Sept. 11, 1962 R. STEIGER 3,053,065

CONTROL SYSTEM FOR RECTILINEAR KNITTING-MACHINES

Filed Jan. 12, 1960

2 Sheets-Sheet 1

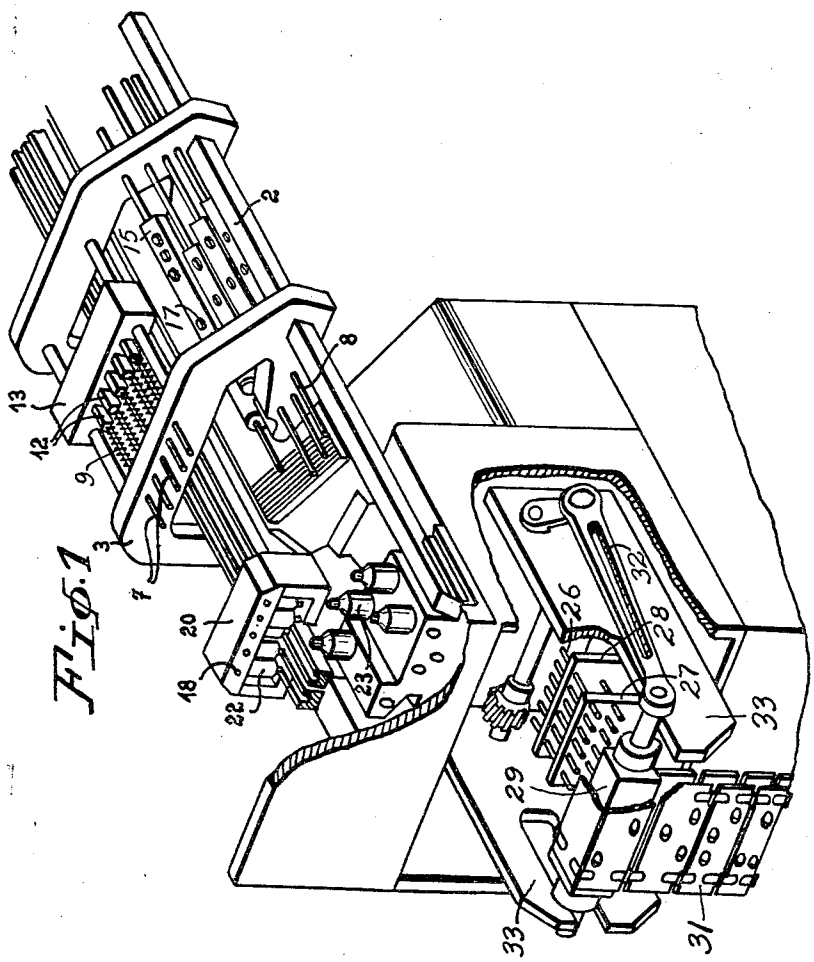


Fig. 1

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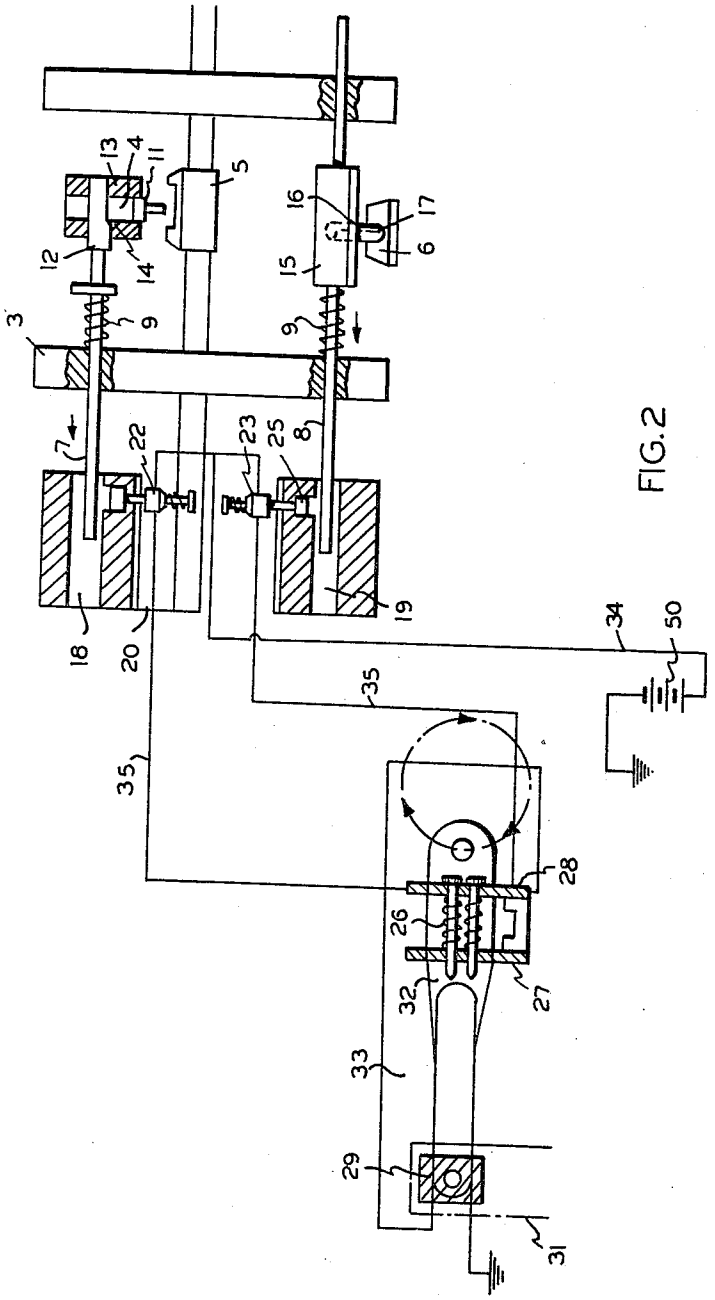


FIG. 2

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CONTROL SYSTEM FOR RECTILINEAR KNITTING-MACHINES

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4 Claims. (Cl. 66—154)

This invention concerns an improved control system for thread guides in a rectilinear knitting machine. A rectilinear knitting-machine includes a needle bed carrying needles. Slideways are mounted over the needle bed. On the slideways is a carriage having a reciprocating rectilinear movement. The carriage is provided with needle-controlling cams and pistons adapted to carry along thread guides with them.

The pattern of the knitted fabric obtained on this machine is determined by the movement of the cams and of the pistons. Said movements are controlled at the start by a chain of perforated cards, according to some mechanical or electrical system.

The mechanical system requires the use of levers, connecting rods, catches and the like parts, so that it employs necessarily a complex mechanism which is subject to rapid wear and requires frequent servicing.

The electrical system employs electromagnets each actuating a cam or a piston, all the electromagnets being located on the reciprocating carriage. This system leads to the use of a simpler and stronger arrangement, but it also has certain drawbacks. Thus, the electromagnets being practically always energized, have a tendency to become overheated and to operate consequently in an eratic manner after a short time of operation. They are required, furthermore, to be large-sized, so that their power be sufficient for depressing a needle-actuating cam. Another drawback consists in the presence of a cable which contains all the electric leads and connects the carriage with the stationary section of the frame and which moves with the carriage.

In order to overcome these drawbacks, the present invention has for its object a control system according to which all the movements of the thread guide control members in the machine are produced by electromagnets positioned at one end of the frame in planes perpendicular to the direction of reciprocation of the carriage. The electromagnets, when they are energized, control transverse stops for rods mounted slidingly on the carriage and actuate corresponding cams and pistons. The rods pass freely through the support of the electromagnets when the latter are not energized.

One of the main advantages of the present control system resides in the fact that the electromagnets are energized only during a very short time at the end of the stroke of the carriage. Their circuit is closed upon engagement with a prism support for movable perforated cards, by a number of contactors equal to the number of operations to be executed. The prism support over which the cards move is mounted on an auxiliary carriage, the movements of which are controlled by that of the main carriage. The perforated cards provide for energizing only those electromagnets whose controlling contactors register with corresponding perforated areas of the cards. Each contact-maker is constituted by a sliding metal rod which is insulated from the mass of the apparatus and is connected with the corresponding electromagnet so as to be capable of grounding the latter through contact with the grounded prism. The electromagnet which is connected with one of the terminals of a supply of energy, the other terminal of which is grounded, is thereby energized.

