United States Patent [19]

Krause

[11] **3,776,003**

[45] **Dec. 4, 1973**

[54] **SAVING MOTION FOR CONTROL MEANS ON KNITTING MACHINES**

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[73] Assignee: **Universal Maschinenfabrik Dr. Rudolf Schieber KG**

[22] Filed: **Feb. 25, 1972**

[21] Appl. No.: **229,523**

[52] **U.S. Cl.** ..... **66/154 A**, 66/75

[51] **Int. Cl.** **D04b 15/66**

[58] **Field of Search** ..... 66/154 A, 155, 156, 66/75

[56] **References Cited**

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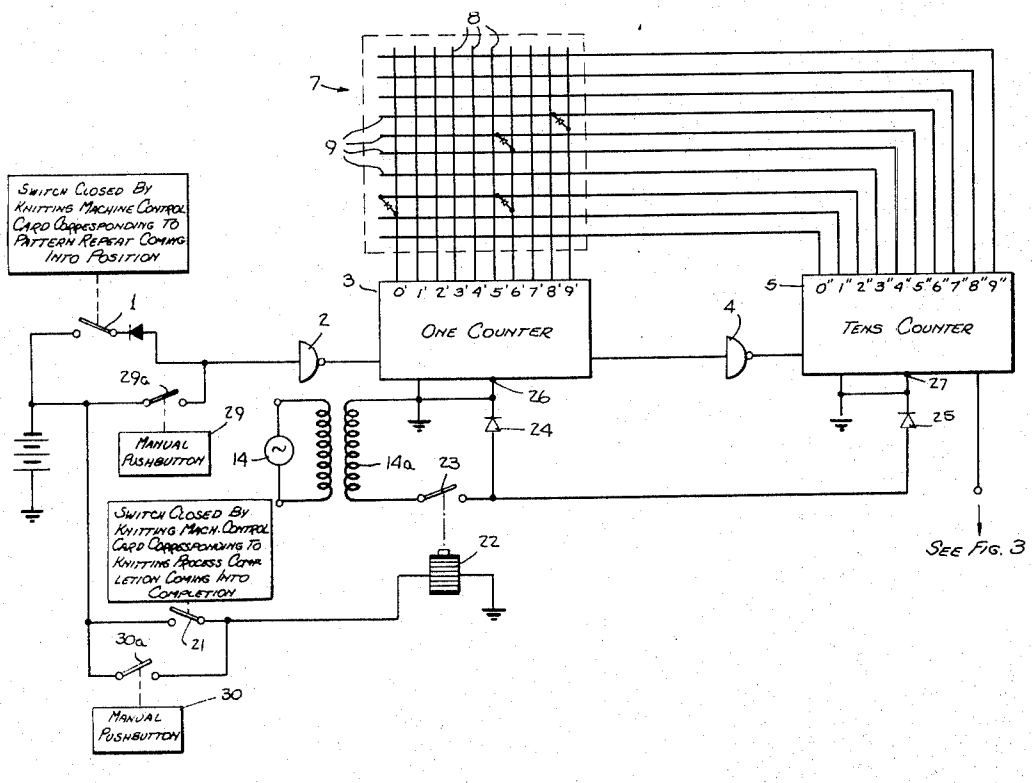
Primary Examiner—Ronald Feldbaum

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[57] **ABSTRACT**

A control circuit for producing signals which change the normal movement of control cards, and the like, in knitting machines. The circuit includes a pair of decade counters with the count terminals of one sewing as output terminals and cross connected via a distributor with the count terminals of the other, serving as input terminals.

