March 3, 1931. Y. RUINNET 1,795,235

DEVICE FOR REPRODUCING DESIGNS UPON KNITTING MACHINES

Filed July 15, 1929 3 Sheets-Sheet 1

Fig. 1.

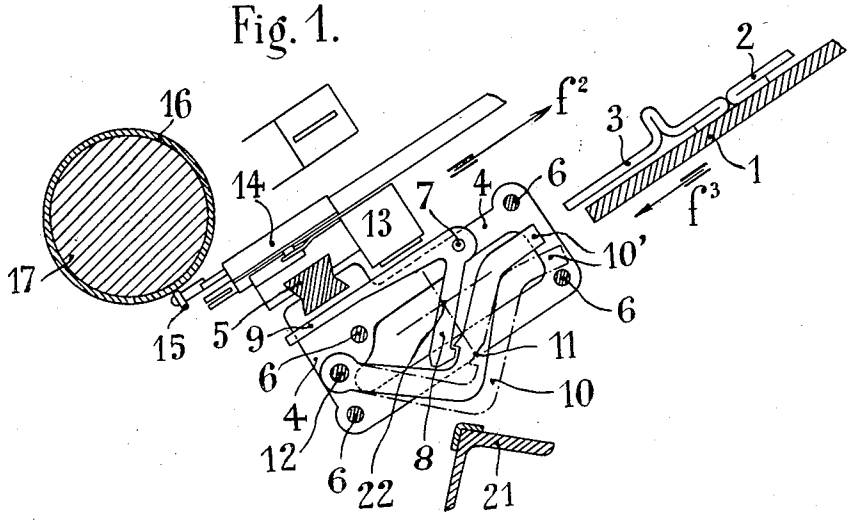
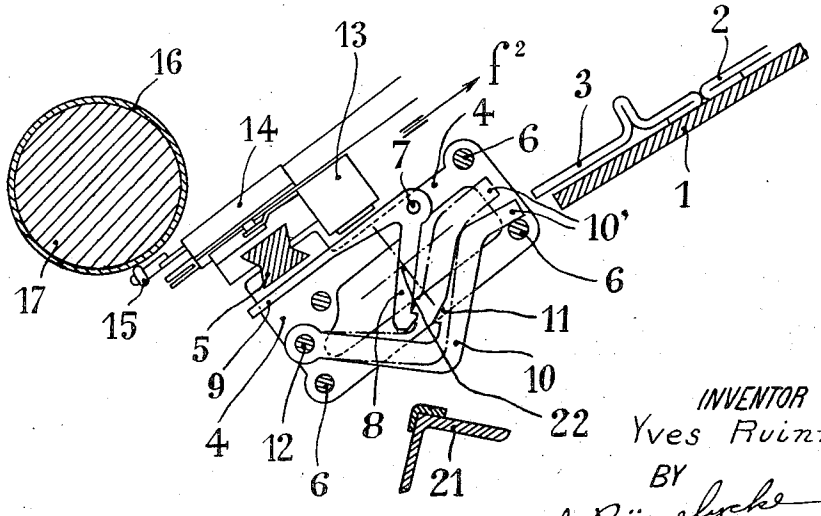


Fig. 2.