I have illustrated, by way of example in the accompanying drawings, an embodiment of my improved control system for the movements of a rectilinear knitting-machine. In said drawings:

FIG. 1 is a general perspective view of the knitting frame.

FIG. 2 is, on an enlarged scale, an elevational partially sectional and partially schematic view of a piston controlling a thread guide, together with an associated electromagnet; a needle-controlling cam, together with an associated electromagnet; the contactors which control the operation of the electromagnets and associated circuitry.

Turning to FIG. 1, the slideways 2, extending above the needle bed of the machine, carry slidingly a carriage 3 provided with pistons 4 (FIG. 2) controlling movement of thread guides 5 and with cams 6 controlling movements of the needles. The thread guides serve to guide passage of knittting yarn to the needles. Neither the needles nor knitting yarn associated with the cams and thread guides, respectively, are illustrated since the former are conventional and well known in the art.

According to my invention, a plurality of rods 7, 8 are slidingly mounted on the carriage 3, the number of said rods being equal to that of the pistons 4 and of cams 6. Rods 7 control the pistons 4 and rods 8 control cams 6.

Each rod 7 projects beyond one of the lateral surfaces of the carriage 3 and is subjected to the action of a spring 9 which has a tendency to shift it outwardly to the left in the direction of the arrow 10 of FIG. 2. Inside the carriage 3, each rod 7 is in contact at its end with a member 12 slidingly mounted inside a supporting block 13 and provided on its lower surface with a slope 14. The sloping lower surface is in contacting relationship with the piston 4 which controls thread guide 5. Piston 4 is urged upwardly by spring 11 in block 13. It is thus apparent that the downward movement of the piston 4 providing for engagement with thread guide 5 is obtained by exerting on rod 7 a thrust to the right in the direction opposed to the arrow 10 of FIG. 2, so as to shift the member 12 in the same direction and thus cause the piston 4 to descend under the sloping surface 14 of member 12 when the rod 7 moves to the left in the direction of arrow 10, piston 4 is disengaged and retracts upwardly. As to the rods 8, each of which controls a cam 6 to actuate a needle, they project beyond both lateral surfaces of the carriage 3 and each carries a bolt 15 provided with an aperture 16 through which a spring loaded stud 17 projects to engage the cam 6. The cam is controlled through the longitudinal shifting of rod 8. When the rod 8 is retracted to the left in the direction of arrow 10, stud 17 is disengaged from cam 6.

The longitudinal movements of the rods 7 and 8 with reference to the carriage 3 on which they are mounted are obtained at the end of the stroke of the carriage upon engagement of the rods inside corresponding recesses 18 and 19 formed in blocks 20 rigid with the frame body.

Blocks 20 serve as supports for electromagnets, the number of which is equal to that of the rods 7 and 8. Each rod 7 is associated with an electromagnet 22 and each rod 8 is associated with an electromagnet 23. The electromagnets are arranged vertically. Each of their cores carry a plunger designated by 24 or 25 for the electromagnet 22 or 23. Each plunger slides in a bore of the corresponding supporting block 20 opening into the associated recess 18 or 19 thereof.

The operation of the control system is as follows: When the electromagnets 22 and 23 are deenergized, the plungers 24 and 25 do not project into the recesses 18 and 19 so that, when the carriage 3 reaches the end of its stroke, the rods 7 and 8 freely enter recesses 18 and 19 and are subjected to no relative shifting with reference to the carriage 3.

Conversely, if one or more of the electromagnets 22 and 23 are energized, one or more of the plungers 24 and

25 enter the recesses 18 and 19, whereby, at the end of the stroke of the carriage 3, one or more of the rods 7 and 8 abut against said plungers, so that their movement is stopped, while the carriage moves slightly further up to the end of its stroke. This leads to a relative shifting of one or more of the rods 7 and 8 with reference to the carriage 3, whereby the corresponding thread guides 5 and/or cams 6 are operated.

The electromagnets are not subjected to any longitudinal or even transverse shock, so that they may be very small-sized and they may be energized only at the moment at which the thread guide or cam associated therewith is to be operated.

This energization of the electromagnets 22 and 23 is caused by contactor rods 26, the different rods 26 being slidingly and insulatingly mounted in two stationary plates 27 and 28, the number of said rods being equal to that of the electromagnets.

