Feb. 24, 1948. A. O. HURXTHAL 2,436,719

EXPANDING SLEEVE FOR LOOP DRIER GIRTS

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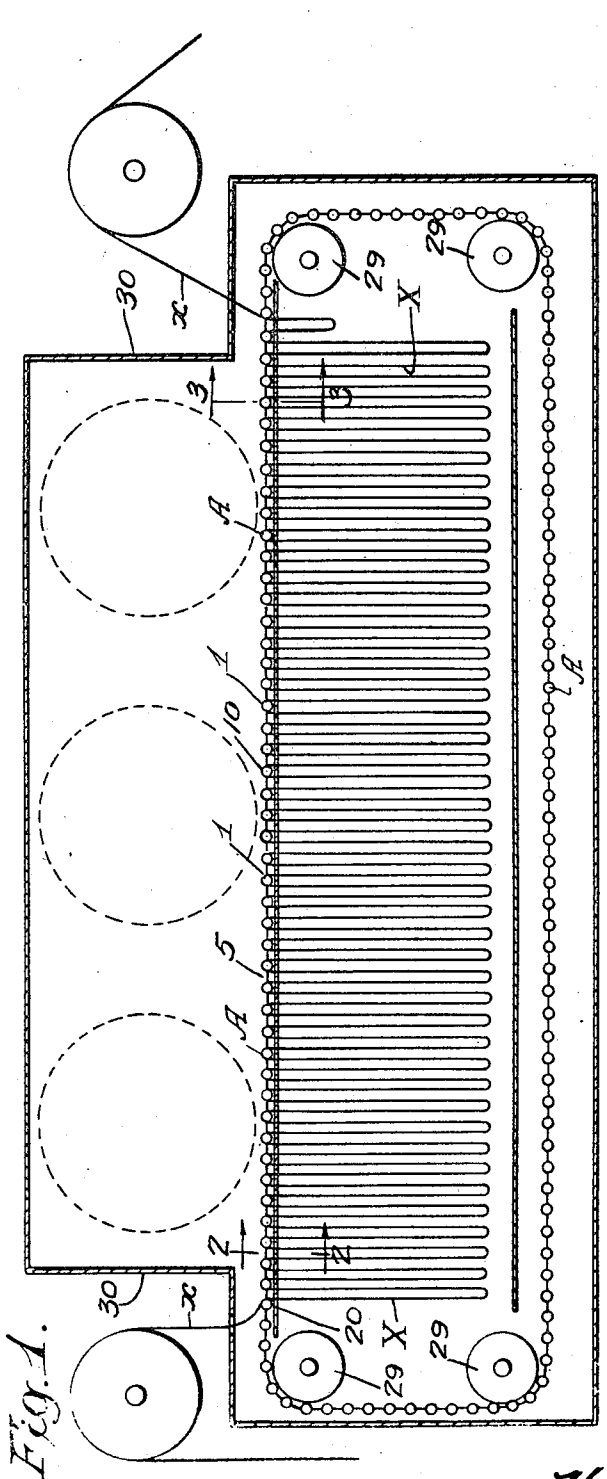

Fig. 1.

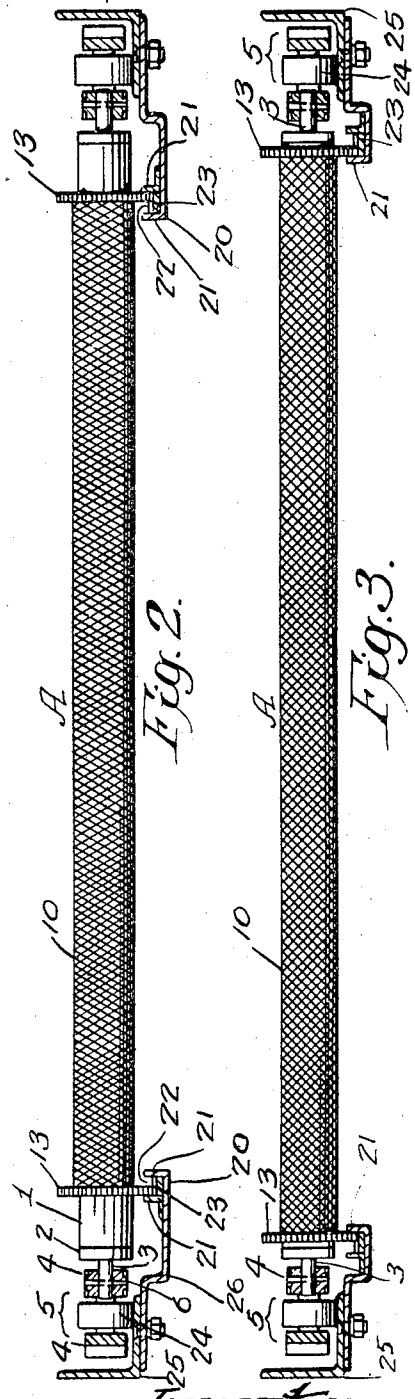

Fig. 2.

Fig. 3.

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Fig. 4

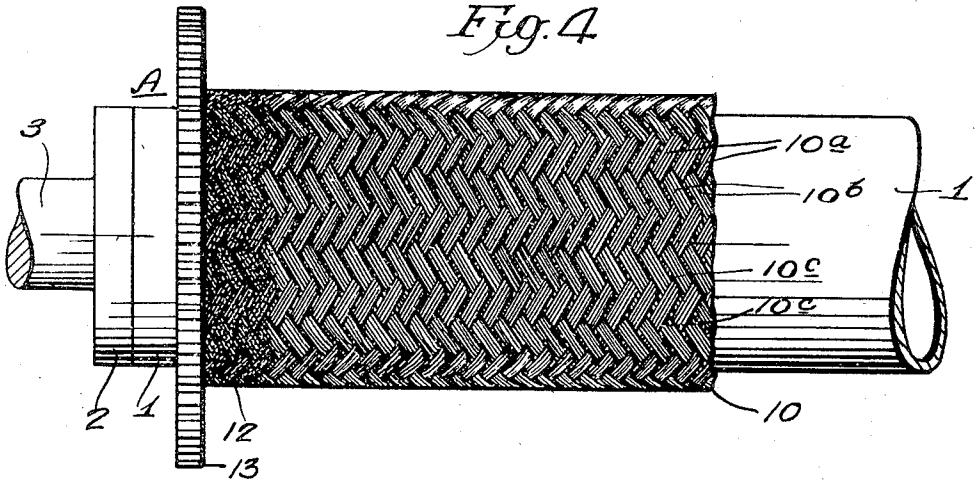


Fig. 5.

