May 3, 1932. F. SIEGRIST 1,856,970

PUNCHING PRESS, PARTICULARLY FOR PATTERN CARDS AS USED IN KNITTING MACHINES AND THE LIKE

Filed Dec. 23, 1930 2 Sheets-Sheet 1

Fig. 1

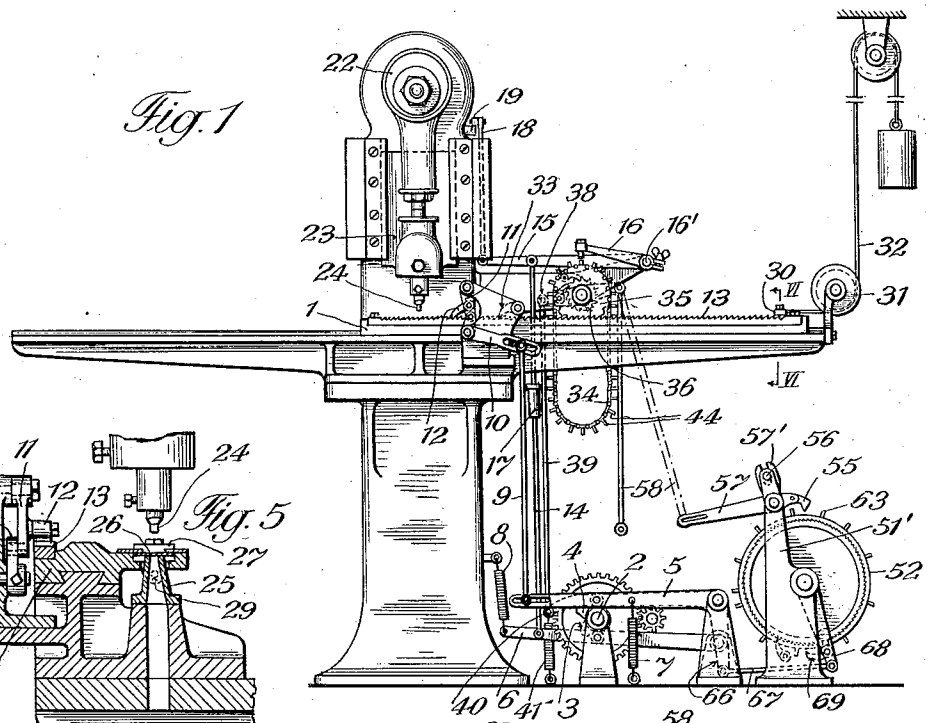


Fig. 5

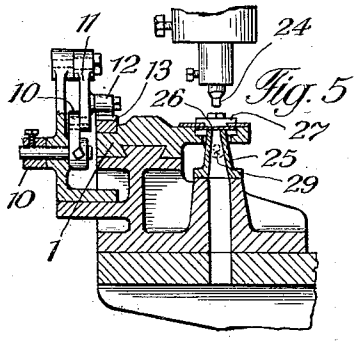