The prism 29 assumes an intermittent rotary movement, so as to produce an intermittent movement of the perforated cards 31. The prism is coupled for this purpose with a connecting rod 32 which allows the prism to reciprocate in the slideways of a stationary support 33, so that the prism 29 may engage the rods 26 and then move away from them.

Each electromagnet is connected through a lead 34 with a terminal of the power supply 50 and, through another lead 35, with the corresponding rod 26. The prism 29 is grounded, as is also the other terminal of the power supply. It is thus apparent that when a rod 26 meets an unperforated area of a card 31, no contact is obtained. On the other hand, whenever such a rod 26 registers with a perforation of the card 31, it passes through the perforation and closes the circuit via the prism 29, so as to energize the electric circuit of the corresponding electromagnet. The energized electromagnet produces the movement of its associated thread guide or cam, in accordance with the requirements determined by the card perforations.

What I claim is:

1. In a rectilinear knitting-machine including needle-actuating cams and thread guides, the combination of a carriage assuming a rectilinear reciprocation over said cams and thread guides along a predetermined path, a plurality of rods slidingly mounted in the carriage in parallelism with the path of the latter, stationary electromagnets positioned in planes perpendicular to said path of the carriage beyond at least one end thereof, plungers urged by said electromagnets when energized transversely into registry with the path of the corresponding rod, circuits energizing the electromagnets, means carried by said rods, controlling the corresponding cams and thread guides each time said rods moving in unison with the carriage reach the end of their stroke, and means producing the selective energization of said electromagnets to stop said rods through the plungers before said rods reach the end of their stroke.

2. In a rectilinear knitting-machine including needle-actuating cams and thread guides, the combination of a carriage assuming a rectilinear reciprocation over said cams and thread guides along a predetermined path, a plurality of rods slidingly mounted in the carriage in parallelism with the path of the latter, stationary electromagnets positioned in planes perpendicular to said path of the carriage beyond at least one end thereof, plungers

controlled by said electromagnets, adapted to move upon energization of the electromagnets transversely into registry with the path of the corresponding rod, circuits energizing the electromagnets transiently at the end of the travel of the carriage in at least one direction, means carried by said rods, controlling the corresponding cams and thread guides each time said rods moving in unison with the carriage reach the end of their stroke, and means producing the selective energization of said electromagnets to stop said rods through the plungers before said rods reach the end of their stroke.

3. In a rectilinear knitting-machine including needle-actuating cams and thread guides, and a prism carrying a chain of perforated cards corresponding to different operations, the combination of a carriage assuming a rectilinear reciprocation over said cams and thread guides along a predetermined path, a plurality of rods slidingly mounted in the carriage in parallelism with the path of the latter, stationary electromagnets positioned in planes perpendicular to said path of the carriage beyond at least one end thereof, plungers controlled by said electromagnets, adapted to move upon energization of the electromagnets transversely into registry with the path of the corresponding rod, circuits energizing the electromagnets, means carried by said rods, controlling the corresponding cams and thread guides each time said rods moving in unison with the carriage reach the end of their stroke, a carriage for the card-carrying prism, slidable contactor rods, the number of which is equal to the number of said electromagnets, and means driving the prism-carrying carriage to make the prism impinge against said contactor rods at each end of its stroke in a predetermined direction to close the circuits energizing the electromagnets corresponding to perforations of the operative card.

4. In a rectilinear knitting-machine including needle-actuating cams and thread guides, and a grounded prism carrying a chain of perforated cards corresponding to different operations, the combination of a carriage assuming a rectilinear reciprocation over said cams and thread guides along a predetermined path, a plurality of rods slidingly mounted in the carriage in parallelism with the path of the latter, stationary electromagnets positioned in planes perpendicular to said path of the carriage beyond at least one end thereof, plungers controlled by said electromagnets, adapted to move upon energization of the electromagnets transversely into registry with the path of the corresponding rods, circuits energizing the electromagnets, means carried by said rods, controlling the corresponding cams and thread guides each time said rods moving in unison with the carriage reach the end of their stroke, a carriage for a card-carrying electrically grounded prism, conductive sliding members, the number of which is equal to the number of said electromagnets, and means driving the prism-carrying carriage to make the prism impinge against said conductive sliding members at each end of its stroke in a predetermined direction to make those members which register with a perforation in the card engage the grounded prism, to close the corresponding electromagnet circuit.

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