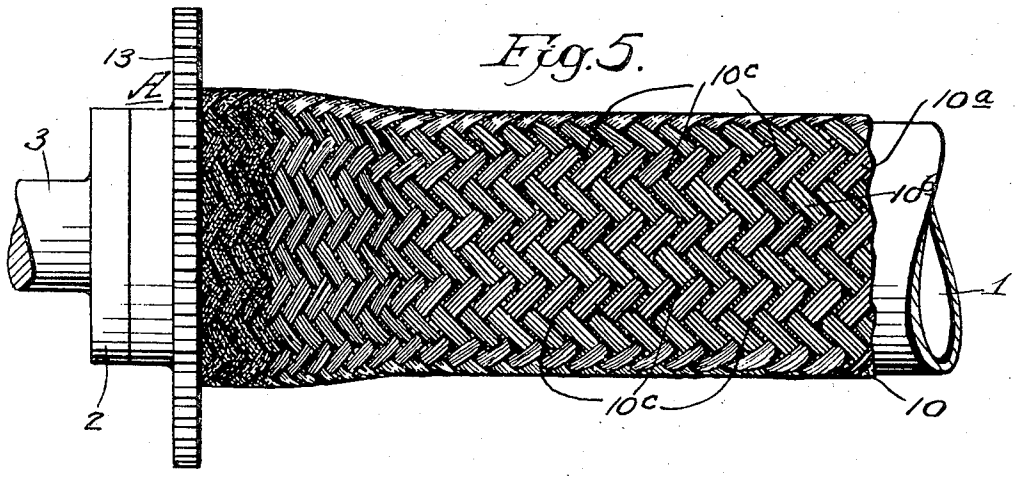
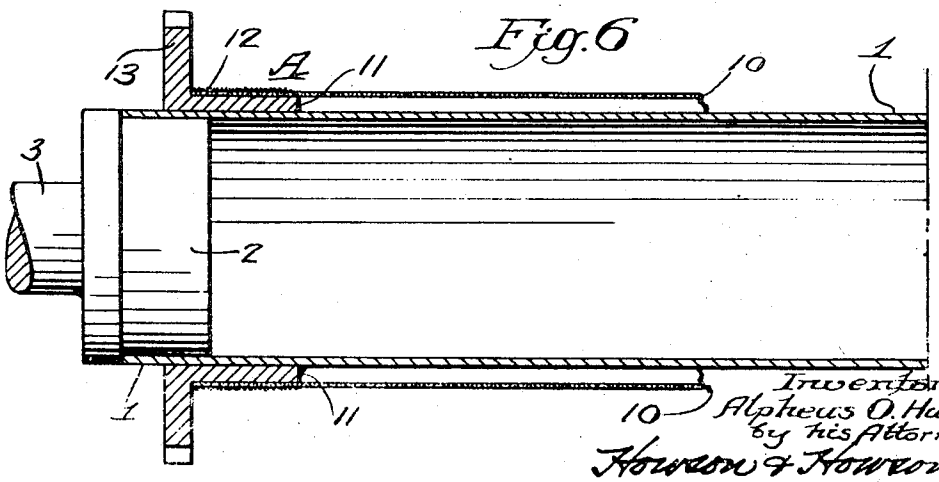


Fig. 6



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EXPANDING SLEEVE FOR LOOP DRIER GIRTS

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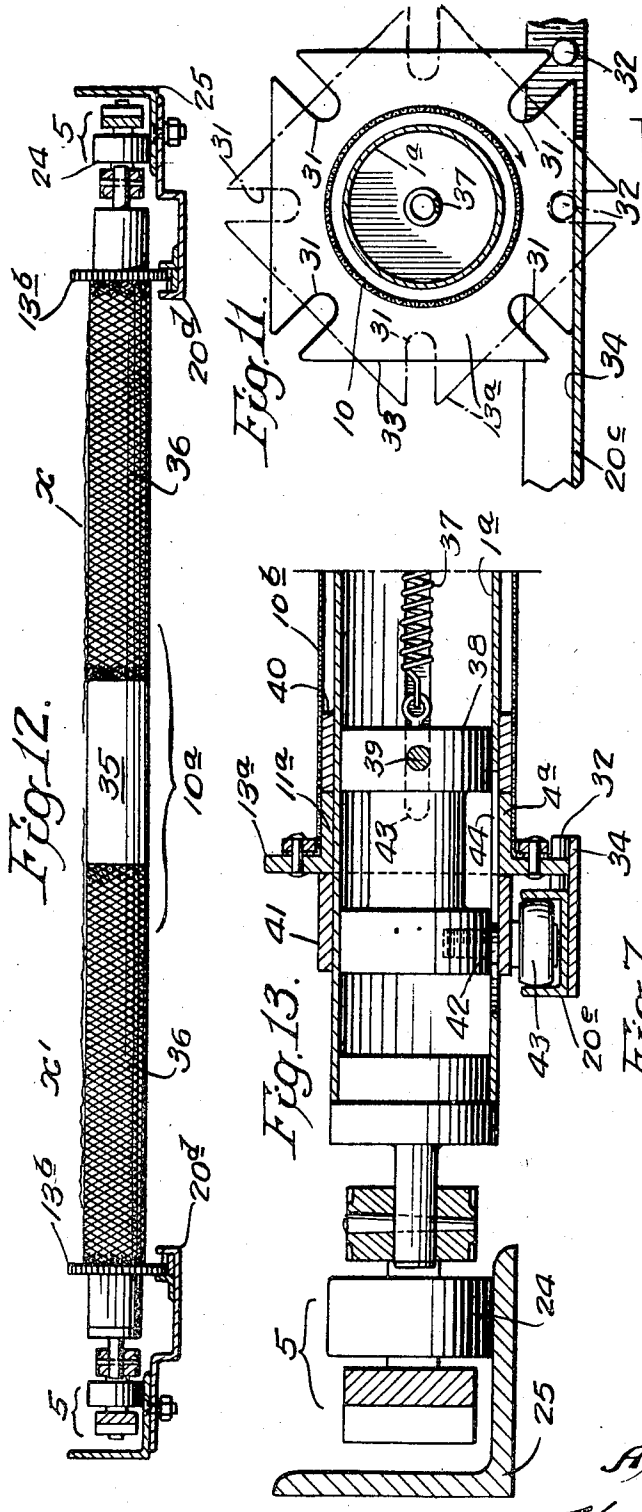