Fig. 2

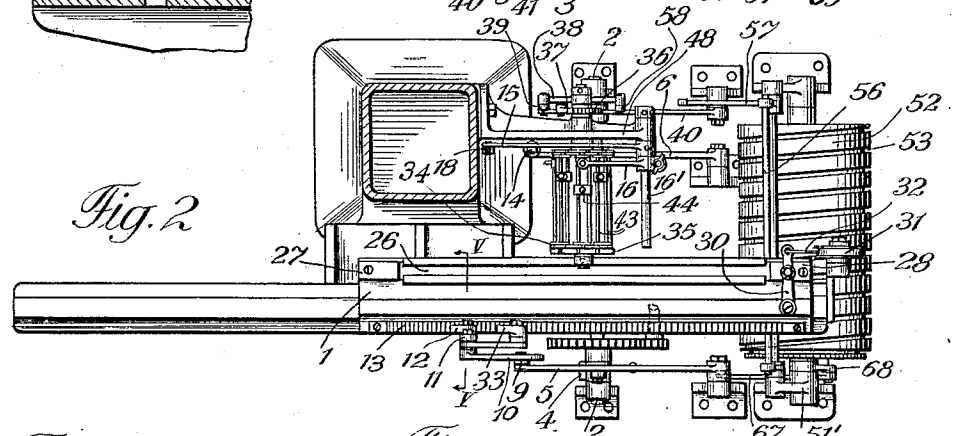


Fig. 6

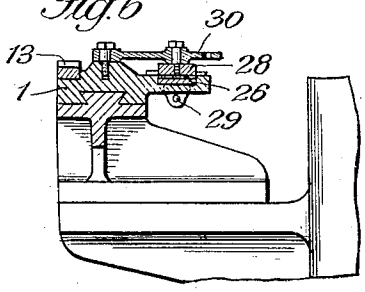
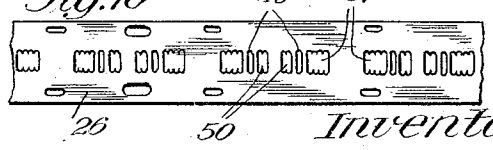


Fig. 10



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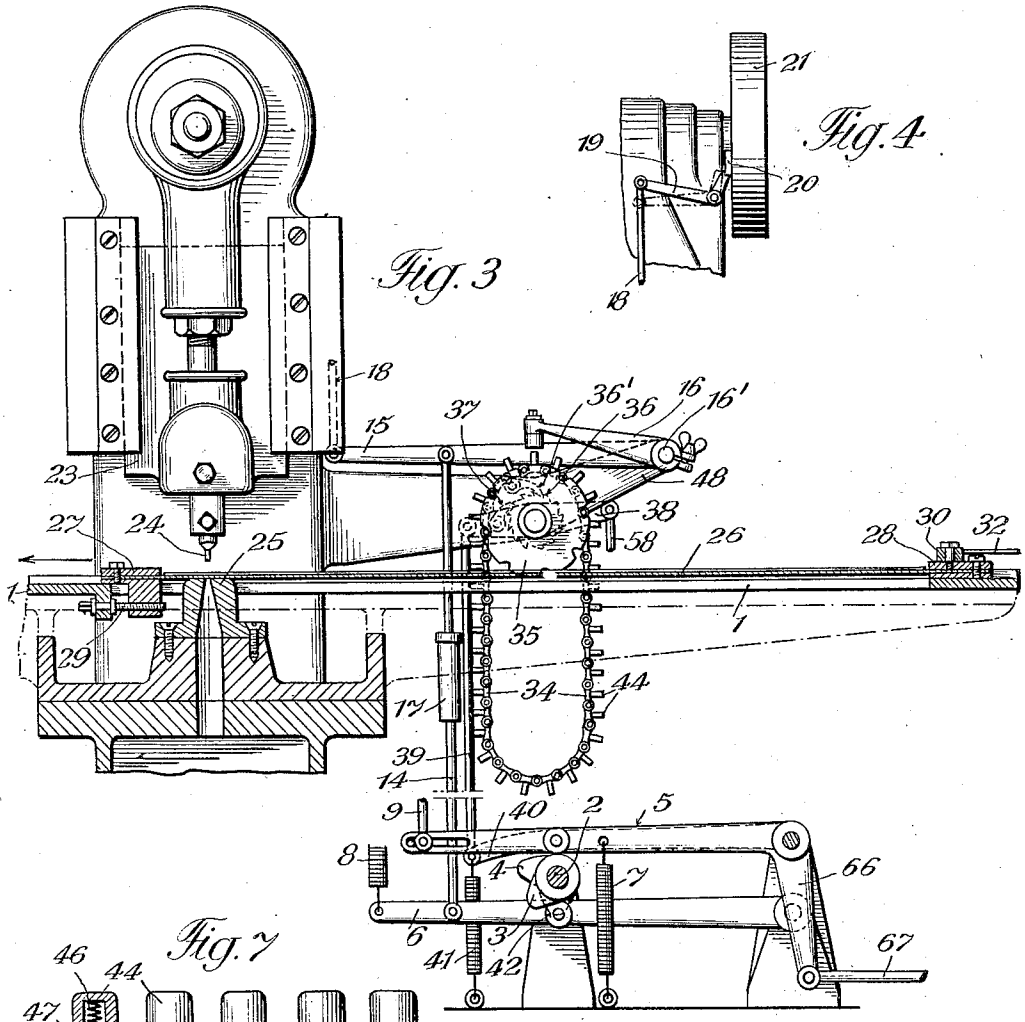

