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METHOD OF PRODUCING ON A FRAME A KNITTED FABRIC  
HIGHLY ELASTIC IN BOTH THE LONGITUDINAL AND  
THE TRANSVERSE DIRECTIONS AND TO A DEVICE  
FOR PERFORMING THE METHOD

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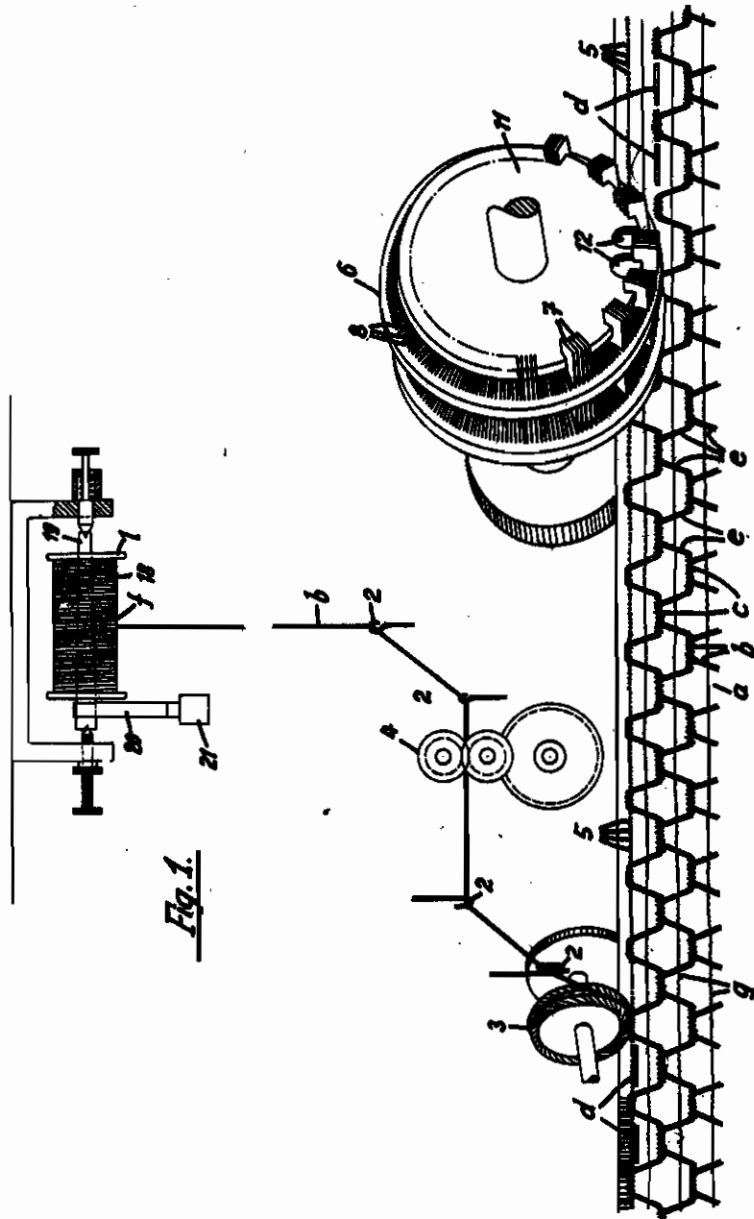


Fig. 1.

Inventors:

