May 20, 1952 F. B. MORRILL ET AL 2,597,839

REEL

Filed June 19, 1947 2 SHEETS—SHEET 1

Fig. 1.

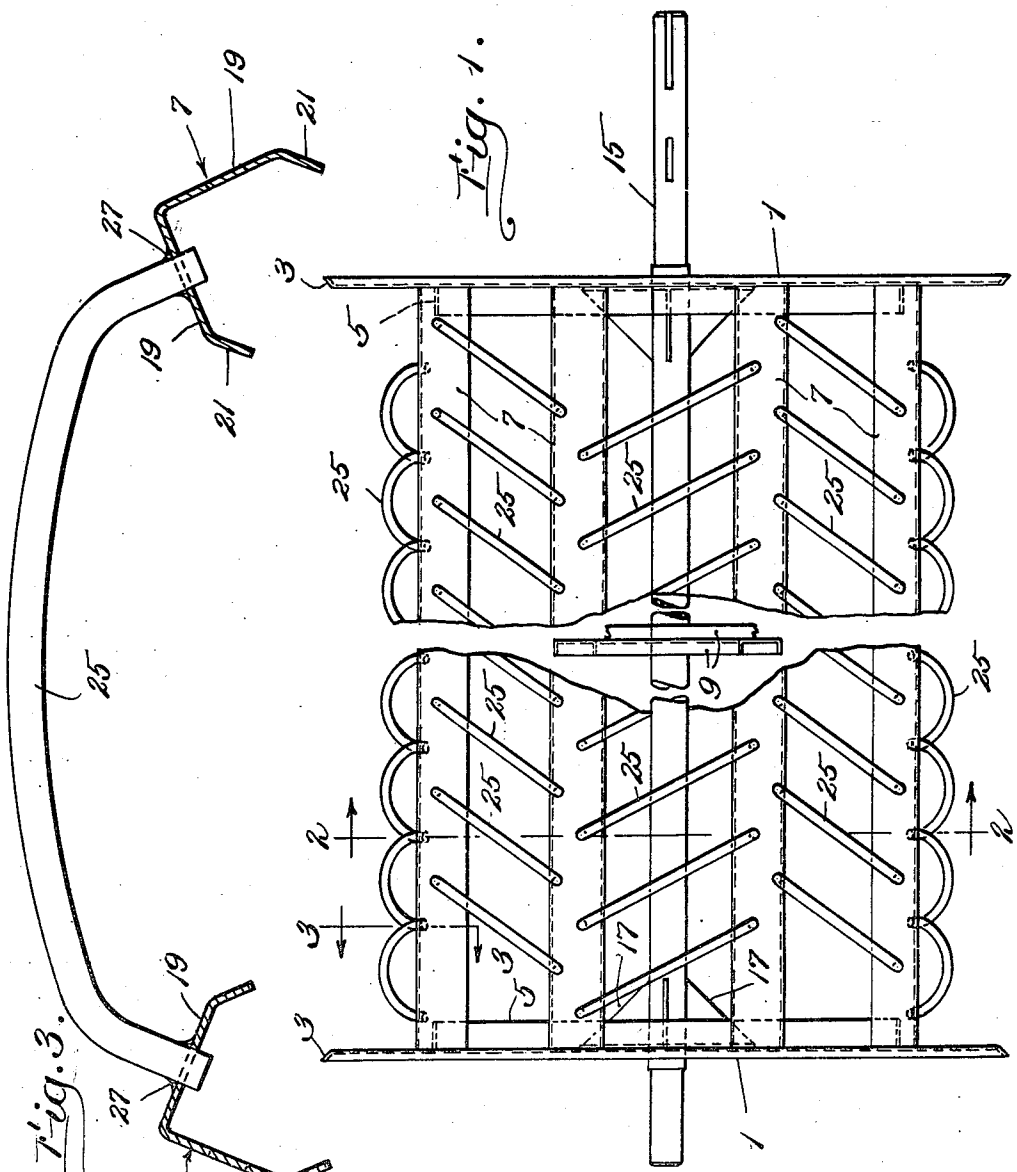


Fig. 3.

