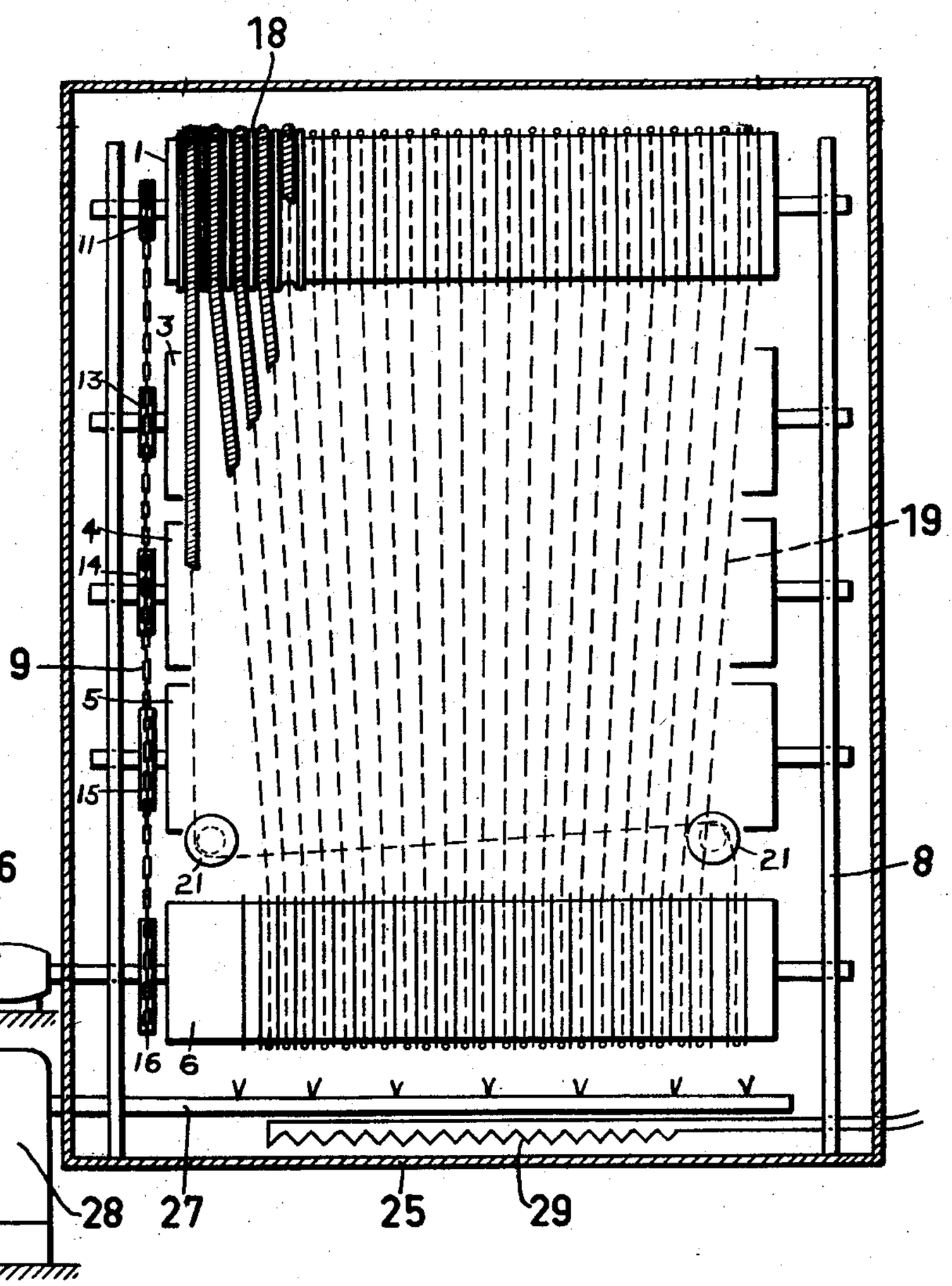
Sept. 2, 1958 K. I. J. ROSÉN 2,849,782

MACHINE FOR SHRINKING KNITTED FABRICS

Filed March 29, 1954 3 Sheets-Sheet 1

FIG. 1



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Filed March 29, 1954 3 Sheets-Sheet 2

