July 8, 1924. 1,500,797

C. C. CADDEN

HOSE WRAPPING MACHINE

Filed March 8, 1922 2 Sheets-Sheet 1

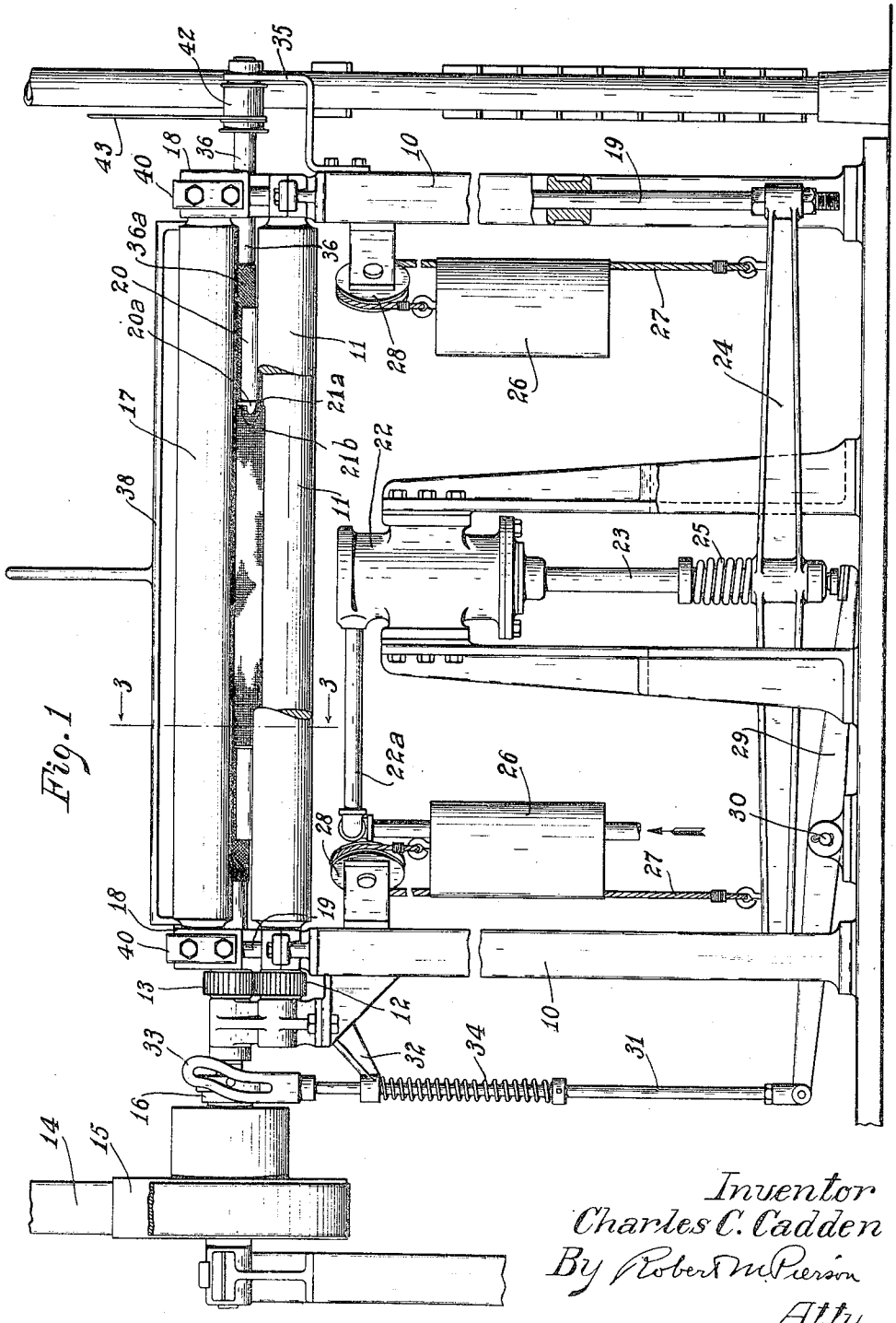


Fig. 1

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Fig. 2

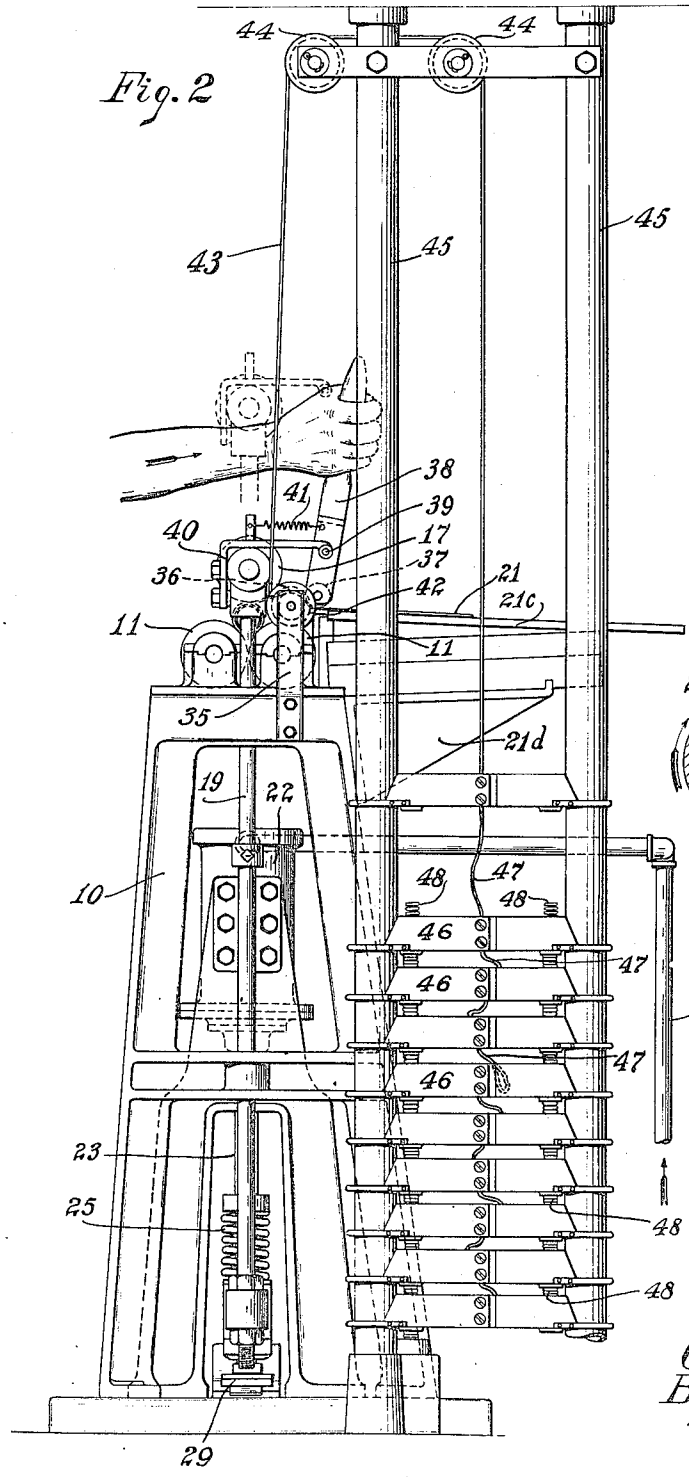
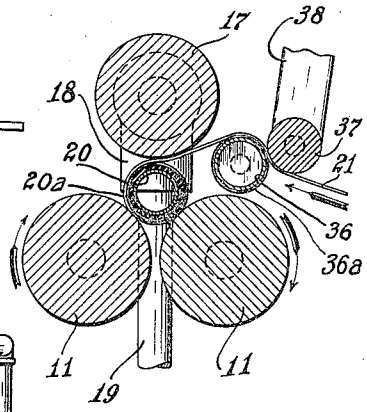


Fig. 3



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Patented July 8, 1924. 1,500,797

UNITED STATES PATENT OFFICE.

CHARLES C. CADDEN, OF AKRON, OHIO, ASSIGNOR TO THE B. F. GOODRICH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

HOSE-WRAPPING MACHINE.

Application filed March 8, 1922. Serial No. 542,030.

To all whom it may concern:

Be it known that I, CHARLES C. CADDEN, a citizen of the United States, residing at Akron, in the county of Summit and State of Ohio, have invented a certain new and useful Hose-Wrapping Machine, of which the following is a specification.

This invention relates to winding or wrapping machines, such, for example, as are used for making convolute wound hose wherein the hose is formed by wrapping a sheet of material such as rubberized fabric in successive, superposed convolutions upon a mandrel.

