Sept. 10, 1935. H. H. HOLMES 2,014,132

KNITTING MACHINE

Filed Jan. 31, 1934 3 Sheets-Sheet 1

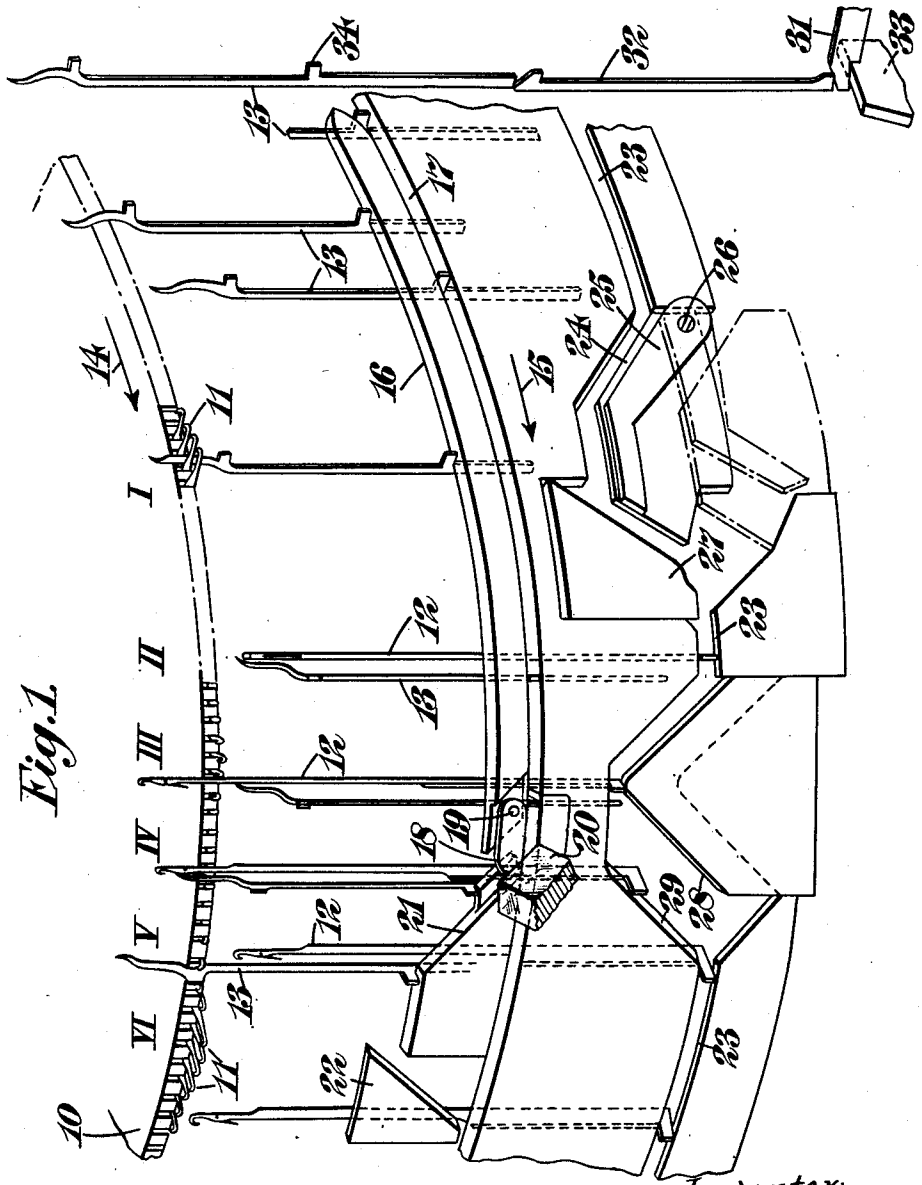

Fig. 1.

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Fig.2.

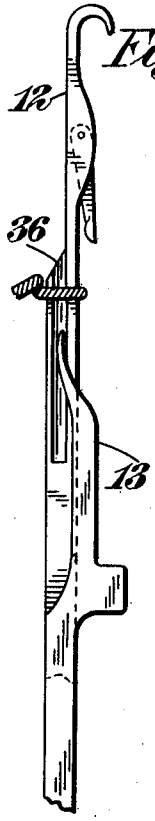


Fig.3.

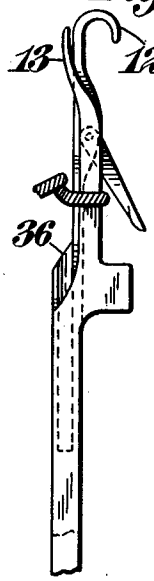


Fig.6.