4 Claims, 6 Drawing Figures



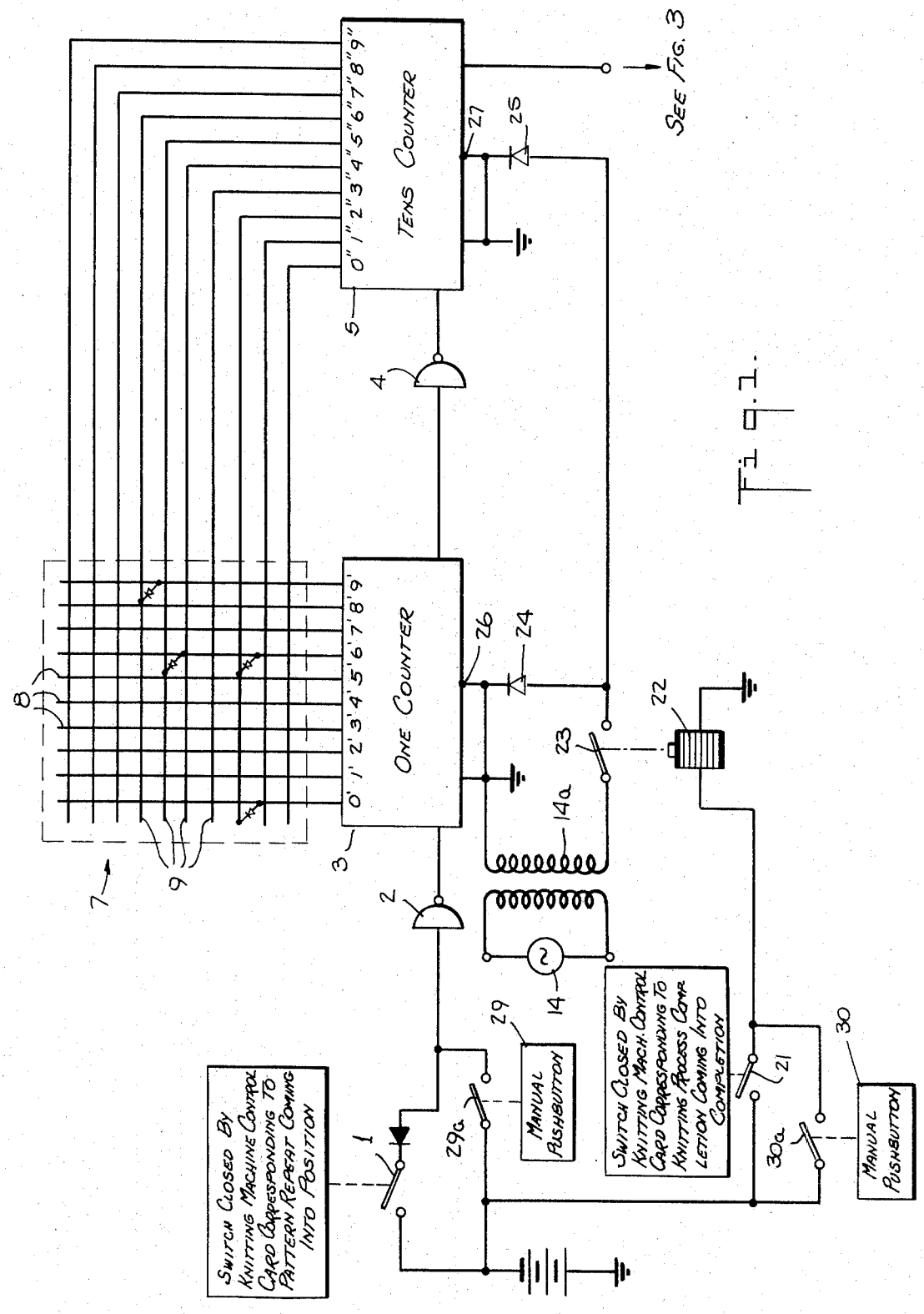