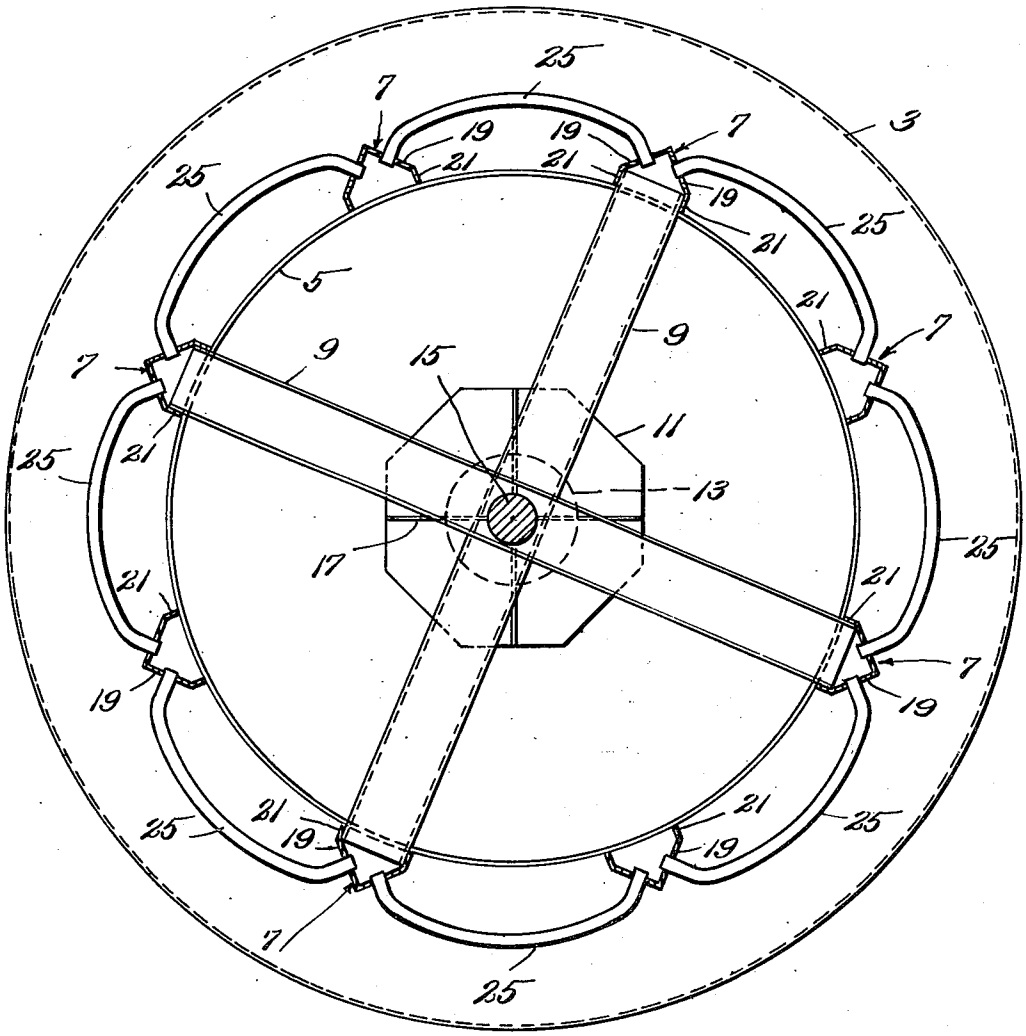
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REEL

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Fig. 2.



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REEL

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12 Claims. (Cl. 28—71.5)

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The present invention relates to reels for use in various closely related machines for dyeing, washing, bleaching, and otherwise administering liquid treatments to cloth in rope form. These machines are variously known as dyeing machines, piece dye kettles, dye becks, jiggers, cloth washers, slack washers, bleaching machines, and by other names, but they all work on substantially the same principle of successively and repeatedly immersing the cloth in the liquid and drawing it out again into the air, lifting and propelling the cloth by means of the reel, the cloth extending approximately half way around the reel and thence into the liquid, up over the reel, into the liquid again, and so on.