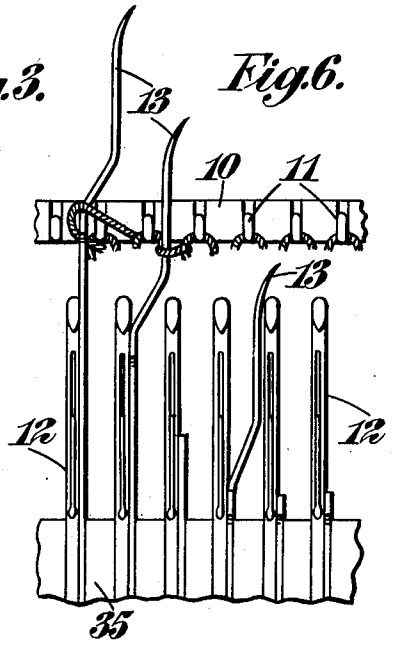


Fig.4.

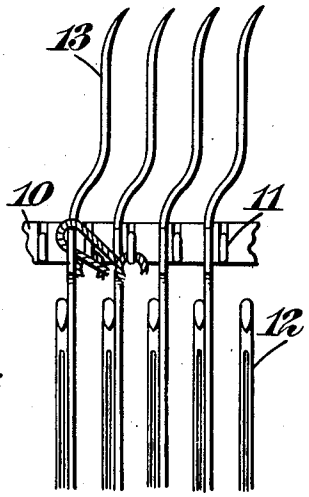
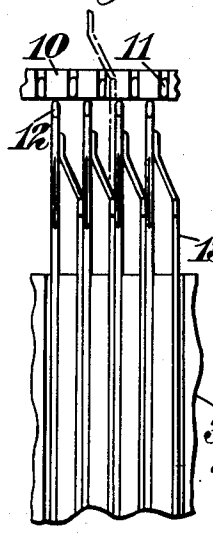


Fig.9.



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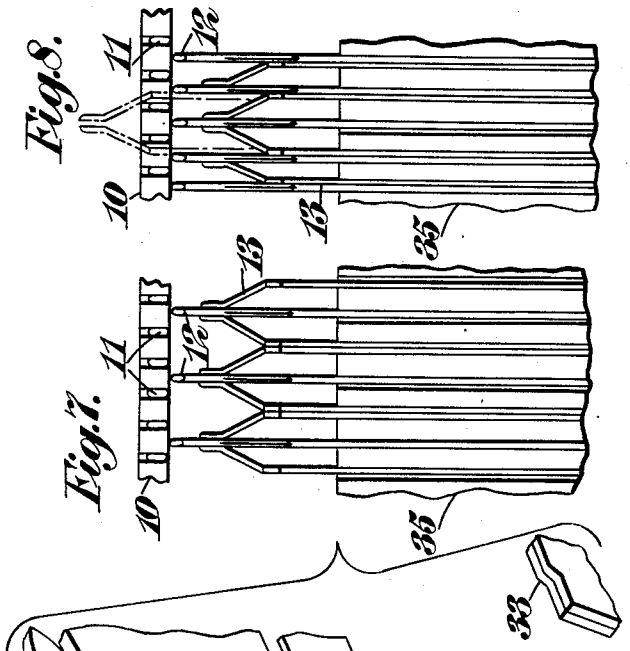

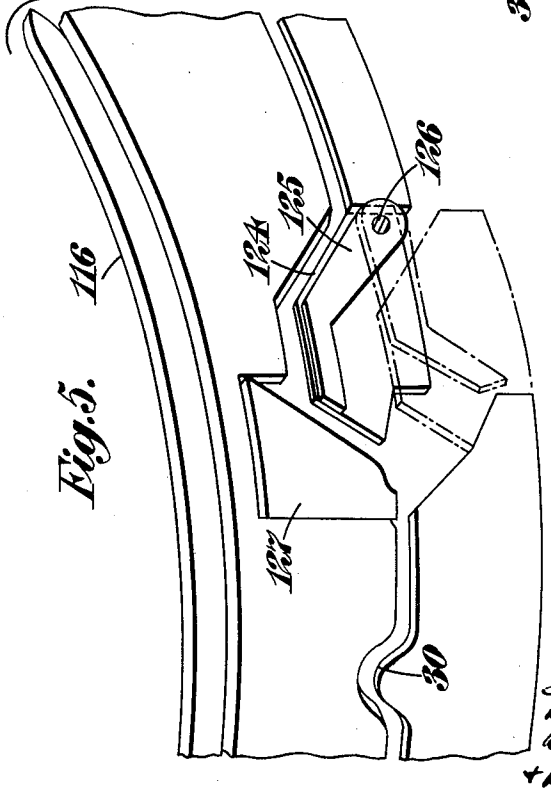

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UNITED STATES PATENT OFFICE

2,014,132

KNITTING MACHINE

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Application January 31, 1934, Serial No. 709,216
In Great Britain February 9, 1933

