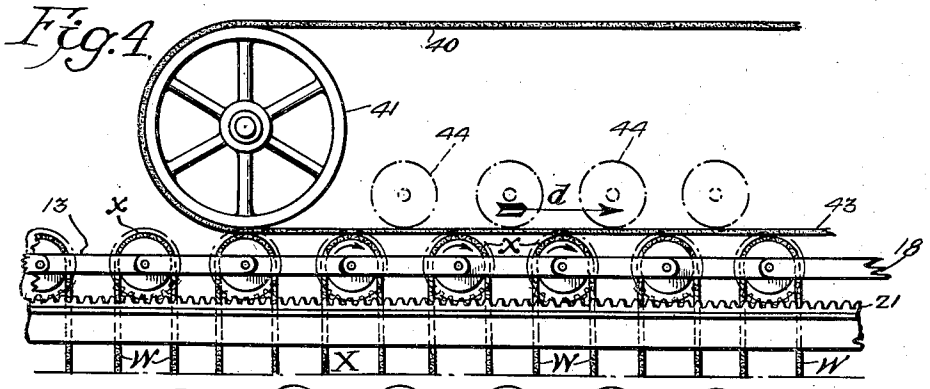
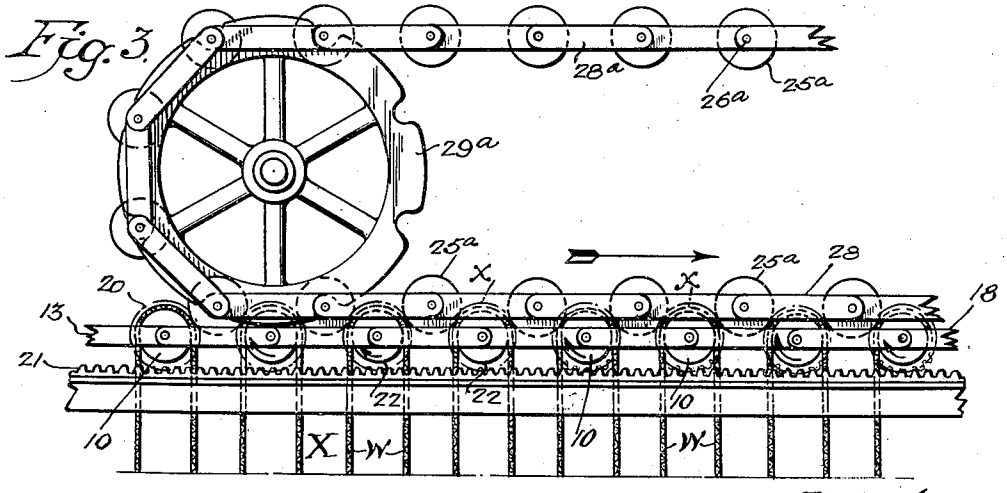


Fig. 3.



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UNITED STATES PATENT OFFICE

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WEB HANDLING APPARATUS

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Application October 29, 1938, Serial No. 237,755

12 Claims. (Cl. 271—2.2)

This invention relates to an apparatus for handling web materials, such as textile fabrics, etc. in subjecting the material to some prescribed treatment, such as the drying of textile fabrics after processing, dyeing, etc. The invention relates to the handling of web materials in the form of a series of loops or festoons; and is particularly applicable to what is commonly known in the art as loop dryers.

In a loop dryer, the web is hung over and between a series of supports which are arranged in substantially parallel laterally spaced relation to each other, in a substantially horizontal plane. The material is usually fed continuously to the supports, at one end of the dryer, while the supports are advancing horizontally below the feeding apparatus, whereby the material is formed into successive loops or festoons which advance through the dryer to the opposite end thereof where the material is constantly withdrawn from the loops or festoons successively, the festooned material, intermediate the formation of the loops or festoons at the one end of the dryer and the removal of the material from the loops or festoons at the opposite end of the dryer being subjected to the influence of air or other drying or treating medium in circulation within the dryer.

Disadvantages of the loop dryer have been marking of the material where it made contact with the festoon supports; and non-uniformity of drying throughout the length of the web. These disadvantages have been caused by the moisture from the upper portions of the loops or festoons running down through the material to the lower portions of the loops, which caused the portions of the material which were resting on the supports to dry more rapidly than the portions of the material in the lower portions of the loops.

Many attempts have been made in the past to overcome the above-noted difficulties, for example, by rotating the supports for the loops as the series of loops is advanced through the dryer, to effect a relative movement between the material and the loop supports, the purpose of such relative movement being two-fold.