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EXPANDING SLEEVE FOR LOOP DRIER GIRTS

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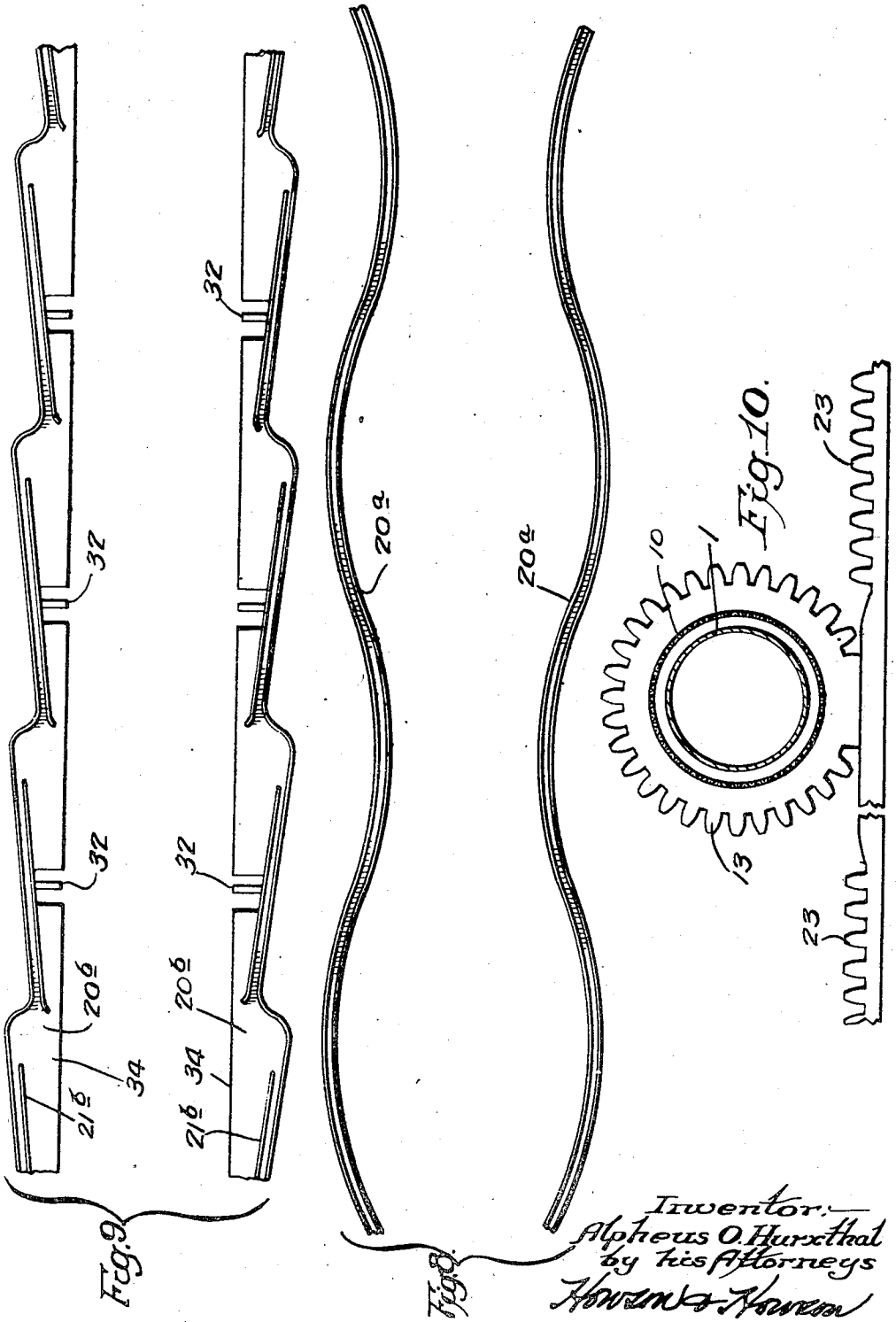

Fig. 9.

Fig. 8.

Fig. 10.

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EXPANDING SLEEVE FOR LOOP DRIER GIRTS

