

June 14, 1938.

H. K. LEA

2,120,758

METHOD AND APPARATUS FOR PRODUCING ELASTIC KNITTED FABRIC

Filed April 20, 1935

6 Sheets-Sheet 1

Fig. 1.

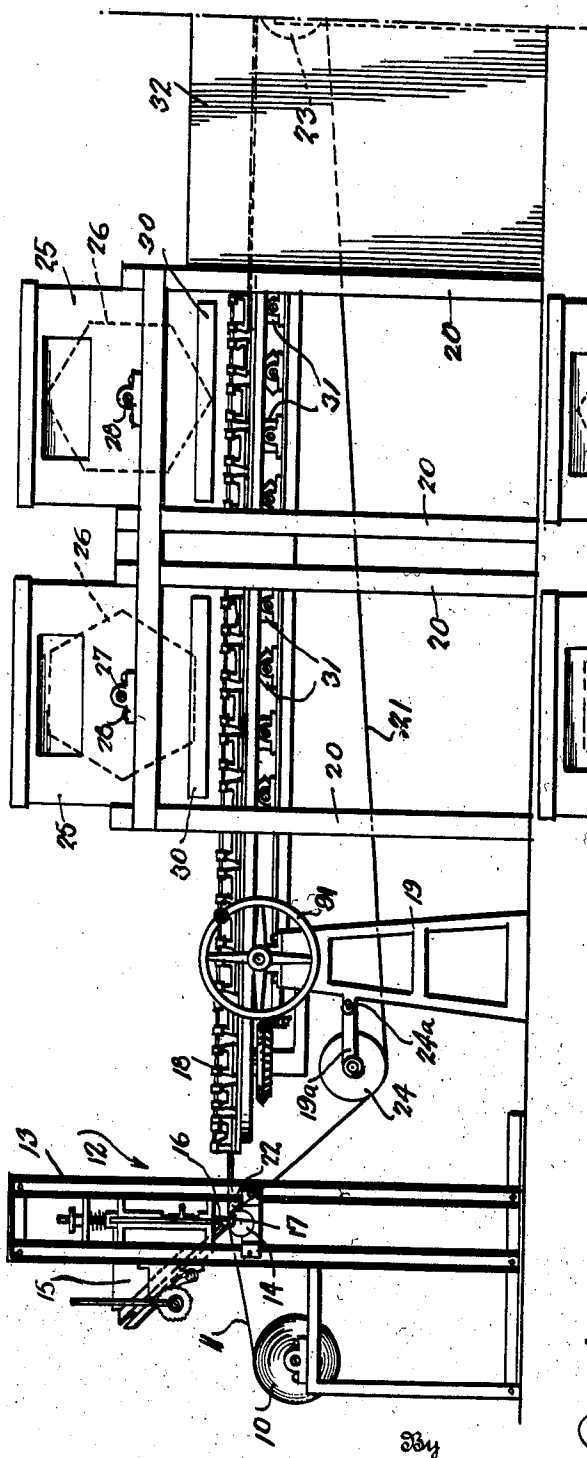
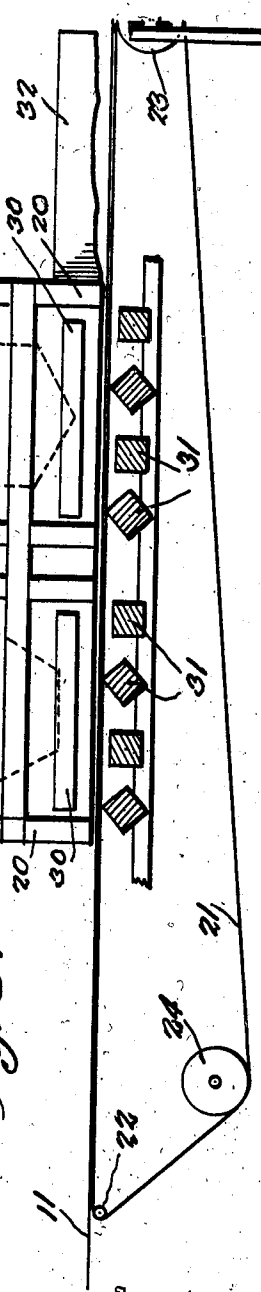


Fig. 3.



