June 16, 1953 A. H. SCHAUB 2,642,099

CARD SETTING MACHINES

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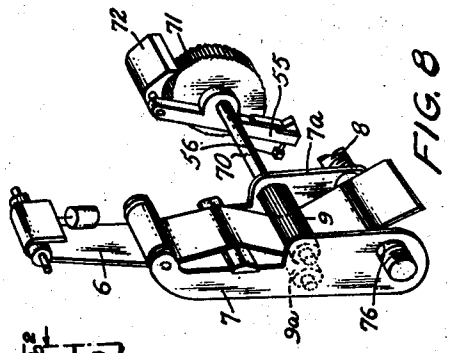

FIG. 8

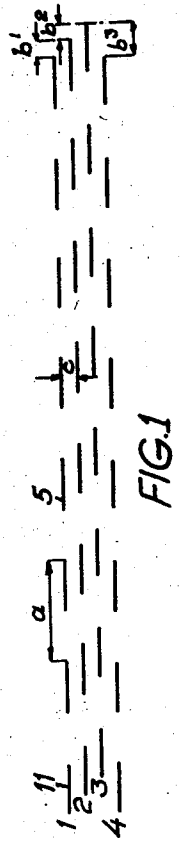

FIG. 1

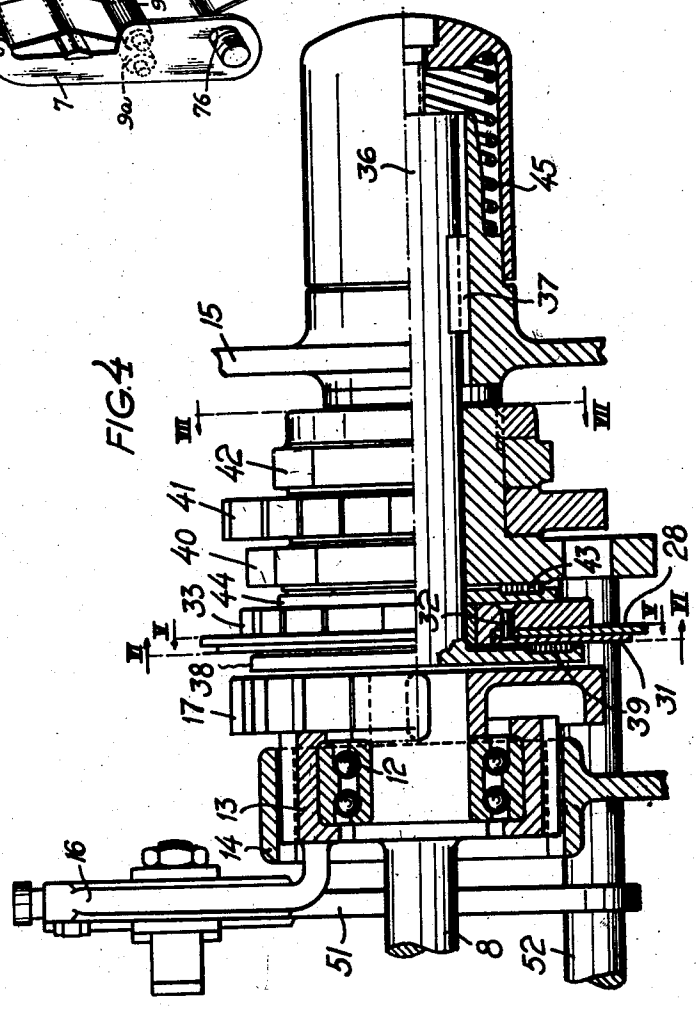

FIG. 4

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FIG.2