FIG. 2

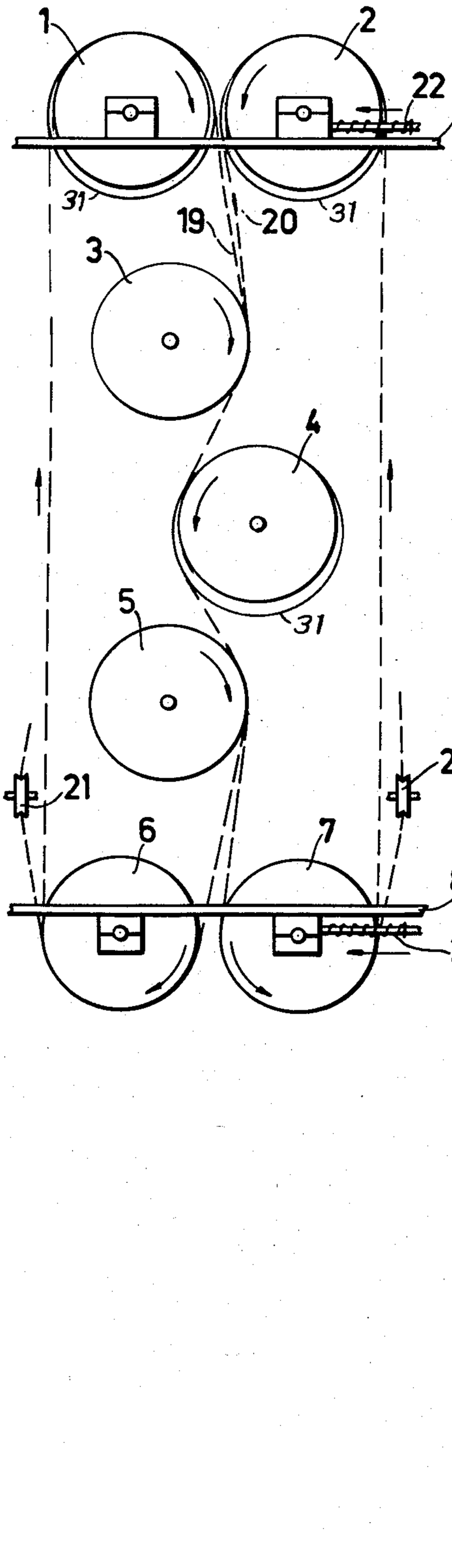
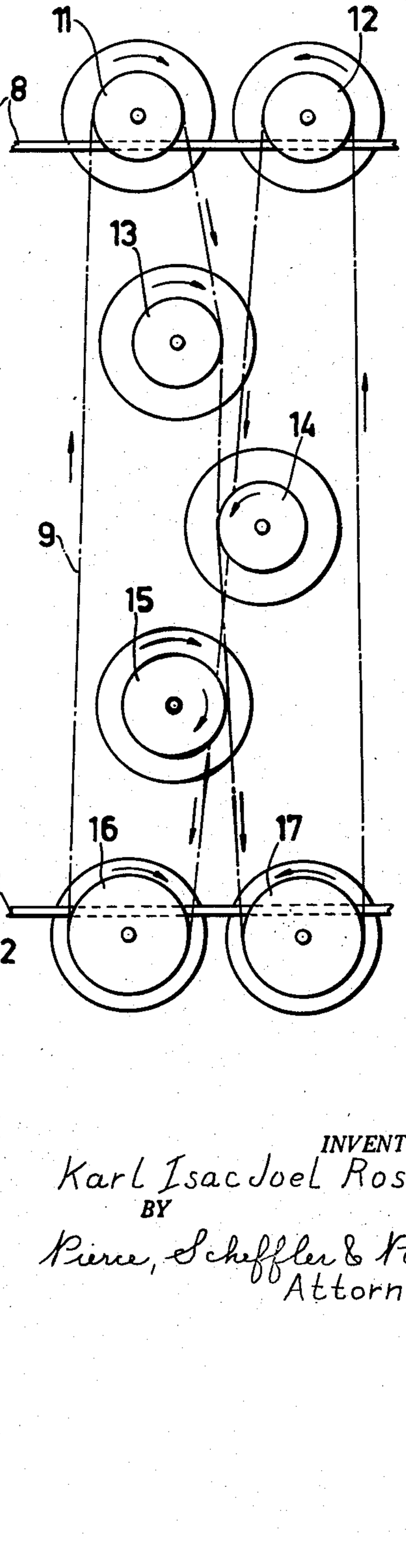