12 Claims. (Cl. 66—24)

This invention consists in improvements in or relating to knitting machines, and has for its object to provide an improved means whereby openwork or other pattern effects can be produced in fabric partly or wholly with the aid of pelerine instruments.

The present invention comprises, in a knitting machine, the combination of needles and pelerine instruments carried in one and the same bed, and means to actuate said needles and instruments for their appropriate functions. Preferably, the means for actuating the needles and pelerine instruments is selective in its action on either the needles or on the pelerine instruments or on both.

In some circumstances, it may be preferable to arrange the needles and pelerine instruments in different tricks in the bed, and in other circumstances, the invention may include a construction in which a single trick contains both a needle and a pelerine instrument or instruments.

The invention also comprises a knitting machine in which some or all of the pelerine instruments are so shaped and actuated that they can receive a stitch from a needle in one needle bed and transfer it to a needle in a companion needle bed in a rib knitting machine, thereby serving to produce a change in the character or pattern of the knitting, that is to say, a change from rib knitting to plain knitting and vice versa.

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

Figure 1 is a diagrammatic view representing a dial needle bed with needles, and an associated cylinder having needles, pelerine instruments and operating cams therefor,

Figures 2 and 3 are side views showing the relative positions of needles and pelerine instruments at different stages in the operation of the machine,

Figure 4 illustrates the operation of the pelerine instruments during the action of transferring a cylinder loop to a dial needle,

Figure 5 illustrates an arrangement of cams for cylinder needles and pelerine instruments different from that of Figure 1,

Figure 6 illustrates the action of the cams shown in Figure 5, and

Figures 7, 8 and 9 serve to illustrate different types and arrangements of pelerine instruments that may be used in accordance with this invention.

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

Turning first of all to Figure 1, a dial needle bed 10 is shown having dial needles 11 therein. The cylinder bed for the sake of clearness has been omitted, but it is to be understood that Figure 1 represents cylinder needles 12 and pelerine instruments 13 arranged in alternate tricks in the cylinder. In Figure 1 for sake of clearness, only a few of the needles and pelerine instruments are shown, but it is to be understood that the cylinder will preferably be completely filled with the alternately disposed needles and instruments. Naturally, the dial 10 may be replaced by any other form of needle bed serviceable in rib knitting machines.

The dial needles will be operated by an associated cam system of any known form, by which they will be projected at a position marked I to receive a yarn feed, whereupon they will be retracted in the usual manner to form knitted loops at a position approximately that indicated by II. The relative direction of movement of the dial needles with respect to their cams is indicated by the arrow 14, and the arrow 15 serves similarly to indiacte the relative movement of the cylinder needles and pelerine instruments relatively to their cams. In the cylinder cam box there is a dividing cam 16 for the pelerine instruments spaced above a low level track 17 therefor, and at the termination of the cam 16 there is a swing cam 18 pivoted at 19, a radially movable bolt cam 20 and lifting and depressing cams 21 and 22 respectively for use in a transferring operation. For the cylinder needles there is a low level track 23 leading to needle raising cams 24, 25 of which the cam 24 can be adjusted vertically from the full to chain line positions shown, and the cam 25 can swing about a pivot 26 also from the full to the chain line positions indicated. These cams serve to accommodate and actuate long and short butt needles in known manner, and in their raised positions lead the needles to a stitch cam 27 by which the needles are returned again to the low level track 23. Succeeding the stitch cam 27 in operation are raising and lowering cams 28 and 29 respectively for acting on the cylinder needles during the stitch transferring operation, and of these two cams, 28 is vertically adjustable from full to chain line positions.