Fig. 3

Fig. 4

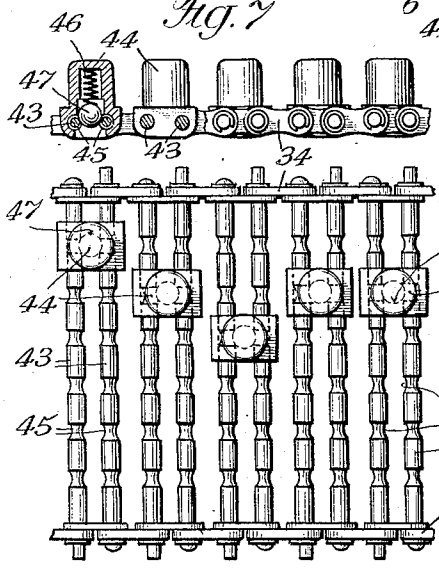

Fig. 7

Fig. 8

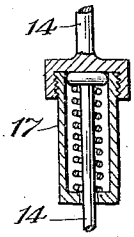

Fig. 9

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UNITED STATES PATENT OFFICE

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PUNCHING PRESS, PARTICULARLY FOR PATTERN CARDS AS USED IN KNITTING MACHINES AND THE LIKE

Application filed December 23, 1930, Serial No. 504,404, and in Switzerland January 11, 1930.

This invention relates to punching presses particularly for pattern cards as used in knitting machines and the like. The manufacture of pattern cards for controlling the knitting needles in automatic multicolor knitting machines, which cards consist of a plurality of metal bands or strips joined together has hitherto been effected on punching presses in which the release of the punching tool for producing the apertures in the metal band was executed by the operator in accordance with a correspondingly designed pattern. By such method it unavoidably happens even to experienced operators provided with pointers or other visual means that are moved over the designing board that errors of punching occur and metal bands are produced which are useless due to said errors of punching, thus involving unnecessary expense.

According to the present invention this disadvantage is eliminated in the punching press, by initiating the operation for aperturing the work piece by the punching tool, for example, in a metal band, in predetermined manner by a feeler device. By this means errorless punching work following a given pattern is obtained in an automatic manner also the punching work can be done quicker and cheaper than when, as heretofore, the apertures to be punched are selected by the operator. With the aid of my punching press the manufacturer of knitted goods may, for instance, make the pattern cards for automatic multicolor machines himself, so that he does not any longer run the risk of unauthorized copying of his patterns by independent pattern makers by whom the pattern cards were furnished on his order.

The annexed drawings illustrate two examples of construction of the invention, only the parts that are necessary for a proper understanding of the invention being shown.

Fig. 1 shows a sectional elevation of the first example and the second example respectively;

Fig. 2 is a sectional plan view of Fig. 1;

Fig. 3 is a vertical part-section of Fig. 1, on a larger scale;

Fig. 4 is a detail view;

Fig. 5 is a part-section on line V—V of Fig. 2 showing a detail;

Fig. 6 is a part-section on the line VI—VI in Fig. 1,

Fig. 7 shows in elevation a part of the corresponding patterning device on a larger scale;

Fig. 8 is a top plan view of Fig. 7;

Fig. 9 is a section through a detail;

Fig. 10 shows a part of a punched band.

