April 12, 1932. A. ISHERWOOD 1,853,975

WEB HANDLING APPARATUS

Filed March 11, 1929 2 Sheets-Sheet 1

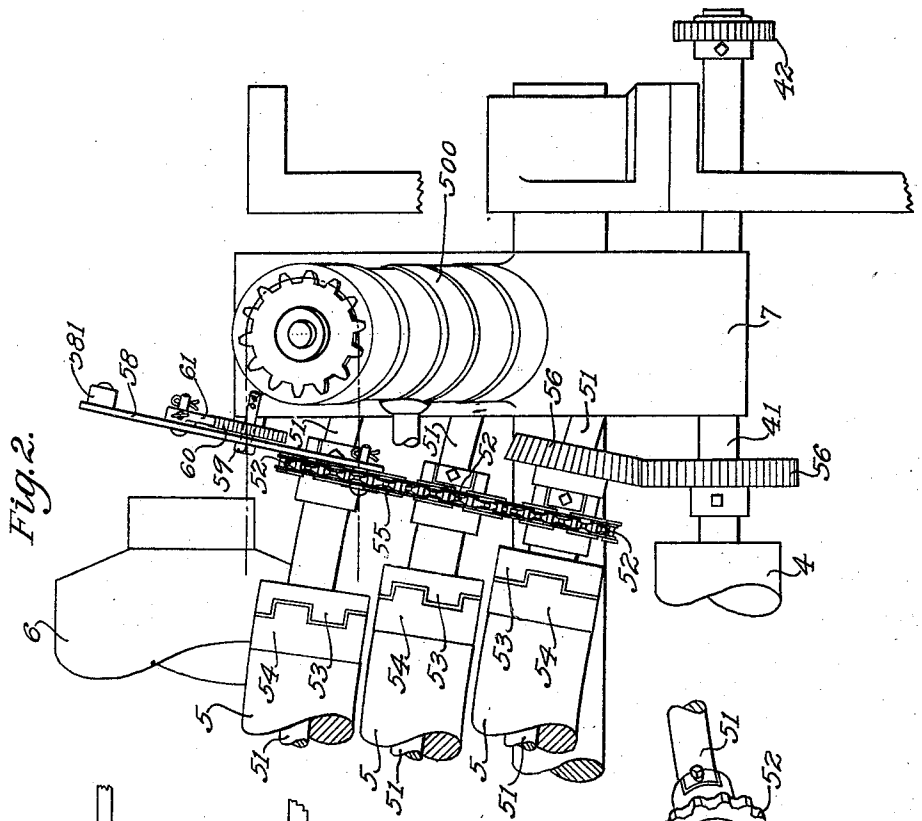

Fig. 2.

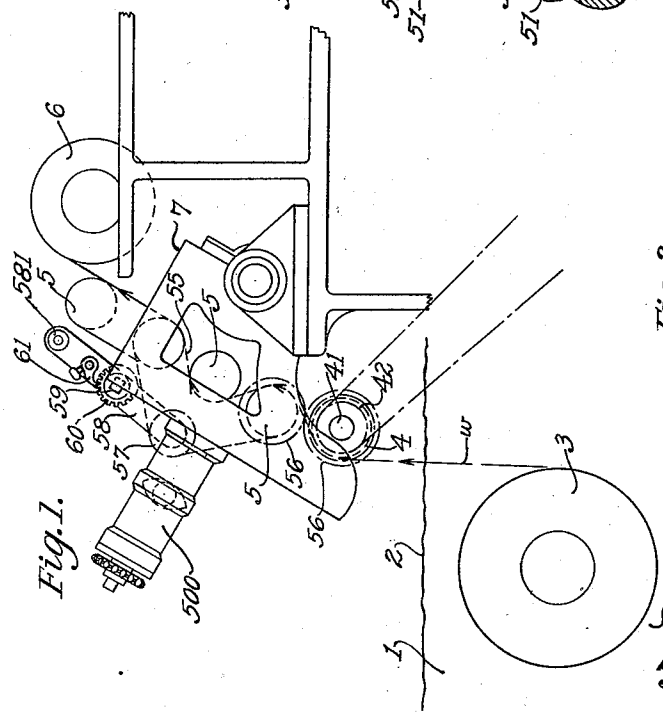

Fig. 1.

