

March 19, 1935.

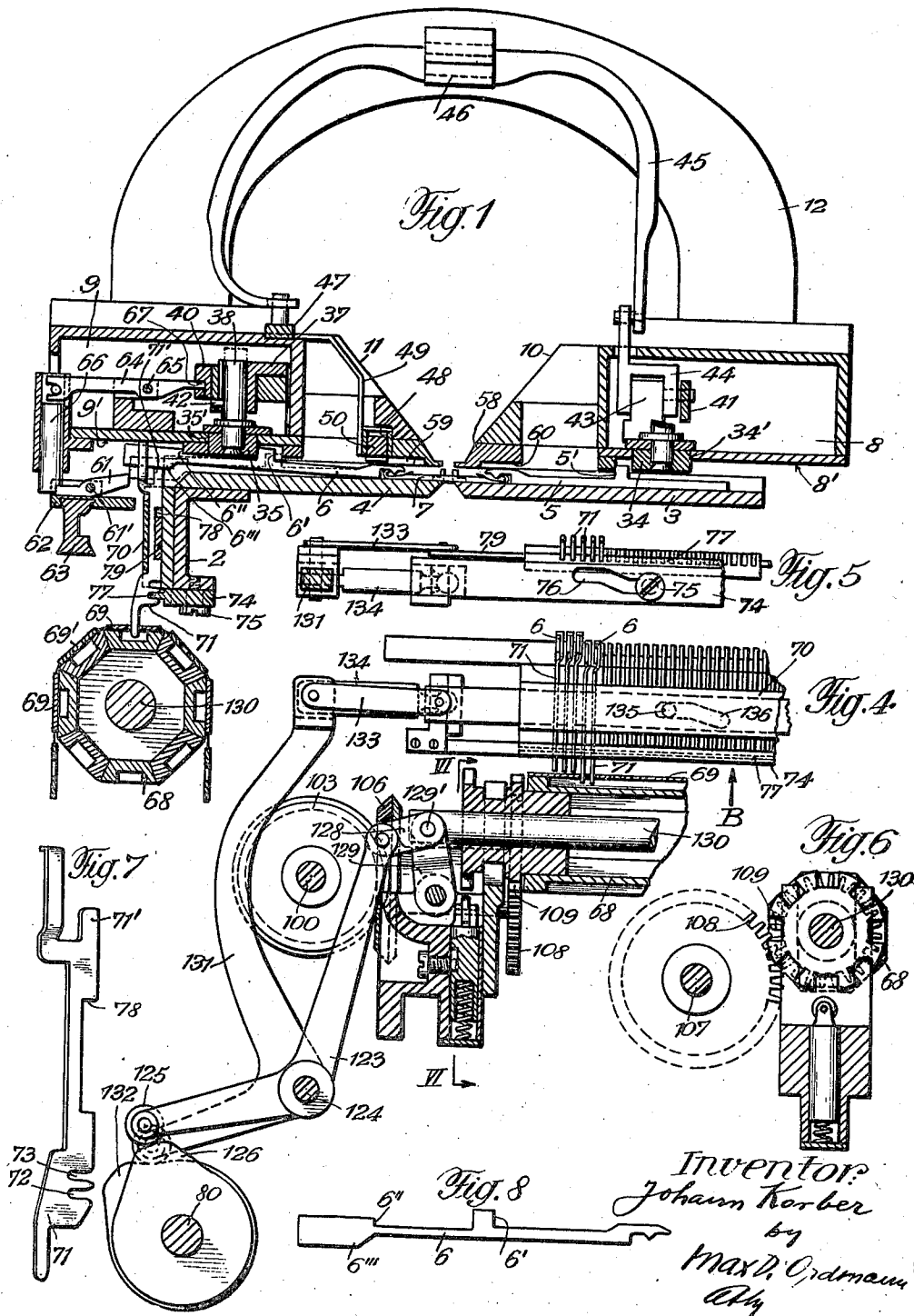
J. KORBER

1,994,653

JACQUARD MECHANISM CONTROLLED KNITTING MACHINE

Filed Feb. 9, 1933

6 Sheets-Sheet 1



March 19, 1935.

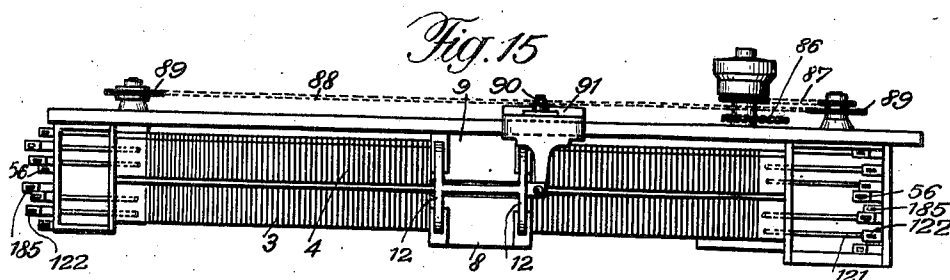
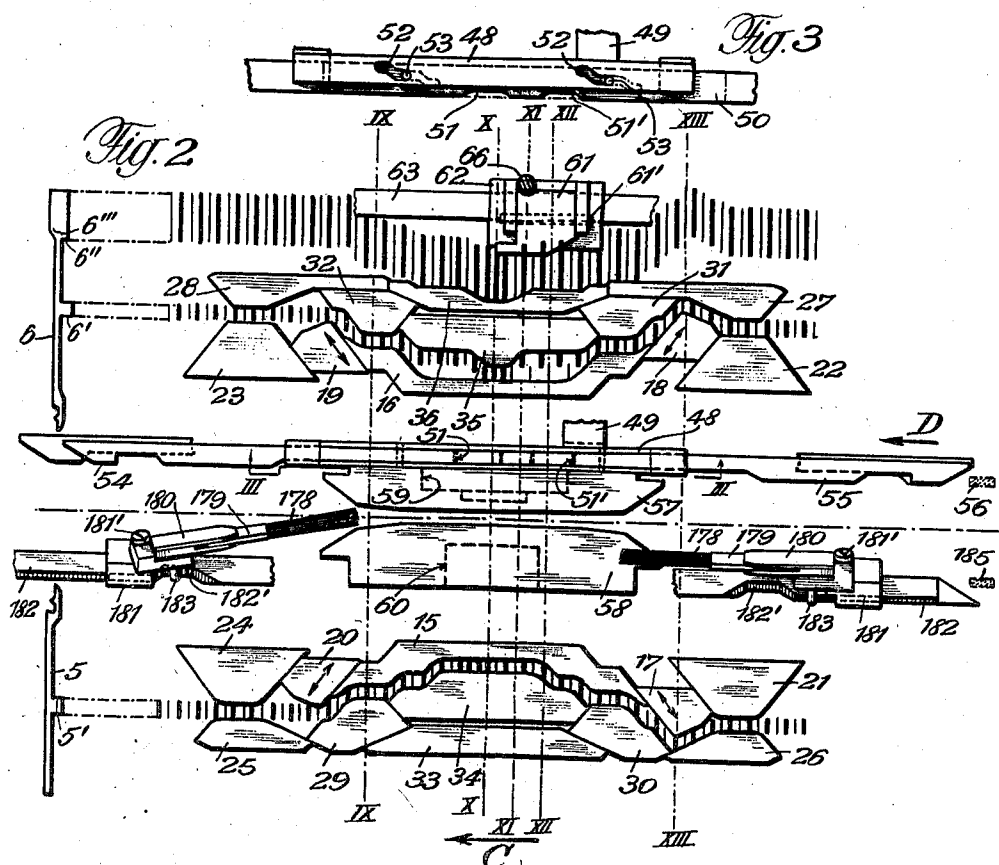
J. KORBER

1,994,653

JACQUARD MECHANISM CONTROLLED KNITTING MACHINE

Filed Feb. 9, 1933

6 Sheets-Sheet 2



Inventor:
Johann Kober
by
Max V. Dudeney
att'y

March 19, 1935.