It has been found that when the hose is composed of successive convolutions of material wound under the same tension, the bursting strength of the hose is less than when each convolution is wound under greater tension than the one which preceded it, so that the tension of the fabric increases from the inner to the outer periphery of hose, the reason apparently being that when bursting strains are applied from within the hose radial compression of the walls permits a greater percentage of expansion in the inner plies than occurs in the outer plies, whereby the former reach the limit of elongation and break before the outer plies have received their share of the load, unless the radial compression is compensated by relatively high tension in the outer plies.

My general object is to provide a simple and effective machine for wrapping or winding a flexible material, such as the fabric used in hose, with an increasing tension. A more specific object is to provide a machine wherein the tension may be automatically increased in a series of steps, so that the tension may be uniform throughout the laying of each convolution, though greater for each succeeding convolution, and the change of tension may be had at a predetermined time with regard to the laying of each convolution.

Of the accompanying drawings:

Fig. 1 is a side elevation, with parts broken away, of a hose wrapping machine embodying a preferred form of my invention.

Fig. 2 is an end elevation of the same.

Fig. 3 is a section on line 3—3 of Fig. 1.

In the drawings, 10, 10 are a pair of end standards in the tops of which are journaled a pair of parallel, spaced apart, mandrel-supporting and driving rolls 11, 11, provided at one end with gears, one of the latter being shown at 12 (Fig. 1), said gears being meshed with a gear 13 adapted to be driven by a belt 14 on a pulley 15, through a clutch 16, the rolls 11 thus being adapted to be driven in the same direction, clockwise, as viewed in Fig. 2

An idle presser roll 17, over the rolls 11 and parallel therewith, is journaled in blocks 18, 18 respectively supported by vertical slide-bars 19, 19 mounted in the end standards 10, said presser roll being adapted to press the work downward against the supporting and driving rolls 11, and to be lifted therefrom to permit the insertion or removal of the mandrel, 20. 21 is the fabric sheet from which the hose is formed, said fabric being cut away in Fig. 1 to show successive convolutions, 21^a, 21^b of fabric and a layer of unvulcanized rubber 20^a thereunder upon the mandrel 20.

The machine is equipped with a fluid pressure cylinder 22 having a fluid inlet pipe 22^a provided with a control valve (not shown). The piston-rod of said cylinder, 23, has a yoke 24 slidably mounted thereon and backed by a spring 25, the ends of said yoke being secured respectively to the lower ends of the slide-bars 19, for forcing the presser roll 17 down upon the work. 26, 26 are weights connected with the yoke 24 by cables 27, 27 passing over pulleys 28, 28, for lifting the presser roll and other parts hereinafter described, when the cylinder 22 is exhausted. The lower end of the piston-rod 23 is adapted in its downward movement to strike the end of a lever 29 fulcrumed at 30 (Fig. 1), the opposite end of said lever having pivoted thereon a slide-bar 31 extending upward through a guide bracket 32 and having at its upper end a forked, cam-slotted member 33 adapted to throw the clutch 16 in and out as the roll 17 is lowered and raised respectively. 34 is a spring upon the slide bar 31, adapted to urge the latter downward to throw out the clutch when the pressure in the cylinder 22 is released.

Journaled in brackets, one of which is shown at 35, is a hold-back tension roll 36, preferably covered with fabric 36^a, said tension roll lying close to, parallel with, and preferably over, the rear work supporting roller 11. 37 is a presser roll journaled between the widely spaced arms of a lever 38

pivoted as at 39 (Fig. 2) between brackets 40, 40 secured to the blocks 18, the roll 37 thus being adapted to be pressed against the fabric 21 as the latter passes over the tension roll 36, to prevent its slipping thereon, and said roll 37 is adapted to be lifted from the work with the roll 17 when the latter is raised by the weights 26. 41 (Fig. 2) is a pull spring adapted to hold the presser roll 37 clear of the tension roll 36 as the former descends upon the work. 21^c is a table supported by brackets 21^d, 21^d mounted upon the end standards 10, said table being adapted to support the fabric 21 as the latter is drawn into the machine.

For applying an increasing tension to the fabric 21 as it passes onto the mandrel 20, a windlass spool 42 is secured upon the tension roll 36, from which spool a cable 43 passes, over pulleys 44, 44, journaled at the top of a pair of guide posts 45, 45, to the uppermost of a stack of weights 46, 46, said weights being slidably mounted on said guide-posts and connected, each with the next, by a cable, 47, 47, of measured length. 48, 48 are buffer springs mounted on the several weights and adapted to prevent too sudden changes of tension by reason of the jerking of the weights, and to cushion their return.