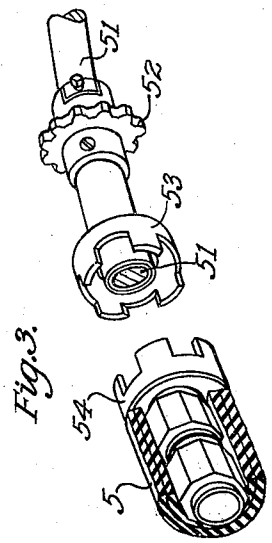

Fig. 3.

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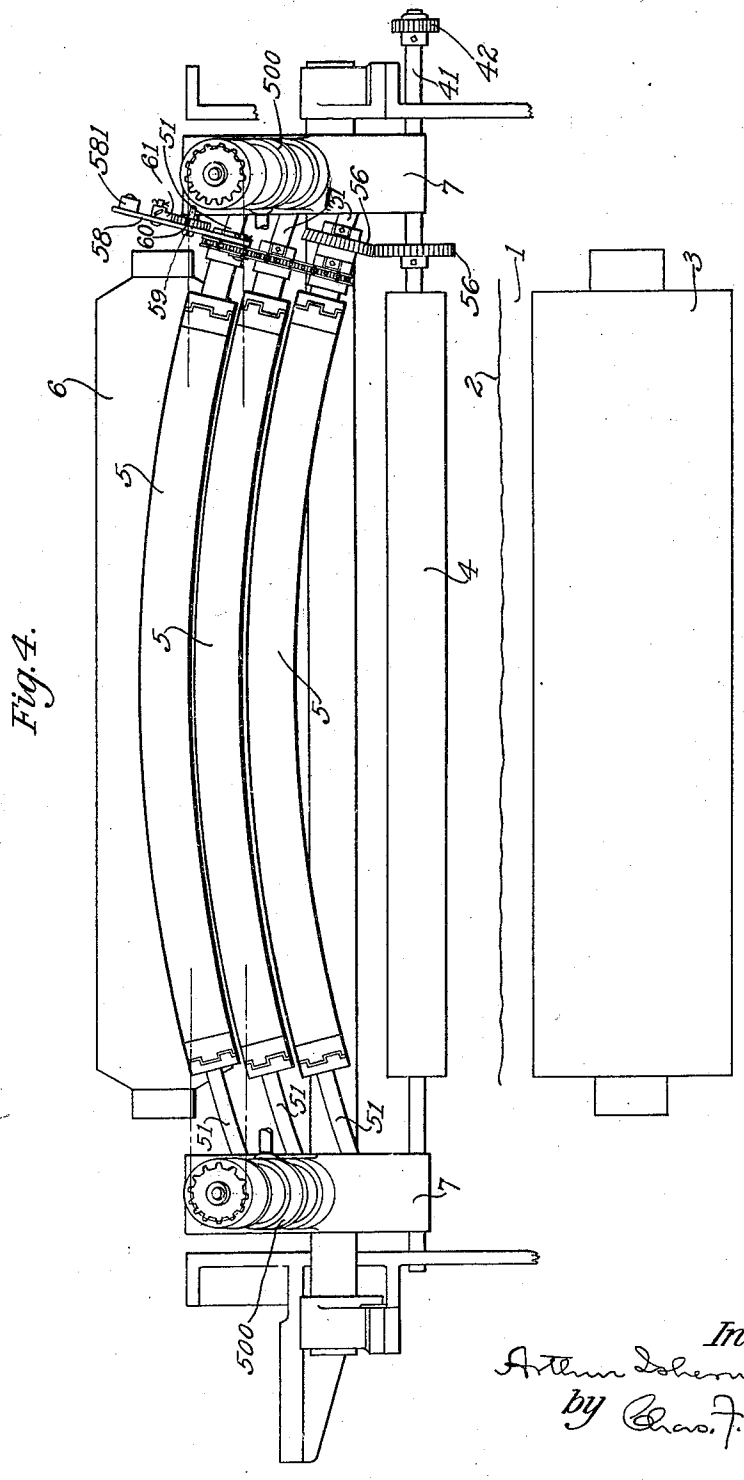

Fig. 4.