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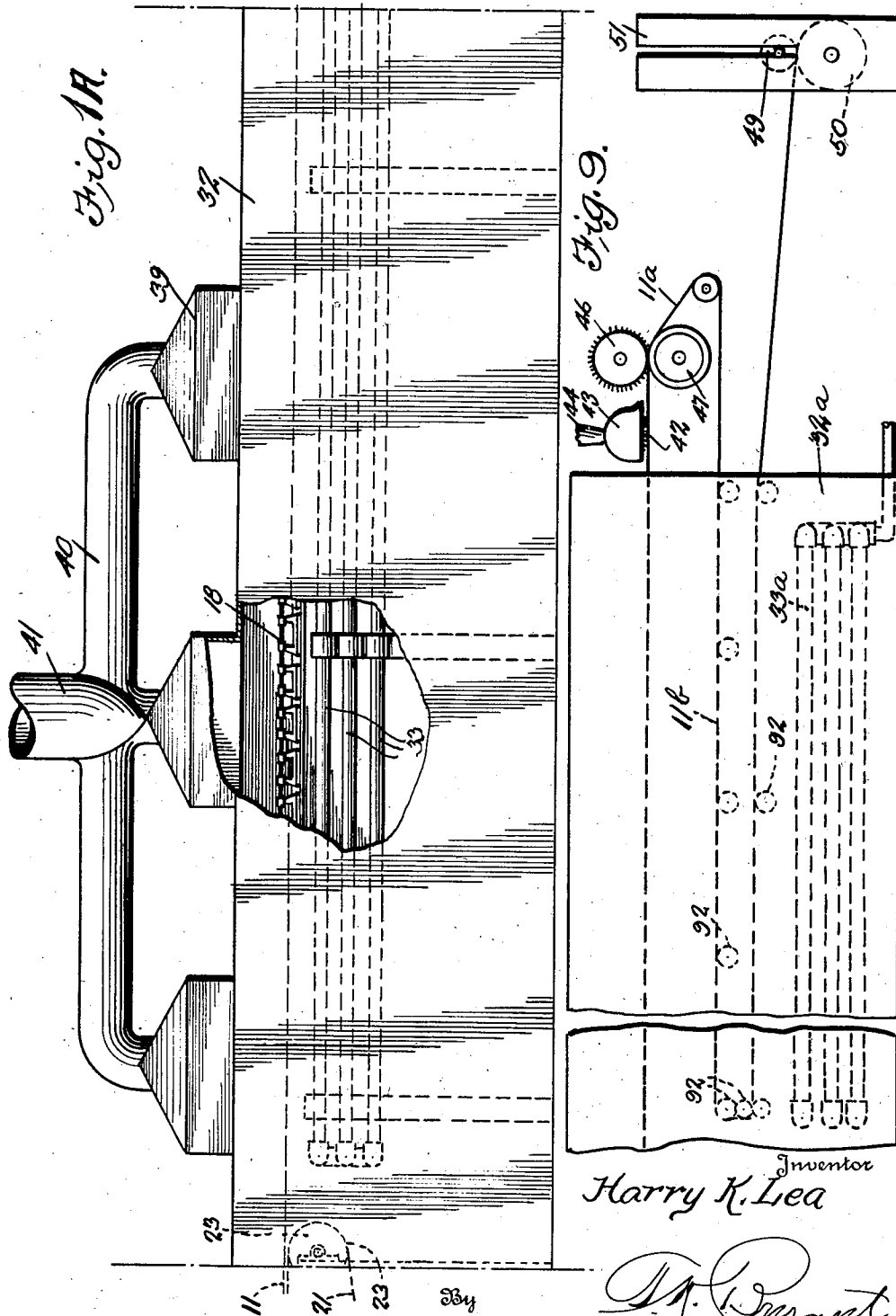
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METHOD AND APPARATUS FOR PRODUCING ELASTIC KNITTED FABRIC

