May 22, 1928. 1,670,791

E. WILDT ET AL

KNITTING MACHINE

Filed March 4, 1927 3 Sheets-Sheet 1

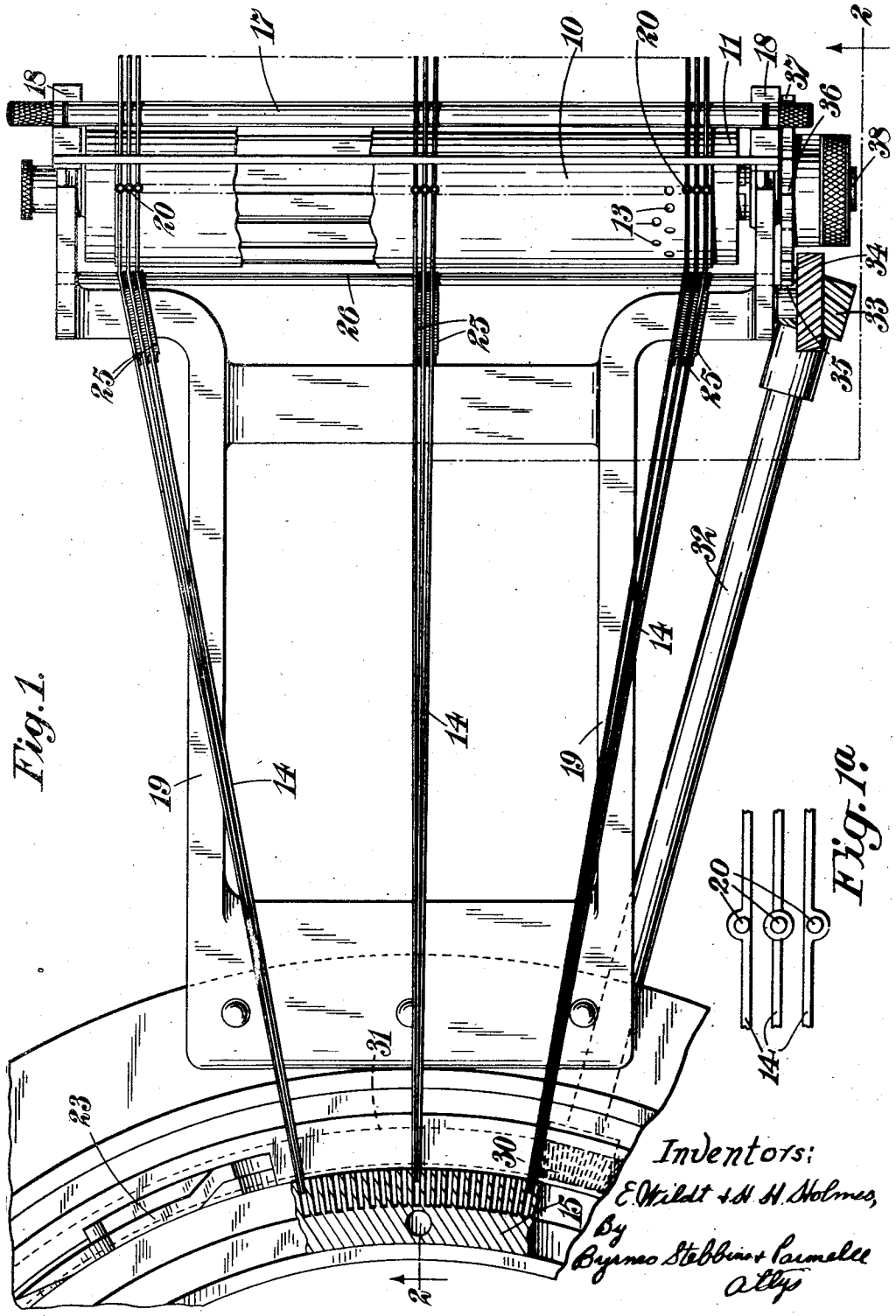


Fig. 1.

Fig. 1a.