Figure 1 may be taken to represent the cams at one feed in the machine, and preferably on each side of that feed will be other feeds associated with a cam arrangement as illustrated in Figure 5. The latter can, therefore, be considered as illustrating a continuation of the cylinder cam box at either end of the parts shown in

Figure 1. The cams illustrated in Figure 5 are intended to be associated with a feed at which stitch transference from the needles of one bed to those of another is not to occur. The cams 116, 124, 125 and 127 of Figure 5 are similar in their operation to the cams 16, 24, 25 and 27 respectively of Figure 1, and in place of cams such as 28 and 29 there will be the usual latch-opening cam 30.

There will be a gap between the termination of cam 116 and the commencement of cam 16 if the cam system of Figure 5 is to the right of that shown in Figure 1, and there will also be a gap between the cam 23 and cam 116 when the system occurring in Figure 5 is on the left of that shown in Figure 1.

The position corresponding to the gap between cams 116 and 16 is to be considered as a selecting position for the pelerine instruments and this selection is obtained by means of selectors 31 which can be moved endwise into and out from a position to engage jacks 32 associated with the instruments 13—one jack to each instrument. Each selector 31 when moved to a position illustrated in Figure 1 to engage beneath a jack 32 will, at the same time, be brought into the path of a jack lifting cam 33, whereby the pelerine instrument will be raised to a height at which its butt 34 will be raised to the upper edge of cam 16. Instruments associated with jacks that are unselected in this manner, will enter the tracks 17 beneath the cam 116.

Similarly, it is to be understood that selecting means similar to 31, 33 will be employed immediately in front of each cam 16 or 116, so that at each feed selection of pelerine instruments can take place.

The pelerine instruments are preferably shaped as shown in Figures 1, 2 and 3, from which it will be seen that the upstanding horn at the top of the instrument is offset circumferentially towards its associated needle on the right of it, and also rearwardly in a radial direction towards the axis of the machine. The needles 12 are each preferably formed with a stem having below the latch a groove 36 in which the point of the associated pelerine instrument can slide when the needle has been fully raised as shown in Figure 2.

In operation the action of the machine is as follows:

Assuming that the cylinder and dial needles are all knitting to produce ribbed fabric, cams such as 28 will be lowered to the chain line position, bolt cams such as 20 will be withdrawn clear of the track 17, and selectors 31 will remain in inoperative positions. The needle actuating cams in both the cylinder and dial will be operative to cause their needles to knit in the usual manner, but the pelerine instruments will travel in the low level track 17 and will therefore be inactive. When it is desired to change from rib knitting to plain knitting, bolt cams such as 20 will be moved into position across the track 17. The cam 20 will bridge the gap between cams 16 and 21, and the swinging cam 18 will be raised to permit entry of the bolt cam 20 into its position. A continuous cam surface is, therefore, virtually afforded along the upper edge of cam 16 leading on to the sloping surface of cam 21. Cams such as 28 will be raised to the full line position in Figure 1 and all the selectors 31 will be brought into operation to raise the pelerine instruments to the tops of cams 16. After the cylinder needles have been drawn through loops at position I and have formed their stitches at position II, they will be again projected by cam 28 to a height sufficient to clear the stitches below the needle latches and immediately after this raising of the needles is completed, the associated instruments 13 will in turn be raised by cams such as 20 on to cams such as 21. While the pelerine instruments ride up cams such as 21, the needles will be simultaneously retracted by cams such as 28, and the pelerine instruments will enter the stitches previously held by the cylinder needles, and during the transference of the needles to the pelerine instruments, the heads of the latter will slide in grooves 36 of the needles.

Figure 2 represents the commencement of this transferring operation of the stitches to the pelerine instrument and corresponds to a needle at position III of Figure 1. Figure 3 illustrates the needles at a position IV of Figure 1 and Figure 4 similarly illustrates the positions at position V of Figure 1. In the latter position it will be seen that the needle has completely shed its stitch, and the pelerine instrument has been so far moved through the stitch that the latter has passed on to the vertical portion of the pelerine instrument and in so doing has been deflected in front of an adjacent dial needle so that on a further projection of the dial needles at position VI they will in turn enter the loops that have been thus deflected in front of them, whereupon the pelerine instruments will be retracted by cam 22 to yield the loops completely to the dial needles. Thereafter all the cylinder needles will be retained in the low level track 23, cams 24, 25 and 124, 125 will be lowered to the chain line positions, and plain knitting will thus proceed.