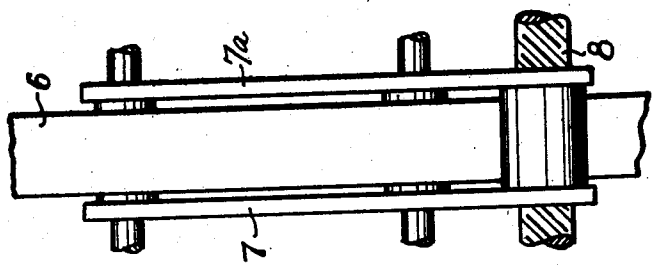


FIG.3

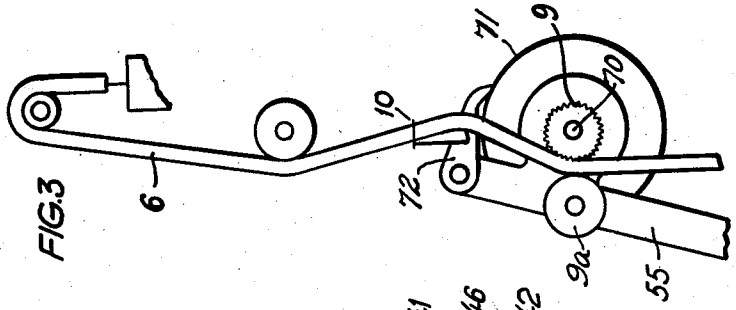


FIG.7

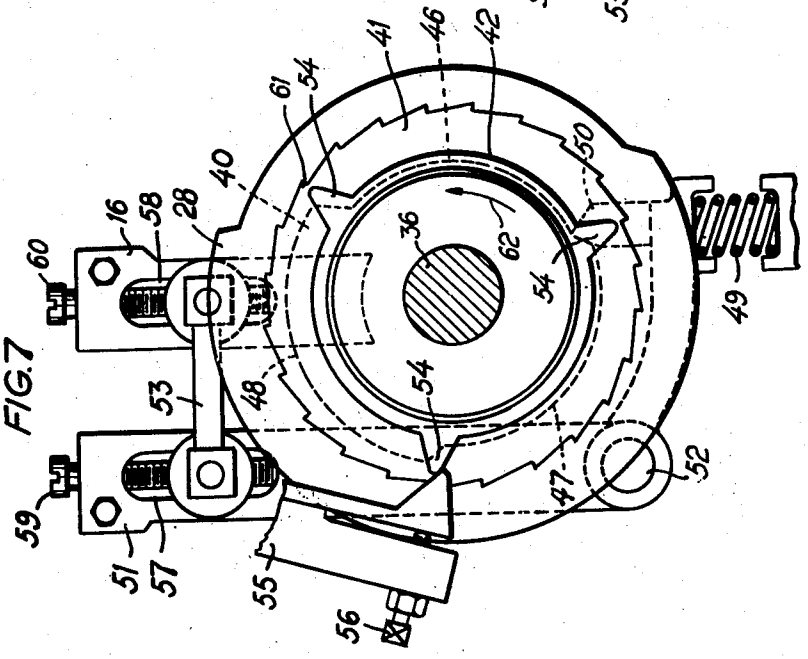


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FIG.5

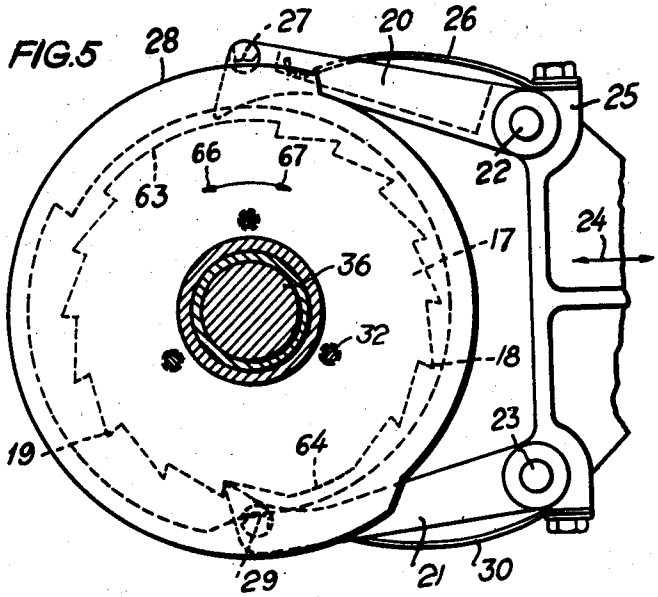
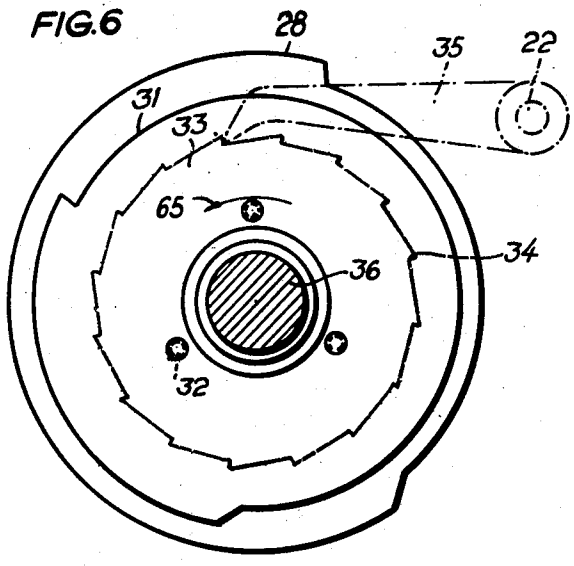