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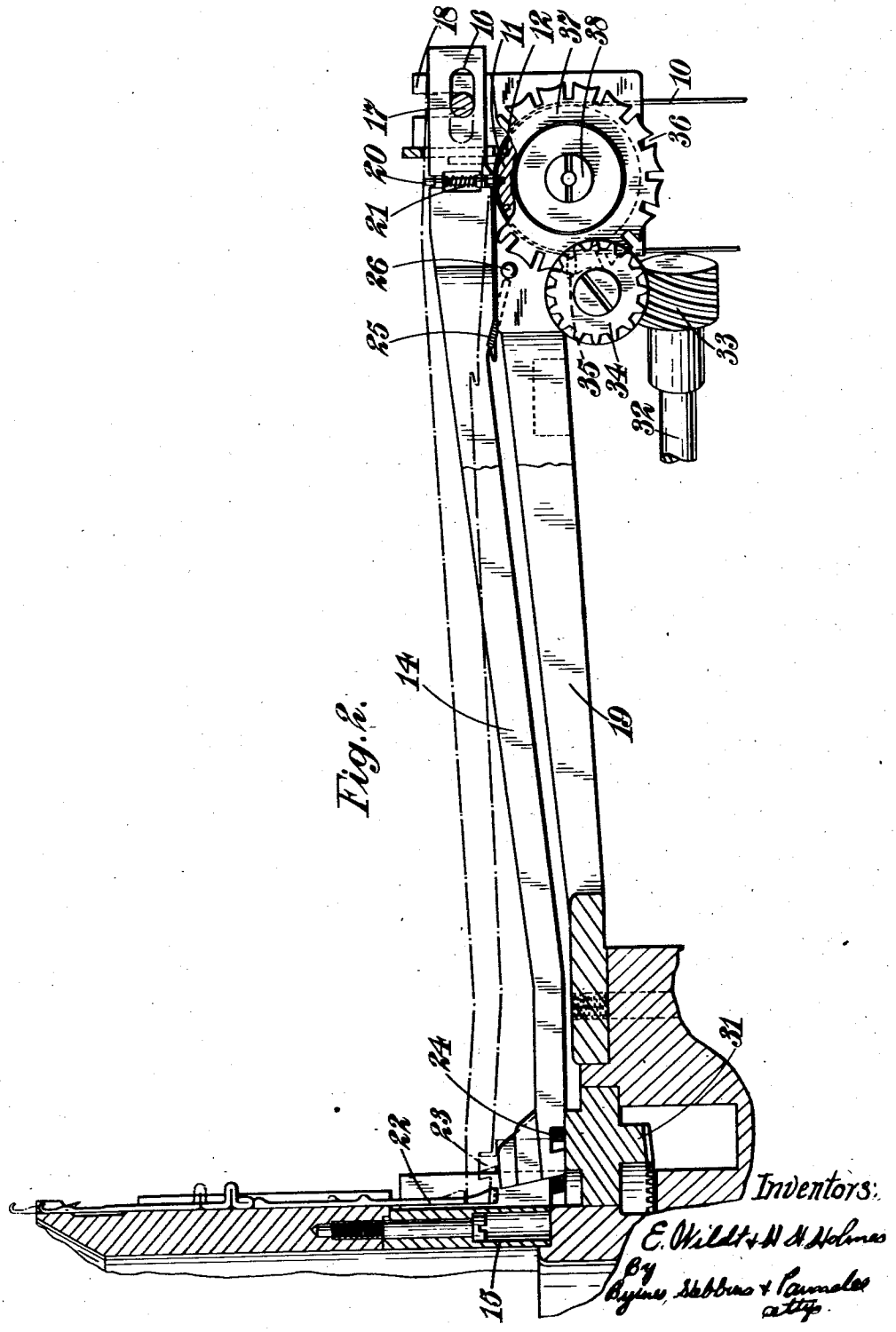


Fig. 2.

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Fig.3

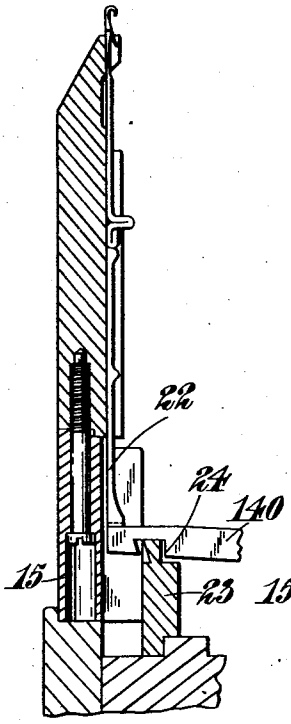


Fig.4.