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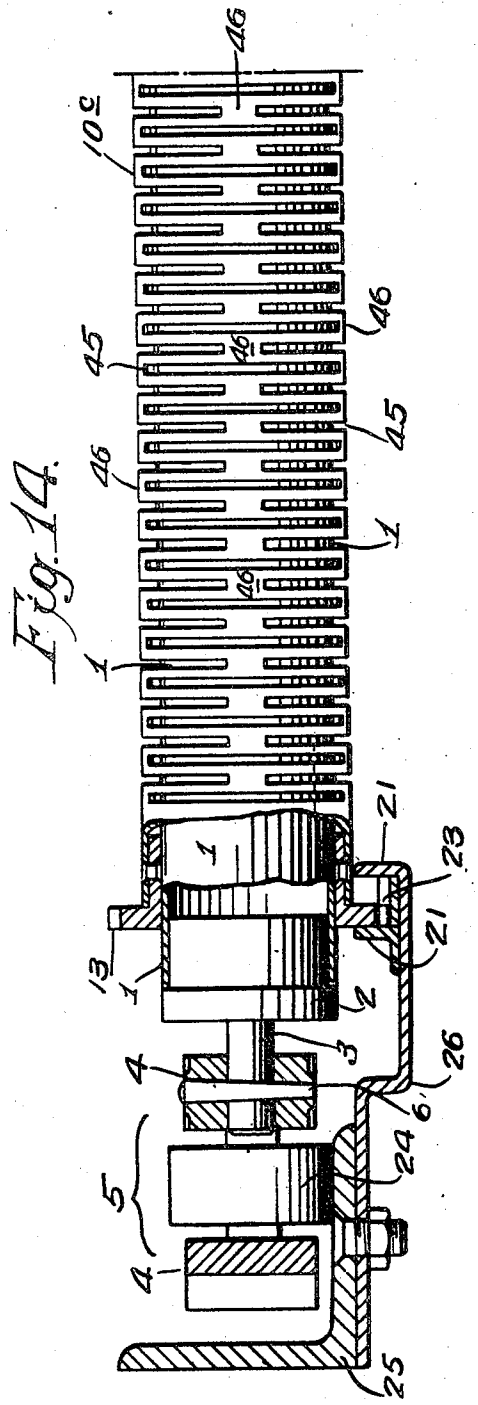

Fig. 14.

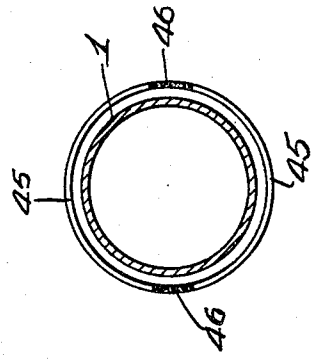

Fig. 16.

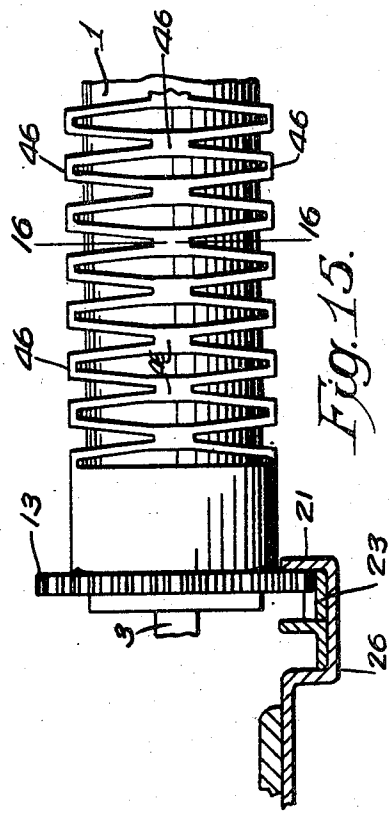

Fig. 15.

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EXPANDING SLEEVE FOR LOOP DRIER GIRTS

Filed Feb. 9, 1945 6 Sheets-Sheet 6

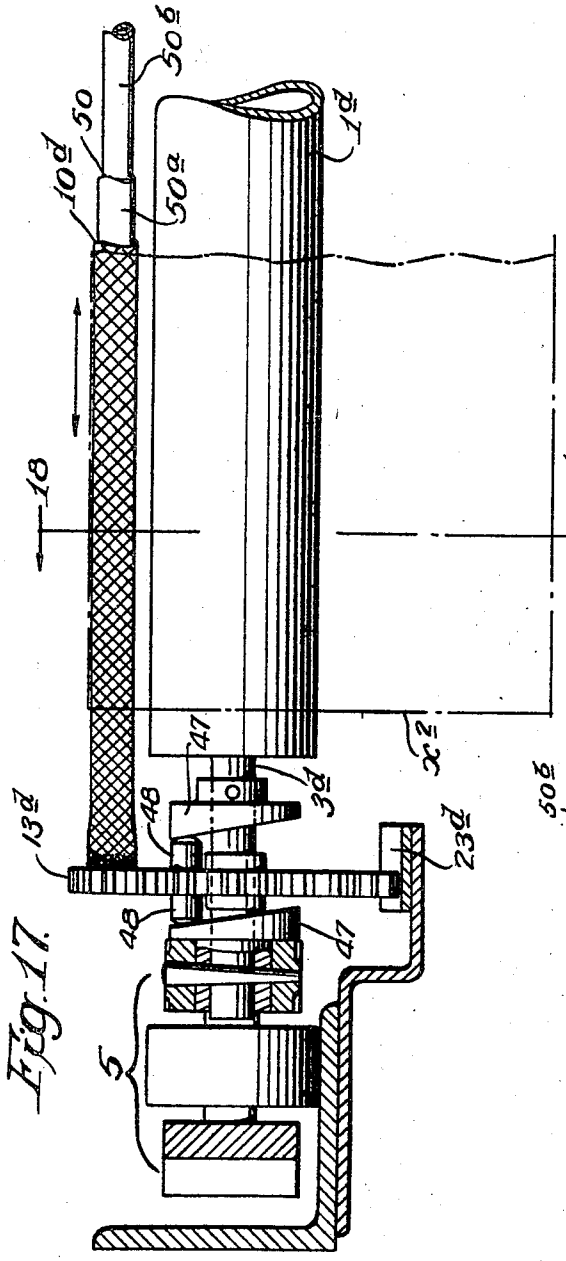

Fig. 17.