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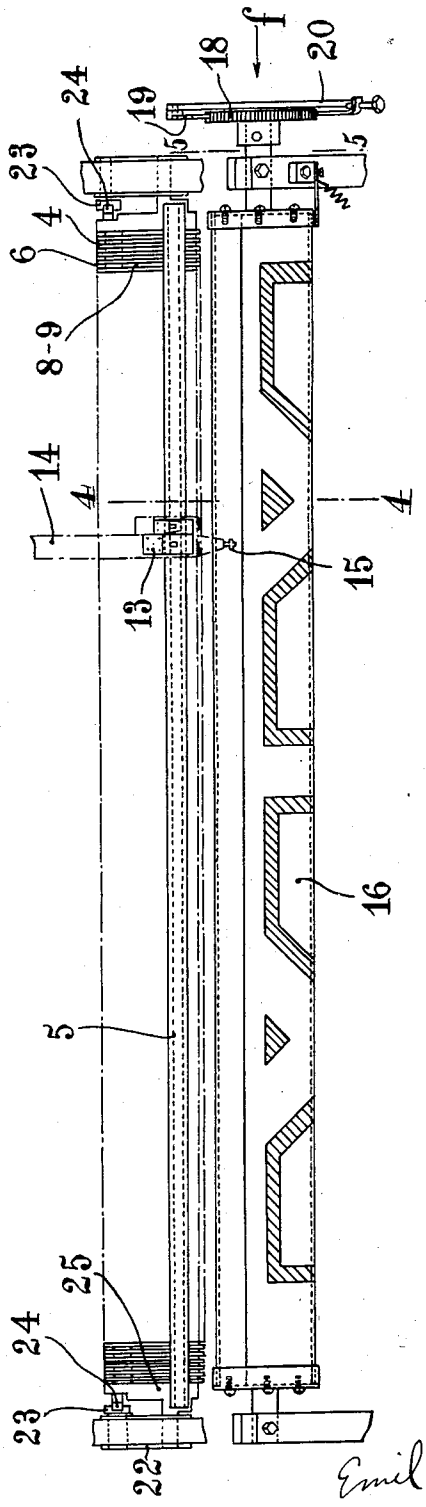


Fig. 3.

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Fig. 4.

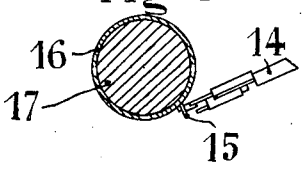


Fig. 5.

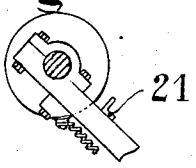


Fig. 6.

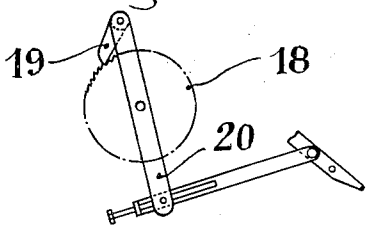


Fig. 7.

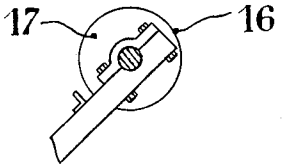


Fig. 8.

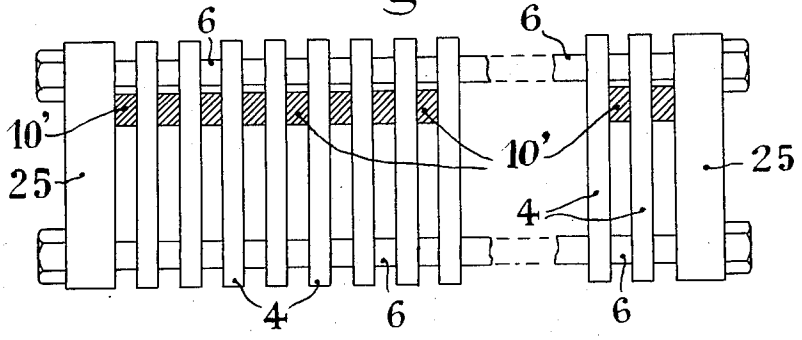
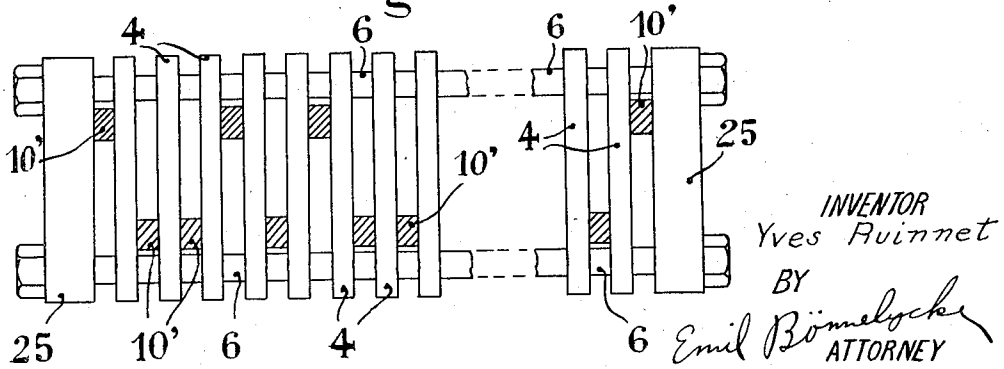