A leading feature of the present device is the arrangement of arched bars in herringbone relation, that is, in series and in succession such that the members of each series of such bars extending longitudinally of the reel have an opposite oblique slant with respect to the members of the previous series, to form the traction surface of the reel. These arched bars are not new in themselves, being known as humps, but they have usually been arranged so that they extend a short distance around the reel in planes at right angles to the axis of the reel, though the humps of each series or course are staggered with respect to the humps of the preceding course. This prior arrangement permits the cloth in rope form to wedge between the humps, entering between them in a straight or slightly sinuous path, and thus to acquire folds which are set in the cloth in the course of its half turn around the reel before leaving the same to enter the liquid again, these folds persisting throughout the travel of the cloth from the reel to the submerged roll and the subsequent passages of the cloth around both these members. As a result, the liquid of the bath does not permeate the cloth uniformly, which results in unequal treatment of the cloth throughout its width with resulting shading of the cloth and other undesirable results.

The novel arrangement of the humps of the improved reel has the object and result of avoiding the production of folds in the cloth, and of increasing the efficiency of the reel over the common slatted, knurled, or even the aforesaid prior hump reels, while attaining a much gentler and less injurious action on the cloth. The opposite slant of the successive series of arched bars, coupled with the angle of slant and the staggered and hence overlapping relation of the bars of successive courses, i. e., the location of a succeeding arched bar with one of its ends between the radial planes of the reel in which are fixed the ends of the preceding arched bar in the adjacent series, both increases the frictional engagement and thus the driving power of the reel exerted on the cloth, and also prevents the cloth from entering and wedging between the arched bars, while at the same time preventing the yarns of the cloth from being strained and the cloth thus cockled by straddling and being pulled down hard on the humps while adjacent lateral portions are drawn between the humps.

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Other objects of the invention, and the manner of their attainment are as made plain in the accompanying description.

An illustrative embodiment of the invention is shown in the accompanying drawings, in which

Fig. 1 is a side elevation of the improved reel.

Fig. 2 is a transverse section of the same on line 2—2 of Fig. 1.

Fig. 3 is an enlarged view in section on line 3—3 of Fig. 1, showing two of the slats of the reel and one of the arched bars which connect them.

The reel is in general built on conventional lines, preferably being composed entirely of stainless steel or other non-corrodible metal, having circular heads 1 of sheet metal with turned-up rims 3 to fit closely against the walls of the machine in which it is used and exclude entry of the cloth therebetween. Each head is provided with a flange 5 welded to the inward surface of the head, on which the slats 7 are mounted and fixed, preferably by being welded to the flange and the adjacent surface of the head. The heads are fixed on an axial shaft 15 whereby the reel is mounted and rotated in the machine, the heads being provided with a hexagonal reinforcing plate 11 welded to the inward surface and a circular plate 13 welded to the outward surface of each head, these parts being in turn welded to shaft 15 where the latter passes through them. Additionally, four triangular gussets 17 arranged 90° apart around shaft 15 are welded to each octagonal plate 11 and also to shaft 15, to maintain the head perpendicular to the shaft. In wide rolls, of from 8 to 12 feet in length, intermediate supports for the slats 7 are provided midway between the heads or at equidistant points in this interval, in the shape of channel-section spokes 9 made of sheet metal welded together back to back at right angles to each other in radial planes and having their ends welded to the slats 7, shaft 15 passing through these spokes at their point of crossing.

In accordance with the invention, the slats are

formed from sheet metal by bending a strip of metal along its central line into planes disposed at 90° to each other, to form faces 19, the lateral portions of each strip being then bent again to lie in spaced and parallel relation, forming the marginal portions 21, as shown in Fig. 3. Holes are formed in one face 19 of each slat in equally spaced relation throughout the major portion of the length thereof, and additional holes are formed in the other face 19 of such slat in an equally spaced series, staggered with respect to the holes in the first face so as to lie in radial planes (of the reel) located equidistant between the holes in such first face. The holes in the proximate faces 19 of each adjacent pair of slats are disposed in the same radial planes, while the holes in the remote faces 19 of each such pair of slats are likewise disposed in identical radial planes interpolated between and equidistant from the planes in which the holes of the first named proximate faces are located.

Each hump 25 is formed of solid rod stock bent in the form of a flattened arch with its end portions again bent at a sharper angle so that these portions will stand perpendicular to the faces 19 of the respective slats 7 in which they are mounted, all as plainly shown in Fig. 3, being secured in place by a welding bead 27 joining the end portions to the faces 19.