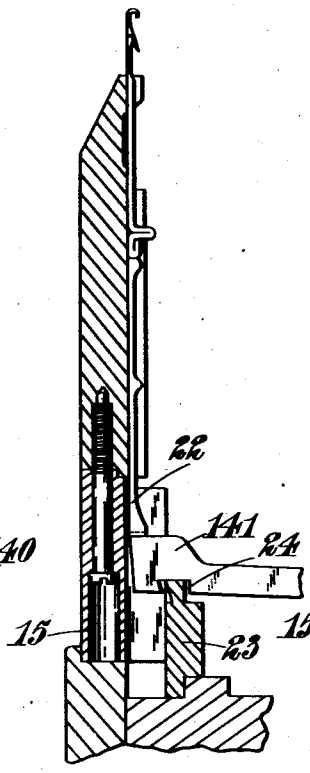


Fig.5.

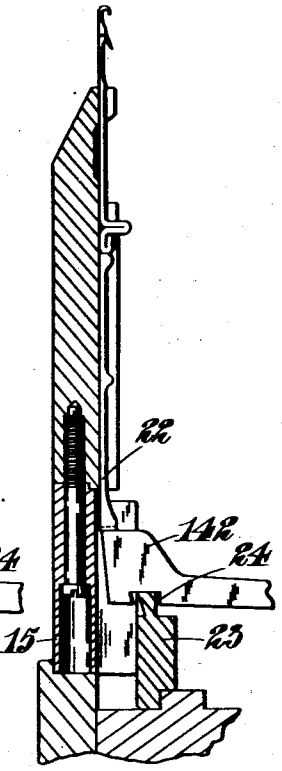


Fig.6.

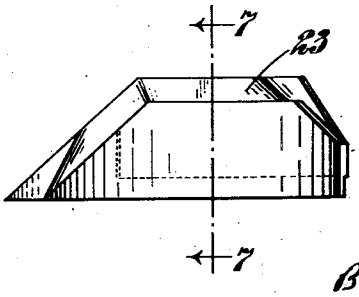
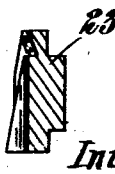


Fig.7.



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UNITED STATES PATENT OFFICE.

EDWIN WILDT AND HENRY HAROLD HOLMES, OF LEICESTER, ENGLAND, ASSIGNORS TO WILDT & COMPANY LIMITED, OF LEICESTER, ENGLAND, A BRITISH COMPANY.

KNITTING MACHINE.

Application filed March 4, 1927, Serial No. 172,873, and in Great Britain March 8, 1926.

This invention consists in improvements in or relating to knitting machines and while it has particular application to circular knitting machines it is not limited thereto.

The type of machine to which the present invention is applied is that in which a pattern-control mechanism comprises selector devices, the operation of which is controlled by perforations in a pattern- or Jacquard-card or equivalent device. In such pattern mechanisms a selector generally becomes operative when a perforation, appropriate to that selector, registered with a part of it or a part of another member co-operating with it.

In our prior British specification No. 237,961 of 1924, accepted August 4, 1925, we have described one such pattern mechanism in which, for each needle, there is a sliding selector device controlled by a card perforation in such a manner that a part of the device is moved to different positions in relation to the needle or needle-jack, according to the nature of the perforation controlling it, and the needle is, by the aid of the selector device, raised to one or other of two or more different heights. Other pattern mechanisms of this general character are also known in which a selector is actuated with the aid of a perforation in the pattern-card so that it either assists in raising the needle to one particular height or else it remains entirely inoperative. In this latter case the selectors only serve to control the movement of the needles to one height.

An object of the invention is to improve such pattern mechanisms so that while they will enable a selective control to be applied to the needle from the pattern card to cause each needle to make stitches of two or more different characters, each selector will only be required to make a movement of one definite extent and not of a varying length as in our own prior British specification above referred to.