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UNITED STATES PATENT OFFICE

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WEB-HANDLING APPARATUS

Application filed March 11, 1929. Serial No. 346,071.

In various connections in which a continuous web travels longitudinally in a flat state, it is usual to employ a so-called expander for the purpose of distending or expanding the traveling web widthwise, thereby to take out slack and wrinkles, and sometimes to stretch the web widthwise. At times, such employment is incidental to the manufacture or treatment of a web; at other times an expander is employed for the purpose of preparing the web for being operated upon by machine elements, or for a finishing treatment, or for being wound or otherwise disposed of. The so-called Mycock expander is well-known and widely used. Forms thereof are shown and described in U. S. Letters Patent No. 687,847, granted Dec. 3, 1901, for Apparatus for distending textile fabrics; and No. 1,233,059, granted July 10, 1917, for Cloth spreader or expander.

An expander of the Mycock type is characterized by having a plurality of revoluble rollers, arranged for the passage of the web alternately over and under the respective rollers, in contact with the roll-peripheries, these rollers being bowed in the direction in which the web is traveling. It is common to make provision for shift of certain of the expander rolls into and out of the same working plane as the remainder, this adjustability being utilized for varying the expanding action or effect upon the web as it travels past the rolls.

Ordinarily, a bowed expander roll comprises a flexible roll-body surrounding and capable of revolving around a bowed nonrevolving supporting shaft. In usual practice heretofore, the frictional engagement between the traveling web and the roll-exteriors has been depended upon to cause the body of a roll to revolve around the non-revolving bowed supporting shaft. In various instances, certain factors have operated so that the resulting degree of strain imposed upon a web subjected to an expander of the type under consideration has interfered with employment of such expanders in the manufacture or treatment of webs of easily ruptured character, or in treating light and sleazy or otherwise delicate woven fabrics, because of the liability of injury due to the said strain. Thus, it has interfered with such employment in connection with webs of some natures which are very tender in certain states of the manufacture thereof.

My invention remedies the drawback just set forth, as explained later herein.

The nature of the invention is indicated more precisely in the following description having reference to the accompanying drawings, the latter showing spreading or expanding devices of the type aforesaid in which the invention is embodied.

In the drawings,—

Fig. 1 is a view, on the order of a diagram, looking at one end of an apparatus including the said devices.

Fig. 2 is a plan view, on a larger scale than Fig. 1, of parts at one end of the expander of Fig. 1.

Fig. 3 shows elements of one of the expander rolls of Figs. 1 and 2, disassembled.

Fig. 4 is a plan view, on a smaller scale than Figs. 2 and 3, of the general apparatus seen in Fig. 1.

Having reference to the drawings:

In Fig. 1 a web *w* extends upward through a bath 1 of fluid, the upper level of which is indicated at 2, from a roll 3 that is submerged within said fluid, the web extending from the bath to and over a roll 4 serving the combined functions of guiding and feeding the web. The shaft 41 of roll 4 is shown as having fixed thereon a sprocket-gear 42 through which power is received to rotate roll 4 to feed or assist in feeding web *w* through frictional engagement between the roller-periphery and the surface of the web. From roll 4 the web passes to the rolls 5, 5, 5, of a Mycock expander, going under the first of such rolls, over the second thereof, and under the third thereof, and thence to a roll 6. Roll 3 may be a batch roller comprising a wound supply of web to be treated and operated upon, or a guide-roll serving to conduct the web in its travels through the fluid bath and upward to the expander. The fluid bath 1 may be one employed in the treatment of a previously formed web, or it may be one in which a web is formed by precipitation or otherwise, as

the case may be. Roll 6 may be a winding roll upon which the web is received and wound as the web leaves the expander, in which case suitable provision is made for occasioning rotation of such roll to wind up the web, or it may be a simple guide-roll serving to conduct the web to a subsequent portion of the apparatus.

At 7, 7, are shown the stationary supports at opposite ends of the expander, serving to sustain the ends of the non-revoluble bowed supporting shafts 51, 51, 51, of the expander rolls. As stated earlier herein, the flexible roll-bodies surround and are capable of revolving around these non-revoluble shafts.