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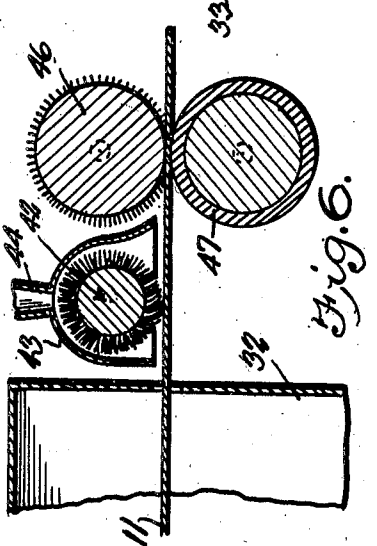
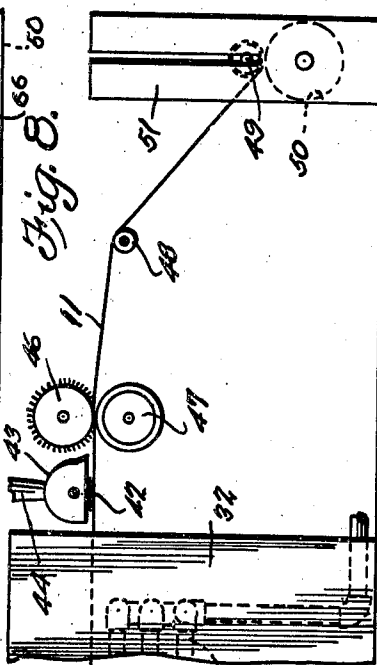
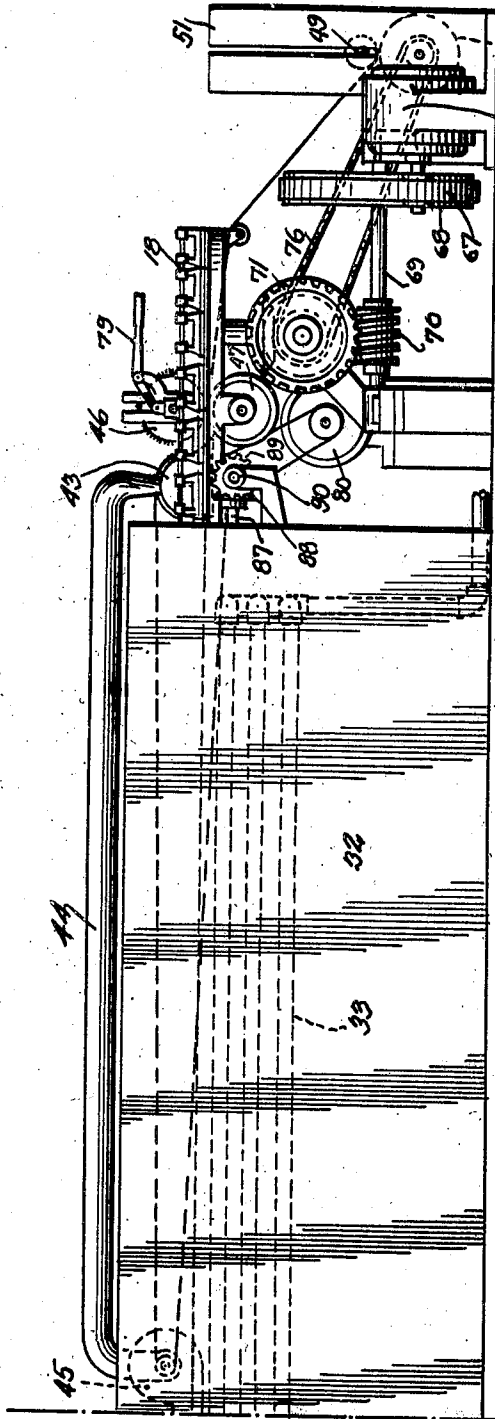
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METHOD AND APPARATUS FOR PRODUCING ELASTIC KNITTED FABRIC

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Fig. 1B.



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METHOD AND APPARATUS FOR PRODUCING ELASTIC KNITTED FABRIC

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Fig. 6.

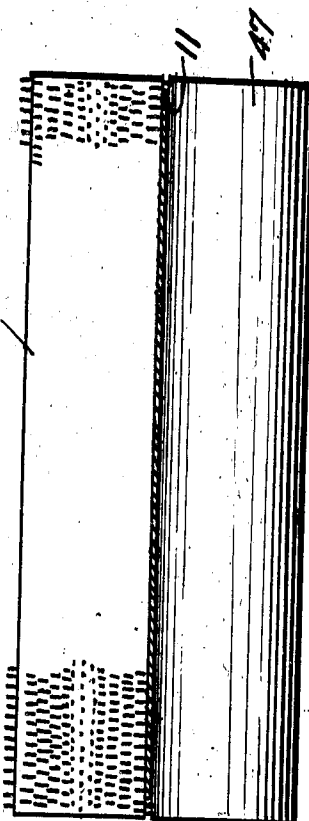
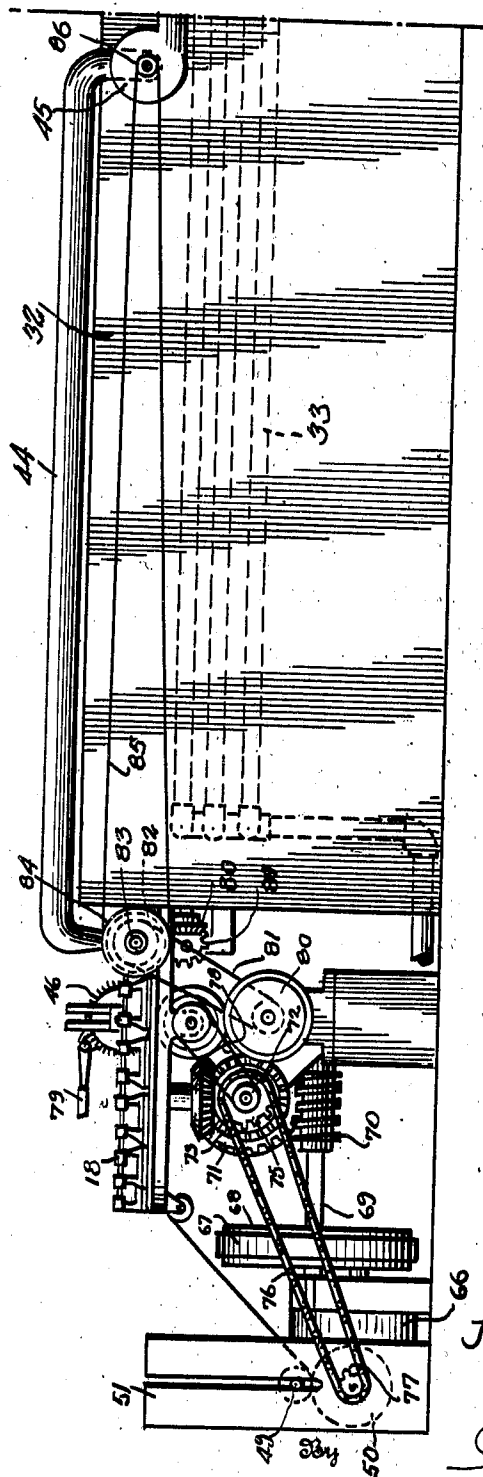


Fig. 7.