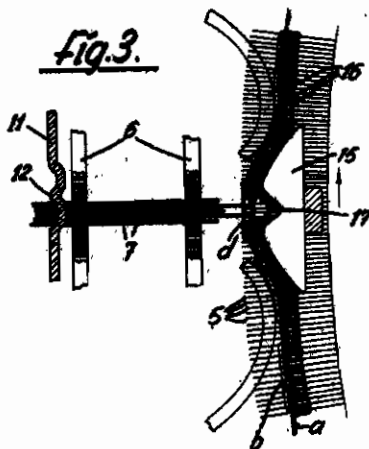
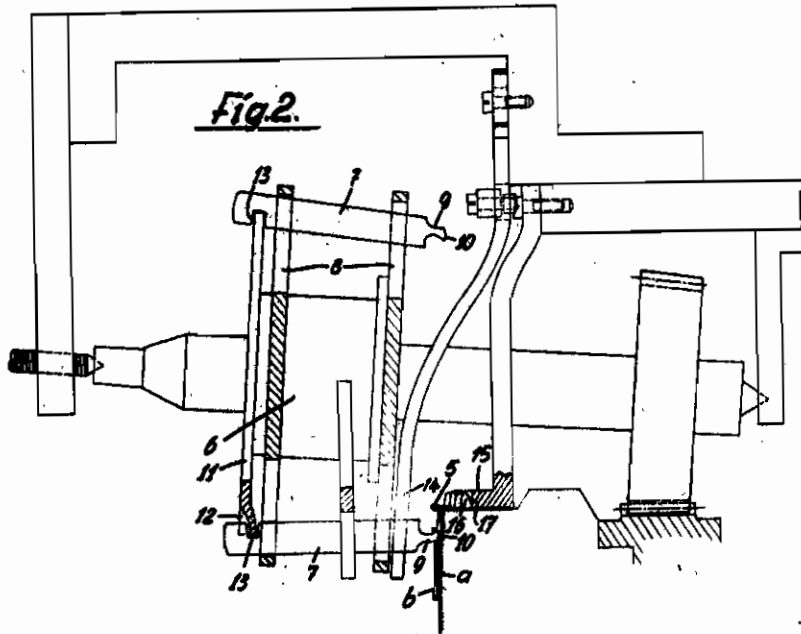
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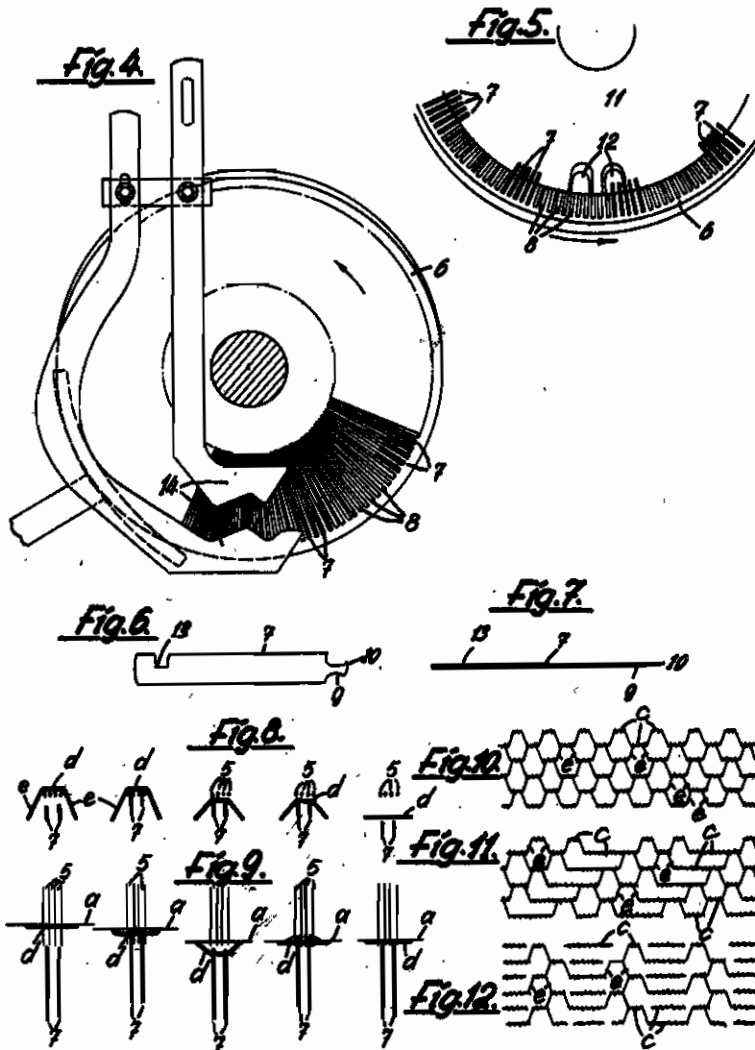
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THE TRANSVERSE DIRECTIONS AND TO A DEVICE

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# ALIEN PROPERTY CUSTODIAN

## METHOD OF PRODUCING ON A FRAME A KNITTED FABRIC HIGHLY ELASTIC IN BOTH THE LONGITUDINAL AND THE TRANSVERSE DIRECTIONS AND TO A DEVICE FOR PERFORMING THE METHOD

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This invention relates to a method of producing on a frame a knitted fabric highly elastic in both the longitudinal and the transverse directions and to a device for performing the method.

The main feature of the invention resides in imparting to a fabric elasticity in two directions extending vertically to one another by means of a single rubber thread which is so arranged in the fabric that portions thereof run in both these directions and render the fabric elastic.

In particular, the method according to the invention provides for working in those portions of the rubber thread that extend in the longitudinal direction of the fabric.