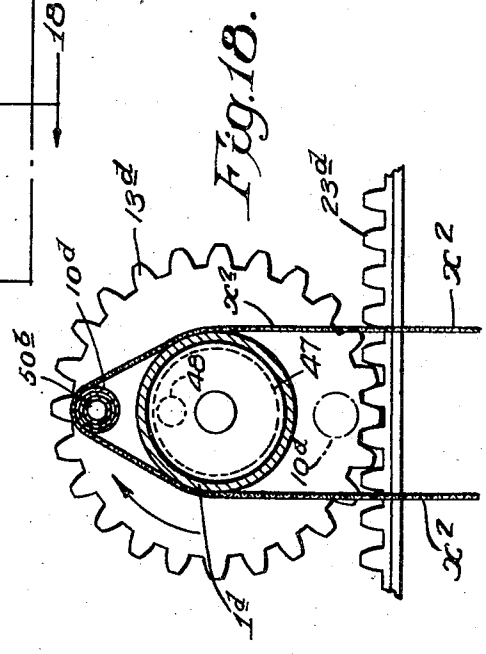

Fig. 18.

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UNITED STATES PATENT OFFICE

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EXPANDING SLEEVE FOR LOOP DRIER GIRTS

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Application February 9, 1945, Serial No. 576,951

6 Claims. (Cl. 26—63)

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This invention relates to apparatus for handling and controlling a relatively wide single web, or simultaneously controlling a plurality of laterally contiguous narrower strips of textile fabrics or other goods of similar character, during drying or other processing of the goods, while the goods is arranged in long depending loops hanging over and between laterally spaced parallel poles or girts moving concurrently through a drying or other processing chamber.

In some instances the loop-supporting poles or girts are rotated continuously, or intermittently, while en route through the processing chamber, for the purpose of discouraging or preventing the formation of what are known as transverse pole marks on the goods. These pole marks become apparent when no relative movement between the goods and the supporting surfaces of the poles is effected during the drying of the goods while hanging over the poles.

During the initial formation of the goods into the loops, and during subsequent rotations of the poles, with the festooned goods thereon, there are times when longitudinally extending wrinkles, folds, laps, or creases are formed in the goods, which if permitted to remain throughout the rest of the drying or processing period, form longitudinal streaks in the goods.

Prior to the present invention, attempts have been made to discourage, prevent and remove all laterally overlapping folds, wrinkles, etc., in adjacent portions of the goods which cause the above-noted longitudinal streaking of the goods during drying etc.

One known apparatus designed for overcoming the longitudinal marking or streaking of the goods as caused by lateral wrinkling, overlapping or creasing of the goods involves the use of what are known as "sectional expandable poles" for supporting the goods in festoons during drying or other processing thereof.

The aforesaid sectional expandable pole of the prior art consists of a plurality of axially aligned sections disposed with the adjacent ends of the pole sections in axially abutting relation to each other, with a pair of diametrically opposite narrow portions of one section extending axially therefrom into corresponding slots formed in the adjacent end of the next section, in so-called telescoping relation to each other.

As the poles advance horizontally through the drying chamber, the adjacent sections of each pole are gradually moved axially, relative to each other, outwardly toward the opposite ends of the pole, and the frictional contact of the relatively

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moving sections with these portions of the goods respectively lying thereon produces a leveling or evening of the fabric as the sections of the pole separate; however, as the sections move apart, narrow crevices which develop into relatively wide open spaces are formed in the surface of the pole over which the goods hangs, and the goods, due to the weight of the hanging loops or festoons is drawn into these recesses. The falling of the goods into these crevices and spaces has a tendency to cause the formation of other marks in the goods as it is being dried.

One object of the present invention is to provide an axially expandable and contractible pole or girt, for loop or festoon driers, wherein the entire cylindrical goods-supporting surface of the girt will at all times present substantially uniform continuity devoid of all deep crevices or wide open spaces into which the goods could be drawn by the weight of the loops hanging thereon throughout the whole of the range of axial dimensional variability of the girt, i. e., while in its fully contracted, expanded and all intermediate stages.

Another object of the invention is to provide a supporting pole or girt for loop driers which shall include an inner rigid support and an outer relatively movable sleeve of woven, knitted or braided construction capable of axial expansion and contraction with respect to the axis of the inner support. The interbraided construction is preferable for the reason that pivotal movement between the interbraided strands at the crossing of these strands, at multitudinous spots distributed uniformly over the entire area of the sleeve, provides uniform continuity over the entire area of the goods-supporting surface, without creating detrimental crevices or wide open spaces therein, at any part of the range of dimensional variability of the sleeve.

Another object of the invention is to provide means for effecting the axial expansion and contraction of the sleeve by which the axial expansion may be effected gradually and but once in a single passage of the girt in one direction through the drying chamber; or to provide mechanism by which expansion and contraction of the girt may be repeated a number of times in a single unidirectional passage of the girt through the drying chamber, with the speed of the expansion and contraction uniform; or to provide means whereby the speed of the expansion may be slow, while the speed of contraction may be relatively quicker during repeated axial actua-

tions of the sleeve as it moves once through the chamber.

Another feature of the invention attending the formation of the goods-supporting sleeve as an interbraided tubular structure resides in the provision of a ventilated surface under the goods and by which the goods making contact therewith will dry at substantially the same rate as the goods in the more remote portions of the hanging loops, whereby the formation of girt marks will be prevented regardless of whether the girt revolves or remains stationary as it travels through the drying chamber with the goods lying quiescently thereon.

The construction and operation of the device will be more readily understood upon reference to the accompanying drawings of which:

Fig. 1 is a diagrammatic longitudinal sectional elevation of a loop drier involving the use of girts constructed and operated in accordance with the principles of the present invention;

Fig. 2 is an enlarged transverse sectional elevation taken on the line 2—2, Fig. 1, and showing the goods-supporting sleeve of one of the girts in its axially contracted condition;

Fig. 3 is a transverse sectional elevation, similar to Fig. 2, and taken on the line 3—3, Fig. 1, with the goods-supporting sleeve in its axially expanded condition;

Fig. 4 is an enlarged detail view of one end of the girt showing the contracted sleeve of Fig. 2;

Fig. 5 is an enlarged detail view of one end of the girt showing the expanded sleeve of Fig. 3;

Fig. 6 is a longitudinal sectional view of the girt showing the sleeve expanded as in Fig. 5;