Referring to the drawings, the punching press comprises a table 1 which during the operation of the machine is, in the known manner, automatically moved step by step in the direction of the arrows, shown in Fig. 3. This feed movement of the table 1 is initiated by a motor (not shown) which drives a shaft 2. The shaft 2 is provided with cams 3, 4 which cooperate with rollers on swingably mounted control levers 5, 6 to rock the latter periodically against the action of tension springs 7, 8.

The control lever 5 is connected at its outer end by a connecting rod 9 with a bell crank lever 10, rotatably mounted in the machine frame (Fig. 5) and coupled with a lever 11 also mounted in the machine frame and carrying a feed pawl 12. During each upward movement of the control lever 5 the feed pawl 12 causes the table 1 to advance by a step, the pawl 12 cooperating with a toothed rack 13 arranged on the table 1. The rack 13 is detachably secured to the table 1 to permit of being exchanged when desired against a rack of a different tooth pitch. Thereby, the length of the feed step of the table 1 is adjustable corresponding to the division of the needles of the knitting machine concerned, the connecting rod 9 for this purpose being adjustable in slots in the levers 5 and 10.

The control lever 6 by means of a connecting rod 14 is connected to a lever 15 which transmits its movement to a feeler arm 16. The connecting rod 14 is made in two parts, the parts being coupled in known manner within a box 17 by means of a coil spring, (see Fig. 9), suchwise, that the said spring during the downward movement of the connecting rod 14 is compressed when the feeler arm 16 meets with an obstacle, thus prevent-

ing the connecting lever 15 from performing its full throw. The connecting lever 15 by means of a link 18 is connected to a detent 19, pivoted to the machine frame, which cooperates with a rotatable arm 20 (Fig. 4). When the detent 19 enters on the circular path of the arm 20 it checks the rotational movement of the same (Fig. 4). Thereby in a known manner a pulley 21 driven by the motor is caused to keep on moving ineffectively, i. e. without entraining a coupling combined therewith in a common assembly. Consequently, the drive of a shaft end 22 (Fig. 1) eccentrically arranged with respect to the axle of the pulley 21 is discontinued, so that the slide 23 to which the punching tool 24 is fixed comes to rest i. e. remains at standstill in its raised position. When, however, the detent 19 is swung to clear the circular path of the rotatable arm 20, as shown in chain lines in Fig. 4, the said arm being coaxially arranged with the pulley 21, the coupling associated with the pulley 21 turns in unison with the arm 20 due to power being applied by means of said pulley. Thereby the slide 23 is lowered and raised for operating the punching tool 24. Opposite the tool 24 a die 25 (Fig. 5) is provided on the machine frame.

The metal band 26 to be punched is moved past the die 25 by action of the table 1. The band 26 is clamped with its ends to the table 1 by means of clamping devices 27, 28 (Fig. 2). The clamping device 27 is displaceable relatively to the table 1 by means of a screw spindle 29 (Fig. 3) which permits of precisely adjusting the band to be punched with respect to a starting position. The clamping device 28 is displaceably guided on the table 1 and connected to a lever 30 (Figs. 2, 3, 6) pivoted to the table and connected to a cable 32 passed about a guide roller 31. By the cable 32 the band 26 to be punched is stretched and at the same time a tension exerted on the table 1 in the opposite direction to its feed movement. The check pawl 33 (Fig. 1) provided on the machine frame prevents by engagement in the rack 13 an undesired rearward movement of the table 1.