In the first place, the relative movement between the material and the supports was intended to prevent any portions of the material from lying constantly in contact with the loop supports throughout the whole of the drying or other processing cycle. Secondly, the relative movement between the supports and the material was intended to move the material from the tops to the bottoms of the festoons and vice versa, one or more times during the drying or treating cycle, to obtain greater uniformity in the drying or other treatment of the material.

The rotating support has only partially solved the problem confronting the makers and users of this type of dryer, in that there has been no assurance that the material will move with the carrying surfaces of the supports or be moved thereby as the supports rotate.

In the case of textile fabrics, the movement of the web with and by the rotating supports is most efficient while the material is in its extremely wet condition, but, as the material begins to dry traction between the material and the carrying surfaces of the supports decreases, resulting in the material moving or being moved in varying degrees as the supports revolve. This causes the festoons to vary in length. Eventually the longer loops rob the shorter loops and in some instances the shorter loops are eliminated entirely. This frequently results in the elongated loops dragging along the bottom of the dryer, damaging the material.

In order to avoid or reduce to a minimum the above objections, some manufacturers and users of the loop type of drying mechanism have resorted to roughening the carrying surfaces of the supports, in order to increase the tractive engagement between the supports and the material. Such procedure has been but partially successful and has added other difficulties in the form of abrasion of the surface of the material, without providing any positive assurance of equal movement between the carrying surfaces of the supports and the material passing around the supports.

The object of the present invention is to provide an apparatus for applying an extraneous pressure to the web where and as it makes contact with the rotating supports, to insure tractive engagement between the material and the carrying surfaces of the supports, whereby, as the supports revolve, the material will be moved concurrently therewith and to an equal extent with the carrying surfaces of the supports. Thus, by constantly rotating the supports as they travel from approximately the point of formation of the festoons to approximately the point where the material is withdrawn from the festoons, the relation between the carrying surfaces of the supports and the portions of the material making contact with the carrying surfaces of the supports is constantly changing; and the material is caused to progress constantly through the festoons from the tops thereof to the bottoms thereof and vice versa, whereby marking of the material by the supports

is entirely eliminated and uniform drying of the material is efficiently effected.

In the accompanying drawings:

Fig. 1 diagrammatically illustrates a loop dryer equipped with pressure exerting means in accordance with the principles of the present invention;

Fig. 2 is an enlarged side elevation of a portion of the pressure applying means illustrated in Fig. 1;

Fig. 3 is a view similar to Fig. 2, illustrating a modified form of pressure applying means; and

Fig. 4 is a view similar to Figs. 2 and 3, illustrating a still further modification of the invention.

As shown in Fig. 1, the drying or other processing device comprises a casing 1 through which the material to be dried or otherwise treated is advanced from the feed end 2 of the casing to the discharge end 3 thereof. It will be understood that any desired form of treatment may take place within the casing 1. The treating medium may be maintained in circulation within the casing by any suitable means, not shown, which per se forms no part of the present invention.

In the present instance the web W is formed into a series of loops or festoons X, over and between a series of supports 10, 10 which extend transversely of the casing 1. The supports 10, 10 are rotatably supported at their opposite ends respectively by trunnions 11, 11, which form or which are coaxially arranged with the pintles connecting adjacent links 12, 12 of a pair of laterally spaced side chains, which together with the supports 10, 10 form a suitable conveyer 13 by which the loops X respectively carried by the supports 10, 10 are moved longitudinally through the casing 1, from the feed end 2 thereof to the discharge end 3 thereof.

The supports 10, 10, in the present instance, are in the form of round poles or rollers constituting girts extending transversely of the conveyer 13 from one of the side chains thereof, composed of the links 12, to the other of the side chains of the conveyer.

The side chains of the conveyer 13 pass around sprockets 14, 15, 16 and 17 which may be supported and driven in any suitable manner and by any suitable means to move the conveyer 13 in the direction of the arrows illustrated in Fig. 1, it being noted that the conveyer 13 is of the endless type and that the loops or festoons X are supported by the girts 10 along the upper run 18 of the conveyer, while the lower run 19 of said conveyer is disposed a substantial distance below the upper run 18 and the lower ends of the loops or festoons X carried thereby.

As shown in Fig. 2, each of the girts 10, adjacent one or both ends thereof, is provided with the gear wheel 20. Along the upper run 18 of the conveyer 13, the teeth of the gears 20, 20 are adapted to mesh with the teeth of a stationary gear rack 21. The toothed rack or racks 21 are maintained in fixed position in and with respect to the casing 1, whereby as the upper run 18 of the conveyer 13 is moved in the direction of the arrow *a*, Fig. 2, the girts 10 are constantly rotated in the directions of the arrows *b*, Fig. 2.