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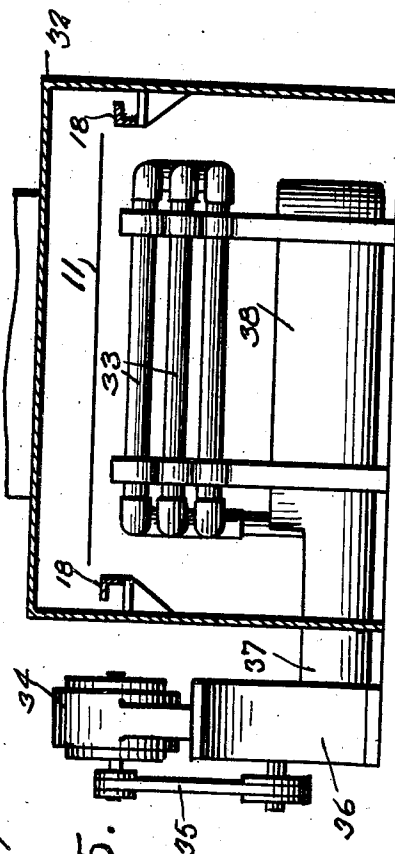
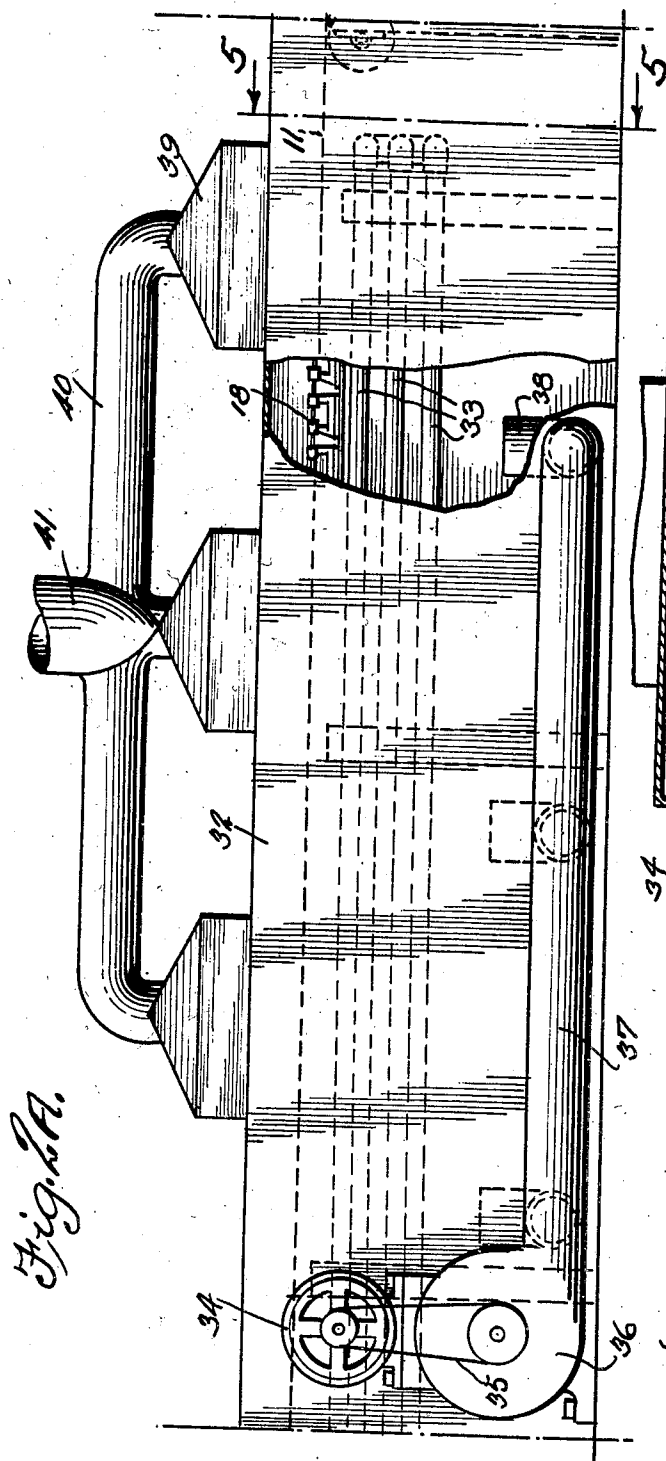
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METHOD AND APPARATUS FOR PRODUCING ELASTIC KNITTED FABRIC