In the first example (Fig. 1) the feeler arm 16 cooperates with a dismountably assembled endless patterning device 34 (Fig. 3) which is passed round a cylinder 35 rotatably mounted in the machine frame. This cylinder 35, during the operation of the machine, is moved step by step by a feed mechanism comprising wheel 36, pawl 37 and supporting lever 38; 36′ is a locking pawl. The lever 38 carrying the pawl 37 is connected by a connecting rod 39 to a control lever 40 which is periodically lifted by a cam 42 on the shaft 2 against the influence of a tension spring 41, for the purpose of imparting feed motion to the cylinder 35. The cylinder 35 positively entrains the patterning device 34 by means of studs so as to displace the cylinder at each feed step one pitch distance. The patterning device 34 comprises bars 43 (Figs. 7, 8) which by means of links are joined together to form an endless chain. The bars 43 serve for receiving control cams in the form of studs 44 for the feeler arm 16 so as to be displaceable on said bars. The cams 44 are secured in position when they are placed on two adjacent bars 43 so as to engage in recesses 45 in the bars 43 by means of a ball 47 provided inside of each stud and acted upon by a compression spring 46. In this manner the cams 44 are adapted to be adjusted into their operative positions on the bars 43. In Fig. 8 each bar 43 is shown to be provided with six recesses 45 which enables the establishment of six guideways by means of the cams 44 or the arrangement of these cams in six groups on the patterning device. The feeler arm 16 is adapted to be correspondingly adjusted on its shaft 16′ which is carried on a supporting arm 48, so as to permit of moving the feeler arm in the path of travel of the individual groups of cams 44 for cooperation with the one or other of these groups.

When subsequent to the advancement of the table 1 by one feed step, the downwardly swinging feeler arm 16 hits on one of the cams 44 of the patterning device the arm 16 moves but through a small angular displacement, which is not sufficient to cause the link 18 influenced by the connecting lever 15 to rock the detent 19 out of the path of movement of the rotatable arm 20, thus preventing the punching tool 24 from executing a full working stroke. When, however, after the next or a future feed step of the table 1 as well as of the cylinder 35 for moving the patterning device 34 the downward swinging feeler arm 16 hits no more on one of the cams 44 of the patterning device the feeler arm together with the connecting lever 15 performs a full working throw whereby the punching tool 24 apertures the band 26. Fig. 10 shows such a single aperture in the band 26 at 49. When the punching tool 24 is operative at succeeding feed steps of the table 1 correspondingly large apertures will be effected in the band 26, as shown in Fig. 10 at 50 and 51. As in the given example each feed step of the table 1 corresponds to the pitch of the needles in the knitting machine each punched aperture is correlated to a knitting needle as was provided for in advance in the patterning device 34 by the respective arrangement of the studs 44.

The adjustment of the cams 44 in the patterning device is carried out in accordance with a designed pattern. The cams in the same path of movement for the feeler arm with respect to the patterning device are appropriated to one and the same colored thread, so that, for instance, for a three color

pattern three groups of cams are required. Thus three different bands are punched in succession which jointly, after being fastened together, are adapted to be employed in connection with a knitting machine for forming the loops. The employment of an endless patterning device for controlling the punching operation enters particularly then into consideration when smaller designs are involved which are repeated over the length of the individual metal band and therefore also in the line of needles of the knitting machine several times. Such an endless patterning device may depending on requirements include a larger or smaller number of bars for receiving the control cams for the feeler arm 16 i. e. it must comprise the same number of cams as the width of the repeat of pattern of the design to be reproduced requires needles to be used.

Instead of an endless patterning device for controlling the punching operation the device as provided for the second example (Figs. 1 and 2) may be used. The same enters into consideration particularly for punching bands for changing designs, which therefore are not repeated in the entire row of loops on the knitting machine and also for very large repeated designs which, for instance, extend over more than 125 needles.

This device is provided with a cylinder 52 rotatably mounted in a frame 51′ (Figs. 1 and 2) and fed step by step by means of the motor of the machine. The cylinder 52 is formed with a helical circumferential groove 53 with four parallel rows of holes (not shown) between each set of grooves. The groove 53 of the cylinder 52 is engaged by an arm of a slide which is displaceably guided in the axial direction of the said cylinder on a guide rod and which besides carries a feeler member 55 which is coupled with a bell crank lever 57 by means of a forked arm 57′ and a rockable traverse 56. The lever 57 is connected by a link 58 to the two armed lever 38 which cooperates by means of a feed pawl 37 with the ratchet wheel 36 on a cam disk cooperating with the feeler arm 16.