As shown in Fig. 2 the upper portions *x* of the loops or festoons X pass around the upper sides of the rotary girts 10. In accordance with the principles of the present invention, extraneous pressure, i. e., pressure other than that exerted by the weight of the material itself in the festoons or loops X, is applied to the upper portions *x*, *x* of said loops or festoons where these portions of the festooned material make contact with the peripheral carrying surfaces of the girts 10.

In the preferred form of the invention, as illustrated in Figs. 1 and 2 of the drawings, the extraneous pressure, applied to the upper portions *x*, *x* of the festooned material for the purpose of insuring tractive engagement between the carrying surfaces 22, 22 of the girts 10, 10 and the web W, is produced by a series of freely rotatable cylindrical weights, in the form of rollers 25, 25, which are arranged in vertical alignment with the axes of the girts 10, 10 and bear on the upper portions *x*, *x* of the material W, preferably, though not necessarily, from side to side of the material.

It will be understood that, while it is preferred to employ solid rollers extending continuously from side to side of the material, the rollers may be of a hollow or tubular construction; and furthermore it will be understood that the rollers 25 may consist of two or more independent sections arranged in end to end abutting, or relatively spaced axially aligned relation to each other, as desired.

The pressure exerting rollers 25, in the present instance, are provided with trunnions 26, 26 at each of their opposite ends, which may constitute the connecting pintles between successive links 27, 27 of endless carrying or spacing chains 28, respectively disposed at opposite ends of said rollers, or the trunnions 26 may be independent of the chain pintles and be rotatably mounted in suitable bearings carried by the chains 28.

The chains 28 pass around sprockets 29 and 30 which are disposed adjacent the feeding and discharging ends 2 and 3 respectively of the casing 1. The sprockets 29 and 30, or either thereof, may be operated by any suitable means, from any suitable source of power whereby the lower runs 31 of the chains 28 will be moved concurrently, in the direction of the arrow *a*, Fig. 2, with the upper runs 18 of the side chains of the conveyer 13, whereby the pressure exerting rollers 25, 25 are maintained in horizontal laterally spaced relation to each other and in vertical alignment with the revolving girts 10, 10 of the upper run 18 of the conveyer 13 at all times during the travel of the girts 10, 10, from the point at which the festoons or loops are formed to the point at which the web is withdrawn from said loops or festoons successively.

The material W is fed to the conveyer 13 by a drum 32, under a roller 33 disposed above the upper run 18 of the conveyer 13, by which, as the girts 10, 10 pass successively under the roller 33, as the upper run of the conveyer 13 moves in the direction of the arrow *c*, Fig. 1, the web W is caused to be laid over the successive girts 10, 10 to form the upper parts *x* of the loops or festoons X, and between the successive girts 10, 10 to form the lower portions *x1* of the loops X successively.

The material W is withdrawn from the loops, adjacent the delivery end 3 of the casing 1, between a pair of guide rollers 34, by a drum 35 which delivers the dried material to any suitable form of folding, piling, or rolling device.

The drums 32 and 35 and the conveyer 13 are driven at the proper relative speeds by any suitable variable speed transmission etc. for accomplishing the formation and withdrawal of the web W into and from the loops X; and the weight carrying conveyer chains 28, or the supporting sprockets 29 and 30 thereof, are driven at the

proper speed with respect to the speed of the conveyer 13 to maintain vertical alignment between the girts 10 in the upper run of the conveyer 13 and the freely rotatable weights 25 at all times.

From the above it will be clear that as the upper run of the conveyer 13 advances in the direction of the arrow c, Fig. 1, the web W is formed into the loops X successively around the constantly moving girts 10 and the constantly moving girts 10 are continuously rotated from the point of formation of the loops X to the point of derangement of said loops, by the gears 20 being in constant driving contact with the teeth of the stationary rack 21. It will also be obvious that as the loop supporting girts 10 pass under the sprockets 29 one of the pressure exerting weight rollers 25 will be laid on top of each loop supporting girt 10, in contact with the upper portion x of the web W, and maintained in vertical alignment with the loop supporting girt throughout its travel through the casing 1, and that the weight roller 25 in each instance will produce and maintain an extraneous pressure on the web W, whereby tractive engagement between the web W and the carrying surfaces 22 of the girts 10 is at all times insured; and whereby the constant rotation of the girts 10 will advance the web W progressively through the loops X with the portions x of the loops alternately changing position with the lower portions $x1$ of the loops to prevent running of the moisture from the upper portion of a loop into the lower portion thereof, whereby uniform drying of the web is maintained and marking of the web by the girts as a result of the web laying constantly and quietly on the girts is prevented.