Fig. 7 is a diagrammatic plan view illustrating a pair of diverging control tracks for effecting gradual single expansion of the girt sleeve in a single passage of each girt through the drier;

Fig. 8 is a diagrammatic plan view similar to Fig. 7, wherein the control tracks are undulated to effect repeated expanding and contracting of the girt sleeves at uniform speeds during one passage of each girt through the drying chamber;

Fig. 9 is a diagrammatic plan view illustrating a control track arrangement wherein the girt sleeves are slowly and gradually expanded and then quickly retracted;

Fig. 10 is a sectional elevation illustrating one means for effecting complete intermittent rotations of the girts during their goods-carrying passage through the drying chamber;

Fig. 11 is a view similar to Fig. 10 showing means for intermittently rotating the girts one-quarter of a turn at a time;

Fig. 12 is a view similar to Fig. 2 showing a modified form of girt sleeve as including a central rigid portion intermediate the axially expandable and contractible opposite end portions thereof;

Fig. 13 is an enlarged sectional elevation illustrating a modified form of mechanism for effecting longitudinal expansion and contraction of the goods-supporting sleeve of the girt;

Fig. 14 is an enlarged longitudinal sectional view showing a modified form of sleeve construction, with the sleeve in its contracted state;

Fig. 15 is a view similar to Fig. 14 but showing the modified sleeve in its expanded state;

Fig. 16 is a transverse sectional elevation taken on the line 16—16, Fig. 15;

Fig. 17 is a longitudinal sectional view showing a modified form of the invention; and

Fig. 18 is a transverse sectional elevation taken on the line 18—18, Fig. 17.

As shown more particularly in Figs. 4, 5 and 6, the preferred form of girt A of the present invention comprises a rigid pole 1 which may be of solid or hollow construction, and formed of any suitable material. In the present instance, the girt pole 1 is of metallic tubular construction and is provided at each of its opposite ends with a solid plug 2 welded or otherwise rigidly secured therein. Each plug 2 is provided with an axial trunnion 3, and the trunnions 3, 3, at the opposite ends respectively of each girt, are mounted in side links 4, 4 of conveyer chains 5, 5. Rotation of the trunnions 3 in the chain links 4 is prevented by pins or other fastening means 6.

Encircling the rigid tubular girt pole 1, and extending substantially from end to end thereof, is the axially expandable and contractible sleeve 10 upon which the present invention is primarily predicated. As shown in Fig. 4 the sleeve 10 is of interbraided construction composed of a plurality of ribbon-like strands 10*a* extending in spiral convolutions around the rigid girt pole 1 in one direction and interbraided with a second series of ribbon-like strands 10*b* arranged in spiral convolutions extending around the rigid girt in the opposite direction.

As shown in Fig. 6 the sleeve 10 is normally, and particularly when in its axially contracted state, of greater diameter than the rigid pole 1 and is free to rotate thereon about the axis of said pole.

The sleeve 10 is secured at each of its opposite ends to a collar 11 and the collars 11, 11 are mounted on the rigid pole 1 to effect longitudinal expansion and contraction of the sleeve 10. Preferably the ends of the sleeves 10 are rigidly secured, as by soldering or the equivalent, to their respective collars 11 to anchor all of the ends of the interbraided strands 10*a* and 10*b* to said collars.

In the present instance the individual oppositely extending spirally interlaced or interbraided ribbon-like strands 10*a* and 10*b* of the tubular fabricated axially expandable and contractible sleeve 10 are composed of a series of individual filaments 10*d*, 10*d* laid in substantially parallel side by side abutting relation to each other in each strand.

The filaments 10*d* may be composed of any suitable and durable material, preferably a non-corrosive material such as copper, aluminum, nickel, stainless steel or other base metal or metal alloy; or the filaments may be composed of fibre-glass or an extruded plastic material fusible at a higher temperature than would normally be encountered in the drying or processing of the webs or strip goods which would be hung in loops over and be supported by the sleeves 10.

The prime requisite of the material of which the sleeves 10 and their component parts are made is that the material shall be non-absorbent of and non-affected by the dye-stuff or other chemicals used in the processing of the webs or strip goods either before the goods is hung over the sleeves 10 or while the goods is supported thereby; and that any residual chemicals, coloring, etc., deposited on the sleeves may be readily removable therefrom when a change of web or strip goods is made as from one color to another, for example.

Sliding movement of the collars 11, 11 in opposite directions, at the opposite ends respectively of the sleeve 10, on and with respect to the rigid pole 1, and rotation of the sleeve 10 relative to the rigid pole 1, are effected, in one

form of the invention, by a gear 13 rigidly secured to each collar 11.

In each instance the gear 13 is of greater diameter than the sleeve 10 and is controlled, as to axial and rotary movement relative to the rigid pole 1, in a manner and by means hereinafter described.

As shown in Fig. 4, when the sleeve 10 is contracted axially, the pitch of the convolutions of the spirals in which the strands 10*a* and 10*b* extend are at a steeper angle with respect to the axis of the sleeve and the rigid pole 1 than the angles of the convolutions of the spirals when the sleeve 10 is axially extended or expanded as shown in Fig. 5, and it will be noted that the interbraided strands 10*a* and 10*b* undergo a relative pivotal action at the points 10*c* where any one strand crosses another. In this way the entire area of the peripheral surface of the sleeve 10 remains substantially the same throughout the full range of axial expansion and contraction of the sleeve, without creating any crevices or openings of sufficient area to permit the material to enter and effect marking of the goods resting thereon.

The interstices of the interbraided fabrication render the sleeve 10 relatively porous and subject to the passage of air and moisture from the interior to the exterior of the sleeve, and vice versa.

The operating gears 13, 13, at the opposite ends respectively of the tubular sleeves 10, 10, are adapted to run in tracks 20, 20 which extend along the opposite sides of a portion of the course to be traversed by the girts 1 and their encircling sleeves 10, 10.

The tracks 20, 20 comprise upstanding side flanges 21, 21, providing a trough 22 therebetween in which are mounted continuous or interrupted gear racks 23, 23 for engagement with the teeth of the gears 13, 13 as the gears move longitudinally of the tracks 20.