According to the present invention, for each needle there are two or more selectors each independent of one another and operative to cause the needle to make a stitch that differs in character from that made under the control of the other or others of them.

In one form of the invention each selector, for an individual needle, comprises a part which cooperates with a single lifting cam of fixed height and which comprises an operative connection between the said cam and the needle or needle-jack, the operative connection afforded by one selector serving, with the aid of the lifting cam, to raise the needle to a different height from that to which it will be raised with the aid of the other selector or each of the other selectors.

It is preferred to make each selector in the form of a slider, for example a slider that is disposed radially with respect to a needle cylinder. The inner end of the slider, when it is operative, will be interposed between the lifting cam and a part of the needle or jack; and the interposed end of each slider will be different in its effective height (measured in the direction of lifting) from that of the other slider or of each of them. By means of the present invention it is possible to control all the selectors directly from the pattern card without the aid of interposed devices.

In order that the invention may be more clearly understood, one preferred example will now be described with the aid of the accompanying drawings, in which:—

Figure 1 is a plan of those portions of the knitting machine and patterning mechanism sufficient for the understanding of the invention;

Figure 1ª is a detail view;

Figure 2 is a section on the line 2—2 of Figure 1;

Figures 3, 4 and 5 illustrate respectively the positions to which needles will be raised by the several selectors of each set;

Figure 6 shows in elevation a cam employed for raising the selectors; and

Figure 7 is a section on the line 7—7 of Figure 6.

Like reference numerals indicate like parts in all figures of the drawings.

For the complete cylinder of needles there will be a plurality of groups or selectors, one group of which is shown in Figure 1; and for each group there will be a separate pattern card or its equivalent which, in the present instance, is in the form of an endless band of paper or other flexible material. The pattern card 10 passes over and is car-

ried by a roller 11 which latter is formed with longitudinal grooves 12 adapted to register with each row of perforations such as 13 in the pattern card when that particular row of perforations is in operative relation to the selectors.

Carried above the pattern cord 10 and the roller 11 is a plurality of selectors 14 which are movable endwise towards and away from the needle cylinder 15. The selectors, as shown clearly in Figures 1 and 2 are formed of strip material and are mounted at their outer ends by means of slots 16 through which is threaded a rod 17 mounted in end bearings 18 of a frame 19 which is secured to the base of the knitting machine. There will be one frame such as 19 for each group of selectors. Mounted in each selector is a pin 20 which is slidable endwise in a direction radially of the roller 11 and is normally pressed towards the roller by means of a light spring 21. At their inner ends, that is to say, the ends that are adjacent the needle cylinder, the selectors enter the needle tricks as shown in Figures 1 and 2. In the particular example illustrated there is a set comprising three selectors for each needle and the ends of the selectors of each set all extend into the appropriate needle trick.

Thus it will be seen that endwise movement of the individual selectors is produced when the pin 20 of the selector passes through a perforation such as 13 in the pattern card and into a groove 12 in the roller 11. The rotation of the roller, after the pin has entered the groove, will be sufficient to enable the trailing wall of the groove to push forward those selectors whose pins have entered the groove. The roller 11 is rotated intermittently and is so timed that the movement of the selectors takes place immediately before the lifting cam, to be described more fully hereinafter, engages the selectors and lifts them. The selectors may be guided in their movement by means of combs which may be mounted on the frame 19 if desired, but no such combs are illustrated in the accompanying drawings, as it is thought unnecessary to describe such parts in detail. They may be employed wherever it is found convenient or necessary to guide the selectors.

The selectors of each set are so formed at their inner ends that each will be operative to raise the needle to a different height from that to which it will be raised by the others. This is shown in Figures 3, 4 and 5. In Figure 3 the end of a selector, which is indicated by the numeral 140, has a relatively small depth interposed between a needle jack 22 and the lifting cam 23. In Figure 4 the extremity of the selector 141, which is the second selector of the set, has its ends so formed as to interpose a greater depth between the needle jack 22 and the cam 23 than has the selector 140. Similarly the end of the selector 142 in Figure 5 has a greater depth than either of the selectors 140 141 to be interposed between the needle jack and the cam.

