Dec. 6, 1932. G. THIERFELDER 1,890,200

FLAT HOSIERY FRAME

Filed April 24, 1931 2 Sheets-Sheet 1

Fig. 1.

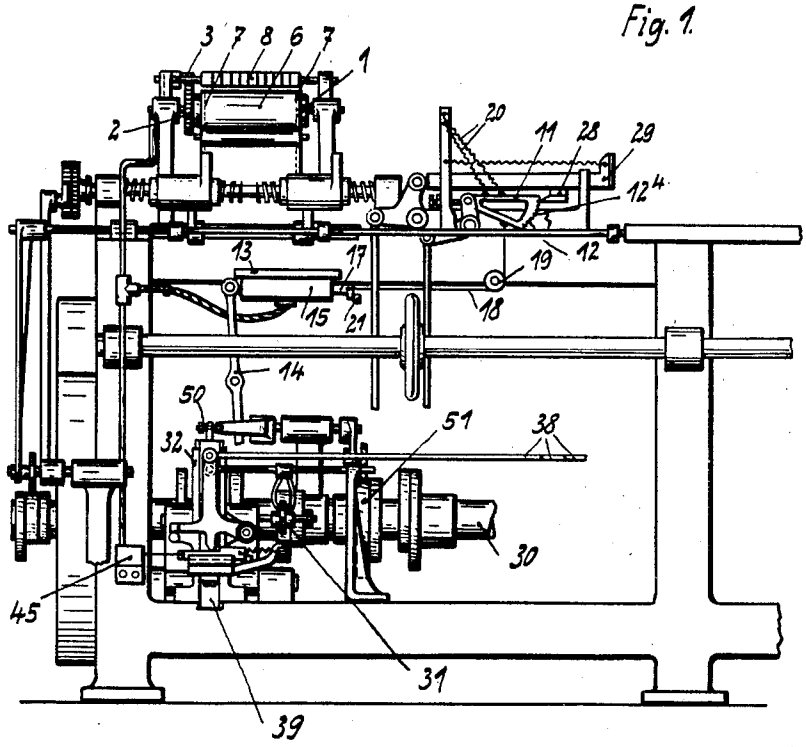


Fig. 2.

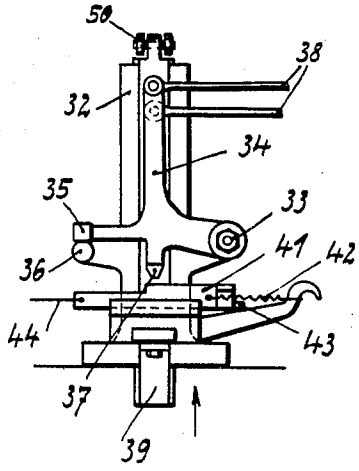
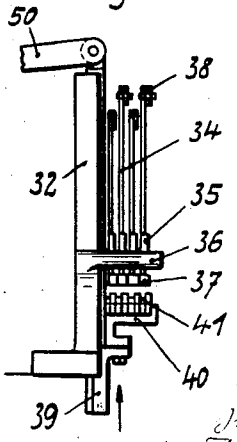


Fig. 3.



Inventor:
G. Thierfelder
per F. Dellmar
Attorney

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Fig. 4.

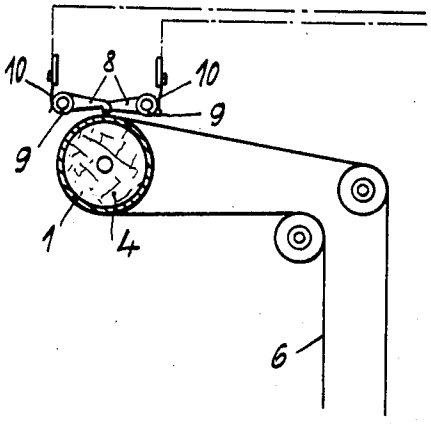


Fig. 5.

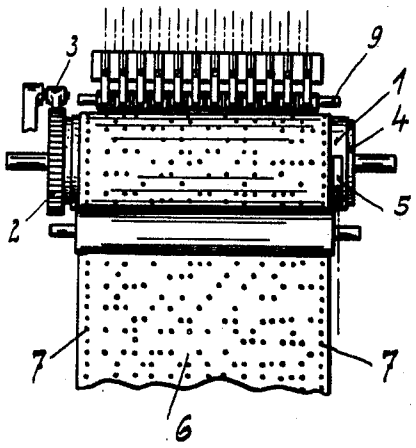


Fig. 7.