Expansion and contraction of the sleeves 10 are effected by the side faces of the gears 13 making contact alternately with the inner flanges 21 or the outer flanges 21 of the tracks 20; and rotation of the sleeves 10 with respect to the girts 1 is effected by the teeth of the gears 13 meshing with the gear racks 23 as the girts travel longitudinally of the tracks 20.

The side chains 5, 5, which are made up of the chain links 4, 4, by which the opposite ends of the girts 1 are supported and conveyed longitudinally of the tracks 20, are also provided with rollers 24 which ride on uniformly laterally spaced supporting and guiding rails 25. The tracks 20 are held in predetermined relation to the rails 25 by means of brackets 26, as shown in Figs. 2 and 3.

As shown in Fig. 1 the tracks 20 and rails 25 are mounted horizontally in the upper portion of a suitable drying or other processing chamber 30, and extend longitudinally therethrough, substantially from one end to the other thereof.

The chains 5, which carry the girt poles 1 and their encircling sleeves 10, pass around suitable guide sprockets 29, 29 mounted within the drier 30, adjacent the opposite ends thereof, one or more of said sprockets 29 being driven from any suitable source of power to effect movement of the carrying chains 5, 5, and consequently the girts 1 and sleeves 10, within the drier chamber 30.

Any suitable means may be provided for forming the goods *x* into festoons or loops X, over and between the sleeves 10 carried by the girts 1, and for removing the goods from said loops at the opposite ends respectively of the drier 30.

Any suitable means may be provided for circulating heated air or other gaseous processing medium within the chamber 30, as the festoons X advance therethrough from one end to the opposite end thereof.

As shown in Fig. 7, the tracks 20 may be disposed in diverging relation to each other, from the entrance end of the chamber 30 toward the exit end thereof, by which the inner rails 21, 21, of the tracks 20 will engage the inner faces of the gears 13, 13 and effect a single gradual, axial expansion of the sleeves 10, 10 progressively, as the girts and sleeves, with the goods draped thereover, are moved longitudinally through the chamber 30, toward the exit end thereof, by the side chains 5, 5.

As shown in Fig. 8, the tracks which effect expansion and contraction of the sleeves 10 may be of a reversely undulated nature, as indicated at 20*a*, 20*a* for effecting repeated uniform axial expansion and contraction movements of the sleeves 10, during a single passage of the girts and sleeves in one direction through the drier.

As shown in Fig. 9, the sleeves 10 may be gradually expanded and quickly contracted a number of times during one passage in a single direction of the sleeves 10 through the processing chamber. In this instance the inner flanges 21*b* of the tracks 20*b* may be of an interrupted character, to effect gradual outward movement of the gears 13 and then completely release said gears, whereby the sleeves 10 may contract under an inherent tendency of the sleeves to contract, due to their interbraided spring-like nature.

Fig. 10 illustrates the gears 13 and the gear racks 23 as being of the interrupted type, by which intermittent single full-revolution rotations of the sleeves 10 are effected with respect to the rigid inner girt.

Fig. 11 illustrates means for rotating the sleeves 10 with respect to the rigid girts 1 to the extent of a quarter of a turn each time, and wherein the gears 13 are replaced by rectangular gear plates 13*a* having diagonal slots 31, 31 extending radially inward from each of the four corners thereof, to be entered by pins 32 located at relatively spaced points along the tracks 20*c*, the gear plates 13*a* being provided with flat surfaces 33 adapted to slide along flat plain surfaces 34 of the rails 20*c* and prevent rotation of the sleeves as the girts advance through the drying chamber, intermediate the turning pins 32, 32.

As shown in Fig. 12, the sleeve 10*a* may be provided with a central plain portion 35, with an expandable and contractible portion 36, 36 at each of the opposite ends thereof to which the operating gears 13*b*, 13*b* are respectively attached for operation by the tracks 20*d*, 20*d*. This arrangement is adapted for use when two strips *x*1, *x*1 are laid side by side on the girts to travel simultaneously through the processing chamber. The adjacent edges or marginal portions of the two strips *x*1, *x*1 are adapted to lie on the plain portion 35 of the sleeve with the remainder of the width of each strip lying on the expandable and contractible portions 36, 36 respectively of the sleeve 10*a*.

As shown in Fig. 13, axial contraction of the sleeve 10*b* may be assisted by complementary means in the form of a spring 37 enclosed within the rigid girt pole 1*a* and attached at its opposite ends to spools 38 respectively located inside the

girt pole adjacent the opposite ends thereof. The spools 38, in each instance, may be connected by a pin 39 to a non-rotatable collar 40 slidably mounted on the outside of the girt pole 1a. At one end of the collar 11a, to which the end of the sleeve 10b is attached, the collar 11a may be provided with an operating gear 13 or 13a, as previously described, which is rotatably mounted on the girt 1a, between the non-rotatable collar 40 and a second non-rotatable collar 41, which latter is connected to the internal spool 38 by a pin 42. The pin 42 is adapted to rotatably support a roller 43 operable in a track 20e, or on the track 20b as illustrated in Fig. 9, by which the axial expansion of the sleeve 10b may be effected. The track 20e may be provided with the flat surfaces 34 and the turning pins 32 for engagement with the turning gears 13a as shown in Fig. 11. Connection between the internal spool 38 and the external collars 40 and 41 is established by the pins 39 and 42 extending through slots 43 and 44 formed in the tubular girt 1a.

As shown in Figs. 14, 15 and 16, the sleeve 10c may be composed of a metal or plastic tube provided with transverse slots 45, 45 extending around only part of the complete circumference of the sleeve, with solid connecting portions 46 therebetween, alternate slots 45 being cut at 90° to the intermediate slots 45, and with the solid connecting portions 46 disposed in circumferentially staggered relation to each other. This construction provides for axial expansion of the sleeve 10c, as illustrated in Fig. 15, and the resilient character of the material of which the sleeve 10c is formed will inherently effect axial contraction of the sleeve 10c to its normal state shown in Fig. 14.