The particular and novel arrangement of the humps is that each hump runs from a hole in one slat 7 to a hole in the adjacent slat which is staggered with respect to the hole at the beginning end of such hump and thus is remote from the radial plane of such initial hole by a distance corresponding to the spacing of the holes lengthwise of the slats. That is, the humps spanning any given interval between slats 7 are disposed in a series of which the members are all parallel to each other and oblique to radial planes through the reel, the amount of offset of one end of each hump from the other end thereof measured axially of the reel being the same as the axial separation of each hump from its neighbor in the series.

Further, the members of each series of humps are given an equal but opposite slant with respect to the humps forming the series immediately preceding and immediately following it around the entire circuit of the reel, so that the humps are arranged in herringbone pattern all the way around the reel.

Additionally, the humps of a succeeding series have their starting ends located in radial planes midway between the radial planes of the terminal ends of the humps of the preceding series, so that their extremities and thus the humps themselves are staggered with respect to the ends of the adjacent humps, and these latter humps as well, of the preceding and following series. The only departure from the arrangement thus described occurs at the ends of each series, as to which the disposition is clearly made plain in Fig. 1.

By reason of this combined herringbone and staggered arrangement the cloth even though in rope form and even when of light-weight construction is prevented from settling into the spaces between adjacent humps with attendant folding because the tension on the cloth incident to lifting it out of the kettle or tub is sufficient to prevent the cloth making the reverse bends necessary to get down onto the slats, and additionally is prevented from thus fitting itself into the space between any two adjacent humps in a series because it is lifted by the hump immediately preceding and immediately following such interval and overlapping the zone occupied by such interval. In other words, the cloth cannot have free access into any such interval because the ends of the preceding and following humps, being located half way along such interval, prevent its easy access thereinto.

The oblique relation of the humps gives a superior grip on the cloth because of their substantial extent crosswise of the cloth they are lifting, as compared with the prior reels in which the humps simply extend circumferentially of the reel and thus lengthwise of the cloth. At the same time, the zigzag or herringbone relation of the successive series of humps prevents the reel from feeding the cloth endwise of the reel in the course of its passage over the reel. The pulling power of the reel in lifting the wet and heavy cloth has been found to be markedly superior to the usual slatted reel, and even to the prior knurled reels, as well as over the prior hump reels just described, while having a much gentler action on the cloth. This results from the fact that the component yarns thereof are not stretched by having an intermediate portion of the width of the cloth raised up on a hump under the pull of the pendent mass of wet fabric while the portions of the cloth at each side of the hump settle down onto the slats to follow a shorter path and thus to bear less than their share of the burden of lifting the following portions of the cloth out of the kettle.

The lateral portions of the rope of cloth thus straddled over a given hump are supported by the humps of the preceding and following series and held out more completely to the full diameter defined by the crowns of the humps, thus distributing the load and sparing the straddling portion of the cloth the distortion incident to being mainly lifted and supported by only one or two humps.

The arrangement of the humps in oblique, slanting relation makes possible a very considerable economy in the cost of constructing the reel. In prior types of hump reels in which the humps were disposed in planes at right angles to the axis of the reel, the diameter of the stock from which these prior humps were made had to be relatively great, on the order of two inches, in order to provide a surface wide enough to afford a substantial bearing area of these humps against the cloth when the cloth straddled the humps as just described, in the effort to prevent an intolerable degree of straining and cockling of the cloth when straddled over these circumferentially extending humps. To prevent excessive weight of the reel, tubular stock was used to form these humps, and the extreme difficulty of bending the tubes to the required shape was reflected in a relatively large part of the cost of manufacturing these hump reels. However, when the novel oblique arrangement of the humps in zigzag relation is employed, the cloth is not allowed to settle down onto the slats at each side of a hump as before, and the localized straining of the fabric previously occurring is thus avoided regardless of the diameter of the stock forming the humps, and to the same end the axial component of extent of each oblique hump extends its bearing contact much farther widthwise of the cloth than ever attained with the thickest of the humps employed in the prior circumferential type of construction. The novel arrangement thus makes it possible to form the humps of solid

round stock of relatively very small diameter, much less expensive in itself, and capable of being bent accurately to the desired shape with a minimum of trouble and cost, thus effecting a substantial economy in the cost of constructing the reel while at the same time providing a better-working device.