In an organization like that represented in Figs. 1 and 2 the middle roll 5 of the group of three expander rolls is made adjustable in directions at right angles with the plane of the axes of the rolls at each side of said middle roll, so as to modify the course of the web (indicated by the dotted line) to vary the spreading action in effect on the web. The adjustment devices, of well-known character, are provided in connection with turrets 500 at opposite ends of the rolls.

As is well-known, in the revolution of the body of an expander-roll around the non-revoluble bowed shaft upon which such body is mounted, the portions of the said body intermediate the middle of the length of the bowed roll and the ends of the latter revolve in planes which are inclined with relation to a plane intersecting the axis of the roll, at right angles therewith, at the middle point. The planes of revolution of the different portions of a roll body between the middle point and one end of the roll body incline outwardly toward the said end; those intermediate the middle point and the other end of the roll body incline outwardly toward the latter end. This secures the mode of operation providing for the action of the roll in spreading or expanding a web.

Factors of the resistance which in the case of expanders heretofore has had to be overcome by the web, causing injurious strains upon the latter, comprise (1) the resistance of the web being spread or expanded widthwise, or it may be to being stretched widthwise; (2) that incident to causing revolution of the different portions of the roll-body at various degrees of inclination in opposite directions around the non-revoluble supporting shaft; and (3) in the case of a rubber-covered roll, Fig. 3, the resistance due to opposition of the rubber covering to being extended lengthwise in opposite directions toward opposite ends of the roll in passing from the concave side of the roll to the convex side thereof, and to being condensed lengthwise from the opposite ends of the roll toward the middle of the length of the latter, in passing around from the convex side to the concave side.

I have stated hereinbefore that my invention remedies the drawbacks presented by expanders heretofore, through the employment of means for rotating the bowed expanding rolls of an expander without strain upon the web operated upon. Such means comprises, in the illustrative embodiment of the invention, sprocket-wheels 52, 52, 52, having in fixed connection therewith clutch-hubs 53, 53, 53, normally interengaging with clutch-hubs 54, 54, 54, in fixed connection with ends of the roll-bodies, a sprocket-chain 55 in engagement with the sprocket-wheels 52, 52, 52, and gears 56, 56, combining the shaft 41 of the guide and feed-roll 4 with the sprocket-wheel 52 of one of the expander rolls. By means of the gears, sprocket-wheels and sprocket-chain, and clutch-hubs, the bowed expander rolls are rotated at a proper surface speed from the guide and feed roll 4. Preferably, the expander rolls are rotated at a surface speed corresponding with the rate at which the web is fed forward by the guide and feed-roll 4 and necessitated by the apparatus-equipment succeeding the expander; or, when suitable for the results to be attained, the expander-rolls may be given a surface-speed exceeding more or less that of the guide and feed-roll 4.

The interlocking clutch-projections of the sprocket-wheel hubs and the roll-bodies have a loose fit providing for play, as customary in the case of the clutch portions of the roll-sections of some types of Mycock expanders.

The roll-driving connections may be duplicated at the opposite ends of the rolls.

In connection with sprocket-chain 55 I provide a chain-tightener to keep the said sprocket-chain properly taut, and to give and take up slack as the middle roll is adjusted with relation to the plane occupied by the axes of the first and third rolls of the series. Such chain-tightener comprises a sprocket-wheel 57, Fig. 1, taking against the underside of the tight or driving run of the sprocket-chain, such sprocket-wheel being carried by a lever 58 mounted pivotally at 59 upon a suitable fixed support. The lever may be swung manually so as to cause the tightener-sprocket 57 to tighten the chain as much as may be requisite. At 581 is shown a weight for actuating the chain-tightener automatically to take up any slack that may arise during the working of the mechanism. At 60 is a fixed ratchet in fixed connection with the adjacent support 7, and at 61 is a detent-pawl which is pivotally mounted upon lever 58 and through engagement with the fixed ratchet 60 latches the lever 58 and tightener-sprocket in adjusted position.

In some cases, for use in operating upon classes of goods capable of withstanding strain, the means for producing roll-surface movement, combined with the roll-equipment of an expander of the type represented

by that shown in the drawings, may be proportioned to impart to the rolls a surface speed higher than that of the feed and guide-roll 4; and I contemplate, also, providing for giving in some cases different rates of surface speed to the second and succeeding rolls, for the attainment of special results in handling webs of some classes.