Patterning can now be effected with the aid of the pelerine instruments only. At a feed such as Figure 1, the instruments can be selectively controlled by the selectors 31 and those which are raised to the top of cams 16 or 116 will receive on them sinker loops of the plain knitting. When the instruments reach cams such as 21 they will serve similar to the manner shown in Figure 4 to transfer sinker wales to dial needles on one side or the other according to the shape of the horns of the instruments. For instance, when the instruments are bent to the right as in Figures 1 to 4, the sinker loops will be transferred to the left. If, on the other hand, the horns of the instruments are inclined to the left as in Figure 9, they will transfer sinker loops to the right or alternatively as in Figures 7 and 8, some of the instruments may be formed with other horns bent in one direction and some in the other direction.

In Figures 8 and 9, each trick in the needle cylinder 35 is of sufficient width to receive a needle and a pelerine instrument side by side. In the arrangement illustrated in Figure 7, the tricks will be formed to receive in alternate tricks needles only, and in the intermediate tricks two pelerine instruments side by side.

If the cam systems at all the feeds are arranged as in Figure 1, transference of sinker loops by selected instruments will occur at each feed. If it is desired to accumulate more than one loop on an instrument prior to transference, the cam system of Figure 5 or more than one such system can be utilized in advance of that according to Figure 1. It will be seen in Figure 5 that selected instruments will ride along the top of cam 116, but no transfer movement of the instruments will be made. Those instruments which have thus been selected will continue to

ride on to the top of cam 16 and will each accumulate a second sinker loop, both of which will be transferred together when they reach the cam system 20, 21, 22. Obviously, it is possible thus on some instruments to accumulate the loops, and on other instruments to take only one loop by selecting those instruments immediately in advance of cam 16 to raise them to the upper track of that cam. Moreover, by the selective action of a selector such as 31, which as stated above, may be in advance of each cam such as 16 or 116, the action of the instruments can be controlled selectively to produce any desired pelerine pattern.

What has been described in the foregoing in relation to the cylinder needles and their association with pelerine instruments may obviously be employed in a similar manner in association with the dial needles, in which case representations such as are made in Figures 2 and 3 must be viewed as though turned through a right angle, and representations such as in Figures 4 and 6 must be then considered as plan views of the needle and instrument arrangement instead of elevations. On this understanding also, it will be appreciated that it is possible to provide in each needle bed, a combination of needles and pelerine instruments.

In Figure 1 as has been stated, some, but not all of the needles and pelerine instruments in the cylinder have been illustrated. This illustration can, therefore, be taken to indicate that there are as many needles in the cylinder as there are in the dial, or there may be more needles in the dial than in the cylinder thus providing for a pattern set-out for rib knitting. When there are the same number of needles in both needle beds, 1 x 1 rib knitting will be produced.

If the arrangement is such that adjacent needles in the needle cylinder are separated (in the knitting sequences) by two dial needles, 2 x 1 rib knitting will be produced. Alternatively some of the needles in the dial may be omitted to enable a reverse pattern set out to be made. Notwithstanding the set out of the needles stitch transfers can be made in the manner above described and pelerine patterns may also be similarly worked. It will be further understood that a pelerine instrument could be actuated without material alteration of the mechanism described to penetrate a loop held on a dial needle and to transfer it to a cylinder needle. For this purpose it will be necessary while the cylinder needles are retracted to raise an instrument to the position V and at VI to project the dial needles sufficiently far to shed their loops and to leave them on the pelerine instruments. The latter would not be retracted by a cam such as 22 until they reach the position at which the cylinder needles are raised to knitting height by cams such as 24 and 25, whereupon the instruments may be retracted to pass their loops on to the cylinder needles. Thus, transference from rib to plain or plain to rib knitting can be made.

The reference at the commencement of the specification to the adjustment of needles for patterning effects can be obtained by means of the cams 24, 25 which can be adjusted so that either short butt needles or long butt needles or both are raised to thread taking height.

Selectors such as 31 may be actuated by any preferred mechanism such as jacquard mechanism.

It will be realized that where reference is made to the transfer of needles or instruments along their cam tracks, it is intended that butts on such elements will engage the tracks in the usual manner; and butts have been illustrated as so doing in the drawings.

I claim:

1. A knitting machine comprising two sets of needles and in combination with at least one set thereof additional instruments so formed as to be capable of functioning optionally as pelerine instruments or as stitch transfer instruments.

2. A knitting machine comprising two sets of needles, means to feed yarn thereto, and combined with at least one set thereof additional adjustable instruments each so shaped that its outer end lies sufficiently close to an adjacent needle that relative movement between them in a direction parallel to the length of the needle will cause the instrument to enter a knitted loop carried on the needle and a portion of the instrument behind that end is spaced sufficiently from the needle to be capable of receiving a sinker wale portion of yarn fed to needles in the companion bed when the instrument is adjusted to co-operate with the latter needles.