FIG.6

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# UNITED STATES PATENT OFFICE

2,642,099

## CARD SETTING MACHINE

André Heinrich Schaub, Brodalen, Sweden

Application September 23, 1948, Serial No. 50,805
In Sweden September 25, 1947

1 Claim. (Cl. 140—99)

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The invention relates to card setting machines in which the card clothing or the setting mechanism is adapted to perform an intermittent lateral movement corresponding to the pitch of staples located in a row, said movement being termed staple spacing step, a further lateral movement corresponding to the lateral displacement of adjacent staple rows, said further movement being termed the staple row displacement step, and a longitudinal movement corresponding to the distance between two adjacent staple rows. A number of devices have been constructed to effect the above named movements. The present invention has for its object to provide an improved device which, as compared with previously known constructions, is more simple and cheaper and involves a less number of movable parts, improved precision and reliability and the possibility of a considerable increase of the operating speed.

Further objects and advantages will appear from the following description of an embodiment of the invention illustrated in the annexed drawings, in which—

Fig. 1 shows part of a set type for a card clothing viewed from the rear side of the clothing; Fig. 2 shows a portion of the card clothing or foundation with appertaining guide and feed screw; Fig. 3 is a diagrammatic view of a device for feeding the foundation in its longitudinal direction; Fig. 4 shows the feeding device partly in section. Figs. 5, 6 and 7 are views taken on the lines V—V, VI—VI and VII—VII, respectively, in Fig. 4. Fig. 8 is a perspective view of parts of the invention shown in Figs. 2 and 3.

In Fig. 1, there is shown an example of a portion of a card clothing as viewed from the rear side thereof and provided with three consecutive staple rows 1, 2 and 3 arranged in a staggered relationship. The next row 4 corresponds to row 1, etc. The crowns of the staples are indicated at 5. According to the example illustrated, each staple row comprises eight staples, each staple having, in a manner known per se, points or teeth projecting from the foundation. While in Fig. 1 there is illustrated a three rib set, it should be noted that the device according to the invention is equally well suited for any other set type. During the setting operation, the foundation 6, Figs. 2, 3, and 8, is guided by means of a guide comprising two plates 7 and 7a which are movable merely laterally together with the foundation and receive the required movement from a feed member in the shape of a feed screw 8 which engages a threaded opening 6b in the guide.

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The longitudinal movement of the foundation 6 is effected by means of an indented feed roll 9 and a counter-roll 9a mounted in the guide. The shaft 10 of the feed roll 9 has mounted thereon a ratchet wheel 11 to be engaged by a pawl 12 mounted on a lever 55. Numeral 10 diagrammatically denotes the setting device by means of which the staples are inserted.