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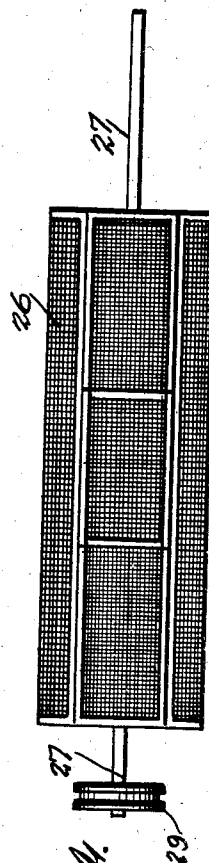
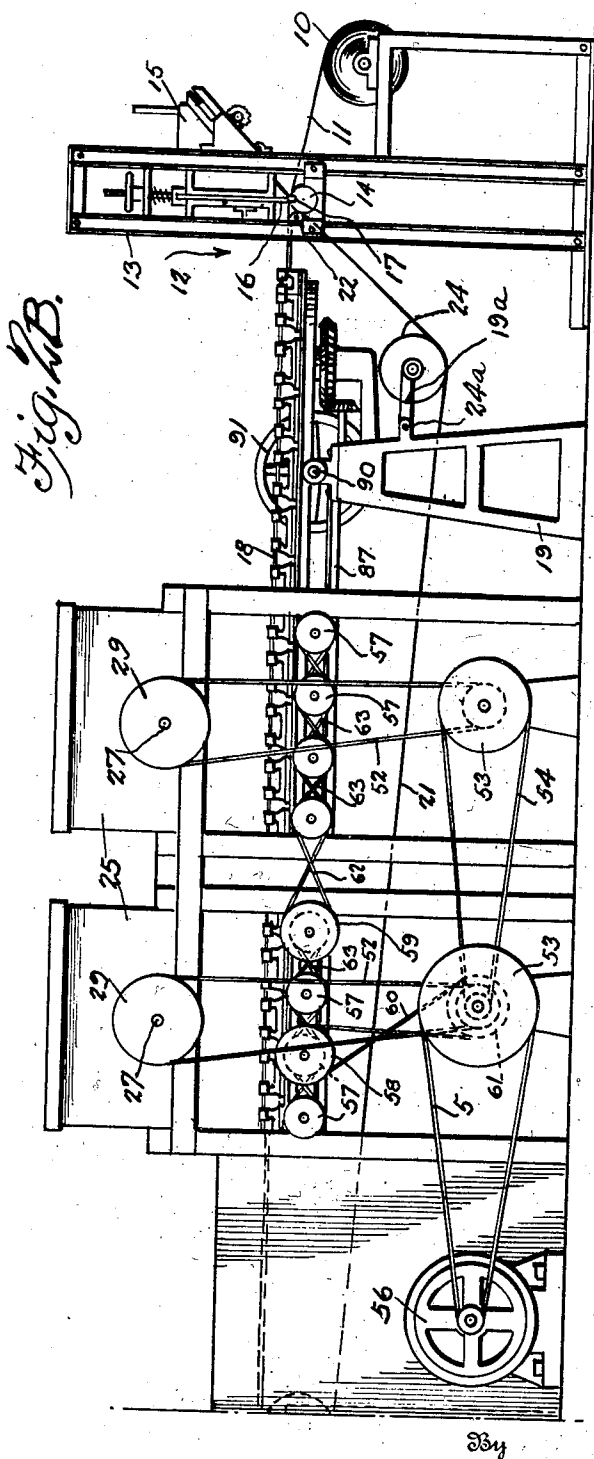
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METHOD AND APPARATUS FOR PRODUCING ELASTIC KNITTED FABRIC

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6 Sheets-Sheet 6



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UNITED STATES PATENT OFFICE

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METHOD AND APPARATUS FOR PRODUCING
ELASTIC KNITTED FABRICHarry K. Lea, Johnstown, N. Y., assignor to Ken-
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Application April 20, 1935, Serial No. 17,527

5 Claims. (Cl. 91-8)

This invention relates to a method and apparatus for producing elastic knitted fabric of the type disclosed in application filed by Harry K. Lea, on March 28th, 1935, Serial Number 13,576 and the spreader blade or knife forming a part of the apparatus is shown in detail in application filed by Harry K. Lea, on March 28th, 1935, Serial Number 13,575.

Various methods and machines are known and are in use for the coating of woven fabric with a rubber cement or adhesive for the production of an elastic woven fabric, but in view of the flimsy character and stretching characteristics of knitted fabrics, such as jersey silk and the like, it has heretofore been impossible to handle knitted fabrics and effect an even distribution of adhesive or rubber cement coating thereon as the knitted fabric has a tendency of unduly stretching and rolling during the coating operation and it has heretofore been commercially impossible to produce a coated knitted fabric of the type disclosed in the aforesaid applications.

It is therefore the primary object of this invention to provide apparatus and a novel method for the coating and flocking of a knitted fabric, such as jersey silk or the like with the resultant fabric possessing its basic inherent stretching characteristics with increased elasticity imparted thereto by the rubber cement coating as compared with similarly coated woven fabrics, the flocking material presenting a soft velvety finish on one face of the knitted fabric with the other face thereof possessing the original characteristics.