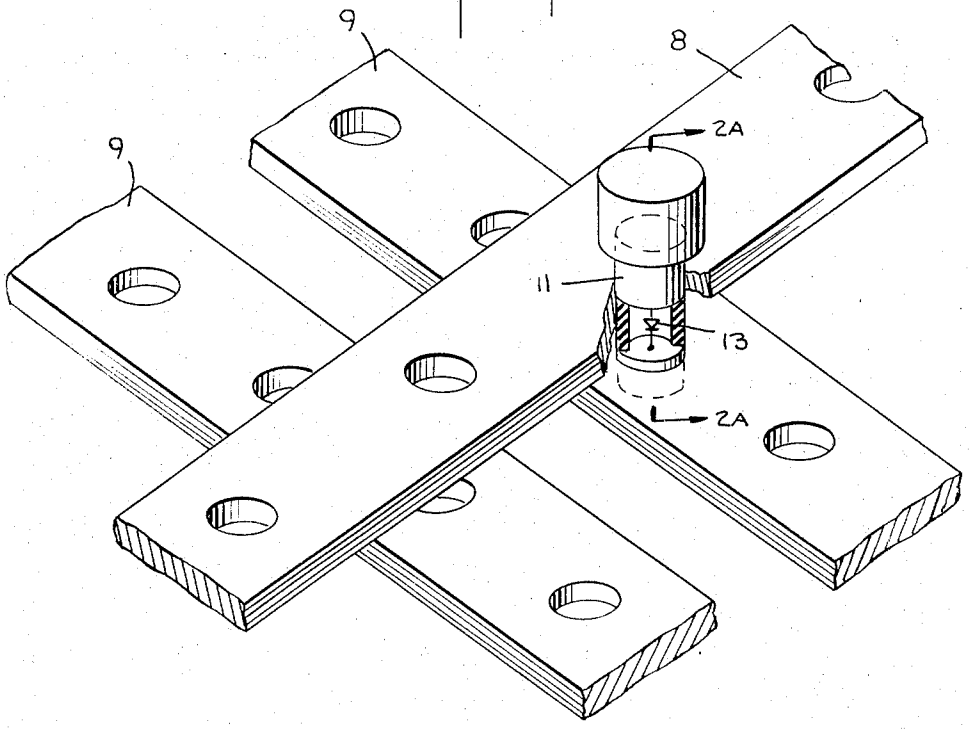
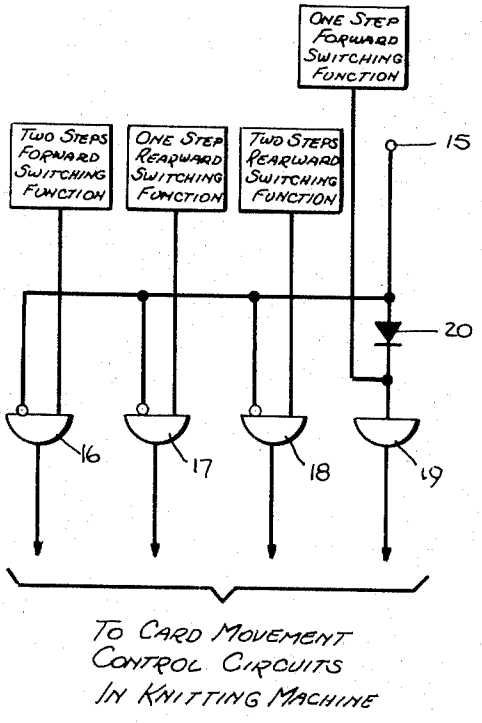