J. KORBER

1,994,653

JACQUARD MECHANISM CONTROLLED KNITTING MACHINE

Filed Feb. 9, 1933

6 Sheets-Sheet 3

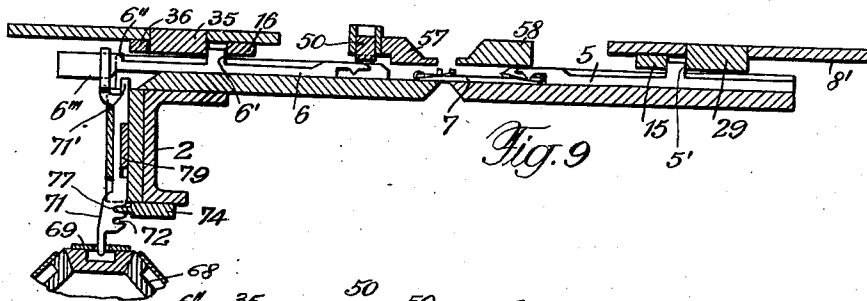


Fig. 9

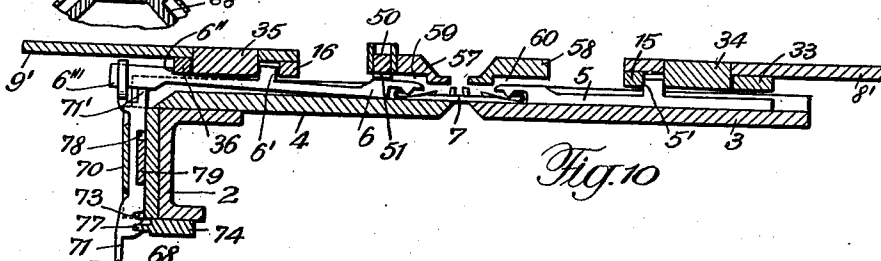


Fig. 10

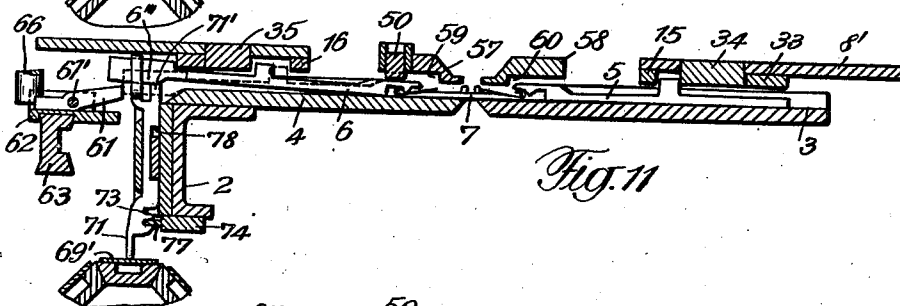


Fig. 11

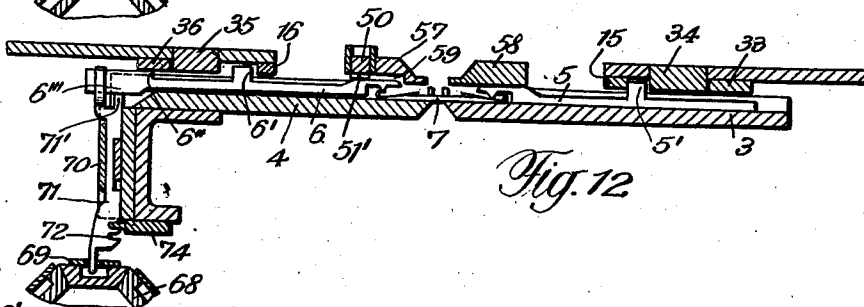


Fig. 12

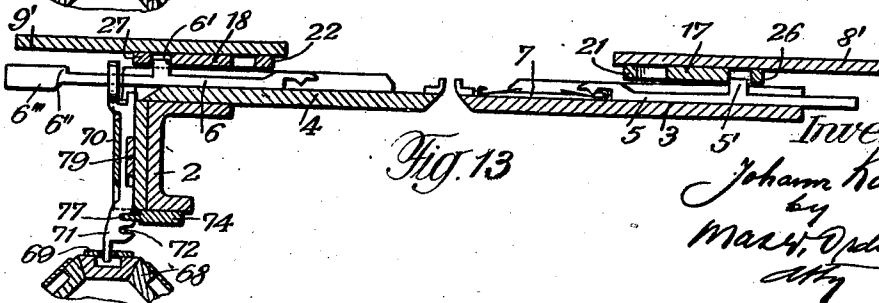


Fig. 13

Inventor:
Johann Korber
by
Max V. Orlmann
att

March 19, 1935.

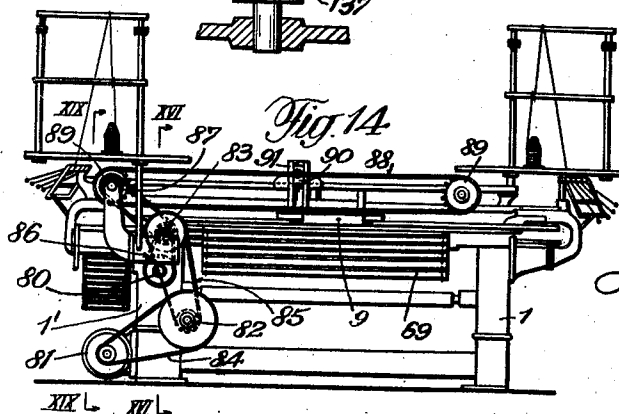
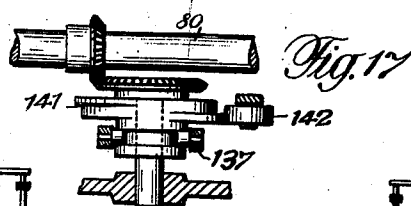
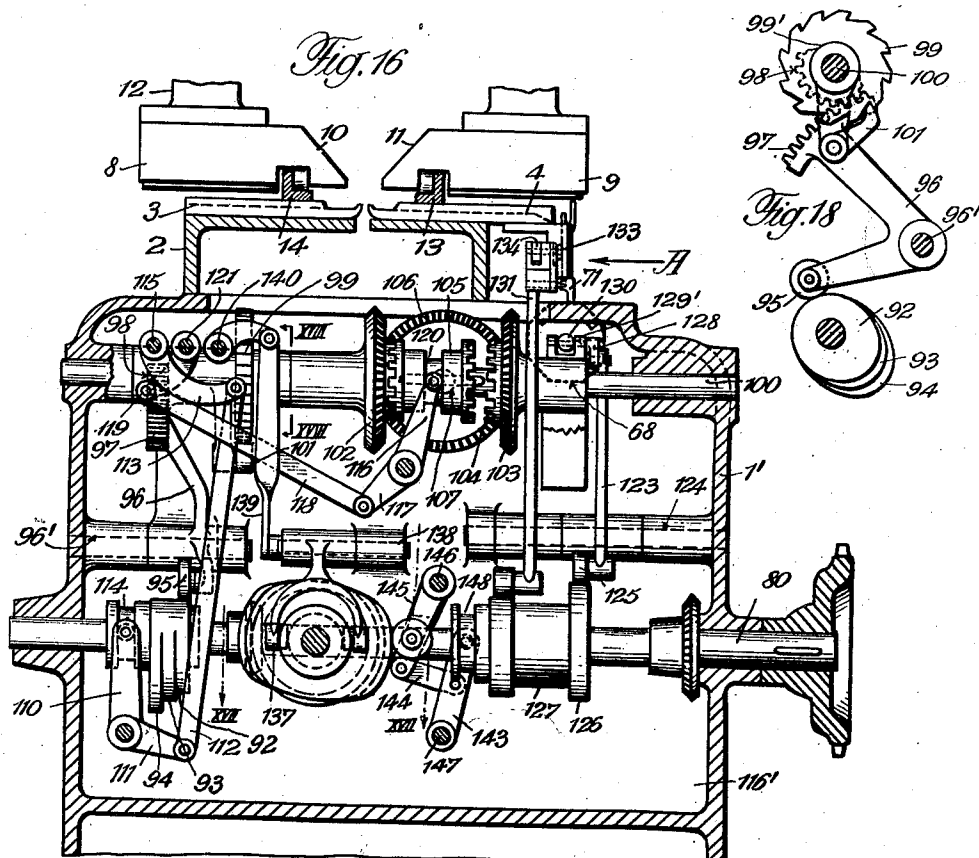
J. KORBER