In the known methods for rendering a knit fabric elastic with the aid of rubber threads the latter are worked in in one and the same direction, that is, the transverse direction, and if an increase in elasticity in longitudinal direction is desired, additional rubber threads are applied by sewing, etc. in a second operation. In contradistinction to the known methods the invention proposes to produce elasticity in two directions in one operation and by making use of a single rubber thread. In case of breakage of a rubber thread or cutting of the fabric the invention further prevents the ends of the thread from slipping back by arranging the rubber thread not in one and the same direction as heretofore but by alternating its course in longitudinal and transverse directions. According to the invention, some portions of the rubber thread are knitted in the transverse direction of the fabric, and other portions thereof, positioned between the worked in portions, remain loose or float, and these floating portions, after a number of rubberless courses corresponding to the desired pattern, are drawn up and worked into the last course. This has the effect that the worked in portions of the rubber thread located in the various courses produce elasticity of the fabric in transverse direction and the floating portions insure elasticity in longitudinal direction.

Depending on the pattern, the worked in portions of the rubber thread are made shorter or longer, and the number of rubberless courses has also an effect upon the pattern. For example, if the worked in portions are of equal length, a uniform pattern will be produced, whilst a difference in length will yield striped and other patterns.

When it is desired in certain cases to increase the elasticity in transverse direction still more, a second rubber thread may be worked in additionally in the customary continuous manner.

The method according to the invention can be carried out on existing machinery, for instance circular frames. The sectional fixing of the rubber thread in the fabric and the working in of the portions of the thread drawn up into the last

course are performed by a filling burr of known type to which the rubber thread is fed from a braked roll having a horizontal axis. Compared with the spools with vertical axis hitherto employed for this purpose, the use of such a roll insures a uniform supply of thread to the feeder wheel and thus to the working place or filling burr, whereby defective working of the rubber thread is avoided.

The free sections of the rubber thread are drawn up to the course in which they are to be knit by a sinker wheel of the kind used in forming meshes, whose sinkers are arranged in groups corresponding in number to that of the meshes or needles of the section to be drawn up. The front or working end of the sinkers possesses a catch, for instance in the form of a hook, and the sinkers are so controlled that they pass the rubber thread in a curve upwardly around the needle end and then place it on the needles. For this purpose, the sinkers are first advanced until they catch the thread from the rear and then drawn back, so that their hook takes along the thread. They are then lifted and advanced again to place the rubber thread over the needles. During further rotation of the needle carrier with the fabric attached thereto the portions of the rubber thread placed on the needles pass to the filling burr which works them in in known manner.

To prevent excessive advance of the sinkers when engaging the rubber thread from the rear the fabric is moved forward on the needles at the working point by a cam section. To insure secure grasping of the rubber thread the sinkers then press back the fabric to a certain extent, which is made possible by an inward bulge of the cam piece located opposite this point. The sinkers cannot enter the fabric because their front end is held correspondingly high, so that the front edge of the sinkers bridges several meshes or mesh openings.

The invention is illustrated by way of example in the accompanying drawing, in which all parts not essential for the understanding of the invention are omitted and in which

Figure 1 is a front view of the important parts of a device for carrying out the method according to the invention, and illustrates also the working in of the rubber thread;

Fig. 2, an axial section of the sinker wheel;

Fig. 3, a top view of the working part thereof;

Fig. 4, a rear view of the sinker wheel;

Fig. 5, a view of the lower portion thereof;

Figs. 6 and 7 are, respectively, a front and top view of a sinker;

Figs. 8 and 9 illustrate progressively from the right to the left the working mode of the sinkers, the drawing up of the free portions of the rub-

ber thread and their arrangement on the needles; and

Figs. 10, 11 and 12 are diagrammatic views of three different patterns produced according to the invention by the working in of differently positioned portions of different length of the rubber thread.

The fabric *a* to be rendered elastic in two directions extending vertically to each other is made on a circular frame of known type whose description may therefore be dispensed with. To impart elasticity to the fabric *a*, Fig. 1, in these two directions a rubber thread *b* is worked into it which extends by sections in both the transverse and longitudinal directions of the fabric *a* and thereby renders the latter correspondingly elastic.

The rubber thread *b* unwinds from a roll *f* and is passed through guides *2* to a filler burr *3* of known design to which it is supplied in uniform quantity and at uniform tension by feeder wheels *4*, though it may be worked also without tension. The filler burr *3* works the thread *b* into the last meshes of the finished fabric *a*.