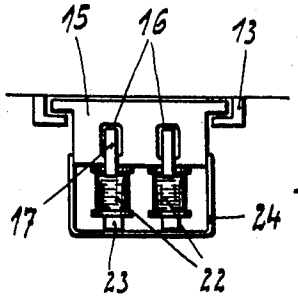
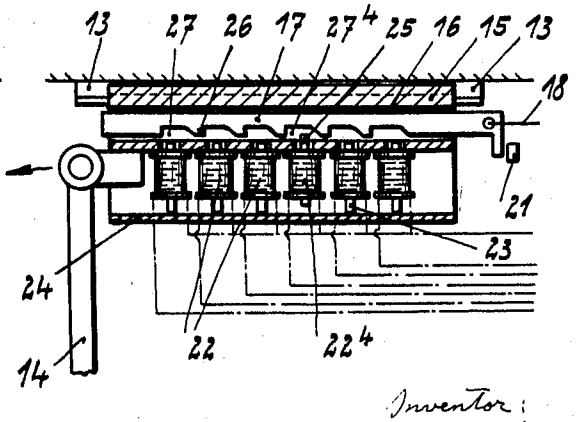


Fig. 6.



Inventor:
G. Thierfelder
per D. Dittmar
Attorney.

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UNITED STATES PATENT OFFICE

GUIDO THIERFELDER, OF AUERBACH, GERMANY

FLAT HOSIERY FRAME

Application filed April 24, 1931, Serial No. 532,624, and in Germany May 6, 1930.

The present invention relates to flat hosiery frames.

In flat hosiery machines, the known covering, loose course, lace, striping and similar attachments are controlled till now by means of chains provided with cams, each of the attachments mentioned requiring, as a rule, for its operation a special chain. This arrangement suffers from the drawback that the various chains concerned have to be controlled separately and, in addition, adjusted exactly relative to one another corresponding to the number of courses. Special difficulties are connected particularly with the resetting of the machine, an operation which can therefore be carried out only by a person thoroughly familiar with the machine, while the adjustment of the chains is equally difficult and consumes much time. Furthermore, in view of the high cost of chains, this troublesome work has to be undertaken for each pattern.

To remove these defects it has been proposed to control the attachments mentioned by a jacquard device. However, as these attachments are disposed at different spots in the machine, they are more or less inaccessible to the jacquard device, and the technical difficulties are increased still more by the fact that the motions required for controlling the various attachments differ totally from one another and, with respect to some of the attachments, are of different size also so that a single control mechanism along these lines would become too complex and bulky to insure proper operation.

According to the present invention, the control of the various attachments is effected by means of a current-carrying movable roller of known type arranged at a suitable place within the machine. Over the roller a non-conducting band is guided provided with perforations according to the requisite control of the various attachments and carrying a plurality of levers whose points come in contact with the roller on meeting a hole in the band. The lever, on coming in contact with the roller, closes a circuit connected with an electromagnet which is excited and initiates the control motion at the desired point of the covering, loose course, lace or changing attachment.

Electromagnetic controls in knitting machines are known per se. In circular knitters, they are used only for selecting the needles according to pattern and raising them and in flat knitting machines they adjust the cams besides the needles. It is further known to adjust the brakes of the yarn guide bars in flat hosiery frames by electromagnets excited by the closing of the circuit of the control roller and adapted to actuate the bars. However, in all the known arrangements it is not necessary to impart to the members to be adjusted by the electromagnet a motion differing in size according to circumstances, as required, for example, by the open clock covering segments in cotton machines, and it is therefore impossible to equip a flat frame with one of the known electromagnetic pattern devices. This explains why the advantages connected with such an arrangement were unattainable till now in flat hosiery frames.

The invention makes it possible to control the various units, such as the open clock, striping or similar attachments, which have to be adjusted for different distances, from the electromagnetic pattern device by providing a special electromagnet for each distance to which the attachment has to be adjusted separately and by connecting the magnets not directly to the attachments to be adjusted but causing them to act on interposed devices by means of which the motion of each magnet is converted into distances of different size by lever transmission, variation of stroke, stepped wedges or the like. If it is taken into consideration that the segments of the open clock covering attachment must be adjusted, for instance, to six different heights while other attachments require an entirely different adjustment, it is evident that an electromagnetic pattern device can be used in connection with a flat hosiery frame only if the stroke converting means are interposed which are outlined above.