As explained already, in an expander of the Mycock type, the usual construction provides for shift of certain of the expander rolls into and out of the same working plane as the remainder, and, in the present instance this adjustment is provided for in connection with the middle expander roll of the group shown in the drawings. The sprocket-chain 58, in virtue of being flexible, accommodates itself to such a shift, without disengagement of the chain from the sprocket-wheels, and also without interruption of the driving of the rolls and of their accompanying expanding action upon the cloth, when the lever 58 is properly manipulated. The improved arrangement permits the adjustment of the degree of expanding action to be made quickly and easily, thus greatly facilitating the adaptation of the expander organization to the different kinds of web material put through it. Since every change in the degree of expanding action calls for a corresponding change in the relative position of the three sprockets 52 on the rolls, a simple and easily manipulated means of taking up or giving up slack in the drive chain 55 has had to be devised in the form of the described chain-tightening arrangement. Further, on account of the nature and construction of the machines on which these expanders are used as auxiliary devices, it is not practicable to insert the chain-tightening means in the slack run of the chain, and through being of necessity in the tight or driving run of the chain, such tightening means must be adapted to resist being pulled from its desired adjusted position when the chain is subjected to the load of driving the rolls 5. To meet these conditions the novel tightener device of the invention has been devised, in which the weighted lever will automatically take up any slack resulting from adjustment of the middle roll 5, while the expander is momentarily at rest, or the weighted end of the lever may be moved by hand to impart the desired degree of tightness to the chain. Thereafter, the position given the sprocket-wheel 57 in either of these ways will be maintained by the engagement of the pawl 61 with the fixed ratchet 60, until it is necessary to give up slack to the reverse shift of the middle expander roll, which giving-up is quickly effected by releasing the pawl from its engagement with the ratchet.

What is claimed as the invention is:

1. Web-expander apparatus having in combination a plurality of bowed expander rolls adjustable into and out of alinement to vary the expanding action, power driving means for the rolls including sprockets upon the respective rolls and a sprocket-chain, and a chain-tightener compensating for the change of centers of the sprockets upon adjustment of the expander rolls to vary the expanding action thereof.

2. Web-expander apparatus having in combination a plurality of bowed expander rolls adjustable into and out of alinement to vary the expanding action, power driving means for the rolls including sprockets upon the respective rolls and a sprocket-chain, and a chain-tightener adapted to give up or take up slack in the chain to permit the shift of centers of the sprockets incident to changing the expanding action of the rolls, and thereafter to maintain fixedly its position and the tension of the chain.

3. Web-expander apparatus having in combination a plurality of bowed expander rolls adjustable into and out of alinement to vary the expanding action, power driving means for the rolls including sprockets upon the respective rolls and a sprocket-chain, and a chain-tightener in the tight or driving run of the chain, adapted to assume a position taking up or giving up slack in the chain resulting from shift of the rolls to vary the expanding action, and to maintain such position against the tension of the chain under driving load.

4. Web-expander apparatus having in combination a plurality of bowed expander rolls adjustable into and out of alinement to vary the expanding action, power driving means for the rolls including sprockets upon the respective rolls and a sprocket-chain, and a chain-tightener in the tight or driving run of the chain comprising a lever, a sprocket pivoted thereon, a pawl upon the lever, and a fixed ratchet engaged by the pawl to maintain the lever and the sprocket in adjusted position against the tension of the chain when the latter is under load.

5. Web-expander apparatus having in combination a plurality of bowed expander rolls adjustable into and out of alinement to vary the expanding action, power driving means for the rolls including sprockets upon the respective rolls and a sprocket-chain, and a chain-tightener in the tight or driving run of the chain comprising a weighted lever, a sprocket pivoted on such lever, a pawl upon the lever, and a fixed ratchet engaged by such pawl to maintain the lever in the position into which it gravitates as the chain is loosened.

6. Web-expander apparatus having in combination a plurality of bowed expander rolls, equipped at their ends with rotation-imparting elements, means for shifting such rolls into and out of alignment to vary the expanding action, and power driving means

engaging such elements for imparting rotation to the rolls, such driving means including devices maintaining the parts in driving relation and the rolls rotating to continue the expanding action and the travel of the web while the relative shift of the rolls is being accomplished.

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