The cam 23 is shown in Figure 1 as having passed beyond all the selectors of the group illustrated in that figure. It will be seen that each selector is formed on its under side with an undercut groove 24 which, when the selector has been pushed forwardly towards the needle cylinder under the action of the pattern card and pattern roller, will be entered by the leading edge of the cam 23 as the latter is brought beneath the selector. The upper edge of the cam 23 is shaped to correspond with the undercut walls of the grooves in the selectors. By this means those selectors which have been pushed forwardly are retained positively by the cam against accidental or other backward movement until the action of the cam is no longer required. Normally each selector is returned by means of a tension spring 25 (Figures 1 and 2) each spring 25 being anchored at one end to the selector and at the other end to a rod 26 mounted in the frame 19. If it were not for the engagement of the cam 23 in the groove 24 the spring 25 would, as soon as the selector had been raised sufficiently by the cam to free its pin 20 from the perforation of the pattern card, draw the selector out from beneath the needle jack. This is prevented, however, so long as the cam is engaged in the groove 24 and by this means the positive and unfailing action of the selector is assured.

In Figure 2 one of the selectors 14, which is that corresponding with the selector 140 in Figure 3, is shown in full lines in its normal position of rest before it is moved forwardly by the pattern card and pattern roller. In chain lines it is shown as having been pushed forward into its operative position to be engaged by the cam 23 and to raise the needle jack. All those selectors which are not pushed forward by the pattern roller will, as can be seen from Figure 2, be raised by the cam 23 without moving the needle jack as their inner ends are normally clear of the jack and will not engage it. Thus, those selectors which are not pushed forward by the roller will be raised idly each time the cam 23 passes beneath them and only those that have been pushed forward will serve to raise their appropriate needles.

Selectors such as 140 may, for instance, be of such dimensions that they serve to raise the needles to a tucking height. Selectors such as 141 can serve to raise the needles to a full knitting or clearing height and selectors 142 can serve to raise the needles to a greater height still so that they will take in a high splicing or plating thread.

It will be appreciated that the cam 23 is of fixed height and the variation in the height to which the needles are raised will be obtained by means of the different depths of the selector ends which are interposed between the needle jacks 22 and the cam 23.

In the example illustrated in Figure 1 the pins 20 are shown as being so disposed as to lie in the middle planes of the selectors. If preferred, and in order to increase the distance between adjacent holes in the pattern card, the pins 20 may be arranged in the selectors 14 as shown in Figure 1ª, in which the pin of the middle one of the three selectors in each set is positioned in the middle plane of the selector while those pins 20 in the selectors at each side of the middle one will be disposed so that their axes are offset from the middle planes of these selectors to the sides thereof which are remote from the middle selector. By this means the spacing of the holes in the pattern card will be farther apart in the direction of the axial length of the roller 11, and thus the strengh of the card will be increased.

It will be understood that the foregoing description has been given as one example only of the invention and it will be appreciated that with the necessary modifications in detail the invention can be applied not only to circular knitting machines but also to flat frame machines. Furthermore although in the particular example described the needle cylinder is intended to be stationary and the cam box is intended to revolve round the axis of the cylinder while the frames 19 are held stationary, it is within the invention to employ a stationary cam box and a revolving needle cylinder. In this case the frames 19 and the parts carried by them will be rotated in company with the needle cylinder.

In the case of a stationary needle cylinder machine as illustrated the drive for the roller 11 can be conveniently that shown in Figures 1 and 2 wherein a bevelled pinion 30 meshes with a ring or gear teeth 31 formed on a part that rotates with the cam box. The pinion 30 is fast on a spindle 32 at the other end of which is a skew-tooth gear-member 33 engaging with a complementary gear 34 which is rotatably mounted in the frame 19. Projecting from the gear member 34 is a pin 35 which is adapted to enter slots 36 formed radially of member 37 which is fixed to and rotates with the spindle 38 of the roller 11. The ratio of the gearing is so chosen that for each revolution of the cam box the roller 11 will be racked round an angular distance corresponding to that between two adjacent slots 12.