1,994,653

JACQUARD MECHANISM CONTROLLED KNITTING MACHINE

Filed Feb. 9, 1933

6 Sheets-Sheet 4



Inventor:
Johann Korber
By
Max. V. Diering
Att'y

March 19, 1935.

J. KORBER

1,994,653

JACQUARD MECHANISM CONTROLLED KNITTING MACHINE

Filed Feb. 9, 1933

6 Sheets-Sheet 5

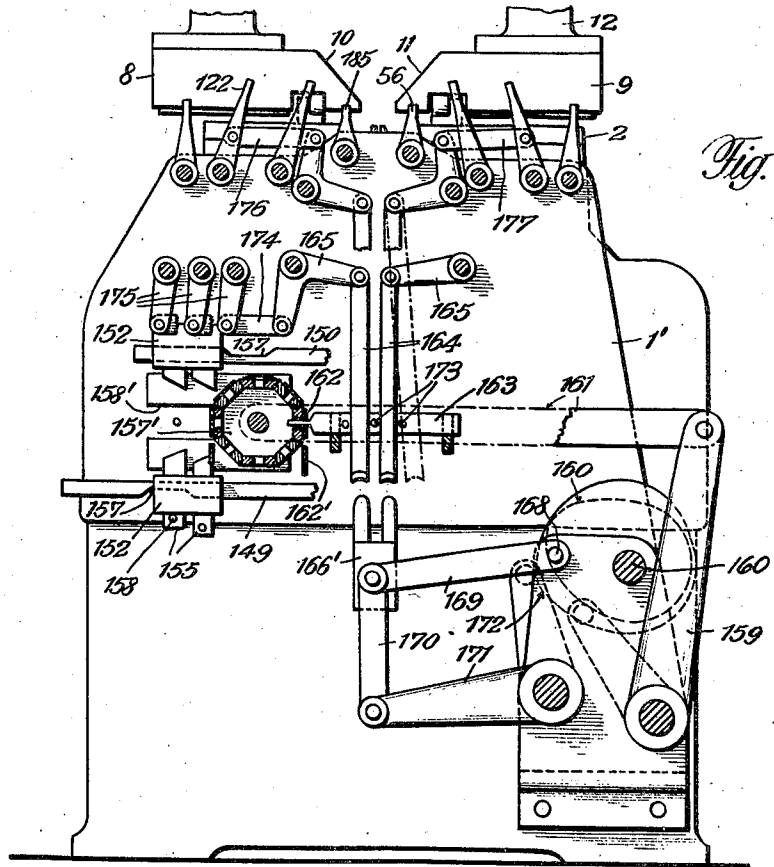


Fig. 19

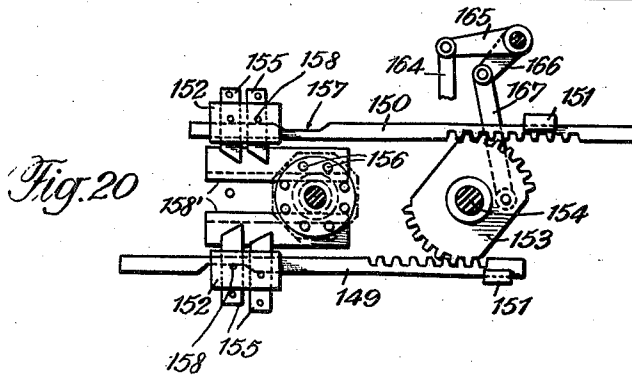


Fig. 20

Inventor:
Johann Korber
by
Mar. H. Ordway
Atty

March 19, 1935.

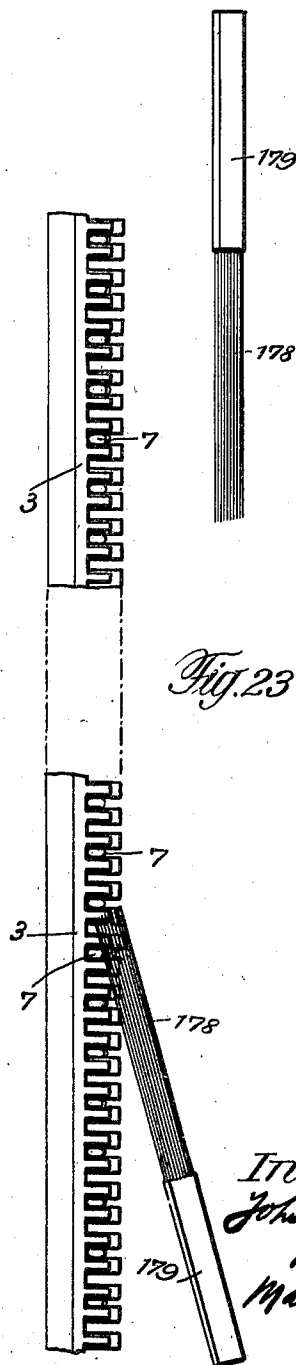
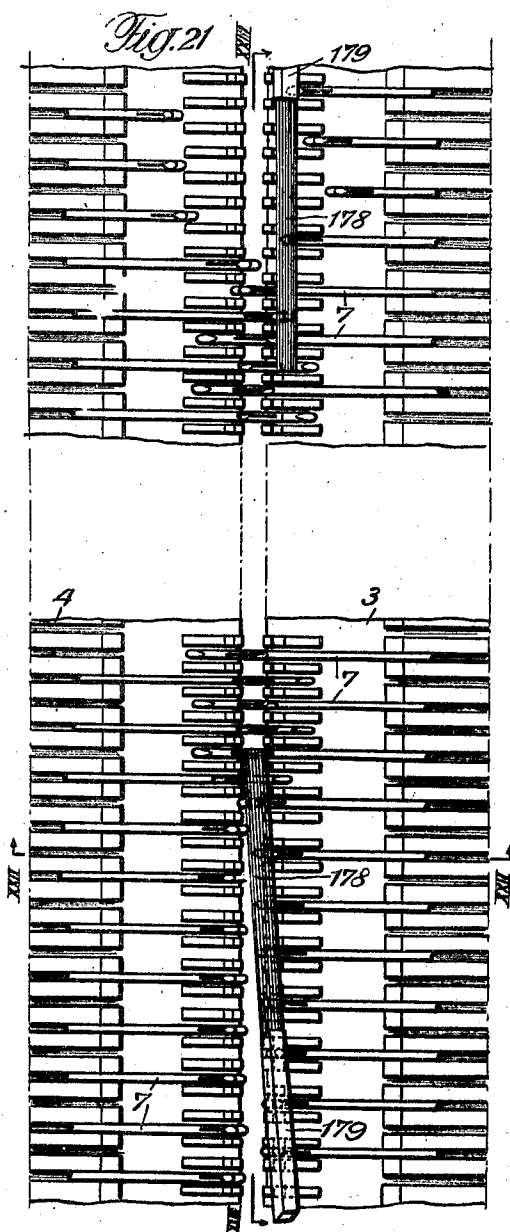
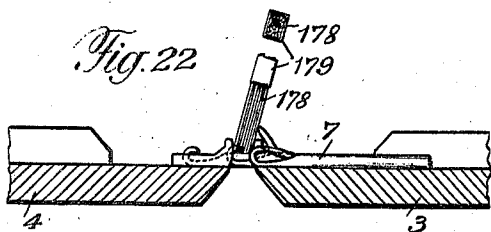
J. KORBER