SEE FIG. 3
TENS COUNTER
0" 1" 2" 3" 4" 5" 6" 7" 8" 9"
ONE COUNTER
0' 1' 2' 3' 4' 5' 6' 7' 8' 9'
SWITCH CLOSED BY KNITTING MACHINE CONTROL CARD CORRESPONDING TO PATTERN REPEAT COMING INTO POSITION
MANUAL PUSHBUTTON
SWITCH CLOSED BY KNITTING MACH. CONTROL CARD CORRESPONDING TO KNITTING PROCESS COMPLETION COMING INTO COMPLETION
MANUAL PUSHBUTTON

Fig. 1.

Fig. 2.





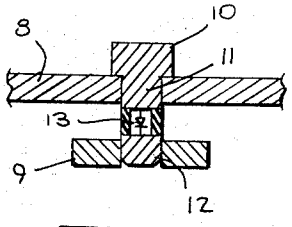


Fig. 2A.

Fig. B.

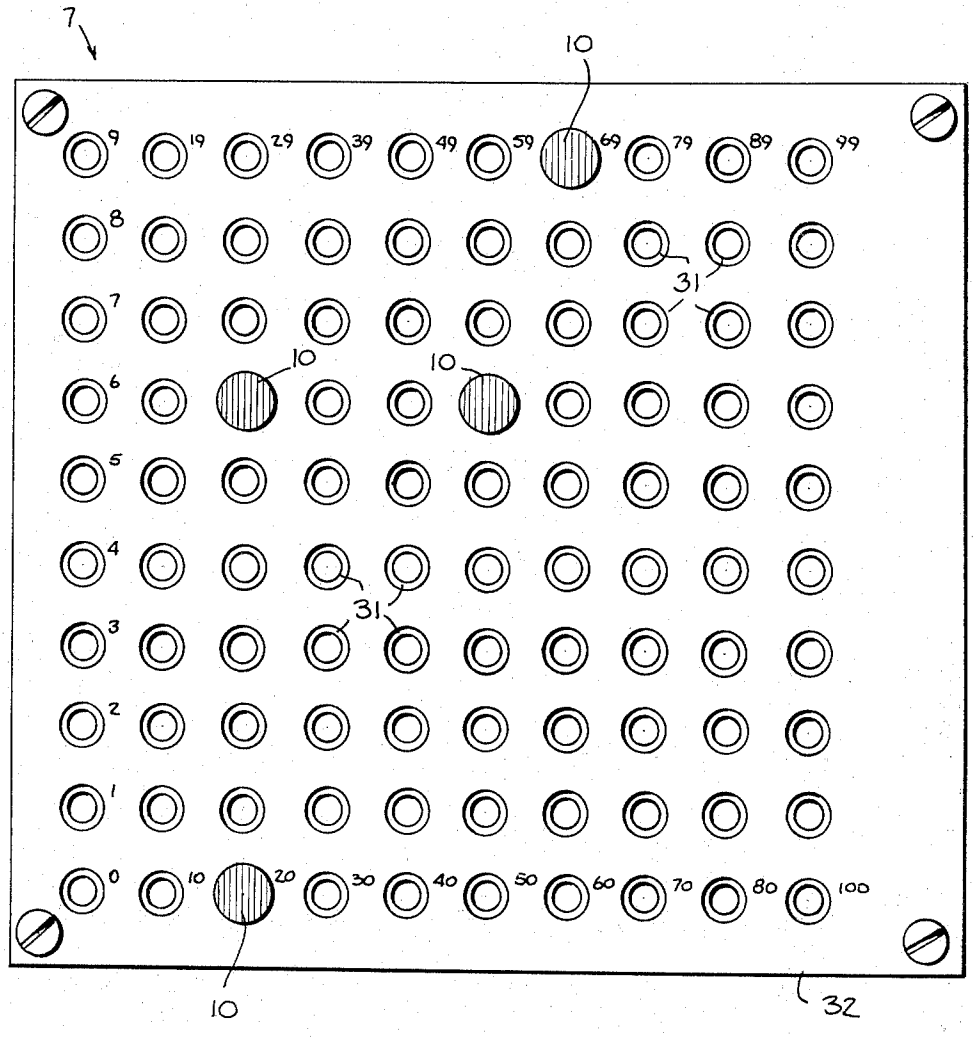
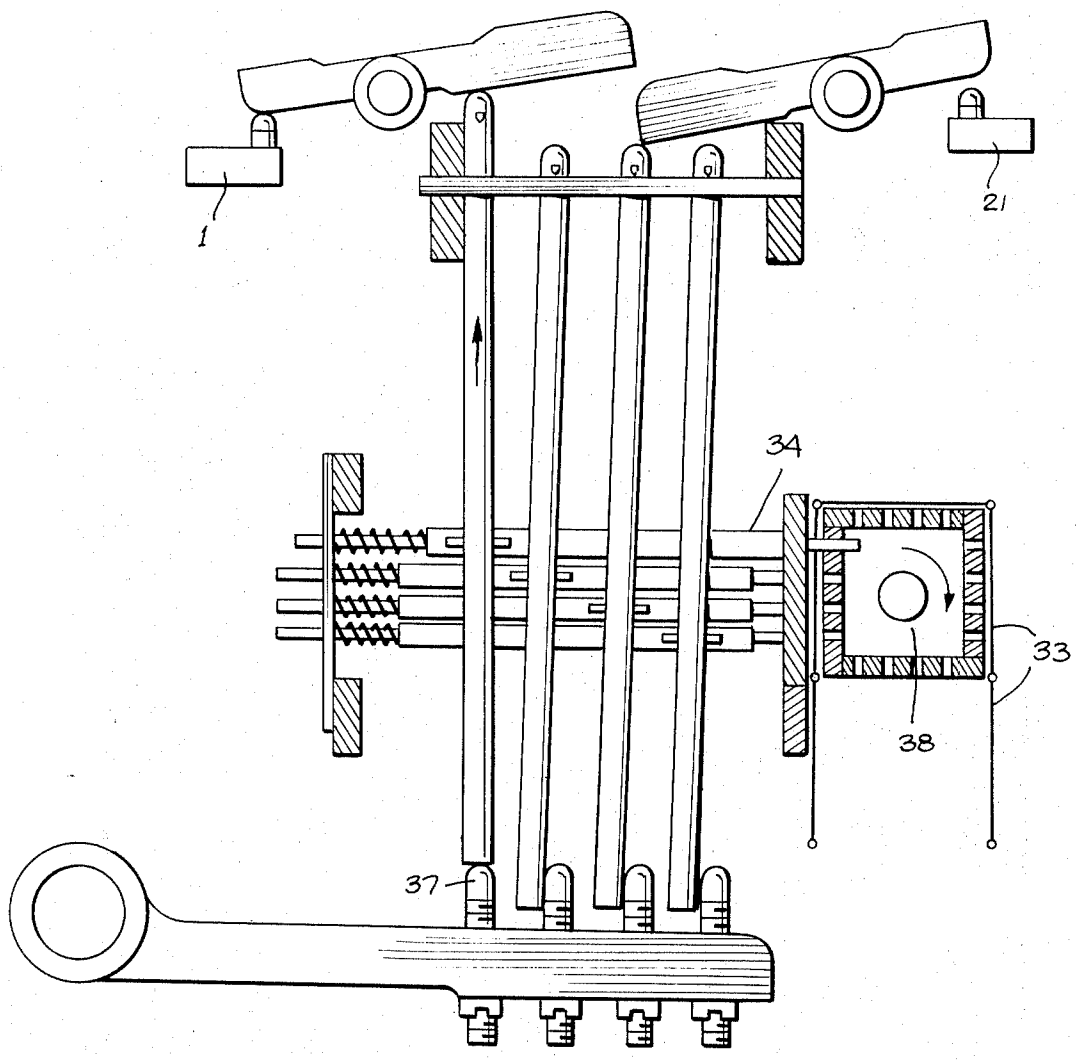