Although in the particular example described each set comprises three selectors appropriated to each needle the invention is not limited to this particular number as there may be less or more according to requirements.

We claim:—

1. For a knitting machine having a plurality of needles, pattern mechanism comprising in combination a plurality of selector devices allocated to and operatively connected with each needle, the selectors for one needle being other than those for each of the other needles. and pattern control means capable of independently actuating each selector device and serving to select which of said devices are to be actuated, the plurality of selector devices for each needle being such that needle movements having different characteristics are produced respectively by each selector device in that plurality.

2. For a knitting machine having a plurality of needles, pattern mechanism associated with each needle and comprising in combination a plurality of selector devices, the selector device for one needle being other than those for each of the other needles, pattern control means for independently operating each selector device and for selecting which of said devices is to be operated, and needle actuating means operating in conjunction with the selector devices to move the needle, the co-operation between the needle actuating means and the plurality of selector devices being such that needle movements having different characteristics are produced respectively by each selector device in that plurality thereof.

3. For a knitting machine having a plurality of needles, pattern mechanism comprising in combination a needle lifting cam, a plurality of selector devices associated with each needle, the selector devices for one needle being other than those of each of the other needles. each of said selector devices having a distance part that can be interposed between said lifting cam and the needle and operating in conjunction with the lifting cam to move the needle and pattern control means for independently operating each selector device and for selecting which of said devices is to be operated, said distance part of one selector device being different in form from the distance part of another selector device of the plurality thereof whereby different needle movements are produced respectively by each selector device in that plurality thereof.

4. For a knitting machine having a plurality of needles, pattern mechanism comprising in combination a needle lifting cam, a set of selector devices associated with each needle, said selector devices being mounted for sliding adjustment towards and away from the needle and each selector device having a distance part that can be interposed between the said lifting cam and the needle

by adjustment of the selector device and operates in conjunction with the lifting cam to move the needle and pattern control means for independently adjusting each selector device and for selecting which of said devices is to be operated, the said distance parts of the several selector devices of the set thereof being different from one another in form whereby different needle movements are produced respectively by each selector device of a set thereof.

5. For a knitting machine having a plurality of needles, pattern mechanism comprising in combination a needle lifting cam, a set of selector devices associated with each needle, said selector devices being mounted for sliding adjustment towards and away from the needle and each selector device having a distance part that can be interposed between the said lifting cam and the needle by adjustment of the selector device and operates in conjunction with the lifting cam to move the needle, resiliently controlled sliding pins carried by said selector devices and pattern control means having a movable perforated member into the perforations of which the sliding pins can engage for the independent adjustment of the selector devices by the movable perforated member, the said distance parts of the several selector devices of the set thereof being different from one another in form whereby different needle movements are produced respectively by each selector device of a set thereof.

6. For a knitting machine having a plurality of needles, pattern mechanism comprising in combination a needle lifting cam, a set of selector devices associated with each needle, said selector devices being mounted for sliding adjustment towards and away from the needle and each selector device having a groove which is entered by the lifting cam and a distance part that can be interposed between the said lifting cam and the needle by adjustment of the selector device and operates in conjunction with the lifting cam to move the needle and pattern control means comprising a pattern card directly operative upon the selector devices for independently adjusting each selector device, the said distance parts of the several selector devices of the set thereof being different from one another in form whereby different needle movements are produced respectively by each selector device of a set thereof.

7. For a knitting machine having a plurality of needles, pattern mechanism comprising in combination a needle lifting cam, a set of selector devices, associated with each needle, said selector devices each comprising a slider of strip material mounted for lengthwise sliding adjustment towards and away from the needle and each slider having at one end, a groove which is entered by the lifting cam and a distance part that can be interposed between said lifting cam and the needle, said distance parts of the several sliders in the set of selector devices being of different form one from another so that different needle movements are produced respectively by the sliders of a set thereof, a resiliently controlled pin carried by the other end of each slider and pattern control means having a movable perforated member into the perforations of which the said pins can engage for independently adjusting the sliders.

In testimony whereof we have signed our names to this specification.

EDWIN WILDT.
HENRY HAROLD HOLMES.