3. A knitting machine according to claim 1 having a bed to receive a set of needles and the additional instruments associated with them, and tricks in the bed formed to receive, in a single trick, a needle and an additional instrument.

4. A knitting machine according to claim 2 having a bed to receive a set of needles and the additional instruments associated with them, and tricks in the bed formed to receive, in a single trick, a needle and an additional instrument.

5. A knitting machine comprising in combination two needle-beds, needles in each bed, additional instruments so formed as to be capable of functioning optionally as pelerine instruments and as stitch transfer instruments which instruments are formed with butts, and are slidable in at least one of the needle beds, idle and actuating tracks engaging the instrument butts, and selecting means for guiding the said butts into the respective tracks thereby to determine which of their functions they are to fulfill.

6. A knitting machine comprising in combination two needle beds, needles in each bed, additional instruments so formed as to be capable of functioning optionally as pelerine instruments and as stitch transfer instruments, which instruments are formed with butts and are slidable in at least one of the needle beds, idle and actuating tracks engaging the instrument butts, selecting means for guiding the said butts into the respective tracks thereby to determine which of their functions they are to fulfill, a needle track, stitch cams therein, and needle transfer cams and instrument transfer cams whereby not only can the needles be raised and retracted to cast their loops but the instruments can also be raised to receive those loops and thereafter move them to a transfer position relatively to the needles in the associated needle bed.

7. A knitting machine comprising in combination two needle beds, needles in each bed, a multiple yarn feed, additional instruments in at least one needle bed and so formed as to be capable of functioning optionally as pelerine instruments and as stitch transfer instruments, which instruments are formed with butts, tracks associated with each feed for the needles and instruments, and in association with some at least of the feeds selecting means for the instruments to locate them on a selected track whereby they will be idle or be raised to a position to form a pelerine

stitch according to the track to which they have been selected, and also in association with some at least of the feeds adjustable selective means to move selected instruments to a position to transfer a stitch from one needle bed to the other.

8. A knitting machine comprising in combination two needle beds, needles in each bed, a multiple yarn feed, additional instruments in at least one needle bed and so formed as to be capable of functioning optionally as pelerine instruments and as stitch transfer instruments, which instruments are formed with butts, tracks associated with each feed for the needles and instruments, and in association with each feed selecting means for the instruments to locate them on a selected track whereby they will be idle or be raised to a position to form a pelerine stitch according to the track to which they have been selected, and also in association with each feed adjustable selective means to move selected instruments to a position to transfer a stitch from one needle bed to the other.

9. For a knitting machine having two needle beds and needles therein, an instrument which is additional to the needles and is so formed as to be capable of functioning optionally as a pelerine instrument or as a stitch transfer instrument.

10. For a knitting machine having two needle beds and needles therein, a plurality of instruments which are additional to the needles and are so formed as to be capable of functioning optionally as pelerine instruments or as stitch transfer instruments.

11. A knitting machine comprising in combination a cylinder and a dial both containing needles to co-operate for knitting, additional instruments slidable parallel with the needles in the cylinder and each so formed at its upper end that by a relative sliding movement between it and an associated cylinder needle it can enter and receive the stitch on that needle but when raised to a greater height it will be in a position to receive a sinker loop of yarn fed to the needles, a yarn feed for supplying yarn to the two sets of needles, butts on the needles and on the instruments, upper and lower cam tracks for the instrument butts, cam tracks for the needle butts, switch cams controlling both the instrument tracks and the needle tracks for positioning the needles and the instruments for their desired functions, and selecting means additional to the switch cams for locating the instruments in either the upper or the lower track.

12. A knitting machine comprising in combination a cylinder and a dial both containing needles to co-operate for knitting, additional instruments slidable parallel with the needles in the cylinder and each so formed at its upper end that by a relative sliding movement between it and an associated cylinder needle it can enter and receive the stitch on that needle but when raised to a greater height it will be in a position to receive a sinker loop of yarn fed to the needles, a plurality of yarn feeds for supplying yarn to the two sets of needles, butts on the needles and on the instruments, upper and lower cam tracks for the instrument butts, cam tracks for the needle butts, switch cams at some at least of the feeds for controlling both the instrument tracks and the needle tracks for positioning the needles and the instruments for their desired functions, and selecting means additional to the switch cams for locating the instruments in either the upper or the lower track.

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