1,994,653

JACQUARD MECHANISM CONTROLLED KNITTING MACHINE

Filed Feb. 9, 1933

6 Sheets-Sheet 6



Inventor:
Johannes Korber
By
Max F. Erdmann
Att'y

UNITED STATES PATENT OFFICE

1,994,653

JACQUARD MECHANISM CONTROLLED
KNITTING MACHINEJohann Korber, Couvet, Switzerland, assignor to
the firm Edouard Dubied & Cie. Société
Anonyme, Neuchâtel, SwitzerlandApplication February 9, 1933, Serial No. 655,870
In Germany March 4, 1932

9 Claims. (Cl. 66—63)

This invention relates to improvements in jacquard mechanism controlled knitting machines.

The known jacquard mechanisms for flat knitting machines and pearl machines, particularly of the type comprising several needle cam boxes arranged side by side, require special needle cam box constructions. Most of these constructions include a plurality of guideways for the heels or snugs of the needles or else movable cam rails for the actuation of auxiliary needles. All these devices require the arrangement of special cam plates which complicate the needle cam boxes considerably, so that these become so large that not only the assembly of the machine as a whole is rendered unwieldy, but also the needle beds, the auxiliary needles, the jacks, lifting members and the like are disadvantageously affected. Another drawback of such constructions is that their reliability of operation for producing fancy knitted goods at a great number of varieties of patterns is very unsatisfactory.

Furthermore, the operation of latch openers for the latch needles of flat pearl machines, which openers were hitherto provided with edges similar to the cutting edge of a knife for entering between the hook and the latch of the needle caused considerable difficulties. This is due to the fact that this kind of opener requires to be very accurately adjusted, as otherwise very often the latches and hooks and even the set-up comb on the needle beds are damaged by engagement with the opener.

According to the present invention these disadvantages are eliminated in the knitting machine, in that the knitting members, as needles, jacks or intervening parts respectively, which are actuated by the usual cam guide elements of the needle cam boxes, are, during their advance movement, adjusted by direct engagement of pattern card controlled sinkers, into preliminary positions for cooperation with other cam box guide elements.

In other words, the needles or the correlated parts respectively are advanced by the usual cam box guide elements through guideways in the needle beds, but so deviated from their paths according to the simultaneous adjustment of pattern card controlled sinkers that the withdrawal of the needles from their preliminary positions is effected in accordance with the pattern card by other cam box elements.

For reciprocating means for opening the needle latches, according to the invention, brushes are provided in such a disposition that

each time at the end of the traverse of the slide one of the brushes is alternately positively moved into operative position, so that the brush is substantially perpendicularly directed to the longitudinal axis of the needles and inclined to the plane of the needle beds at an acute angle in respect of the direction of movement of the brush, in which position the brush engages the needle latches for opening the same.

Due to the above-mentioned provision of influencing the knitting members during their advance movement by pattern card controlled jacks to deviate these members out of normal position, simple needle cam box constructions comprising a single guide track only and being devoid of any auxiliary members, such as heretofore used for flat knitting machines or pearl machines without a jacquard mechanism are applicable. In this way considerable simplification of construction is rendered possible without reducing the number of varieties of patterns obtainable with the machine in the least.

The deviation of the knitting members during the advance movement by the ordinary cam box guide elements from their paths of travel is effected by means of the invention, in such manner, that for example the push type jacks for the needles are provided on the lower sides of their shanks with at least one shoulder or snug or cam face which is adapted to ride up on the sinkers that are lifted in accordance with the pattern card, so that the knitting element, as the needle, jack or the like, is raised at its rear end, whereby the heel or snug of the respective knitting element is adapted to engage other cam box guide elements for the withdrawal of the same.

In the accompanying drawings the knitting machine according to the invention is illustrated by way of example, in which

Fig. 1 is a cross-section of the needle bed of the knitting machine inclusive of the jacquard mechanism and the slide;

Fig. 2 is a plan view of the needle cam boxes with the slide, the face plates of the cam boxes and the control members omitted;

Fig. 3 is a section on the line III—III in Fig. 2 showing a slidable check rail for jacks;

Fig. 4 illustrates a larger scale elevational section of the machine in the direction of the arrow A in Fig. 16;

Fig. 5 is a bottom view of a lock bar for the sinkers as seen in the direction of the arrow B in Fig. 4;

Fig. 6 is a section on the line VI—VI in Fig. 4;

Fig. 7 is a perspective view on a still larger scale of a sinker;

Fig. 8 is a view of a push type jack for the needles;

Figs. 9 to 13 depict sections through the needle beds on a larger scale along the lines IX—XIII in Fig. 2 respectively with parts in different positions;

Fig. 14 shows a smaller scale elevation of the knitting machine at the side of the drive;

Fig. 15 is a schematical top view of the machine;

Fig. 16 is a cross-section of the machine on the line XVI—XVI in Fig. 14 through the main drive shaft;

Fig. 17 is a horizontal section through the main drive shaft between the lines XVII—XVII in Fig. 16;

Fig. 18 is a section on the line XVIII—XVIII in Fig. 16;

Fig. 19 is a section on the line XIX—XIX in Fig. 14 showing the control device;

Fig. 20 shows a detail of Fig. 19;

Fig. 21 shows a plan view of the needle bed on a larger scale schematically indicating the position of brushes for controlling the needles;

Fig. 22 is a section on the line XXII—XXII in Fig. 21, and

Fig. 23 is a section on the line XXIII—XXIII in Fig. 21.

Referring to the drawings, on the standards 1, 1' (Fig. 14) of the knitting machine a bed frame 2 is supported which carries the needle bed plates 3 and 4 for the two sides of the machine the plate 3 providing the front needle bed and the plate 4 the rear needle bed (Fig. 1). In guideways of the bed plates 3 and 4 push type jacks 5 and 6 respectively for the needles are slidably arranged the jacks 5 being each provided with a projecting shoulder or snug 5' and each of the jacks 6 with two such shoulders 6' and 6'' (Fig. 8). 7 denotes the needles which are inserted in the guideways of the bed plates in any suitable distribution and operated by the jacks 5 and 6.

Needle cam boxes 8 and 9 cooperating with the jacks 5 and 6 on both sides of the machine for actuating the same in order to perform the knitting operation in conjunction with the needles 7, are connected to slide portions 10 and 11. These slide portions are interconnected by an upper double yoke 12 to constitute the slide of the knitting machine which slide is displaceably arranged in the longitudinal direction thereof for traversing the needle beds on guide rails 13 and 14 (Fig. 16), as will be hereinafter more specifically described.

