

Jan. 17, 1939.

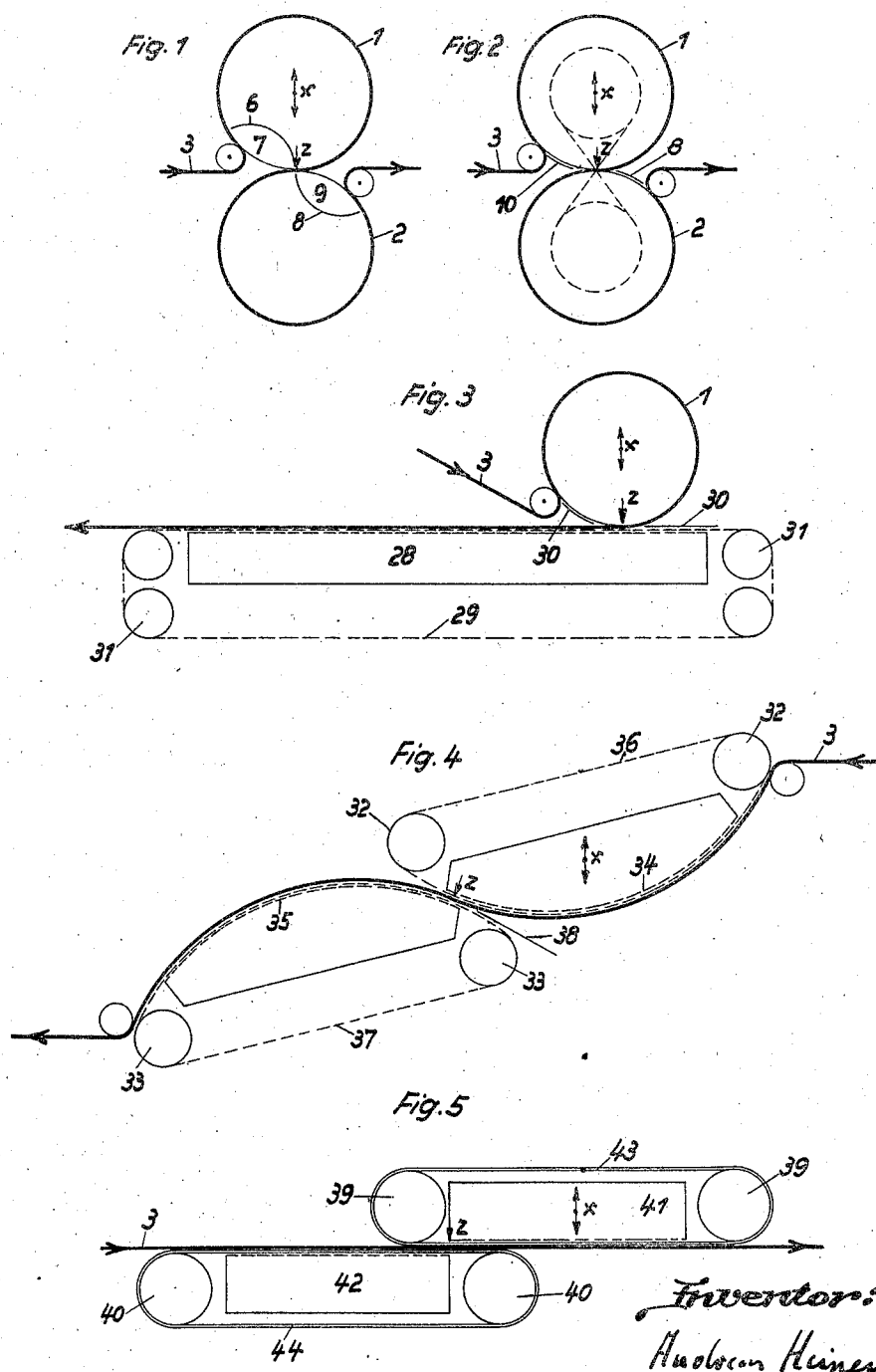
A. HEINEN

2,144,151

METHOD AND APPARATUS FOR SHRINKING WOVEN OR KNITTED TEXTILE FABRICS

Filed Oct. 5, 1934

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Fig. 6

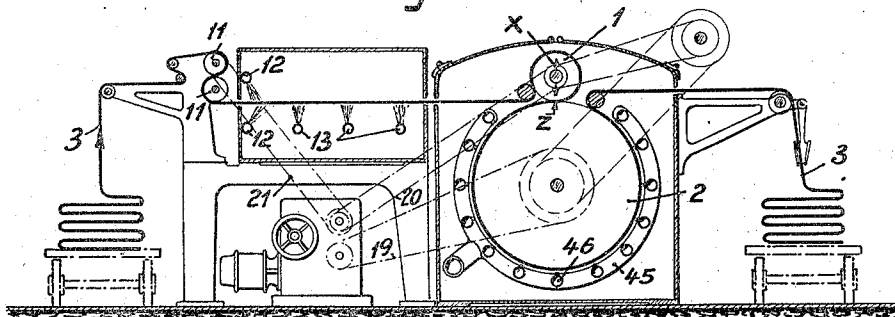


Fig. 7

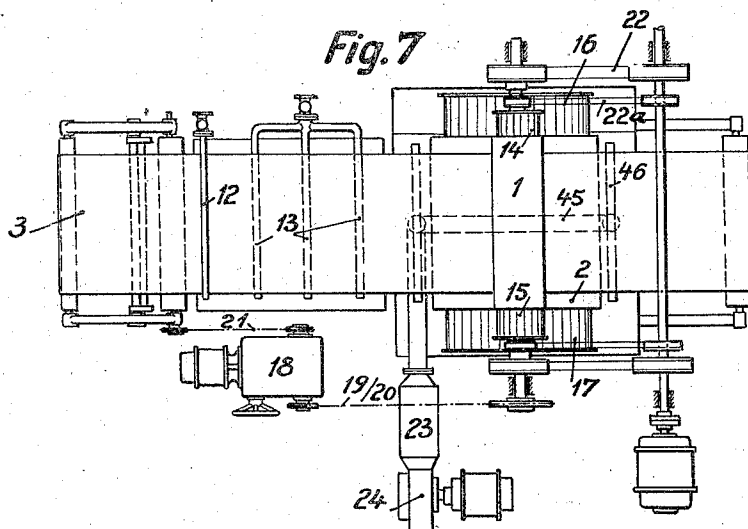
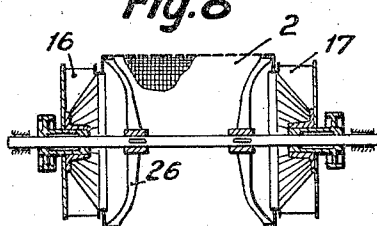


Fig. 8



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METHOD AND APPARATUS FOR SHRINKING
WOVEN OR KNITTED TEXTILE FABRICS

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In Germany October 6, 1933

6 Claims. (Cl. 26—18.5)

This invention has for its object to balance by shrinking the inner tensions caused in textile fabrics during the manufacturing and finishing processes.

5 With the known methods and devices which act during the shrinking process upon the full width of the fabric, the latter is influenced by adhering means which, if bent in one or other direction, get lengthened or shortened on its surface
10 touching the fabric. This process requires a covering of the other side of the fabric also. Therefore the threads have no possibility to balance their inner tensions voluntarily. However the yarns and also the weaves in the textile fabrics
15 are not so perfectly even that (by applying a mechanical treatment being absolutely the same for all parts of the fabric) it could be expected to get rid of all inner tensions caused during the finishing processes, as it is the case in the washing process where the fabrics have every possi-
20 bility to balance all tensions.

The invention however gives to all particles of the fabric this possibility by giving to the soaked threads (soaked for instance by the known
25 steaming process) the impulse for balancing the tensions by a short but effective pushing. The fabric is fixed in the balanced state by drying, in a manner that the particles of the fabric have still to some extent the possibility to balance tensions. The shrinkage itself is obtained according
30 to the invention by fixing the fabric to the conveying means (particularly to perforated drums) only by difference in air pressure produced either by positive air pressure on the outer side or nega-
35 tive air pressure on the inner side of the conveying means, pushing it together at the place where it moves from one to the other drum, in a manner that the first conveying means is faster driven than the second one. Because the fabric,
40 treated in such manner, reaches the slower running conveying means with loosened weave and is held on this means point for point on account of the suction pressure, it is possible to balance the tensions up to the moment when the fab-
45 ric is perfectly dry.

For fixing the fabric reliably (after pushing it together) to the drum running at lower speed, it is proposed according to the invention to keep the difference in pressure acting on this drum
50 higher than the difference in pressure of the drum running at higher speed.