In the operation of the machine, the cylinder 22 being exhausted and the rolls 17, 37 and their mountings being held in their uppermost position by the weights 26, and the clutch 16 being disengaged, the mandrel 20, with the layer of rubber 20^a thereon, is laid upon the work-supporting and driving rolls 11 and the margin of the fabric 21 started on said mandrel. Fluid pressure is then applied to the cylinder 22, clamping the presser roll 17 down upon the work and at the same time throwing in the clutch 16, causing the mandrel 20 to be rotated between the rolls 11, 11, 17 and drawing the fabric 21 onto said mandrel. As the winding is started, the presser roll 37 is held against the tension roll 36, preventing slippage of the fabric 21 thereon, and by reason of the drag of one or more of the weights 46 upon the windlass spool 42, imparting a tension to the fabric 21 as it passes onto the mandrel. Said tension is periodically increased by the picking up of successive weights 46.

When the winding is completed, the cylinder 22 is vented, whereupon the weights 26 lift the rolls 17 and 37 and the spring 34 throws out the clutch 16, the mandrel with the wound hose thereon is removed, the weights 46 drop back to original position and the operation is repeated.

By adjustment of the lengths of the cable 43 and the cables 47 connecting said weights, the increases of tension may be had at the beginning, or at any desired part, of the winding of each convolution of fabric. While the tension may be increased in steps, unduly abrupt changes of tension, or momentary excesses of tension from the jerking of the weights 46, is avoided by the springs 48.

Modifications may be resorted to without departing from the scope of my invention, and I do not wholly limit my claims to the specific construction shown.

I claim:

1. A hose wrapping machine comprising means for supporting and rotating a hose mandrel, means for applying tension to fabric as it is wound on said mandrel, and yielding trailer means whose force is overcome by the longitudinal pull of the fabric for increasing said tension by a predetermined amount while said fabric is being so wound.

2. A hose wrapping machine comprising means for supporting and rotating a hose mandrel, means for applying tension to fabric as it is wound on said mandrel, and means for periodically and automatically increasing said tension by amounts predetermined solely by structural characteristics of the machine as successive convolutions of said fabric are so wound.

3. In combination with a winding machine, a tension device comprising a member adapted to contact the work and resist the feeding movement thereof, a set of yielding members, and means for successively and cumulatively bringing the force of said yielding members to bear upon said work-contacting member.

4. A hose-wrapping machine comprising means for supporting and rotating a hose mandrel, a work-contacting tension member for fabric wound on said mandrel, and a set of weights adapted successively to exert their force upon said tension member to increase its tensioning effect.

5. A hose wrapping machine comprising means for supporting and rotating a hose mandrel, a tension roll for fabric wound on said mandrel, a series of weights, and a flexible member connecting successive weights of said series, said weights being adapted to be lifted in succession by the rotation of said tension roll and to resist said rotation.

6. In combination with a winding machine, a tension device comprising a hold-back rotary member, a windlass member driven thereby, a set of weights, and a flexible connection between weights of said set, said weights being adapted to be lifted successively by the rotation of said windlass member.

7. In combination with a winding machine, a tension device comprising a work-contacting tension member, a stack of weights, a flexible member connecting suc-

cessive weights of said stack, means responsive to the feeding movement of the work for lifting the uppermost weight and causing its force to be applied to said work-contacting tension member, and yielding members interposed between successive weights of said stack.

8. A hose wrapping machine comprising means for supporting and rotating a mandrel, a hold-back tension roll, for fabric wound on said mandrel, and means for increasing the resistance of said hold-back roll as successive plies of fabric are drawn onto said mandrel, the last said means comprising a flexible member adapted to be drawn forward by the rotation of said tension roll and yielding hold-back means connected in tandem to said flexible member.

9. A hose wrapping machine comprising a set of mandrel-supporting and driving rolls, a hold-back tension roll adjacent one of said rolls, a presser roll adapted to hold the work against said tension roll, a windlass member driven by said tension roll, a flexible member adapted to be wound upon said windlass member, a weight secured to said flexible member, a second weight, and a flexible member connecting said weights.

In witness whereof I have hereunto set my hand this 6th day of March, 1922.

CHARLES C. CADDEN.