FIG. 3



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Filed March 29, 1954 3 Sheets-Sheet 3

Fig. 4.

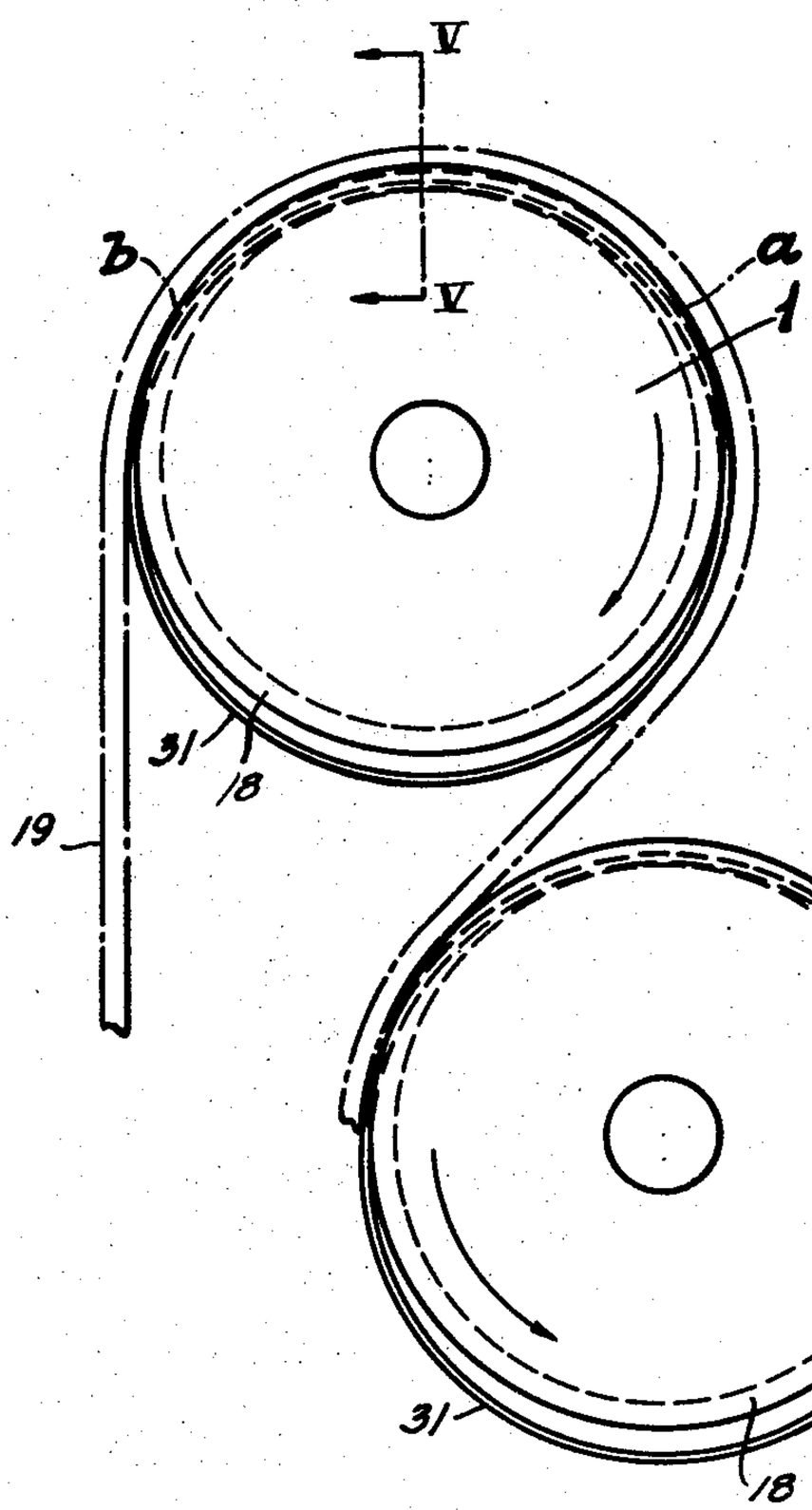
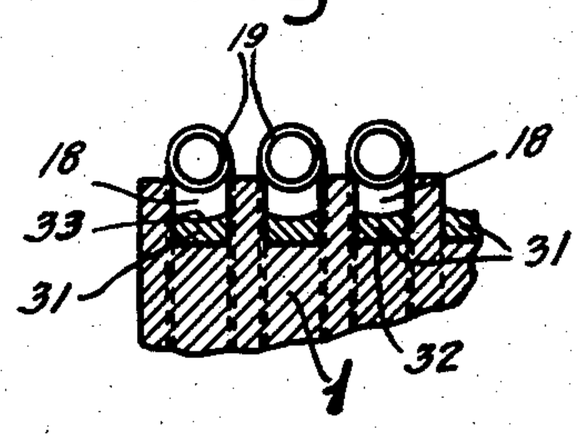