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Fig. 4.

Fig. 5.



SAVING MOTION FOR CONTROL MEANS ON KNITTING MACHINES

The present invention relates to a saving motion device for use with control means such as control cards, control chains and the like on flat knitting machines.

Flat and knitting machines are generally controlled by control cards or by control chains. Since in such knitting machines a knitted article is started generally with a fixed starting end, it would be necessary to provide a separate control card or chain link for each knitted course. This, however, would make the control means too long and too cumbersome to be able to operate economically with these control means.

Because of this, the advancing device for these control means are so constructed, in known flat knitting machines, that for instance, a chain of control cards can be moved alternately one step forward, two steps forward, one step back or two steps back so that the corresponding control card itself selects the following step. Thus, the control cards or chain links which form part of a pattern repeat are so attached together that they constantly pass through a predetermined cycle.

In order to be able to switch out of this cycle and into another cycle, there must be provided a mechanism which, for example, converts a switching command for backward movement provided by a particular control card into a switching for continued forward movement. With such a mechanism, it is possible to save control cards or chain links. The controlling of the advancing itself is effected generally mechanically, but in part also electrically.

Known saving mechanisms of the type described generally include a disc with transport teeth on its periphery, each of said teeth having associated with it a separate hole for receiving a stud. Saving mechanisms in the form of a rack which is moved vertically upward are also known. By inserting a stud into the disc or the rack in accordance with a given program, the normal control functions of the corresponding control card, or the like, is passed over and a forward advancing of the card is effected. The resetting of the disc is effected by a spring, while in the case of the rack, it drops back by its own weight.

In both cases, it is difficult to dampen the momentum upon the resetting, so that a rebound occurs both in the case of the disc and in the case of the rack, which rebound has the result that the disc or rack does not engage in its zero position, but rather in a position which is advanced by a few teeth so that the course of the knitting operation is no longer proper. Since, in particular, the distances from stud-to-stud must be as large as possible for the dependable initiation of the corresponding control and switching functions, the weight of the disc or rack becomes relatively large. Both the mechanically and electrically actuated advancing devices are actuated either directly or via switches from such discs or racks.

Another disadvantage of the discs and racks is that it is difficult to change the studs, for instance, upon any change in the number of repetitions of pattern repeats.

It is an object of the present invention to provide a saving motion for control means in knitting machines which does not have the above-described disadvantages and which, in particular, operates independently and can easily be inserted and changed.

This object is obtained in accordance with the invention by a saving motion of the aforementioned type in the manner that it consists of two decade counters, the leads of which are extended to a crossing distributor and in that plug connections can be associated optionally with the points of intersection of the crossing distributor for the passage of a pulse which erases the normal control function initiated by the control card, or the like, present at the time in control position and which effects a further stepping. In this connection, for instance the one decade counter for the "ones" is associated with horizontal contact strips and the other decade counter for the "tens" is associated with the vertical contact strips of the crosswise distributor so that hundreds of points of intersection corresponding to hundreds of counting places or possibilities for a plug connection result.

One suitable embodiment of the invention resides in providing the last control card, or the like, of the last knitting cycle with a device which gives off a pulse for the resetting of the decade counters to zero. Furthermore, the saving mechanism can be constructed in the manner that there is provided below the crossing distributor a conductive plate with which a correspondingly long plug can be brought into contact in order to initiate a pulse which returns the decade counter to zero condition. Manual switching can be provided both for applying each pulse to the decade counters and for the resetting of the decade counters. In a preferred embodiment, diode plugs are provided for the plug connection.

There has thus been outlined rather broadly the more important features of the invention in order that the detailed description thereof that follows may be better understood, and in order that the present contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for the designing of other structures for carrying out the several purposes of the invention. It is important, therefore, that the claims be regarded as including such equivalent construction as do not depart from the spirit and scope of the invention.

A specific embodiment of the invention has been chosen for purposes of the invention. It is important, therefore, that the claims be regarded as including such equivalent construction as do not depart from the spirit and scope of the invention.

A specific embodiment of the invention has been chosen for purposes of illustration and description, and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1 is a schematic wiring diagram of the saving motion in accordance with the invention;

FIG. 2 shows a portion of a crosswise distributor, used with the invention, for the making of the plug connection;

FIG. 2A shows, in cross-section, a plug connection arrangement for the crosswise distributor of FIG. 2;

FIG. 3 is a schematic diagram of a circuit for changing the advance command;

FIG. 4 is a front view of the crosswise distributor used with the invention; and

FIG. 5 is a fragmentary elevational view showing a card sensing arrangement for a knitting machine in which the present invention is utilized.