This machine being extraordinarily suitable for this process is of similar construction to the known suction drums used for warp, but is com-
55 pleted by such means which allow an individual

variable speed transmission to each drum and drum cylinder, respectively, and which allow an exact regulation of the distance of the cylinders at the place where the fabric moves from one drum to the other.

In the accompanying drawings:—

Fig. 1 is a diagram in elevation of one form of apparatus upon which the method or art may be carried out.

Fig. 2, 3, 4, 5 are diagrams of other forms of 10 apparatus for the same purpose.

Fig. 6 is the front elevation of a machine for practising said process.

Fig. 7 is a plan corresponding to Fig. 6.

Fig. 8 is a detail vertical section employed.

For carrying through the idea of the invention as shown on Figs. 1, 2, 6, 7, 8, two drums 1, 2 are arranged, one above the other, in a manner that they may come into contact with each other at the mark *z*. The distance of the upper drum 1
20 from drum 2 can be regulated in the direction of the arrow *X*.

In front and behind the drums there are arranged means for stretching and guiding, in a manner that the fabric goes round the drums in
25 S-form as known in cylinder drying machines. The cylinders of the drums are perforated, and the places which are not covered by the fabric are provided inside or outside with the usual cover-plates 6, 8, 10. In view of the fact that
30 the hollow spaces 7, 9 which are produced by the inside covering show the same pressure as the outside air, they assist the loosening and transferring of the fabric 3 from one drum to the
35 other.

The drive of both drums has to be provided in a way that the peripheral speed of each drum may be regulated independently of each other.

In Figs. 6 to 8 the diameter of the lower drum 2 is considerably larger than the diameter of the
40 upper drum 1. The upper drum has a fine regulating device for moving the drum in the direction of the arrow *x* upwards or downwards. On both sides of the drums which are covered with screens Fig. 7 there are arranged fans 14, 15, 16, 45
17 sucking air through the fabric and screens into the inner portion of the drum. For this purpose the side walls of the drums 26 have openings. At the entrance of the machine, at least two rollers 11 with automatically adjustable speed are
50 arranged. Moreover are arranged in front spraying pipes 12 and steaming pipes 13, in a manner that the fabric if required can be moistened or steamed or warmed. The drums and the feeding rollers are driven through a speed 55

regulating device 18, by means of chains 19, 20, 21. The fans have belt drive 22, 22a, but in such a manner that the speed of the fans and therefore the suction in each drum can be regulated independently of each other. Finally the lower drum 2 is equipped with drying means, consisting in the present case of a number of perforated pipes 46 which receive hot air from a ring main 45. A fan 24 is forcing hot air from a heater 23 into the main ring 45.

Fig. 3 shows in the place of the lower drum 2 a conveying belt 29, also driven at adjustable speed and guided over the guide rollers 31 and suction box 28. The cover-plate 30 corresponds with the plates 10 of Fig. 2.

Fig. 4 shows in the place of both drums conveying belts 36, 37 which are guided over guide rollers 32, 33 and driven at different speeds and over suction boxes with curved perforated surfaces 34, 35 and with cover-plates 38, in a manner that the fabric may go over from the conveying belt running at the higher speed to the belt running at the lower speed, at the place where the belts are closest together (arrow 2). If this line is displaced in consequence of the thickness or sagging of the conveying belts, the cover-plates 38 will be adjusted accordingly.

Fig. 5 shows the conveying belts 43, 44 running over suction boxes with flat surface 41, 42, also guided by guide rollers 39, 40. In this case the distance between the two conveying belts will be adjusted by moving the suction boxes to or from each other, so that the acting edges of the boxes are in the same vertical line. No special protection is required for the construction according to Figs. 3, 4, 5.

The operation is in general the same with all these constructions and may therefore be particularized at the machine according to Figs. 6 to 8. The woven or knitted fabric 3 is taken by the feeding rollers 11 from a pile or from a finishing machine or from a set of such machines arranged in front. Then the fabric is moved to the upper drum 1, directly or after having been moistened, steamed or warmed according to its inner elasticity, moisture content and filling. With those fabrics which show the tendency of shrinking already before arriving at the drum 1 and which should shrink in the direction of the warp, the speed of the feeding rollers must be increased accordingly, and if they should shrink in the direction of the weft, the speed of said rollers must be reduced accordingly. The fabric remains for a certain time in the same state as it comes to the upper drum 1 (the upper conveying means), because it is pressed on to the surface of the drum by means of the suction effect. The fans 14, 15 are so adjusted that the produced suction will be just sufficient to hold the fabric 3 firmly to the drum 1.