One form of the invention is illustrated in the accompanying drawings, in which Figure 1 is a view of the left-hand end of a flat

hosiery frame with the pattern roller and the devices actuated by it and positioned for control in front of the covering, loose course, striping, lace and similar devices mentioned, of which, for the sake of clearness, only the clock segments to be adjusted and the roll facilitating the changing motion of the main shaft are shown; Fig. 2, a front view on a slightly larger scale of the device bringing about the changing or other motion; Fig. 3, a side view thereof; Fig. 4, a side view of the pattern roller with the feeler levers; Fig. 5, a front view thereof; Fig. 6, a sectional view seen from the side of the device for adjusting the clock segments; and Fig. 7, a front view thereof.

Referring to the drawings, on the left-hand side of the flat hosiery frame shown the pattern roller 1 is positioned above the narrowing spindles and moved from a suitable point in each course by its feed wheel 2 and pawl 3. The roller 1 comprises a metal cylinder arranged on a nonconducting roller 4 and supplied at a suitable point with current by means of the sliding contact 5. Over the metal jacket 1 of the pattern cylinder a nonconducting band 6 is guided provided on both sides with the uniformly spaced holes 7 registering with pins projecting from the jacket 1. Above the roller 1 the requisite number of feeler levers 8, which are insulated relative to one another, is movably disposed on the two opposite shafts 9 and hugged at a suitable point by the current collectors 10. The nonconducting band 6, according to pattern and the number of levers 8, is provided with holes in the known manner. The current supplied to the metal jacket of the pattern roller 1 is transmitted to a lever 8 when the point of the latter engages a hole of the band 6 underneath whereby a circuit is closed and an electromagnet connected therewith is excited. The band 6 contains as many holes and above them are disposed as many levers 8 as motions are required for controlling the various attachments mentioned. As the different attachments are actuated by carrying out movements differing in nature and size, special intermediate devices are arranged in front of the attachments and actuated by the magnets excited by the pattern roller 1, the devices being shaped so that the stroke of the armatures of the magnets is transformed into larger or smaller motions of these intermediate devices.

The adjustment of the movable segments 11 limiting the path of the clock spindles requires, for example, as many motions of different extent of the intermediate device concerned as are steps 12 in the segments 11. To make this possible, the machine is provided at a suitable point with the guide 13 in which from an eccentric gear or the like by means of the lever 14 a box 15 is moved to and fro containing the electromagnets 22 whose number corresponds to the control motions to be carried out by a segment 11. In the longitudinal direction of the box 15 and corresponding to the number of segments 11 the slots 16 are provided wherein the racks 17 are displaceably disposed with their teeth 26 pointing downwardly. Each rack 17 is connected by means of a rope 18 or the like over a roll 19 with a segment 11, the spring 20 of which draws the segment 11 continually towards the stop 21. The magnets 22 are spaced uniformly in the lower portion of the box 15 so that when the circuit is opened, i. e., when the lever 8 of the magnet concerned lies on the nonconducting band 6, the movable armature cores 23 of the magnets 22 drop on the plate 24 and when the circuit is closed i. e., when the lever 8 is in contact with the roller 1 through a hole in the card 6, are lifted so that their nonmagnetic ends 25 project into the recesses 27 formed between the teeth 26 of the rack 17. The recesses 27 differ in size so that the core 23 of the left-hand magnet 22 (Fig. 6) at the closing of the circuit concerned would hug directly the vertical edge of the recesses 27 while the distances from the vertical edges up to the magnet cores increase progressively towards the right. For each magnet 22 a feeler lever 8 is provided on the pattern roller 1, which, over the roller 1, closes the circuit for the various electromagnets and interrupts it when the lever rests on the card 6.

The device described functions as follows.

The box 15 carrying the magnets 22 is moved once to and fro within each course or during the covering step only by means of the lever 14 and the eccentric gear, not shown. For example, if the step 12^4 of the segment 11 is to be adjusted, the corresponding lever 8 will find in its track on the band 6 a perforation through which, over the pattern roller 1, it will close the circuit concerned of the magnet 22^4 so that the core 23 of this magnet 22^4 is lifted to such an extent as to cause its portion 25 to project into the recess 27^4 of the rack 17, each core 23 possessing at its upper end a nonmagnetic part 25 to prevent the magnetized core from sticking to the rack. As the core 23 or its portion 25 are farther away from the edge of the recess 27^4 than, for instance, the core opposite to the recess 27 (to the left in Fig. 6), the rack 17 is driven during the forward motion of the box 15 in the direction of the arrow only when the part 25 engages the edge. The motion imparted thereby to the rack 17 is just large enough to bring the step 12^4 into the path of the projection 28 of the bolt 29. If, for example, the first magnet 22 (to the left in Fig. 6) would be excited, the entire motion of the box 15 would be imparted to the rack 17 and the segment 11 concerned drawn down to such an extent that its top step 12 would come into contact with the stop 28 of the bolt 29. During the return of the box 15 the racks 17,

owing to the action of the springs 20 drawing back the segments 11, are caught also and released by the magnet concerned by the opening of the circuit due to the motion of the roller 1 so that the core 23 with its part 25 drops off.