In order to obtain the set type illustrated in Fig. 1, the foundation has to perform the following movements. Firstly, an intermittent lateral movement in a manner such that each step corresponds to the pitch $a$ of the staples located in a row, said step being hereinbelow termed the staple spacing step. Starting from, for instance, the first staple 11 in the first row 1, it will be apparent that in the example illustrated there are required seven staple spacing steps for each row. Secondly, after each last staple spacing step in each row, there is required a step corresponding to the lateral displacement between two adjacent staple rows, the last named step being termed hereinbelow the staple row displacement step. In a set type of the kind illustrated, there are required two short staple row displacement steps, that is a first step $b^1$ between the first row and the second row, and a second equally long staple row displacement step $b^2$ between the second row and the third row, said two steps having the same direction, and an oppositely directed third staple row displacement step $b^3$ which is twice as long as the first named steps. Thirdly, the foundation has to be moved longitudinally a step corresponding to the distance $c$ between two adjacent staple rows. With reference to Figs. 4–7, there will now be described a device for effecting the above named movements in their proper order.

The feed screw 8 is by means of a ball bearing 12 mounted in a ring 13 which is prevented from axial movement relative to the feed screw and is threaded into a nut 14 rigidly secured to the frame 15 of the machine. The ring 13 is rigidly connected with a radially extending arm 16. At the right hand end of the feed screw, there is secured a ratchet wheel 17.

As will be seen from Fig. 5, the ratchet wheel 17 has two sets of oppositely directed teeth 18 and 19, each set comprising seven teeth corresponding to the above named seven staple spacing steps. The ratchet wheel 17 receives its required intermittent movement under the action of two pawls 20 and 21 which are mounted on pivots 22 and 23 in a member 25 reciprocable in the direction indicated by the arrow 24. The pawl 20 has a face 27 which by means of a spring

26 is maintained in abutment with a cam 28 having two arc-shaped cam faces located at different radii, Fig. 6. In a similar way, a face 29 on the pawl 21 abuts, under the action of a spring 30, against a cam 31 which likewise has two arc-shaped cam faces. By means of a rivet 32, Fig. 4, the cams 28 and 31 are rigidly connected with each other and with a ratchet wheel 33 having sixteen teeth 34. The ratchet wheel 33 is given an intermittent movement in a constant direction by means of a reciprocating pawl 35 mounted on the pivot 22. The members 28, 31 and 33 are rotatably mounted on a fixed shaft 36 which is provided in axial alignment with the feed screw 8 and rigidly secured to the frame 15 by means of a key connection 37. Between the unit 28, 31, 33 and a disc 38 secured to the shaft 36, there is inserted a braking ring 39 which serves to prevent excessive rotation of the unit 28, 31, 33 during the stepwise turning movement thereof under the action of the pawl 35.

A separate unit 40, 41, 42 is likewise rotatably mounted on the fixed shaft 36. The last named unit comprises a cam 40, a driving wheel 41 and a disc 42, said members being together rotatable about the shaft 36 and secured against excessive turning movement by means of a friction ring 43 which abuts against a fixed disc 44. The discs 38 and 44 are forced towards the left together with the shaft 36 by means of a compression spring 45.

As will be seen from Fig. 7, the cam 40 has three arc-shaped cam faces 46, 47, 48 each extending over about 120° and located at different radii. The differences between the radii of the cam faces are proportional to the lengths of the staple row displacement steps $b^1$, $b^2$ and $b^3$, respectively, Fig. 1. Consequently, the difference between the radii of the cam faces 48 and 46 is twice the difference between the radii of the cam faces 46 and 47 or 47 and 48. A bell-crank lever 51 pivotally mounted on a shaft 52 and having a projecting part 50 is held in abutment with the cam 40 by means of a spring 49. A link 53 is pivotally connected at one end to the lever 51 and pivotally connected at its opposite end with the arm 16. Turning movement of the lever in either direction will consequently result in a turning movement of the ring 13 in the nut 14 and will thus cause an axial movement of the feed screw 8, guides 7, 7a and foundation 6 in a corresponding direction, the length of this axial movement or staple row displacement step being proportional to the difference of the radii of the corresponding cam faces 46, 47 or 48.

The disc 42 has three equal radial projections 54 in accordance with the three different staple rows of the set type shown in Fig. 1. The projections 54 are equally interspaced around the periphery of the disc and act upon the lever 55 which by means of the pawl 72 actuates the feed roll 9, Figs. 3 and 8, for feeding the foundation in the longitudinal direction thereof. The angular movement of the lever and, consequently, the length of the feeding movement can be adjusted by means of a control screw 56. Also the length of the staple row displacement step is controllable. To this end, the ends of the link 53 are displaceable inwardly or outwardly along slots 57 and 58 by means of screws 59 and 60, respectively, so as to increase or decrease the angle of rotation of the arm 16.