FIG. 1 shows a schematic wiring diagram of the saving motion in accordance with the invention. A switch 1 may be arranged in the control device of a knitting machine (not shown) and is switched by control means, for instance a control card, as indicated in the drawing once in every pattern repeat. The switch 1 can be a mechanical or electronic switch. Via a gate 2, the pulse produced by the switch 1 is fed to a decade counter 3 for "ones." The decade counter 3 is thereby in each case advanced by one step and gives off a pulse to the outputs 0' to 9' corresponding thereto at the time of the pulse produced by the switch 1. When the output 9' is reached, the next pulse effects the resetting of the decade counter 3 to its starting condition 0' while at the same time a pulse is fed via a gate 4 to a decade counter 5 for "tens." By such a pulse, in each case a different one of several inputs 0'' to 9'' of the decade counter 5 is connected to its output 6. The outputs 0' to 9' of the decade counter 3 are connected to vertical contact strips 8 of a crosswise distributor 7 and the inputs 0'' to 9'' of the decade counter 5 are connected to the horizontal contact strips 9 of said crosswise distributor 7.

FIG. 2 shows schematically how a vertical contact strip 8, which is connected for instance with the output 6' of the decade counter 3, crosses two of the horizontal contact strips 9 which are connected, for instance, with the inputs 3'' and 4'' of the decade counter 5 of FIG. 1. A contact point 11 of a plug 10 is seated in the contact strip 8 and makes 41 , with a contact point 12 in the contact strip 9 connected with the input 4''. Between the contact point 11 and the contact point 12, there is arranged a diode 13 which permits current to flow only from the contact point 11 to the contact point 12, i.e., from a contact strip 8 to a contact strip 9, and not in opposite direction. In this example, the connection to the counter place "46" is produced by the plug 10. In FIG. 1, connections to the counting places "20," "26," "56" and "69" in the crosswise distributor 7 are schematically shown. It will be seen from FIG. 1 that when counting from one to nine, only the input terminal 0'' of the decade counter 5 is open. When counting from 10 onwards, the terminals 1'', 2'', etc., are open. Now when a plug 10 is inserted into the counting location "8" for instance, the terminal 15 will receive an impulse via the input terminal 0,'' whereas when a plug 10 is positioned at the counting location "46," the input terminal 15 will receive an impulse via the input terminal 4''.

As shown in FIG. 1, power is supplied to the decade counters 3 and 5 via a generator 14 and transformer 14*a*. If a connection is made via the crosswise distributor 7 from the decade counter 3 to the decade counter 5 by a plut 10 being inserted for connecting the corresponding contact strips 8 and 9 and the conductor contact strip þ is connected with the output 6 of the decade counter, a signal occurs at a connection 15. From this connection 15, the device is mechanically so switched by an electromagnet (not shown) that the advancing frunction preprogrammed on the control card is extinguished and instead, a forward switching function is introduced. Therefore, there is no return transport to preceding control cards, but instead there results a forward transport to the next control succeeding card.

In the card advanving device using electrical actuation as herein illustrated, four electromagnets are switched. As shown in FIG. 3, all advancing control functions take place via gates 16, 17, 18 and 19. On the gate 16, there is provided the forward switching function "two steps forward," on the gate 16, the function "one step rearward," on the gate 18, the function "two steps rearward" and on the gate 19, the function "one step fprward." Furthermore, the gates 16 to 18 are controlled by the inverting of the signal of the connection 15 while the gate 19 is connected via diode 20 with the connection 15. If now an order arrives from the control device of the machine at one of the gates 16 to 19, they switch to the corresponding switch point if no signal is present at the connection 15. If a signal is present at the connection 15, the gates 16 to 18 are blocked independently of any other command fed while the command "one step forward" is forwarded via the gate 19 to a switch point.

When the knitting process is complete and a new piece of knitting is to be started, a switch 21 (FIG. 1) is actuated by a control card. This switch closes a circuit to an electromagnet 22 which, in its turn, closes a switch 23. As a result, the decade counters 3 and 5 are controlled at their reset contacts 26 and 27 via diodes 24 and 25 and both are returned to zero, i.e., the output 0' and the input 0'', respectively.