The jacks are operated by the cam boxes 8 and 9 by means of cams 15 to 36 (Fig. 2) which are all connected to face plates 8', 9', of these boxes (Fig. 1). The cams 21, 24, 25 and 26 which are fixed to the front cam box 8 cooperate with the snugs 5' to move the jacks 5 into a certain position after they have been withdrawn in their respective guideway by the retracting cams 17, 20 of this cam box. The cams 17 and 20 are shiftable on the face plate 8' of the cam box 8 in the directions of the double arrows indicated in Fig. 2 by means of a suitable latch arrangement of well known type according to the desired length for the yarn loops. In a similar manner, as just described for the cam box 9, the fixed cams 22, 23, 27 and 28 of the cam box 9 serve for moving the jacks 6 by cooperation with the snugs 6' into

a certain position upon their displacement by the retracting cams 18, 19.

The cams 34 and 35 of the cam boxes 8, 9 represent cardigan cams and the cams 29 to 32 tubular cams. These cams are guided for vertical displacement in the cam boxes on the one hand by corresponding apertures such as 34', 35' (Fig. 1) in the face plate. 8', 9' of the boxes and on the other hand by guide members such as the member 37 of the cam box 9 as shown to the left in Fig. 1, whereas the corresponding guide member for the box 8 is broken away. To this end these cams are connected to bolts 38 arranged for up and down movement in the corresponding guide member 37. For shifting the cams into the upper or inoperative position beyond the path of the respective jack shoulders, at each side of the machine hand control members (not shown) for slidable bars 40, 41 are arranged. The bars 40, 41 extend longitudinally of the machine, and by displacing the same lengthwise in one or the other direction the bolts 38 are moved up or down by engagement of studs 42 on the bolts in corresponding guide slots in the bars in a well known manner. In Fig. 1 the upper position of the bolt 38 is indicated by dotted lines.

The cardigan cam 34 is linked by means of connecting members 43, 44 to a stirrup 45 which is rockably mounted in a support 46 on the yoke 12. The stirrup 45 is flexibly connected at its other end with a latch 47 on the slide portion 11 which in turn is rigidly connected to a slidable control member 48 (Figs. 1, 2 and 3) through the intermediary of a strap 49. Thus, when the cam 34 is raised into inoperative position by means of the slide bar 41, and a cooperative stop lever 122 (Fig. 19), the control member 48, which is in the form of two side plates interconnected by batten plates, is longitudinally shifted relatively to a slidable check rail 50 for the jacks of the rear needle bed 4. During this shifting movement of the member 48 relatively to the rail 50, which it straddles with the two side plates, notches 51 and 51' for the passage of jacks 6 are opened or closed depending on the direction in which the control member 48 is moved. This is accomplished by cam slots 52 being formed in the side plates of the control member in which studs 53 on the check rail 50 are guided. To the ends of the check rail 50 control cams 54, 55 are connected for cooperation with stop levers 56 disposed at the ends of the machine (Fig. 19), in the manner which will be hereinafter explained.

In addition to the slidable check rail 50 two fixed check rails 57, 58 for the jacks for pushing the needles 7 are provided above the front and rear needle beds 3 and 4 respectively which are, similarly as the rail 50, provided with notches 59 and 60 for the passage of jacks 5 and 6 respectively. The control member 48 serves also for opening and closing the notch 59 in the fixed check rail 57, so that incidental to the raising of the cam 34 of the needle cam box 8 into inoperative position the notch 59 is closed. By closing the notches 51, 51' and 59 the front portion of the respective jacks is prevented from rising up, whereby forward jumping of the corresponding needle is avoided.

In order to avoid jumping of the knitting members as the jacks, needles or any intervening parts therefor, particularly in pearl machines, advantageously a guiding device for these members is applied. This device comprises a tappet 61 (Fig. 1) which provides guidance for the jacks 6 which are adjusted into horizontal position. The tappet

61 is pivoted at 61' on a carriage 62 slidably arranged on a longitudinal carrier bar 63 of the machine frame and is adjustable by means of a two armed lever 64 pivotally mounted at 65 in the needle cam box 9. The carriage 62 is displaced on the bar 63 in unison with the traversing movement of the slide 10, 11 on the rails 13, 14 by a driving member of the same in the form of a plunger 66 connected to the cam slide portion 11. The lever 64 engages with its forward arm in a cam groove 67 of the slide bar 40, while its rearward arm is linked to the plunger 66 for controlling the same. The arrangement is such that when the cardigan cam 35 is lowered into its operative position, as shown in Fig. 1, by the slide bar 41 being axially displaced, the forward arm of the lever 64 is raised by the slide bar 40 being correspondingly axially displaced and vice versa. Consequently on the forward arm of the lever 64 being raised the plunger 66 is lowered and the forward finger of the tappet 61 is also raised, so that the jack 6, when assuming its horizontal position as indicated in dotted lines in Fig. 1, is prevented from sliding rearwardly.

The jacquard mechanism comprises a pattern card drum 68 about which the laced-together pattern cards 69 are passed. To the card drum 68 an auxiliary sinker bed 70 is correlated and angularly disposed to the needle beds 3, 4 between the rear end of the latter and the guide bar 63 for the tappet carriage. Displaceably arranged in guideways of the auxiliary sinker bed 70 are the sinkers 71 which cooperate with the pattern cards 69 in a well known manner. Each of the sinkers 71 is provided with two notches 72 and 73 (Fig. 7) for cooperation with a stop bar 74 transversely slidably arranged on the lower side of the bed frame 2 by means of a pin and slot connection 75, 76 (Fig. 5) and provided with a projecting tongue 77 which is adapted to engage into the notches 72, 73 of the sinkers 71. The underside of each sinker 71 is provided with an aperture 78 for accommodation of the lifter bar 79 for the sinkers.

The pattern card drum 68 is adapted to be rotationally displaced through an angle at the center, which corresponds to one, two or three pattern cards respectively, on each traverse of the cam slide 10, 11 or after any desired number of such traverses, at either end of the machine. On the termination of this rotational displacement the card drum may be pushed towards the stop bar 74 for cooperation with the sinkers 71. These movements of the card drum are effected in the following manner:

The main drive shaft 80 of the machine, which has its bearings in the standard 1' thereof, is actuated from the motor 81 via the main jack shaft 82 and a jack shaft 83 by means of suitable transmission gears, such as belt or chain drives 84, 85, 86 or the like. From the jack shaft 83 the drive of the cam slide 10, 11 is derived by a similar gear 87 which imparts movement to a driving chain 88 passed round a chain wheel 89 on each side of the machine.

The driving chain 88 is connected to a slide block 90 displaceably arranged in a guide frame 91 which in turn is connected to the cam slide 10, 11 (Fig. 14). The ratio of gearing of the transmission gears 85 to 87 is so chosen that while the slide 10, 11 performs one traverse on the guide rails 13, 14 the shaft 80 makes one revolution.

On the shaft 80 a cam member having three sections 92, 93, 94 of different throws (Figs. 17 and 18) is longitudinally displaceable, but se-

cured against rotation, so that the sections are adapted to be individually moved into engagement with a guide roller 95 rotatably mounted on the outer end of one arm of a bell crank lever 96 pivoted at 96', in a manner described below. The outer end of the other arm of the bell crank lever 96 is provided with a toothed segment 97 which meshes in a toothed sector 98 coaxially disposed with a ratchet wheel 99 on a shaft 100 by means of a hub 99'. The arrangement is such that depending with which cam section the roller 95 is caused to cooperate the bell crank lever 96 is rotationally displaced through different angles, so that the ratchet wheel, by engagement of a pawl 101 linked to a crank arm on the hub 99', and the shaft 100 together with it are turned a corresponding amount.