Fig. 5.



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MACHINE FOR SHRINKING KNITTED FABRICS

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Application March 29, 1954, Serial No. 419,307

2 Claims. (Cl. 26—18.6)

The present invention relates to apparatus for shrinking knitted materials or fabrics. At the present time there is on the market an apparatus wherein the shrinking is obtained in accordance with the so-called "Redman process," according to which the fabric while moist, is stretched vigorously in the breadth, so that the meshes are shortened in the length. This method, however, suffers from several drawbacks. There is hardly any unshrinkability, as a comparatively great shrinkage remains owing to the strong stretch. Besides, the apparatus used is most expensive.

It is already known in United States Patent No. 2,262,268 to shrink woven fabric in the length by steaming it and thereafter letting it pass between smooth elastic webs running on rollers rotating at different speeds. Such a process is not, however, suitable for shrinking knitted fabrics since the threads, unlike those of woven fabric, do not form warps and wefts which are substantially at right angles to each other.

There is disclosed and claimed in my co-pending United States application, Serial No. 409,992, filed February 12, 1954, an improved method and apparatus for shrinking knitted fabric simultaneously in the breadth and length, the desired result being obtained by introducing the knitted fabric between, and carrying the same through, two longitudinally moving webs of endless stainless steel helical springs extending in the direction of movement of the webs. These helical spring webs are progressively contracted in the direction of movement thereof and of the knitted fabric, and the webs likewise become progressively narrow by convergence of the springs in the direction of movement thereof and of the knitted fabric. The fabric is thus compressed or shrunk simultaneously in the longitudinal and transverse directions thereof as it is carried through the spring webs. The endless springs which form the webs run on spaced grooved rollers at the ends of the webs and the rollers run at different peripheral speeds so that the portions of the springs which form those flights of the webs between which the fabric is passed are progressively contracted. The portions of the springs which form the "return" flights of the webs from the rollers at which the fabric is discharged, back to the other rollers between which the fabric is introduced for shrinking are, of course, progressively stretched but these "return" flights take no part in the shrinking process. Moreover, all of the rollers and endless springs are enclosed in a heating chamber, the heat being produced by steam evaporated from a tray of water in the chamber so that the fabric is subjected to steam and heat during the shrinking process as it passes between the spring webs.