A further object of the invention is to provide an apparatus of the foregoing character for the production of an elastic knitted fabric and embodying devices for applying an adhesive or rubber cement coating to one face of the fabric, applying comminuted fibre such as flocking material to the adhesive coating, drying the coating and then forming minute perforations completely through the coated fabric, while the adhesive coating is in a dry and plastic condition and thereafter vulcanizing the coated fabric with the walls of the minute perforations maintaining their spaced relation for the purpose of ventilation or breathing when the elastic knitted fabric is used in the manufacture of corsets, girdles, brassières, or the like.

The method disclosed in this application comprises several steps of treating a knitted fabric, such as jersey silk, by applying and spreading an adhesive or rubber cement coating onto one face thereof, applying comminuted fibres or flocking

material to the adhesive coating, exhausting fumes or gases emanating from the adhesive coating, drying the coating, forming minute perforations through the fabric and then vulcanizing the coated fabric and thereafter batching the same onto a roll.

With the above and other objects in view that will become apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and claimed.

In the drawings:—

Figures 1, 1A and 1B, are match lines side elevational views, partly in section of the complete apparatus, showing the device for applying a coating or adhesive cement to the knitted fabric, the device for applying flocking material to the adhesive coating, the means for exhausting fumes from the adhesive coating, the drying device, perforating device for the coated fabric, a part of the operating mechanism and the batching means;

Figures 2, 2A and 2B, are match line opposite side elevational views of the apparatus, partly broken away and illustrating the driving mechanism, the fumes exhauster for the flocking mechanism;

Figure 3 is a fragmentary side elevational view of the endless apron carrying the coated knitted fabric through the flocking mechanism with the beater bars for the apron to effect spreading of the flocking material illustrated in cross section as of polygonal formation;

Figure 4 is a plan view of one of the screened flock receptacles;

Figure 5 is a vertical cross sectional view taken on line 5-5 of Figure 2A, showing the motor operated blower for exhausting fumes from the adhesively coated fabric;

Figure 6 is a detail sectional view showing the rotary brush for removing excess flocking material from the coated fabric and the pin and cooperating roller for forming minute openings in the coated knitted fabric prior to vulcanization of the fabric;

Figure 7 is a side elevational view of the pin roller and cooperating roller with the flocked and coated fabric passing therebetween shown in section;

Figure 8 is a fragmentary side elevational view showing the batching roller receiving the coated fabric after being perforated; and

Figure 9 is a fragmentary side elevational view of a modified construction, showing the fabric

after leaving the pin roller passing through a vulcanizer and then received on the batching roller.

In view of the flimsy and stretchy characteristics of knitted fabrics, such as jersey silk and the like, it has heretofore been impossible to apply a rubber cement or adhesive coating to such knitted fabrics and to effect an even distribution and adhesive coating thereon because knitted fabrics when passed through a coating machine are subjected to pulling and stretching strain which results in wrinkling and rolling of the fabric. The first step of the method practiced by the apparatus disclosed herein is to stiffen or size opposite side edges of the strip of knitted fabric, the line of greatest stretch being between the sized edges and then winding the strip of knitted fabric onto a roll shown at 10 in Figure 1. The apparatus disclosed herein will be described by following the path of travel of the fabric strip 11 from the roll 10, particular reference being had to Figures 1, 1A and 1B.

The knitted fabric strip 11 first passes to the adhesive supply and spreading device designated in general by the reference character 12 and shown in detail in application filed by Harry K. Lea, on March 28th, 1935, Serial No. 13,575 and briefly referred to herein comprises a stand 13 including a stationary cylinder 14 over which the fabric strip 11 passes, the rubber cement or adhesive being fed onto the strip above the cylinder 14 from the regulable hopper 15 and spread over the fabric strip by means of the spreader blade or knife 16 vertically adjustable in the stand 13. A longitudinal groove 17 is formed in the upper side of the cylinder 14 in line with the spreader knife 16 to prevent contact of the spreader knife with the fabric strip and to permit flexure of the fabric strip in passing over the cylinder 14 for the more effective even distribution of the adhesive coating without forcing the adhesive coating into the interstices of the knitted fabric, the coating being merely laid onto the knitted fabric, but tenaciously adhering thereto and ultimately becoming an immovable integral part of the knitted fabric.