Loosely mounted on the shaft 100 are bevel gear wheels 102, 103 that are each provided with a clutch portion 104 with which a clutch member 105, slidably but non-rotatably arranged on the shaft 100, is adapted to cooperate upon choice. As the bevel gear wheels 102, 103 are in mesh with a corresponding bevel wheel 106 which is secured to a stub shaft 107, the other end of which is operatively connected with the card drum 68 by suitable gears 108, 109 (Fig. 4), this drum is adapted to be rotationally displaced in either direction by means of the clutch member 105. The ratio of gearing is so chosen that by actuating the drum 68, by means of cam section 92, its rotational displacement corresponds to an angle at the center subtended by one pattern card, by actuating the drum by means of cam section 93 one card is skipped, and by actuating the drum by means of cam section 94 two cards are skipped.

The longitudinal displacement of the cam member 92, 93, 94 on the shaft 80 is effected by means of a linkage 110 to 113 which is intercalated between a driving collar 114 on the cam member and a shaft 115 near the top of the machine which carries at its outer end a stop lever which is similarly constructed as the lever 56 and operated in a well known manner by cam faces on the slide 10, 11. The clutch member 105 is controlled by means of a linkage 116 to 119 intercalated between a driving collar 120 on the clutch member and a shaft 121 arranged adjacent the shaft 115 and also provided at its outer end with a control lever similar to the lever 56. Thus, the rotational displacement of the card drum 68 is controlled by means of the stop levers on the shafts 115 and 121.

The up and down movement of the card drum 68 is effected by means of a bell crank lever 123 rockably mounted on a pivot 124 (Figs. 4 and 16). The lever 123 carries on the free end of one of its arms a guide roller 125 which cooperates with a guide track 126 of a cam member 127 which is longitudinally shiftably but non-rotatably carried on the shaft 80, whereas the other arm of the lever 123 is pivotally connected, by means of a link 128, to a forked rockable crank arm 129 which is linked at 129' to an axle 130 on which the card drum 68 is longitudinally displaceably arranged.

In a similar manner, as just described for the card drum 68, the stop or lock bar 74 is operated by means of a bell crank lever 131 also linked to the pivot 124 and provided at the outer end of its lower arm with a guide roller which cooperates with a guide track 132 on the cam member 127. The outer end of the other arm of the lever 131 is flexibly connected to the lifter bar 79 and the lock bar 74 by means of links 133, 134 respectively

(Fig. 5). The lifter bar is connected to the auxiliary needle bed 70 in a similar manner as previously described for the lock bar 74 by a pin and slot connection 135, 136, as shown in dotted lines in Fig. 4.

When the cam slide arrives at the end of its traverse, the card drum 68 is rotationally adjusted in the above described manner just before the slide changes its direction of travel. Thereupon the lock bar 74 is moved out of engagement with the notches 72 of the sinkers 71 and the lifter bar dropped, so that the sinkers are moved into their lower positions in which they are locked by the tongue 77 of the bar 74 entering into their notches 73. As soon as the slide 10, 11 has changed its direction of travel, the bar 79 and the card drum 68 are raised, whereby, in accordance with the fresh pattern card 69, a different distribution of the sinkers 71 is obtained. Thereafter the lock bar 74 is again inserted in the notches 72 of the sinkers and the card drum lowered into its lowermost position.

The cam member 127 is controlled by means of a stirrup 137 which is rockable about a pivot 138, carried by the same supporting partition 116' of the machine frame as the inner ends of the pivot 96' and 124, by means of a link 139 operatively connected with a control shaft 140 of similar nature as the shafts 115 and 121. The stirrup 137 acts on a cam member 141 which is provided with two different guide tracks for alternate engagement with a guide roller 142 which is mounted on a linkage 143 to 145 pivotally carried on the partition 116' at 146 and 147 respectively. The outer end of the lever 143 engages a driving collar 148 on the cam member 127. In this manner the jacquard mechanism is adapted to be automatically controlled by means of the cam member 127 from the slide 10, 11 of the machine, as will be more explicitly hereinafter explained.

The general disposition of automatic control means on the driving end of the machine is shown in Fig. 19. Two transverse bars 149, 150 are slidably arranged on the end wall of the machine in guide members 151, 152 and provided with toothed portions for engagement with a toothed disc 153 (Fig. 20) mounted for rotation in the standard 1' at 154. Latches 155 are arranged to be slidable transversely to the bars 149, 150 in the guide members 152 for cooperation with driving studs 156 on the face end of a control drum 157. By turning the disc 153 with the aid of control means 164 to 167 (see later) the bars 149, 150 are respectively shifted relatively to the latches 155, so that depending on requirements certain latches are moved into operative position by entering into notches 157 in the bars. Any suitable means, such as springs or the like, may be employed for urging the latches inwardly for causing them to bear against the outer edges of the bars 149, 150 with stops 158 or the like.

In order to move the latches 155 into engagement with the studs 156 on the drum 157, the latter is adapted to be moved to and fro in a guide frame 158', by means of a bell crank lever 159 cooperating with a rotatable cam disc 160 carried by a shaft 160', and a connecting link 161. When the drum 157' is advanced on the latches 155, it is moved through a certain angular range so as to adjust a desired control card 162 of a flexible band, into which a plurality of punched cards of this kind are united, into work-

ing position opposite a series of jack sinkers 163. Each jack sinker of the series is correlated to a pair of depending push rods 164 which are linked with their upper ends to pivotal lever arms 165 in such manner that, when the respective jack sinker meets with a perforation in the control card confronting it, the push rods 164 remain in their vertical or operating positions. In this position the pairs of the longitudinal row of push rods are adapted to be engaged by a lifting member 166' which is arranged to swing up and down in alignment with the driving arm 167 and the vertically depending rods 164. For this purpose the member 166' is connected on the one hand to a fixed pivot 168 on the machine frame, by a link 169, and on the other hand, by a link 170, to a bell crank lever 171 cooperating with a cam disc 172.

If on the other hand any of the jack sinkers 163 meets with an unperforated portion of the control card 162 it is pushed back by the returning drum, so that the correlated pair of push rods is deviated from the vertical position by action of stops 173 provided on the jacks for the push rods. This deviated or inoperative position of the push rods is shown in chain dotted lines in Fig. 19.

Thus, by means of the just described control device all the parts, as the stop levers 56, 122, the cam members 92, 93, 94, 126, 132, 141, the slides 149, 150 as well as all other parts for transmitting automatic movements to any knitting members of the machine can be actuated through the intermediary of intervening parts 174 to 177 and so forth.

For actuating the latches on the needles a brush arrangement is provided which comprises two brushes 178 disposed on both sides of the cam slide, as schematically indicated in Fig. 2. The brushes which consist of a tuft of bristles held together by a ferrule 179 are inserted with the latter in holders 180 pivoted to projecting parts 181 of the slide at 181'. In the parts 181 a cam bolt 182 is slidably arranged which is provided with cam grooves 182' for guiding pins 183 that project from the underside of the holders. At their outer ends the bolts 182 are provided with cam faces for cooperation with stop levers 185 of similar construction and operation as the lever 56.

When the slide is moving in the direction of the arrow C in Fig. 2, the leading brush assumes its operative position by the pin 183 entering the respective groove 182' by action of the weight of the brush and associated parts. This position of the brushes is shown in the Figs. 21 and 23 to extend substantially perpendicularly to the longitudinal axes of the needles 7 inserted in the needle beds 3 and 4. With respect to the plane of the needle beds the brushes are inclined at an acute angle considering the direction of movement of the brush. Thereby the tips of the bristles engage the latches on the needles, as shown in Fig. 22, with a tendency to open the same.