The feeler member 55 cooperates with control cams in the form of cams 63 arranged on the cylinder 52 in the holes thereof. The cams 63 are constructed as plugs and are provided on the ends of their shanks to be inserted with a longitudinal slot and a thickened portion. In this manner they are adapted to be secured in the holes by clamping action. The plugs 63 are arranged on the cylinder 52 following a design the said cylinder thus representing a patterning device. The four rows of holes in the cylinder 52 to which the feeler member 55 is selectively adjustable on the slide permit of forming four groups of cams which serve for controlling the punching operation for a four color row of loops corresponding to four bands. For the purpose of adapting the cylinder, for instance, for producing a three color row of loops corresponding to three bands three rows of holes are required which are consecutively numbered. The three color design is then transferred from the designed pattern to the cylinder, suchwise, that to each row of holes a color is appropriated and in this row the beginning of the respective color as well as the end thereof is so marked that in the holes plugs are inserted corresponding to the division provided in the design. This mode of construction requires only for each change of color but not for each individual intermediate division a plug to be inserted.

By means of the cylinder 52 which is periodically fed from the shaft 2 by means of a depending arm 66, link 67, crank arm 68 and pawl 69, the slide carrying the feeler member 55 is correspondingly axially shifted along this cylinder. As soon as the feeler member 55 rides on one of the cams 63 of the cylinder 52 the toothed disk is advanced by one pitch of the ratchet wheel which corresponds to half the pitch of the toothed disk. When a tooth of the disk stands opposite the feeler arm 16 this feeler arm 16 which is influenced by the connecting lever 15 is prevented from executing a full throw, so that, as previously described in conjunction with the first example, the punching tool remains ineffective. If, however, a space between two teeth on the disk opposes the feeler arm 16 this feeler arm 16 which is moved by the connecting lever 15 turns through a full angular displacement which causes the punching operation to be initiated, as described above. This working incident is only changed when the feeler arm 55 strikes anew against one of the cams 63 on the cylinder 52 whereupon the punching operation is interrupted until a further cam 63 arrives under the feeler arm 55 and so forth.

Both described modes of construction of the means for releasing and interrupting the punching operation may be incorporated in one and the same knitting machine, so as to be selectively used depending on requirements.

The parts of the second constructional example which differ from the parts of the first constructional example, as shown and described, form no part of my invention and are included merely by way of explanation because they may be used in the machine along with the invention as claimed.

Instead of a cylinder and plugs for inserting in the same a spoked rotatable body or any suitable movable cam member may be provided, for instance, in the form of a sliding track provided with plugs. It is obvious that changes in the details of the described constructions may be made without departing from the spirit of the invention. Thus, for instance, with reference to the second ex-

ample, as described, a rotatable body adapted for plugs to be inserted therein may be employed as patterning device from which by the aid of a feeler arm the punching operations were controlled without the medium of a second feeler member.

It will be seen that with the aid of the punching press according to the invention also pattern cards or the like for other usages than described may be produced.

I claim:

1. A mechanism for controlling the operation of a punch press in the making of jacquard pattern cards in which the punching operations of the press are governed by operations of a clutch in the driving connection, comprising a detent for operating the clutch, a feeler arm and means connecting the latter to said detent to move the same in accordance with movements of the feeler arm, means for imparting an oscillating movement to the feeler arm and an endless pattern chain having adjustable contact studs adapted to control the oscillations of said feeler arm.

2. A mechanism for controlling the operation of a punch press in the making of jacquard pattern cards in which the punching operations of the press are governed by operations of a clutch in the driving connection, comprising a detent for operating the clutch, a feeler arm and means connecting the latter to said detent to move the same in accordance with movements of the feeler arm, means for imparting an oscillating movement to the feeler arm and an endless pattern chain having adjustable contact studs adapted to limit the oscillations of said feeler arm.