As indicated above, the several endless helical springs travel in grooves in the rollers and the springs are engaged in the grooves over an angular span of about 250° as they move around the upper and lower rollers. The springs fit rather tightly in and are gripped by the sides of the grooves, and hence initial contraction of the springs as they leave the upper rollers, where the knitted fabric is introduced, cannot take place until the springs clear

the grooves. It has been found to be of advantage in operation of the apparatus if the springs are caused to be released sooner from the gripping effect of the grooves in the rollers. In accordance with this invention by which such release is advanced, the rollers, particularly the upper ones where contraction of the springs first begin are provided with rings which hang in the grooves of those rollers. The width of the rings is less than the groove width so that the rings hang free in the grooves under the springs, and the diameter of the rings is greater than that of the grooves, so that the springs are forced out of the grooves sooner than would be the case were the rings to be omitted, thus enabling the springs to "skid" on the rings and hence contract sooner. By means of the invention, the angular arc of contact between the springs and the grooves of the upper rollers is reduced from about 250° as is the case in the said co-pending application to about 100° in accordance with the present improvement.

The invention is illustrated in the drawings wherein Fig. 1 is a vertical side view of the machine, the casing being shown in section; Fig. 2 is a view at right angles to Fig. 1 and diagrammatic in character illustrating the rollers and spring webs between which the knitted fabric is introduced; Fig. 3 is a view similar to Fig. 2 showing the endless chain means and drive pulleys associated with the rollers for rotating the latter at progressively slower speeds in the direction of travel of the springs and knitted fabric; Fig. 4 is an enlarged detail view showing one of the top rollers provided with the rings in accordance with the invention and also showing an intermediate roller provided with similar rings; and Fig. 5 is a fragmentary sectional view taken on line V—V of Fig. 4.

With reference now to the drawings, the numerals **1–7** designate grooved rollers of equal diameter mounted in a frame **8**. The two upper rollers **1, 2** and the two lower rollers **6, 7**, respectively are placed opposite each other, while the other intermediate rollers **3, 4** and **5** are placed in staggered relation between the upper and the lower rollers. The rollers **1–7** are driven, as shown in Fig. 3, by an endless chain **9** by means of chain wheels **11–17** connected with the rollers **1–7.** The chain wheels **11** and **12** for driving the two upper rollers **1, 2** have equal diameters as have also the chain wheels **16, 17** for driving the lower rollers **6, 7**, but the diameters of the latter chain wheels are greater than those of the upper rollers, while the diameters of the chain wheels **13, 14, 15** for driving the intermediate rollers **3, 4** and **5**, respectively increase gradually from the top downwards, so that the peripheral speeds of the rollers decrease gradually from the top downwards. The rollers **1, 3, 5** and **6** on one half of the machine are driven in the opposite direction from those on the other half. The rollers are provided with peripheral grooves **18**, these grooves being located closer together as the diameters of the chain wheels of the rollers increase.

As indicated in Fig. 2, one set **19** of the endless helical springs forming one web are placed in the grooves **18** of rollers **1, 3, 4, 5** and **6** and these are driven in the direction indicated by the arrow. A second set **20** of endless helical springs forming a second web are placed in the grooves **18** of the rollers **2, 3, 4, 5** and **7** and these are driven in the direction indicated by the arrow with the result that the adjacent "runs" of the spring webs formed by the two spring sets **19, 20** move in the same direction between the feeding set of rollers **1, 2** and over the intermediate rollers **3, 4** and **5**, and between the trailing or delivery set of rollers **6, 7**. The web of knitted material to be shrunk (not shown) enters at the rollers **1, 2** between the pair of spring webs formed by the two sets of springs **19, 20**, travels between these webs and the intermediate rollers **3, 4** and **5** at progressively slower speeds as the springs contract, and leaves between the

rollers **6, 7.** Pulleys **21** are provided to guide the sets of springs as they pass from their lower rollers **6, 7** back to their upper rollers **1, 2.** The upper and lower rollers such as rollers **2** and **7** are each provided with means **22** for urging the same in the direction of their companion rollers **1** and **6.** As shown in Fig. 1, the rollers and springs and driving chains are enclosed within a casing **25** and the rollers are driven by a motor **26** located outside the casing. In the lower part of casing **25** is a trough **27** supplied with water from an external source **28,** and an electrical heater unit **29** beneath the trough furnishes the necessary heat to convert the water into steam which rises in the casing **25,** heats the springs and freely passes through the spaces therebetween and through the knitted fabric being shrunk.