In order to be able to switch the decade counters 3 and 5 at any time to any desired counting point, there is provided a manual pushbutton 29 (FIG. 1) which is connected to operate a switch 29*a* in parallel to the switch 1. By actuation of the pushbutton 29, the decade counters can be switched further, in each case, to the next counting point. For the resetting of the decade counters by hand, there is furthermore provided a manual pushbutton 30 which is connected to operate a switch 30*a* in parallel with the switch 21; and upon its actuation, brings about the same function as the switch 21.

The adjustment of the number of the individual pattern repeats can be carried out in a very simple and convenient manner by the operator of the knitting machine inserting corresponding plugs 10 into selected jacks 31 on the front plate 32 of the crosswise distributor 7 shown in FIG. 4.

In FIG. 5, there is shown a control and sensing arrangement for control cards. As can be seen in FIG. 5, a chain of control cards 33 extends about a cube-shaped rotary control card moving means 38. The cube-shaped control card moving means is turned mechanically to advance the cards 33 into position to be scanned by horizontal plate bars 34 which respond to perforations in the cards to generate control signals. In the arrangement shown in FIG. 5, the uppermost horizontal plate bar 34 is resiliently biased to the position shown as a result of a perforation in the control card being scanned. As a result of this, an associated vertical plate bar 35 is lifted on a pin 37. This movement of the vertical plate bar 35 in the direction indicated produces rotation of a lever 36 which, in turn, operates the switch 1. The gates 16 and 19 are also supplied with information from the control cards.

Having thus described the invention with particular reference to the preferred form thereof, it will be obvious to those skilled in the art to which the invention pertains, after understanding the invention, that various changes and modifications may be made therein

without departing from the spirit and scope of the invention, as defined by the claims appended hereto.

What is claimed is:

1. Saving motion apparatus for controlling the stepping operation of moveable control means such as control cards, control chains and the like on flat knitting machines, said apparatus comprising a crosswise distributor (7) including a plurality of crossed contact strips (8,9) and plugs (10) for selectively connecting said contact strips, a first decade counter (3) having plural sequentially activated output connections (0'–9'), and a second decade counter (5) having a plurality of input connections (0''–9''), the connections of the two decade counters being arranged along different sides of a crosswise distributor (7) and connected to different groups of said strips respectively in such a manner that plug connections can be made at desired contact strip intersections of the crosswise distributor for causing a control signal to occur at predetermined counts, means for causing changes in the count of said counters in accordance with movement of said control means, and means responsive to said control signals to produce a signal which serves to extinguish the normal stepping operation of the control means and to substitute a different stepping operation.

2. Saving motion apparatus according to claim 1, wherein said decade counters are resettable to zero in response to the positioning of a control card corresponding to completion of a knitting process.

3. Saving motion apparatus according to claim 1, wherein manual switching means (29,30) is provided for supplying of a pulse to the decade counters (3,5) and for the resetting of the decade counters.

4. Saving motion apparatus according to claim 1, wherein diode plugs are provided at various points of intersection of said crosswise distributor to obtain said control signals.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,776,003 Dated December 4, 1973

Inventor(s) ERICH KRAUSE

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Title page, Column 1, add:

--[30] FOREIGN APPLICATION PRIORITY DATA

March 10, 1971

Germany . . . . . P 21 11 535.5--

Signed and sealed this 30th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,776,003 Dated December 4, 1973

Inventor(s) ERICH KRAUSE

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 7, delete the word "and";
Column 3, line 33, "41," to read --connection--;

line 59, "Þ" to read --9--;

line 63, "frunction" to read --function--;

Column 4, line 1, "advanving" to read --advancing--;

line 6, "16" to read --17--;

line 9, "fprward" to read --forward--.

Signed and sealed this 16th day of April 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

USCOMM-DC 60376-P69