At the end of the traverse of the slide the terminal cam face on the cam bolt 182 hits the respective stop lever 185 with the result that the bolt is inwardly shifted in the projection 181. During this shifting movement of the bolt the pin 183 rides up on the forward oblique face of the groove 182' to rest against the front edge of the bolt 182. In this position the brush is retracted from the needles and thus rendered inoperative, as shown in the upper part of the

Fig. 23 with a corresponding plan view in Fig. 21. The brush remains in this position during the entire traverse of the slide in the opposite direction. Simultaneously the opposite groove 182' is moved in front of the pin 183 of the other brush adapting the same to drop into operative position.

The behaviour of the knitting members and associated parts during the operation of the machine is as follows:

As previously explained the pattern card drum of the jacquard mechanism is adapted to be selectively turned in either direction through an angle subtended by one, two or three pattern cards in a manner known per se. This rotational adjustment can be effected, at will, after each single traverse of the cam slide or only after a number of traverses and with the slide positioned at either end of the machine. Upon the termination of the rotational adjustment of the pattern card drum the pattern card facing the sinkers 71 can be raised, after the lock bar 74 has been retracted from the notches 72 of the sinkers and the lifter bar 79 operated to move the sinkers into their lowermost position as indicated in Fig. 9. Thereupon the card drum 68 is raised to advance on the sinkers 71, whereby only those sinkers are shifted to their topmost position which are confronting an unperforated portion of the card 69, whereas the other sinkers, i. e. those that are meeting with a perforation in the card, remain in their lowermost positions (Figs. 10 to 13). Thereafter, all the sinkers are secured in position by the lock bar 74 and the pattern card drum is retracted to its lower position.

It will be observed that by elevating the individual sinkers 71 to their high position the corresponding jack 6 is not raised as long as the rearward broadened portion 6''' on these jacks remains backwardly of the shorter upper finger 71' of the sinkers this finger then but reaching up to the lower edge of the jacks 6. Thus the jacks 6 remain at the previous height until during their advance movement the rearward broadened portion 6''' rides up on the finger 71'.

In the Figs. 2, 3 and 9 to 13 it is assumed that the cam box guide elements or cams 29 to 32, 34 and 35 are lowered into their operative positions. The needles 7 are either distributed over only one or the other needle bed 3, 4 respectively or over both of these beds in any desired manner and are engaged by the jacks 5 and 6. The cam slide 10, 11 travels in the direction of the arrow C in Fig. 2. During this traverse of the slide the front jacks 5 are advanced in the respective needle bed guideways by the cams 29, 34 and the rear jacks 6 by the cams 32 and 35, whereby all the needles are moved to the central position as shown in Fig. 10. Since the check rails are provided with notches 51, 59, 60 for the passage of the jacks each two opposite jacks 5, 6 are at a time raised by the hooks of the corresponding needles 7 and caught by these hooks (Fig. 10). Thus in the central position of opposite needles a jack is hooked to each needle.

Furthermore, in this position the jacks 6 provided with a broadened rear end 6''' are caused to assume an inclined position by the end 6''' bearing against the finger 71' on the sinkers 71 (Fig. 10) so that the shoulders 6'' on the jacks are displaced to grip behind the rear edge of the cam 36. Thus, on the slide continuing its traverse in the direction of the arrow C in Fig. 2 all the jacks 6 that were moved into an inclined

position are retracted in their guideways in the needle bed 4 by the cam 36.

During this working incidence the check rail 50 prevents the jacks 6 from upward movement, whereas the jacks 5 are free to rise up in the notch 60 (Fig. 11), thus permitting the corresponding needles 7 being retracted into the rear needle bed 4 with the aid of the jacks 6 which previously had assumed an inclined position. The jacks 6, however, which had remained in horizontal position are held by the tappet 61 in their advanced position for the purpose that the corresponding needles 7 remain in the central position until the jacks 5 together with the respective needles 7 are retracted into the front needle bed by the cam 15, unless the same have not previously been retracted into the rear needle bed by the jacks 6 (Fig. 12). The jacks 6 which during this traverse of the slide had always remained in horizontal position are permitted to rise up into the notch 51', whereas the jacks 5 are overlain by the rail 58 thus being held down. After this working incidence the jacks 6 which had remained in the horizontal position are retracted through the respective guideways by the cam 16 by engagement of the shoulder 6' with this cam.

When the slide is moved in the opposite direction to the arrow C the afore-described working incidences are repeated, if previously the check rail 50 is displaced in the direction of arrow D in Fig. 2, as is well known. In consequence of this shifting the notches 51, 51' are brought into the same relation to the cam 35 as in the case of the slide moving in the direction of arrow C, so that the catching and releasing of the jacks by the respective needle hooks is performed in the same sequence as above described.

This sequence is illustrated in the Figs. 9 to 13. Fig. 9 shows how the needles 7 are advanced by the jacks 5 of the front needle bed 3. The snug 6' of the jacks 6 is engaged by the cams 19, 32. The front and rear check rails present no notches.

Fig. 10 shows the needles in the central position with the jacks caught on both sides. The front and rear check rails present notches 60, 59, 51 respectively.

Fig. 11 shows the rearward jacks 6 in an inclined position. The front check rail 58 presents the notch 60, whereas the rear check rail 50 opposes the full cross section. The needles are adapted to be retracted into the rear needle bed. The tappet 61 is moved into operative position for engagement with jacks 6 that are left in horizontal position (dotted lines).

Fig. 12 shows the front check rail to oppose its full cross section, whereas the rear check rails present the notches 59 and 51'. The rear jacks 6 assume their horizontal positions. The needles 7 are adapted to be retracted into the front needle bed.

Fig. 13 shows the needles 7 to be retracted into the front needle bed. The front and rear jacks are in their down positions.

The described arrangement provides reliable operation of the needles by means of the jacks any undesired advance movement of the needles being positively prevented.

It will be seen that in the stead of the cams 34 and 35 needle lifters of known construction may be applied to the needle cam box, for tubular goods or cardigan goods of special designs without the necessity of departing from the simple symmetrical cam box construction as outlined. In this way the number of possible varieties of

patterns obtainable with the machine is considerably increased.

The described jacquard mechanism controlled arrangement for the knitting members may in principle also be applied to flat knitting machines. Thereby the knitting members, as needles, jacks or intermediary members are adapted to be moved in engagement with cam box guide elements at different positions of these members by riding up on jack sinkers adjusted into position in accordance with a pattern card. With this arrangement the cam box guide elements are disposed, in a known manner, at higher or lower levels respectively.

It will be appreciated that with the described machine any mode of looping the goods can be obtained.

I do not limit myself to the particular size, shape, number or arrangement of parts as shown and described all of which may be varied without going beyond the scope of my invention as shown, described and claimed.

What I claim is:

1. In a jacquard mechanism controlled knitting machine of the type described, in combination, a needle bed, a cam slide adapted to traverse said needle bed, knitting members slidably arranged in guideways of said needle bed, single system cardigan and tubular cam guides disposed on said cam slide to define a guide channel of the slide for controlling said knitting members for displacing the same in said guideways, an adjustable check rail and fixed check rails for said knitting members correlated to said cam guides of said cam slide, automatic means for setting said adjustable check rail to close notches in the latter and in one of said fixed check rails simultaneously with rendering one of said cardigan cams inoperative, a pattern card drum associated with said needle bed, sinkers cooperating with said drum, a separate bed for said sinkers, means for adjusting said sinkers on said separate sinker bed in accordance with the respective pattern card on said drum, and means provided on said knitting members for shifting the same to control change-over positions for said cam slide during their advance movement in said guideways by action of respective cam guides of said slide for engagement with further slide cam guides adapted for retracting said knitting members.