Fig. 9.



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UNITED STATES PATENT OFFICE

YVES RUINNET, OF ARGENTEUIL, FRANCE

DEVICE FOR REPRODUCING DESIGNS UPON KNITTING MACHINES

Application filed July 15, 1929, Serial No. 378,414, and in France June 7, 1929.

The present invention relates to an electro-mechanical device permitting drawings or tracings of any kind to be reproduced directly upon knitting machines or looms for weaving and in a general manner upon all other like machines.

This device is an improvement on that described in my French application filed by the same applicant February 7, 1928, for "A method and device for reproducing designs of all kinds directly upon looms for weaving, knitting machines and the like".

The device described in this prior specification is characterized by the feature that it employs, for actuating the needles of the machine, levers of suitable form the number of which corresponds to that of the needles, each of these levers being controlled by an independent electromagnet. The electromagnets are energized by an electric current distributed by the passage of suitable brushes over and in contact with a surface upon which is provided, in the form of insulated and conducting parts, a tracing corresponding to the design which it is desired to obtain upon a knitted fabric.

The device which forms the subject of the present invention is based upon the same principle but it permits the members which actuate the needles to be selected with one single electromagnet.

In order to permit the features of the new device to be clearly understood, the manner in which the needles are controlled upon a knitting machine in order to obtain designs will be described hereinafter.

This control may be obtained in different ways, either by hand by means of a rod with movable elements (see my prior French Patent No. 584,226) or automatically by means of jacquard cards.

The jacquard cards are formed by previously perforated bands of metal which, when they are made to advance over the heads or over an extension of the needles of a knitting machine, cause the latter to advance in their moulds by pushing them and bringing them into action wherever they encounter solid parts of the card, while they remain unmoved wherever they encounter the perforations in the card. The following card is perforated in such a way that the needles which were not operated by the previous card are operated in their turn, while those which were operated before remain at rest.

With this means, which is moreover the most usual, it is thus necessary, in order to reproduce a design upon a knitting machine, to prepare in advance as many cards as there are rows of stitches and colours in the height of the design which it is desired to reproduce.

Other means consist in replacing these cards by cards which are perforated in advance with as many holes as there are needles in the machine, and in which, according to the designs to be reproduced, the holes which are not intended to serve are closed by means of small pieces of metal called "fleas".

In all cases the construction of a set of cards for reproducing a design is very long and costly and it necessitates very careful calculations of the number of stitches.

In order to reduce the costs if it is desired to manufacture products at a reasonable cost, it is necessary to manufacture a large number of articles with the same set of cards which will naturally always give the same design.

The device which forms the subject of the invention completely obviates this work which is necessary for the reproduction and permits use to be made directly of the copy of the design to be reproduced. It is thus possible to obtain knitted articles either in single units or in sets without affecting the price.

One possible form of construction of the device in question will now be described with reference by way of example to the accompanying drawing, in which:

Figures 1 and 2 are two views of the aforesaid construction, taken transversely through the front casting, with parts in different positions.

Figure 3 is a plan view to a smaller scale of a part of the mechanism.

Figure 4 is a sectional view taken along the line 3—3 in Figure 3.

Figure 5 is a section taken along the line 5—5 in Figure 3.