The fabric strip 11 with the adhesive coating thereon then passes through the flocking mechanism shown more clearly in Figures 1, 3 and 4 and said fabric strip before its entry into the flocking mechanism has the opposite sized edges thereof engaged with tenter frames such as shown in the patent to C. Von Glahn for Paper feeding apparatus, Patent No. 977,146, dated November 29, 1910 which comprises an endless conveyor at each side of the fabric strip, the endless conveyors having parallel runs 18 with clips for the sized edges of the fabric strip that are automatically operated for opening movement to release the strip after passage through the apparatus and for closing movement to engage the strip to feed the same through the apparatus such tenter frames being common to the art of treating fabric and specifically not forming a part of the present invention. The support for the forward ends of the tenter frames comprises a stand 19 and frame structures 20. An endless apron 21 passes over a guide roller 22 in the stand 13 adjacent the cylinder 14 and the horizontal run of the apron 21 extends over the supporting roller 23 beyond the flocking mechanism, the endless apron 21 being trained over a slack adjuster cylinder 24 supported on the stand 19 by means of the bracket 19a and is adjustable as shown at 24a with the apron 21 driven by mechanism to be later described. A pair of casings 25 is supported on

the frame structures 20 above the tenter frames 18 and each casing 25 has a screened flock receptacle 26 shown in detail in Figure 4 journaled therein by means of the shaft ends 27 journaled in the bearings 28. One shaft end carries a pulley 29 disposed exteriorly of the casing 25 for association with a drive belt to be later described. The screened receptacles or sifters 26 are preferably of polygonal formation in cross section and particularly hexagonal to aid in diffusion of the comminuted fibres thereon for more effective sifting of the flocking material therefrom. Each casing 25 has a sliding drawer or plate 30 disposed therein beneath the screened receptacle 26 whereby either or both screened receptacles may be employed in the flock coating step of the method. To effect a complete application of the flocking material to the adhesive coating, a plurality of beater bars 31 is journaled on the frame structure 20 and extend transversely of and beneath the upper run of the endless apron 21. The beater bars 31 are of polygonal form in cross section as illustrated in Figure 3 with the corners thereof successively moved into contact with the apron to effect vibration thereof and vibration of the coated fabric strip 11 carried by the apron 21 through the flocking devices.

After the fabric strip 11 has been coated with the rubber cement or adhesive and flocking material, the same is carried by the tenter frames and endless conveyors through a casing 32 having heating devices 33 therein to effect drying of the adhesive. The section of the casing 32 illustrated in Figures 1A, 2A and 5, has blowers and exhaust means associated therewith for carrying off the fumes from the adhesive coating. An electric motor 34 has a belt connection 35 with a blower 36 communicating with a manifold 37 exteriorly of the casing 32 with branch nozzles 38 in the manifold 37 extending transversely within the casing 32 beneath the heating devices 33 for blowing air upwardly through the casing and over the fabric strip 11 with the fumes conveyed to the hood 39 carried by the top wall of the casing 32 with pipe extensions 40 from the hood leading to outlets or exhaust conduits 41.

The fabric strip 11 continues in its travel through the casing section 32 shown in Figure 1B and upon passage from the casing section 32, the fabric strip coated with adhesive and flocking material is engaged by a combination rotary brush and flock exhausting device and a pin roller for forming minute openings in the fabric strip. As shown in Figures 1B, 6 and 8, the flocked face of the fabric strip 11 is engaged by a rotatable brush 42 after leaving the casing 32 for the removal of excess flocking material from the fabric and said rotary brush 42 is confined in a hood 43 that is in communication with a conduit 44 that leads to a suction device 45, that in turn is in communication with a receptacle of any character.

When the coated fabric strip leaves the casing 32 and passes the brush 42, the same is in a substantially dry condition with practically all moisture removed from the adhesive coating, the fabric strip 11 then passing between a pin roller 46 having its entire peripheral surface studded with radial pins and a cooperating cushion roller 47, the pins on the pin roller permanently forming minute perforations or openings in the coated knitted fabric strip which remain until the fabric strip is finally vulcanized. In Figure 8, the fabric strip 11 after passing between the pin roller 46 and cushion roller 47

is trained over a guide roller 48 for reception on a batching roller 49 rotated by a driven roller 50 supported in the rack frame 51.

Reference will now be made to Figs. 2, 2A and 2B which are opposite side elevational views of the apparatus and more clearly disclose the operating devices for the movable part of the mechanism. As shown in Figure 2B, each pulley 29 of a screened flock sifter 26 has a belt connection 52 with pulleys 53 and said pulleys 53 are connected by a belt 54. One of the pulleys 53 has a belt connection 55 with an electric motor 56. Corresponding ends of the beater bars 31 carry pulleys 57 and alternate ones of said beater bars associated with the flock sifter adjacent the electric motor 56 carry additional pulleys 58 and 59 respectively. A belt connection 60 extends between the pulley 58 and a pulley 61 supported on the shaft carrying the pulley 53 while a belt 62 connects the pulley 59 to the adjacent pulley of the next flocking device. Belts 63 form communication between the several pulleys 57 of each flocking device. It will therefore be seen that the electric motor 56 effects the rotation of the flock sifters 26 and rotation of the beater bars 31. The roller 23 over which the apron passes has a gear connection with the tenter frames whereby the apron travels at the same speed as the tenter frames. As shown in Figures 1B and 2, the shaft of the electric motor 66 has a belt connection 67 with a pulley 68 fixed to the shaft 69 and said shaft 69 carries a worm 70 engaged with a worm wheel 71. The shaft 72 carrying the worm wheel 71 also has a bevel gear 73 that meshes with a bevel gear 74 that is operatively engaged with the endless conveyor of a tenter frame, a duplicate drive being provided for each tenter frame. The shaft 72 carries a sprocket wheel 75 that has a sprocket chain connection 76 for the sprocket wheel 77 fixed to the shaft supporting the driving roll 50 for the batching roller 49. A belt connection 78 forms communication between the shaft 72 and shaft carrying the cushioned roller 47 associated with the pin roll 46 to effect positive drive of the pin roller by the pins on the peripheral surface thereof passing through the coated fabric and engaging the cushioned roller, the tension of the pin roll being regulated by the hand lever 79 and appurtenant part illustrated in Figures 1B and 2.