As shown in Fig. 3, the weight rollers instead of being maintained in vertical alignment with the respective girts 10, 10, as in Figs. 1 and 2, are positioned intermediate each adjacent pair of girts 10, 10, in tangential relation to the portions x of the web W which pass around the girts 10. The weight rollers 25a in this instance function as nip rolls to pinch the web W between the cylindrical peripheral faces of the nip rolls 25a and the carrying faces 22, 22 of the pair of girts 10, 10, between which each nip roll is positioned.

As in the case of the weight rolls 25 shown in Fig. 2, the nip rolls 25a of Fig. 3 are rotatably mounted at their opposite ends in side chains 28a which pass around sprockets 29a and lay the nip rolls in position between the girts and remove said nip rolls from said position at the feed and delivery ends of the casing respectively.

In Fig. 4 the rolls 25 or 25a are supplanted by a continuous belt or belts 40 which are of the endless type and pass around drums or belt wheels 41 which take the place of the sprockets 29 and 30 of Fig. 1. The belt 40 may be of a width corresponding to the width of the conveyer 13 or said belt may be composed of a plurality of sections disposed in lateral abutting or relatively spaced relation to each other as desired.

The lower run 43 of the belt 40 is adapted to rest on top of the portions x, x of the web W passing around the girts 10, 10 in the upper run of the conveyer 13, to exert a pressure on the portions x, x of the web W sufficient to insure tractive engagement between portions x, x of the web W and the carrying surfaces 22 of the girts 10, 10.

It will be undersood that the drums or wheels about which the belt 40 passes may be driven at such a speed that the lower run 43 of the belt 40 will travel in the direction of the arrow d, Fig. 4 at the same speed as the carrying surfaces of the girts 10, as produced by the movement of the upper run 18 of the conveyer 13 and the engagement of the gears 20 on the girts 10 with the teeth of the fixed rack 21.

If desired, additional pressure may be exerted on the portions x, x of the web W through the belt 40 by rollers 44, 44 bearing against the upper surface of the lower run 43 of the belt 40 and which may be so mounted within the casing in a manner to be held against movement longitudinally of the casing while permitting vertical movement of the rollers 44 within the casing, the said rollers being freely rotated by traction with the upper surface of the lower run 43 of the belt 40.

I claim:

1. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and means continuously traveling concurrently with said supports for applying extraneous pressure to portions of the web contacting said supports en route.

2. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and means adapted to travel with said supports for applying extraneous pressure to portions of the web in contact with the plurality of said supports simultaneously.

3. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and weight means adapted to travel with said supports for applying extraneous pressure to portions of the web in contact with the plurality of said supports simultaneously.

4. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and freely movable weight means adapted to travel with said supports for applying extraneous pressure to portions of the web in contact with the plurality of said supports simultaneously.

5. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and means comprising a series of rollers continuously traveling concurrently with said supports for applying extraneous pressure simultaneously to portions of the web contacting said supports en route.

6. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and means comprising a series of rollers continuously traveling concurrently with said supports and movable substantially perpendicular to the plane of travel of said supports for applying extraneous pressure simultaneously to portions of the web contacting said supports en route.

7. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and means comprising a series of freely rotatable rollers continuously traveling concurrently with said supports for applying extraneous pressure simultaneously to portions of the web contacting said supports en route.

8. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and means comprising a series of freely rotatable rollers continuously traveling concurrently with said supports and movable substantially perpendicular to the plane of travel of said supports adapted to travel with said supports for applying extraneous pressure simultaneously to portions of the web contacting said supports en route.

9. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and means comprising a series of rollers adapted to travel continuously with said supports in vertical alignment with said supports respectively for applying extraneous pressure simultaneously to portions of the web contacting said supports en route.

10. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, means comprising a series of rollers adapted to travel with said supports in vertical alignment with said supports respectively for applying extraneous pressure simultaneously to portions of the web contacting said supports en route and means for causing said rollers to travel concurrently with said supports throughout substantially the full length of said path.

11. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and means comprising a series of rollers continuously traveling concurrently with said supports respectively lying between adjacent pairs of said supports in tangential relation with and for applying extraneous pressure simultaneously to portions of the web contacting said supports en route.

12. The combination of a series of web supports, means for advancing said supports along a predetermined path, means for rotating said supports en route, and means comprising a belt lying above and movable concurrently with said supports in contact with and for applying extraneous pressure to portions of the web contacting said supports en route.

ALPHEUS O. HURXTHAL.