As shown in Figs. 17 and 18 the expandable and contractible element 10d, instead of encircling the rigid girt pole 1d is adapted for planetary movement about the axis of the girt pole 1d, to pick the goods x2 off the girt pole 1d progressively, from one side of the girt, and to lay the goods back on the girt pole 1d as the expandable and contractible element 10d passes around to the opposite side of the girt pole 1d. While the expandable and contractible element 10d is supporting the goods x2 above the girt hole 1d (Fig. 18) axial expansion of the element 10d is effected to remove wrinkles from the goods x2.

As shown in Fig. 17 the girt pole 1d is supported against rotation by the side conveyer chains 5, through the trunnions 3d. Rigidly secured to the trunnions 3d is a pair of collar cams 47, 47 which engage axially aligned pins 48, 48 extending in opposite directions from the plane of the operating gear 13d, in which said pins are mounted. As the gear 13d engages the gear rack 23d, along the path of movement of the girt 1d, the gear 13d is rotated by the rack 23d and at the same time is shifted laterally by action of the pins 48, 48 operating against and between the cam surfaces 47, 47. The timing is such that when the expandable and contractible element 10d is in its lowermost position with respect to the girt, in its planetary movement about the axis of the girt 1d, and wherein the expandable and contractible element 10d is free from all contact with the goods x2, the cams 47, 47 will move the gears 13d inwardly causing contraction of the element 10d for subsequent expansion by said cams as the element 10d continues its planetary movement about the girt pole 1d and picks the goods x2 off the girt pole 1d as previously noted.

It will be understood that there is one of the mechanisms shown in Fig. 17 at each end of each of the girt poles 1d and in order to prevent sagging of the expandable and contractible element 10d, intermediate the gears 13d, 13d located respectively at the opposite ends of the girt pole 1d, said gears are connected by a telescoping rod structure 50 mounted within the tubular element 10d, with one element 50a of the telescoping rod 50 rigidly secured to one of the gears 13d and the second element 50b of said telescoping rod 50 secured to the operating gear 13d located at the opposite end of the girt pole 1d.

I claim:

1. Apparatus for dewrinkling festooned web and strip goods, which comprises a girt for supporting said goods, including a rigid rectilinear body element, an axially expandable and contractible tubular element immediately surrounding said rigid body element and operable intermediate said body element and said goods in a direction transversely of said goods and axially of said girt, means for rotating said expandable and contractible element about the axis of said girt, means for expanding said expandable and contractible element axially for spreading said goods smoothly on said girt, and means for advancing said elements laterally during said axial expansion and rotation of said expandable and contractible element relative to said body element.

2. A girt element comprising a pair of axially aligned unitary axially expandable and contractible fabricated tubes each formed of oppositely extending spirally interlaced flat strands respectively composed of a plurality of parallel laterally abutting filaments, a non-expandable cylindrical element intermediate and axially aligned with and rigidly secured to adjacent ends of said fabricated tubes and therewith collectively affording a uniform cylindrical goods-supporting surface throughout the full range of axial dimensional variability of said tube.

3. A girt element comprising a pair of axially aligned unitary axially expandable and contractible fabricated tubes each formed of oppositely extending spirally interlaced flat strands respectively composed of a plurality of parallel laterally abutting filaments, a non-expandable cylindrical element intermediate and axially aligned with and rigidly secured to adjacent ends of said fabricated tubes and therewith collectively affording a uniform cylindrical goods-supporting surface throughout the full range of axial dimensional variability of said tube, and means secured to the remote ends of said tubes for effecting axial expansion and contraction thereof.

4. Apparatus for dewrinkling festooned web and strip goods, which comprises a girt for supporting said goods, including a rigid rectilinear body element, an axially expandable and contractible tubular element immediately surrounding said rigid body element operable intermediate said body element and said goods in a direction transversely of said goods and axially of said girt, means for axially expanding said expandable and contractible element to spread said goods smoothly on said girt, and means for advancing said elements laterally during said exial expansion of said expandable and contractible element relative to said body element.

5. Apparatus for dewrinkling festooned web and strip goods, which comprises a girt for supporting said goods including a rigid rectilinear

body element, a pair of axially aligned unitary axially expandable and contractible tubular elements surrounding said rigid body element, a non-expandable tubular element intermediate and axially aligned with and rigidly secured to adjacent ends of said tubular elements and forming therewith a cylindrical goods-supporting surface, means associated with said pair of expandable and contractible tubular elements operable to effect axial expansion thereof for spreading said goods smoothly on said girt, and means for advancing the girt laterally during said axial expansion and contraction of said pair of tubular elements.

6. Apparatus for dewrinkling festooned web and strip goods, which comprises a girt for supporting said goods including a rigid rectilinear body element, a pair of axially aligned unitary axially expandable and contractible tubular elements surrounding said rigid body element, a non-expandable tubular element intermediate and axially aligned with and rigidly secured to adjacent ends of said tubular elements and forming therewith a cylindrical goods-supporting surface, means for rotating the tubular elements as a unit about the axis of said body element, mechanism associated with said pair of expandable and contractible tubular elements operable to effect axial expansion thereof for spreading goods smoothly on said girt, and means for advancing the girt laterally during said rotation and axial expansion of said tubular elements relative to said rigid body element.

ALPHEUS O. HURXTHAL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
814,472	Noonan	Mar. 6, 1906
1,038,002	Scholler	Sept. 10, 1912
1,569,343	Voegeli	Jan. 12, 1926
1,595,544	Farrell	Aug. 10, 1926
1,599,257	Voegeli	Sept. 7, 1926
1,738,700	Hadwin	Dec. 10, 1929
1,997,696	Parkes	Apr. 16, 1935
2,041,950	Pierce	May 26, 1936
2,164,278	Kellems	June 27, 1939
2,211,478	Pierce	Aug. 13, 1940
2,220,760	Gates et al.	Nov. 5, 1940