The operating means for the rotary brush 42 that removes excess flocking material from the coated knitted fabric comprises an electric motor 80 having a belt connection 81 with the pulley 82 on the shaft 83 carrying the rotary brush. Another pulley 84 fixed to the shaft 83 has a belt connection 85 with a pulley 86 carried by the shaft of the suction producing device 45. Devices are provided for relatively adjusting the two tenter frames between which the strip of fabric is positioned for movement through the apparatus and to accommodate the apparatus to fabric strips of different widths, such devices being briefly illustrated in Figures 1B and 2 as comprising a shaft 87 extending longitudinally of the apparatus with bevel gears 88 thereon that mesh with bevel gears 89 on cross shafts 90 operated by hand wheels 91, shown in Figure 1, the cross shafts 90 being operatively engaged with the tenter frames for effecting movements thereof towards and away from each other, these devices forming no material part of the present invention.

In the apparatus shown in Figures 2 and 8, the

coated fabric after leaving the pin roll 46 is received on the batching roll 49 and vulcanization thereof is subsequently accomplished. As shown in Figure 9, the apparatus includes a modified step in the method of vulcanizing the perforated coated fabric after leaving the pin roll and prior to reception on the batching roll. The end section 32a of the casing has the heater elements 33a arranged adjacent the bottom thereof and the fabric strip 11a having been coated with rubber cement or adhesive and covered with flocking material and then passed over the pin roll 46 as previously described, it is then re-directed through the casing 32a as shown at 11b and guided in such movement by the roller supports 92 to accomplish vulcanization thereof before reception on the batching roller 49.

From the above detailed description of the invention, it is believed that the construction and operation thereof will at once be apparent and while there are herein shown and described the preferred embodiments of the invention, it is nevertheless to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

I claim:—

1. Apparatus for producing elastic fabrics wherein the longitudinal side edges of the base material from which the elastic fabric is produced have been sized, including means for applying a rubber cement to one face of the base material, means for applying flocking material to the rubber cement, and means for feeding the base material through the apparatus for action by all of said means including endless carriers having means engaged with the sized edges of the base material to hold the same transversely taut and in the absence of longitudinal stretching tension, the flock applying means including screened cylinders rotatable above the line of travel of the base material, a casing structure supporting each cylinder, and means in the casing structure beneath the cylinder for controlling the feed of flocking material.

2. Apparatus for producing elastic fabrics wherein the longitudinal side edges of the base material from which the elastic fabric is produced have been sized, wherein a rubber cement is applied to one face of the base material, and wherein a flocking material is applied to the rubber cement, means for perforating the base material, means for feeding the coated base material through the apparatus including endless carriers having means engaged with the sized edges of the base material to hold the same transversely taut and the said means for perforating the coated base material comprising a rotatable cylinder with a cushioned periphery and a cooperating rotatable cylinder having pins projecting peripherally therefrom with the coated base material passing between the cylinders.

3. The method of producing an elastic fabric from a base material and of a composite type having its opposite sides presenting faces differing in appearance with the material of the opposite faces individual to the zone of such face and with the material of one of the face zones free from interconnection with that of the other, said method consisting of first sizing the longitudinal edges of the base material to prevent rolling and stretching of the base material during treatment thereof, applying an adhesive coating to one face of the base material and then applying flocking material to the adhesive coating.

4. The method of producing an elastic fabric

of knitted base material and of a composite type having its opposite sides presenting faces differing in appearance with the material of the opposite faces individual to the zone of such face and with the material of one of the face zones free from interconnection with that of the other, said method consisting of first sizing the longitudinal edges of the knitted jersey to prevent rolling and stretching of the knitted jersey during treatment thereof, gripping the sized edges of the knitted jersey for movement through the treating apparatus therefor with the knitted jersey maintained in a smooth condition, then applying an adhesive coating to one face of the knitted jersey, then applying a flocking material to the adhesive coating and then vulcanizing the coated knitted jersey.

5. Apparatus for producing elastic fabrics including means for applying a rubber cement to one face of the base material from which the elastic fabric is produced, means for applying flocking material to the rubber cement and means for feeding the base material through the apparatus for action by all of said means including endless carriers having means engaged with the edges of the base material to hold the same transversely taut and in the absence of longitudinal stretching tension, the flock applying means including screened cylinders rotatable above the line of travel of the base material, a casing structure supporting each cylinder and means in the casing beneath the cylinder for controlling the feed of flocking material.

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