3. A mechanism for controlling the operation of a punch press in the making of jacquard pattern cards in which the punching operations of the press are governed by operations of a cluch in the driving connection, comprising a detent for operating the clutch, a feeler arm and means connecting the latter to said detent to move the same in accordance with movements of the feeler arm, means for imparting an oscillating movement to the feeler arm and an endless pattern chain adapted to control the movements of said arm comprising a plurality of transverse guides, and a contact stud carried by said guides and adapted to be adjustably positioned along the same.

4. A mechanism for controlling the operation of a punch press in the making of jacquard pattern cards in which the punching operations of the press are governed by operations of a clutch in the driving connection, comprising a detent for operating the clutch, a feeler arm and means connecting the latter to said detent to move the same in accordance with movements of the feeler arm, means for imparting an oscillating movement to the feeler arm and an endless pattern chain adapted to control the movements of said arm comprising a plurality of transverse guides having adjusting paths extending longitudinally of the chain, and contact studs arranged on said guides and adapted to be selectively adjusted to one of said paths.

5. A mechanism for controlling the operation of a punch press in the making of jacquard pattern cards in which the punching operations of the press are governed by operations of a clutch in the driving connection, comprising a detent for operating the clutch, a feeler arm and means connecting the latter to said detent to move the same in accordance with movements of the feeler arm, means for imparting an oscillating movement to the feeler arm and an endless pattern chain adapted to control the movements of said arm comprising a plurality of transverse guides having adjusting paths extending longitudinally of the chain, contact studs arranged on said guides and adapted to be selectively adjusted to one of said paths and means for retaining said studs in the adjusted position.

6. A mechanism for controlling the operation of a punch press in the making of jacquard pattern cards in which the punching operations of the press are governed by operations of a clutch in the driving connection, comprising a detent for operating the clutch, a feeler arm and means connecting the latter to said detent to move the same in accordance with movements of the feeler arm, means for imparting an oscillating movement to the feeler arm and an endless pattern chain adapted to control the movements of said arm comprising a plurality of parallel rods, each pair of said rods defining a guide, a plurality of adjusting paths extending transversely of said rods, and a contact stud arranged on each pair of said rods and adapted to be selectively adjusted to one of said paths.

7. A mechanism for controlling the operation of a punch press in the making of jacquard pattern cards in which the punching operations of the press are governed by operations of a clutch in the driving connection, comprising a detent for operating the clutch, a feeler arm and means connecting the latter to said detent to move the same in accordance with movements of the feeler arm, means for imparting an oscillating movement to the feeler arm and an endless pattern chain adapted to control the movements of said arm comprising a plurality of parallel rods, each pair of said rods defining a guide, said rods being provided with aligned notches defining adjusting paths, a contact stud arranged on each pair of said rods and adapted to be moved along the same, and a spring actuated check member on each of said studs for engagement with said notches to hold said studs in the adjusted position.

8. A mechanism for controlling the operation of a punch press in the making of

jacquard pattern cards in which the punching operations of the press are governed by operations of a clutch in the driving connection, comprising a detent for operating the clutch, a feeler arm and means connecting the latter to said detent to move the same in accordance with movements of the feeler arm, means for imparting an oscillating movement to the feeler arm and an endless pattern chain adapted to control the movements of said arm comprising a plurality of transverse guides having adjusting paths extending longitudinally of the chain, and contact studs arranged on said guides and adapted to be selectively adjusted to one of said paths and means for adjusting said feeler arm for cooperation with the studs in a selected path.

9. In a control for a jacquard card pattern punching press, a pattern device comprising a plurality of parallel rods, said rods being provided with transverse rows of notches defining adjusting paths, a contact stud arranged on each pair of said rods and adapted to be adjusted along same, and a spring actuated check member on said studs for engagement with said notches to hold said studs in the adjusted position.

In testimony whereof I have signed my name to this specification.

FRITZ SIEGRIST.