To produce elasticity in two directions of the fabric *a* according to the invention the rubber thread *b* is first knit into the fabric *a* only in sections by the correspondingly constructed filling burr *3*, Fig. 1, while the interposed free sections *d* thereof are floating. When any desired number of courses has been knit, the free or loose portions *d* of the rubber thread *b* are placed up to the last course, i. e. up to the needles *5*, in optional width over the needles *5* and worked in jointly with the running rubber thread *b* by the filler burr *3*. This procedure is regularly repeated, so that the elasticity of the rubber thread *b* finds expression in both the transverse direction of the fabric through its transverse portions *c* and also in the longitudinal direction thereof through its free portions *e*.

It is immaterial after how many normally knit courses the loose section *d* of the rubber thread *b* is worked in, how long the sections *c* and *d* of each course are and whether they are of equal or different length. At any rate, it is advisable to operate so that the free portions *e* produced at the drawing up of the loose sections *d* extend as steeply as possible relative to the courses and do not become too long. For example, the loose sections *d* should suitably be worked into every eighth course, in which case seven sinker wheels of known design are used in the machine, which are not shown, so that after each complete rotation the loose sections *d* can be hung over the needles *5* and worked in at one and the same spot shown in Fig. 1.

Figs. 1 and 10 show a fabric *a* of regular pattern, inasmuch as the knit and loose sections *c* and *d* are equally long. Figs. 11 and 12 show that different lengths of these sections produce different patterns, for instance diagonal and vertical stripes.

The drawing up and arrangement of the loose sections *d* on the needles *5* is effected by a separate sinker wheel *6* which is driven by the machine like the usual sinker wheels. The loose sections *d* are drawn up and placed by means of correspondingly constructed sinkers *7* arranged in groups in the wheel *6*. The number of sinkers *7* of a group that are being used and the spacing of these groups depend upon the length of the loose sections *d* or the number of needles *5* corresponding to a section *d*. The body of the wheel

*6* possesses the usual gaps *8* for the reception of the sinkers *7* whose number and the spacing of their groups can thus be adapted to the pattern. The sinkers *7* are so controlled that at the turning of the wheel *6* they arrive at the working point and are advanced to engage the loose section *d* from the rear which has also arrived at that point. The sinkers then move back and take the section *d* along with the aid of a catch *10* provided at their front end *9* in the form of a hook, Fig. 6, whereupon they are lifted and advanced again, whereby the rubber thread *b* to the extent of the loose section *d* is placed over the needles *5* and then released by the lowering and recession of the sinkers *7*. This process is shown in Figs. 8 and 9 where it progresses from the right to the left. The sinkers *7* are controlled in known manner by correspondingly shaped cams or guides, the advance and return motions of the sinkers being for instance effected by means of a stationary disclike guide *11*, Figs. 2 and 3, which with its bulges *12* loosely engages a recess *13* of the sinker *7*. Figs. 3 and 5 show the form of the guide *11* causing the advance and withdrawal of the sinkers *7* whose up and down motion is controlled by a stationary guide path *14* having the form shown in Fig. 4. As indicated in Fig. 3, the fabric *a* is pressed back during the advance of the sinkers *7* to enable the hook *10* securely to engage the rubber thread *b*. In order to prevent the operating sinker wheel *6* from entering the fabric *a* during this step the hooked end of the sinkers *7* is held so as to bridge a number of mesh openings, as shown in Fig. 6.

Prior to the operation of the sinkers *7* the fabric *a* is advanced on the needles *5* to avoid excessive advance of the sinkers *7*. To this end a curved path *15* is provided opposite the working point for advancing the upright sinkers *16* together with the fabric *a*, Fig. 3, and the path *15* has an inward bulge *17* for allowing nevertheless repression of the same when the sinkers *7* are advanced.

To insure uniform supply of the rubber thread *b* to the feed wheels *4* and uniform tension the rubber thread *b* is wound upon a roll *18*, Fig. 1, which on its horizontal shaft *19* is loosely and easily rotatably arranged above the feeding means *4*. The first guide *2* is preferably disposed exactly below the center of the roll *18*, so that the length of the thread portion *b* between its unwinding point *f* on the roll *18* and the first guide *2* does not materially alter, regardless of where the point *f* may be located on the roll *18*. In this way the tension of the thread *b* remains more or less uniform and thereby also the supply to the feeders *4*.

The roll *18* is subjected to slight braking to insure uniform unwinding of the rubber thread *b* therefrom in spite of its easy rotatability and to eliminate accidental motions thereof. In the construction shown a weight *21* is for this purpose suspended from the shaft *19* by means of a frictionally acting loop *20*.

When it is desired to increase still more the elastic transverse tension in the fabric *a*, an additional rubber thread *g*, Fig. 1, can be worked in in known manner. In the example shown this additional thread *g* is applied by a filler burr, not shown, which is arranged between the third and fourth sinker wheel.

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