Figure 6 is an end view of Figure 3, looking in the direction of the arrow *f*.

Figure 7 is an end view taken from the left hand side of the cylinder carrying the design to be reproduced.

Figure 8 is a view of a general arrangement of the mechanism viewed in the direction of the arrow f^3, the levers being all assumed to be in the operative position.

Figure 9 is a view corresponding to Figure 8, in which the levers have been selected and are ready to actuate the needles.

Reference will first be made to Figure 1, in which 1 represents one of the castings of the machine upon which are mounted the needles 2. In front of the foot or extension 3 of these needles in the place of the jacquard cards or similar devices employed for selecting the needles, a series of members 4, made of non-magnetic metal mounted upon a cross member or slide 5. These members are also mounted upon cross stays 6 and they are held at a spacing corresponding to the width of the feet 3 of the needles. The said members 4 thus form between them as many free spaces as there are needles upon the casting. Upon each of the members 4 is pivotally mounted at 7 an iron hook 8 provided with a tail 9 also made of iron. This hook is engaged with a bent lever 10 provided with a beak 11 and adapted to pivot at 12 upon the corresponding member 4 in the same vertical transverse plane as the needles.

The levers 10 can occupy two positions; the raised position shown in full lines in Figure 1 in which their beaks 11 are in engagement with the hooks 8 and the lowered position shown in that figure in dot and dash lines.

In the first or raised position the free end 10′ of these levers is situated opposite the heel 3 of the corresponding needle, and in the second or lowered position it rests upon one of the cross stays 6 and is situated in line with the said heel.

The explanation which was given at the commencement of the description will make it possible to understand that if the levers 10 are placed in the lower position, and the arrangement formed by the members 4, the levers 10 and the hooks 8, is made to advance in the direction of the arrow f^2, none of the needles will move because each extension 3 will pass into the free space above the ends 10′ and will consequently not be brought into action. On the other hand, if the levers 10 are engaged by means of their beaks 11 in the hooks 8 (position shown in full lines) by making the above mentioned arrangement advance, all the needles will be actuated. Thus by selecting the levers which have to be in the upper position and those which must be in the lower position, the needles required for producing a given design can be selected at the same time.

The device which permits the said levers and the said needles to be selected electromechanically, is formed according to the present invention by an electromagnet 13 sidably mounted upon the slide bar 5 mentioned above.

This movable electromagnet 13 is combined with a rod 14 rigidly connected at one end, not shown, to the carriage of the machine, which has a reciprocating movement imparted to it, and comprising at its other end a small rubbing member or brush 15 the function of which will be described hereinafter. The rod 14 is constructed in such a way that it produces the displacement of the electromagnet upon its slide 5 in both directions according to the travel of the carriage.

It will thus be understood that if the levers 10 are assumed to be in their position of engagement (full lines in Figure 1) and if the electromagnet 13, through which an electric current is passed, is disposed above the tails 9 of the hooks 8, these tail pieces being of iron will be attracted during the passage of said electromagnet and the hooks 8 will release all the levers 10 which were engaged with them and which will return into their lowered position by gravity (dot and dash lines in Figure 1).

From the foregoing it is clear that if the levers 10 are always assumed to be engaged (see Figure 8) and the electromagnet 13 to be connected electrically to the brush 15, and if at the same time that the electromagnet moves above the tail piece 9, this brush is made to move over a design 16 wound for example over a drum 17 and formed in the known manner of conducting surfaces and insulated surfaces, each time the said brush passes over a good conducting part of the design 16 a current will flow through the electromagnet and all the corresponding hooks will be attracted in succession and will release their corresponding levers and leave the same number of free spaces opposite the corresponding needles (see Figure 9).

It is thus merely a question now of employing this arrangement formed of two sets of selected needles in order to actuate the needles.

For this purpose use will be made of a suitable mechanism similar for example to that which is employed for actuating jacquard cards with the single difference that in the jacquard system it is only necessary to have one single movement to bring the card always to the same position while in the device forming the subject of the invention it will be necessary to bring the above mentioned arrangement into as many positions as the selecting levers will form rows.