The device could be altered in so far as the racks 17 could be moved positively to and fro instead of the box 15, or the magnets 22 could be spaced unevenly for the different paths of motion and the racks 17 toothed uniformly.

To adjust the roll 31 causing the changing motion of the main shaft 30 or the loose course attachment (not shown) or similar attachments, a member 32 capable of being raised and lowered is employed to which, corresponding to the number of attachments to be controlled, levers 34 are secured which can move about the pivot 33. The levers 34 are provided with a stop 35 with which they rest on a stationary bolt 36 when inoperative. The motion of these levers 34 is transmitted to the attachments to be adjusted by the rods 38. The member 32 is constructed to form a guide in which the carriage 39 is vertically displaceably arranged and connected on top with a lever 50 which can be raised and lowered once within each course from the eccentric gear 51 or the like. The carriage 39 is provided under the noses 37 of the levers 34 with a guide 40 in which the adjusting keys 41 having steps of various heights are displaceably guided and continually drawn back to the stop 43 by the springs 42. To the other end of these adjusting keys 41 the ropes 44 or the like are secured which can be influenced by magnets (not shown) arranged in a box 45 and operating in the manner described. For each adjustable key 41 a magnet is provided, and each magnet has its feeler lever 8. The levers 34 are influenced in so far as, prior to their adjustment by the electromagnets, the keys 41 are removed from the noses 37 of the levers 34 by the lowering of the carriage 39 (Figs. 2 and 3). At this moment the card 6 is moved with the pattern roller 1, and if a lever 8 meets a perforation in the band 6, its magnet is excited and the adjusting key concerned is drawn against the action of the spring 42 until its step is located below the nose 37 of one of the levers 34. If the carriage 39 is then brought up again into its initial position by the rod 50, the nose 37 of one of the levers 34 will hug the step of the key 41, whereby the lever 34 is swung to the right (Fig. 2) and its rod 38 transmits this motion to the part to be adjusted.

For each lever 34 any desired number of keys 41 having steps of different height may be provided. In the modification shown only two keys are used for moving the lever 34 more or less. It is further possible to provide for each lever only one key 41 having a plurality of steps differing in height and adapted to be drawn out more or less by means of a device similar to that described in connection with the adjustment of the segments 11.

As the electric pattern device is moved forward at each course, a special course counter as employed in the known devices can be dispensed with.

I claim:—

1. In a flat hosiery frame, distance converting means interposed between the electric pattern device and the attachment to be controlled, comprising a displaceable carrier, racks displaceably arranged in slotted members connected with the machine and adapted to be driven by the said carrier, electromagnets corresponding in number to the adjusting range of the attachment and arranged on the said carrier, a coil forming part of each magnet, and armature cores in the said magnets disposed loosely in the said coil and adapted to be drawn by the magnet and to extend into notches of the said racks, the teeth of the said racks being spaced differently to vary the distance over which the racks are driven by the said carrier.

2. In a flat hosiery frame, distance converting means interposed between the electric pattern device and the attachment to be controlled, comprising oscillatory levers, adjustable keys with steps of different height adapted to limit the motion of the said levers, and means for removing the said levers from the said keys prior to the adjustment of the latter.

3. A flat hosiery frame, means whereby the same is electrically controlled according to pattern over different distances, and comprising an electromagnetic pattern device adapted to control different moving attachments, movable armature cores having a stroke of unvarying size arranged in the electro-magnets of the pattern device, and means adapted to effect the different motions and paths of the attachments to be controlled and initiated by the electro-magnetic pattern device, the said means designed for converting the armature stroke of unvarying size into movements according to the pattern feed motions of the attachments to be controlled.

4. A flat hosiery frame, means whereby the same is electrically controlled according to pattern over different distances, and comprising an electromagnetic pattern device adapted to control different moving attachments, movable armature cores having a stroke of unvarying size arranged in the electro-magnets of the pattern device, and means adapted to effect the different motions and paths of the attachments to be controlled and initiated by the electro-magnetic device, the said means designed for converting the armature stroke of unvarying size according to the pattern feed motions of the attachments to be con-

trolled, magnets cooperating with and corresponding in number to the different motions to be carried out by the converting means, each magnet initiating a different sized motion.

In testimony whereof I have affixed my signature.

GUIDO THIERFELDER.