2. In a jacquard mechanism controlled knitting machine of the type described in combination, a needle bed formed in two halves, a cam slide adapted to traverse said needle bed, latch needles slidably arranged in guideways of said needle bed, push type jacks for said latch needles, cam guides provided in said slide for controlling said latch needles for displacing the same in said guideways, alternately operative brushes provided on both sides of said cam slide for opening the latches on the needles in both halves of said needle bed with their bristles substantially perpendicularly disposed to the axes of said latch needles and inclined in the operative position of the brushes at an acute angle to said needle bed considering the direction of movement of said slide, means for positively rendering said brushes operative and inoperative respectively at the end of each traverse of said slide, a pattern card drum associated with said needle bed, sinkers cooperating with said drum, a separate bed for said sinkers, means for adjusting said sinkers on said separate bed in accordance with the respective pattern card on said drum, and means provided on said jacks for said latch

needles for shifting the jacks to control change-over positions of said cam slide during their advance movement in said guideways by action of respective cam guides of said slide for engagement with further slide cam guides adapted for retracting said latch needles.

3. In a jacquard mechanism controlled knitting machine of the type described, in combination, a needle bed, a cam slide adapted to traverse said needle bed, a single needle lock provided in said slide for each side of said needle bed knitting members slidably arranged in guideways of said needle bed, cam guides provided in said slide for controlling said knitting members, for displacing the same in said guideways, a pattern card drum associated with said needle bed for selectively deviating said knitting members sliding in said needle bed into control change-over positions for said cam slide, sinkers cooperating with said drum, a separate bed for said sinkers, means for adjusting said sinkers on said separate bed relatively to the bottoms of said guideways for deviating said knitting members into said control change-over position in accordance with the respective pattern card on said drum, means provided on said knitting members for shifting the same by engagement with the selectively operatively adjusted movement deviating sinkers into said control change-over positions, during their advance movement in said guideways by action of respective cam guides of said slide, for engagement with further slide cam guides adapted for retracting said knitting members.

4. In a jacquard mechanism controlled knitting machine of the type described, in combination, a needle bed, a cam slide adapted to traverse said needle bed, a single needle lock provided in said slide for each side of said needle bed, knitting members slidably arranged in guideways of said needle bed, cam guides provided in said slide for controlling said knitting members, for displacing the same in said guideways, a pattern card drum arranged at the rear end of said needle bed for selectively deviating said knitting members sliding on said needle bed into control change-over positions for said cam slide, sinkers cooperating with said drum, a separate bed for said sinkers situated transversely to said needle bed between said rearward drum and said needle bed, means for adjusting said sinkers on said separate bed relatively to the bottoms of said guideways in the transverse direction of said sinker bed, for deviating said knitting members into said control change-over positions in accordance with the respective pattern card on said drum, and a cam provided on each knitting member adapting it to ride up into said control change-over position on the related movement deviating sinker adjusted on said separate bed by selection of said pattern card, during the advance movement of the knitting members in said guideways by action of respective cam guides of said slide, for engagement with further slide cam guides adapted for retracting said knitting members.

5. In a jacquard mechanism controlled knitting machine of the type described, in combination, a needle bed, a cam slide adapted to traverse said needle bed, a single needle lock provided on said slide for each side of said needle bed knitting members slidably arranged in guideways of said needle bed, cam guides provided in said slide for controlling said knitting members for displacing the same in said guideways, a pattern

card drum associated with said needle bed for selectively deviating said knitting members sliding in said needle bed into control change-over positions for said cam slide, sinkers cooperating with said drum, a separate bed for said sinkers, means for adjusting said sinkers on said separate bed relatively to the bottoms of said guideways for deviating said knitting members into said control change-over position in accordance with the respective pattern card on said drum, means adapted for positively locking said deviating sinkers in their operative and inoperative positions of adjustment on said separate sinker bed as selected by said pattern card, and for clearing said sinkers when released from locking engagement with the same, and means provided on said knitting members for shifting the same by engagement with the selectively operatively adjusted movement deviating sinkers into said control change-over positions, during their advance movement in said guideways by action of respective cam guides of said slide, for engagement with further slide cam guides adapted for retracting said knitting members.

6. In a jacquard mechanism controlled pearl knitting machine in combination, a needle bed, a cam slide adapted to traverse said needle bed, a single needle lock provided on said slide for each side of said needle bed knitting members slidably arranged in guideways of said needle bed, single system cardigan and tubular cam guides disposed on said cam slide to define a guide channel of the slide for controlling said knitting members for displacing the same in said guideways, a pattern card drum associated with said needle bed for selectively deviating said knitting members sliding in said needle bed into control change-over positions for said cam slide, sinkers cooperating with said drum, a separate bed for said sinkers, means for adjusting said sinkers on said separate bed relatively to the bottoms of said guideways for deviating said knitting members into said control change-over position in accordance with the respective pattern card on said drum, and means provided on said knitting members for shifting the same by engagement with the selectively operatively adjusted movement deviating sinkers into control change-over positions, during their advance movement in said guideways by action of respective cam guides of said slide, for engagement with further slide cam guides adapted for retracting said knitting members.

7. In a jacquard mechanism controlled knitting machine of the type described, in combination, a needle bed, a cam slide adapted to traverse said needle bed, a single needle lock provided in said slide for each side of said needle bed knitting members slidably arranged in guide-

ways of said needle bed, an adjustable guiding device disposed rearwardly of said needle bed, for positively arresting said knitting members in their central position on said needle bed for preventing said members from performing undue rearward motions, cam guides provided in said slide for controlling said knitting members for displacing the same in said guideways, a pattern card drum associated with said needle bed, for selectively deviating said knitting members on said needle bed into control change-over positions for said cam slide, sinkers cooperating with said drum, a separate bed for said sinkers, means for adjusting said sinkers on said separate bed relatively to the bottoms of said guideways for deviating said knitting members into said control change-over position in accordance with the respective pattern card on said drum, and means provided on said knitting members for shifting the same by engagement with the selectively operatively adjusted movement deviating sinkers into said control change-over positions, during their advance movement in said guideways by action of respective cam guides of said slide, for engagement with further slide cam guides adapted for retracting said knitting members.

8. In a jacquard mechanism for influencing the knitting members sliding in the guideways of the needle bed of knitting machines of the type described, in combination, a pattern card drum associated with said needle bed and positioned behind the knitting member engaging bottoms of said guideways, sinkers cooperating with said drum for deviating said knitting members by selection of said drum into change-over control positions for their control, a shorter finger of said sinkers for cooperation with the undersides of said knitting members engaging said bottoms of said guideways and selectively adjusted, by said drum with its end face to correspond to said bottoms in the operative position of said sinkers for deviating said knitting members into said change-over positions, and a longer finger of said sinkers for lateral guidance of said knitting member.

9. A sinker for a jacquard mechanism for influencing the sliding movement of the knitting member in the guideways of the needle bed of knitting machines of the type described, a flat body of the sinker, an upper shorter finger of said sinker situated in the plane of said sinker body, and adapted for cooperation with the underside of the correlated knitting member, and a longer finger laterally offset relatively to said shorter finger for the thickness of said knitting member, for guiding engagement with the adjacent side of said knitting member.

JOHANN KORBER.