The driving wheel 41 has twenty-four teeth. By means of a pawl not shown, the driving wheel can be intermittently rotated in the direction of the arrow 62 in a similar manner as the ratchet wheel 33.

The mode of operation of the feeding device described is as follows.

It will be clearly apparent from Figs. 5 and 6 that due to the engagement between the pawls 20, 21 and the cams 28 and 31, respectively, one of the pawls only can at a time engage the ratchet wheel 17, and that one of the pawls will turn the ratchet wheel in a certain direction, while the other pawl will turn the ratchet wheel in the opposite direction. As a consequence thereof, the foundation will, for instance during the setting of the staple row 1, be moved from the right to the left. During the setting of the next staple row 2, the foundation will be moved from the left to the right, etc. The two groups of teeth 18 and 19 on the ratchet wheel 17 are separated from each other by interrupted or non-toothed portions 63 and 64 which result in that the ratchet wheel after seven consecutive turning movements corresponding to the seven staple spacing steps will not be actuated by its pawls, while the ratchet wheel 33 will continue to make one turning step, whereupon the ratchet wheel 17 will be turned seven steps in the opposite direction. Then, the wheel 17 will again come to a rest, while the wheel 33 makes a turning step, and so on.

During the above named rest, the members illustrated in Fig. 7 are put into operation for effecting the staple row displacement step as well as the longitudinal step of the foundation. It will be obvious that three staple rows will be set during one full revolution of the driving wheel 41. During the same time, the ratchet wheel 33, Fig. 6, has been turned one and a half revolutions in the direction of the arrow 65, while the ratchet wheel 17 at the same time has performed three intermittent turning movements alternatingly in the direction of the arrows 66 and 67 and has been at a rest between said intermittent movements. As a result thereof, one staple row displacement step and a simultaneous longitudinal step of the foundation will follow after seven staple spacing steps. Thereupon, seven staple spacing steps will follow in the opposite direction, and thereupon one staple row displacement step and a simultaneous longitudinal step, and so on.

As to the cooperation between the part 50 and the cam 46 it will be seen from Fig. 7 that the part 50 as it passes between cam faces having a small difference of radius, that is, as it passes from cam face 46 to cam face 47 or from 47 to 48, will be moved radially outwardly, while on its passage between faces having a larger radial distance, that is from the cam face 46, the part 50 is moved radially inwardly towards the center of the cam 40. In the reverse case, the movement from the innermost to the outermost cam face would obviously be rendered more difficult.

What I claim is:

In a card setting machine of the class described including a holder in which the card clothing is intermittently movable, so as to provide staple spacing steps, a feed screw threadedly connected to said holder, a ratchet wheel secured to said feed screw, two sets of oppositely directed teeth on said ratchet wheel, said sets being separated by interrupted portions, two reciprocating pawls for the two sets of teeth of said ratchet wheel for effecting said staple spacing steps, two cams constructed and arranged to move said pawls alter-

natingly out of engagement with the appertaining set of teeth, a fixed shaft in axial alignment with said feed screw, said two cams being rotatably mounted on said shaft, means for rotating said cams half a revolution during the time between the first step of said ratchet wheel in one direction and the first step thereof in the opposite direction, means for performing staple row displacement steps, said means comprising a third cam having a plurality of arc-shaped cam faces, said third cam being mounted for rotation on said fixed shaft, a lever constructed and arranged to be actuated by said third cam, means for transferring the movements of said lever into axial movements of said feed screw for performing the staple row displacement steps, a feed roll for moving the card clothing longitudinally thereof, a second lever constructed and arranged to impart intermittent rotation of said feed roll, a disc mounted on said shaft and connected with said third cam, said disc having radial projections adapted to act upon said second lever, the number of said projections being equal to the



number of cam faces on said third cam, and means adapted during each half revolution of said two cams to rotate said third cam and said disc through an angle of 360° divided by the number of differently offset staple rows to be set in the card clothing.

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