Because of the fact that the rollers travel at different peripheral speeds, the endless helical springs will be stretched in the portions thereof which travel from the lower rollers **6** and **7** back to their respective upper rollers **1** and **2,** but when the springs disengage from the grooves in the upper rollers **1, 2** they are free to contract again in a progressive manner and hence effect a shrinkage of the knitted fabric in the longitudinal direction.

Furthermore, due to the fact that the springs of each set converge toward the center of the set or web in the direction of travel of the web of knitted fabric to be shrunk between the spring webs, the knitted fabric will also be worked in the transverse direction to establish alternate grooves and ridges running in the direction of travel of the fabric between the spring webs. Thus the knitted fabric will be "corrugated" which adds to its appearance.

In accordance with the present invention, an improved result will occur if the springs are caused to leave the grip of the grooves in the upper rollers sooner than can be obtained with the arrangement disclosed in my aforesaid co-pending application Serial No. 409,992. The desired result is obtained by the use of rings **31** which are hung in the grooves **18** of the upper rollers **1, 2.** These rings **31** are preferably made of stainless steel, they have a width slightly less than that of the grooves **18** so as to run freely in the grooves, their diameters are greater than those of the grooves **18,** their thickness (in the radial direction) is less than the depth of the grooves so as to lie beneath and spaced from the springs **19, 20,** their inner surfaces **32** contact the base portions of the grooves in a tangential manner; and their upper surfaces **33** are curved concavely so as to receive and guide the springs **19, 20** when they become released from the grooves **18** in the rollers **1, 2.**

Because of these structural and dimensional characteristics of the rings **31** it will be evident that only at their topmost points do the rings **31** rest upon the bottoms of the grooves **18** in the rollers **1, 2.** From these topmost points the rings **31** move away from the groove bottoms in both directions thereby forcing the springs **19, 20** out of the grooves **18** so that the springs **19, 20** become free from the edges of the grooves at approximately the point *a* in Fig. 4 and are then free to "skid" on the rings and be contracted while resting against the appertaining portion of the outer surfaces **33** of the rings. In a corresponding manner, the springs **19, 20** will re-engage the edges of the grooves **18** of the upper rollers **1, 2,** as they pass upwardly around the same, at the point *b* shown in Fig. 4. The diameter of the rings **31** is so chosen that the angular peripheral distance *b*—*a* is sufficient to prevent any skidding of the springs **19, 20** on this portion of the grooves. Moreover, if desired, similar rings **31** can also be applied to the intermediate rollers such as roller **4** to decrease the arc of the peripheral contact line between the grooves of this roller and the travelling springs, **19, 20.**

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. Apparatus for shrinking a web of knitted fabric comprising a pair of generally vertical webs of endless helical springs having adjacent runs disposed in web-feeding relation and downwardly between which runs the fabric web is passed for shrinking, the helical springs of each web being spaced apart and extending longitudinally in the direction of travel of the fabric web, upper and lower grooved rollers arranged at the upper and lower ends respectively of each of said helical spring webs and around which said webs pass, the helical springs engaging the sides of the grooves in said rollers and being spaced from the groove bottoms to provide clearance therebetween, intermediate grooved rollers disposed between said upper and lower rollers which are engaged by said helical spring webs, means for driving said rollers at progressively slower speeds in the direction of travel of the fabric web thereby to effect a corresponding progressive contraction of the said adjacent runs of said helical spring webs and thereby to condense the fabric web, and ring means arranged freely in the grooves of at least the upper roller for each helical spring web, said ring means having a diameter greater than that of the groove and being narrower than said groove so as to rest upon the bottom of the same at only the uppermost point thereof, said helical springs being engaged by said ring means at points thereon which extend beyond the periphery of said rollers thereby to effect an earlier release of said helical springs from the grooves in said rollers and permit said springs to skid and contract upon the peripheral surfaces of said ring means.

2. Apparatus as defined in claim 1 wherein the peripheries of said ring means are concave so as to engage the rounded surfaces of said helical springs.

References Cited in the file of this patent

UNITED STATES PATENTS

2,589,344 Cohn ---------- Mar. 18, 1952