The suction of the lower drum 2 (the second conveying means) which in general is to be higher than for the first conveying means, and the degree of the reduced speed of drum 2 are to be adjusted according to the kind of fabric and moisture contents. If for instance it is shown with the pre-test (washing test) that the warp of the fabric has shrunk by 6 per cent, the advanced speed of the upper drum 1, compared to the lower drum 2, must be adjusted in the proportion of 100/94. If necessary, hot air is to be fed in, temporarily or continuously, by the fan 24, in order to be sure that the fabric will dry on drum 2. When leaving the machine, the fabric is plaited or fed into the finishing machines, if

necessary after having it passed through a cooling and moistening arrangement.

Chief attention is to be given to the fabric at the moment when passing from one drum (one conveying means) to the other. As the distance of the conveying means must correspond with the thickness of the fabric, particular care is to be taken that if any swelling of the fabric should occur, the fabric does not come under the effect of squeezing pressure.

When adjusting the advanced speed it will perhaps be necessary to balance any tension being produced in the fabric by the other preceeding finishing processes as it is usual in the shrinking of the fabrics.

What I claim is:—

1. Method of shrinking woven or knitted textile fabrics comprising applying the fabric to the surface of a traveling support, subjecting the fabric while on the support to the action of air pressure for causing it to adhere to support surface, imparting to this support an advance movement at a predetermined speed, transferring the fabric from the said support to another support spaced from but in close succession to the former, subjecting the fabric on the last-said support to the action of air pressure higher than that used on the first-said support for causing the fabric to be affixed to the surface of the last-said support more firmly than to the first-said support, imparting to the last-said support an advance movement at a speed lower than that of the first-said support, thereby to produce a compression of the fabric parallel to its surfaces in the gap between the two supports.

2. Apparatus for shrinking woven or knitted textile fabrics, comprising at least two successively arranged closely spaced endless conveyors over which to pass the fabric, means for producing air pressure at the first conveyor whereby to hold the fabric on this conveyor, means for producing air pressure at the second conveyor higher than at the first whereby to affix the fabric more firmly on the second than on the first conveyor, and means for driving the first conveyor faster than the second.

3. Apparatus for shrinking woven or knitted textile fabrics, comprising at least two perforated drums arranged in close succession to each other at an adjustable distance and designed to have the fabric passed over them, means for creating negative pressure in the interior of the first drum whereby to hold the fabric firmly on this drum, means for creating in the interior of the second drum a negative pressure higher than in the first whereby to affix the fabric more firmly on the second than on the first drum, and means for rotating the first drum faster than the second.

4. Apparatus for shrinking woven or knitted textile fabrics, comprising at least two perforated drums arranged in close succession to each other at an adjustable distance and designed to have the fabric passed over them, fans at the ends of the first drum for creating in the interior thereof a predetermined negative pressure whereby to hold the fabric firmly on this drum, fans at the ends of the second drum for creating in the interior thereof a negative pressure higher than in the first drum whereby to affix and hold the fabric more firmly on the second than on the first drum, and means for rotating the first drum faster than the second drum.

5. Apparatus for shrinking woven or knitted textile fabrics, comprising at least two perforated drums arranged in close succession to each other

at an adjustable distance and designed to have the fabric passed over them, fans at the ends of the first drum for creating in the interior thereof a predetermined negative pressure whereby to hold the fabric firmly on this drum, fans at the ends of the second drum for creating in the interior thereof a negative pressure higher than in the first drum whereby to affix and hold the fabric more firmly on the second than on the first drum, means for rotating the first drum faster than the second drum, and hot air nozzles around the circumference of the second drum whereby to direct hot air to the fabric on this drum for drying the fabric.

6. Apparatus for shrinking woven or knitted fabrics, comprising at least two successively arranged endless conveyors permeable to air over which to pass the fabric, mean for producing a difference of air pressure between the inner and outer sides of the conveyors whereby to affix the fabric on the conveyors, adjustable cover plates associated with the conveyors for preventing passage of air through the conveyors at the points where same are not covered by the fabric, and means for driving the first conveyor faster than the second.

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