The herringbone relation of the humps gives the cloth a slight lateral deflection of a few inches, because the cloth tends to sag into the spaces between the humps, but cannot do so completely, as the humps next before and beyond a given space lift or hold the cloth up. This is visible as the cloth comes off of the reel at the back of the machine. This action shifts the rope of cloth enough about its longitudinal axis in the course of each complete circuit so that folds and creases do not become set. The cloth is piled in slightly zigzag relation as it runs off from the reel.

The herringbone reel tilts the surface of the cloth back and forth in a way that distributes the dye liquor running down therefrom evenly across the surface of the fabric, instead of letting it run steadily in a given zone of the width tending to shade and streak the cloth through uneven oxidizing while lifted and exposed to the air, as when vat dyes are used.

While we have illustrated and described a certain form in which the invention may be embodied, we are aware that many modifications may be made therein by any person skilled in the art, without departing from the scope of the invention as expressed in the claims. Therefore, we do not wish to be limited to the particular form shown, or to the details of construction thereof, but

What we do claim is:

1. A reel for propelling cloth having in combination spaced heads, means non-rotatably fixed in and rigidly connecting the heads, and humps on such means extending obliquely around the reel.

2. A reel for propelling cloth having in combination spaced heads, means non-rotatably fixed in and rigidly connecting the heads, and humps on such means arranged in herringbone pattern around the reel.

3. A reel for propelling cloth having in combination spaced heads, means non-rotatably fixed in and rigidly connecting the heads, and humps on such means arranged in staggered herringbone pattern around the reel.

4. A reel for propelling cloth having in combination spaced heads, means non-rotatably fixed in and rigidly connecting the heads, and humps on such means extending outwardly farther from the axis of the reel than such means and disposed obliquely to the axis.

5. A reel for propelling cloth having in combination spaced heads, slats connecting the heads, and humps bridging the space between one slat and another and disposed in planes oblique to the axis of the reel.

6. A reel for propelling cloth having in combination spaced heads, slats connecting the heads, and curved bars bridging the spaces between the slats, such bars being arranged in spaced and parallel relation in a series between one pair of the slats and in slanting relation to the slats, and in spaced and parallel relation but slanting in the opposite direction in a second series in bridging the space next adjacent one of the slats of such pair.

7. A reel for propelling cloth having in combination spaced heads, slats connecting the heads, and curved bars bridging the spaces between the slats, such bars being arranged in spaced and parallel relation in a series between one pair of the slats and in slanting relation to the slats, and in spaced and parallel relation but slanting in the opposite direction in a second series in bridging the space next adjacent one of the slats of such pair, and the ends of the bars of the first series being offset axially of the reel with respect to the adjacent ends of the bars of the second series.

8. A reel for propelling cloth having in combination spaced heads, slats connecting the heads, and bars arching outwardly beyond the slats, having their extremities respectively fixed to the members of adjacent pairs of slats, the bars joining the members of one pair of slats being slanted all in the same direction with respect to such slats and the bars joining one slat of such pair with an adjacent third slat being equally slanted all in the opposite direction.

9. A reel for propelling cloth having in combination spaced heads, slats joining the heads, and humps joining the slats and arranged in zigzag and offset relation in zones extending around the reel.

10. A reel for propelling cloth having in combination spaced heads, slats joining the heads, and humps attached to the slats and extending obliquely to the slats from one slat to the next, the humps bridging the space between a given pair of slats being parallel and having the opposite slant from those bridging the preceding and following spaces, and having their points of attachment to the slats staggered axially of the reel with respect to the points of attachment of the humps bridging the preceding and following spaces between slats.

11. A reel for propelling cloth having in combination spaced heads, slats joining the heads, and humps disposed at spaced intervals and obliquely to the slats in successive axially disposed series and staggered so that humps of the series immediately preceding and following a given series overlap the zone traced by the intervals between a pair of adjacent humps of the given series as the reel revolves on its axis.

12. A reel for propelling cloth having in combination spaced heads, slats non-rotatably and rigidly fixed to the heads, and means on the slats tilting the surface of the cloth in both directions along the longitudinal axis of the reel and piling the cloth in zigzag relation as it runs off from the reel.

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