When working with two colours, as in the example envisaged here, the arrangement formed by the selected levers will have to be presented successively in two different positions.

First position—(see Figure 1). The levers of the upper row which have remained hooked in engagement are brought opposite the needles and push the latter in order to bring them into action.

Second position—(see Figure 2). The levers which form the lower row, because they have been unhooked by the passage of the electromagnet above their corresponding hooks, are brought in their turn opposite the needles and push all those which remained at rest during the preceding movement, thus bringing them into action.

The mechanism which enables this movement to be obtained may be constructed for example in the following manner:

At each end of the arrangement a member 25 forming a constituent part of the arrangement connected with the cross-stays 6, which connect together the members 4, is provided with a trunnion 22. This arrangement can thus pivot about the trunnions 22 in order to take up the two necessary positions in combination with rollers 24 and small cams 23 which function for each forward and return movement of the arrangement.

The mechanism which produces the forward and return movement may be of any kind. As stated above, it may be similar to that which is employed to secure the forward and return movement of the anvil or prism which carries the jacquard cards arranged in the form of a chain.

This mechanism is actuated directly by the machine itself through the medium of rods or any other suitable mechanical members.

The above example indicates the case for working in two colours. For working in three or more colours the levers which are selected will have to arrange themselves in as many additional rows as there are colours and it will be necessary to dispose of as many more reproducing cylinders as there are additional colours above the number of two. A suitable mechanism will thus have to bring the arrangement successively into as many positions as there are rows of levers formed.

When a number of stitches will thus have been obtained on the knitting machine, the arrangement will have to reform itself in order to select once more the needles which will form the second row of stitches. For this purpose a bar 21 having the form of an angle for example in order to give it more rigidity will position itself under the levers 10 so that the arrangement, when moving downwards, will cause all the levers to strike this bar and rise again on this account into their first position, that is to say the position shown in full lines in Figure 1.

At this moment, the hooks are raised by the ramp formed by the beak 11 of the levers, and as soon as the levers have taken up the position shown in full lines, the hooks fall freely by their own weight and thus, by means of their beaks 11, hold the levers in their upper position.

The cylinder or cylinders which carry the design or designs are driven by a toothed wheel 18 through the medium of a pawl 19 which is itself tied to the movements of the machine by levers 20 one of which is adjustable so that the pawl moves a varying distance in order to turn the toothed wheel through one or more teeth (Figs. 3 and 6).

This movement is produced each time a complete set of stitches has been made so as to follow the design by means of the brush in order to select the needles for the following row of stitches.

In a word, the cylinder moves in its direction of rotation as many times as there are rows of stitches contained in the height of the design and by steps equal to the length of the stitch.

This movement may be obtained by any other means, for example by means of a worm.

It is to be clearly understood that the invention is not limited to the form of construction described above, presents no limiting feature and may receive any desirable constructional modifications, without on that account exceeding its scope as claimed.

I claim as my invention:

Mechanism for reproducing designs with knitting machines, comprising a plurality of movable elements corresponding in number to the number of needles in the front of the machine; members intermediate the movable elements and the needles for controlling the movement of the former; a movable magnet associated with said movable elements to form a grille comprising a plurality of rows of free and full spaces, each free space being produced by the absence of the corresponding element, and each full space by the element itself; means associated with said grille adapted to bring into action groups of needles on the machine alternately and each group in its turn, and being also adapted to compose the rows of empty and full spaces automatically and simultaneously each time the machine has formed a row of the elements constituting said grille by the passage of said magnet; a rubbing contact to which one pole of the magnet is connected, the other pole being connected to a source of current; and a cylinder provided with insulating and conducting parts forming the design to be reproduced, said rubbing contact being movable over said design-forming parts.

In testimony whereof, I affix my signature.

YVES RUINNET.