

Dec. 13, 1938.

W. L. HOUSEMAN

2,139,754

KNITTING MACHINE

Filed April 27, 1935

3 Sheets-Sheet 1

FIG. 1.

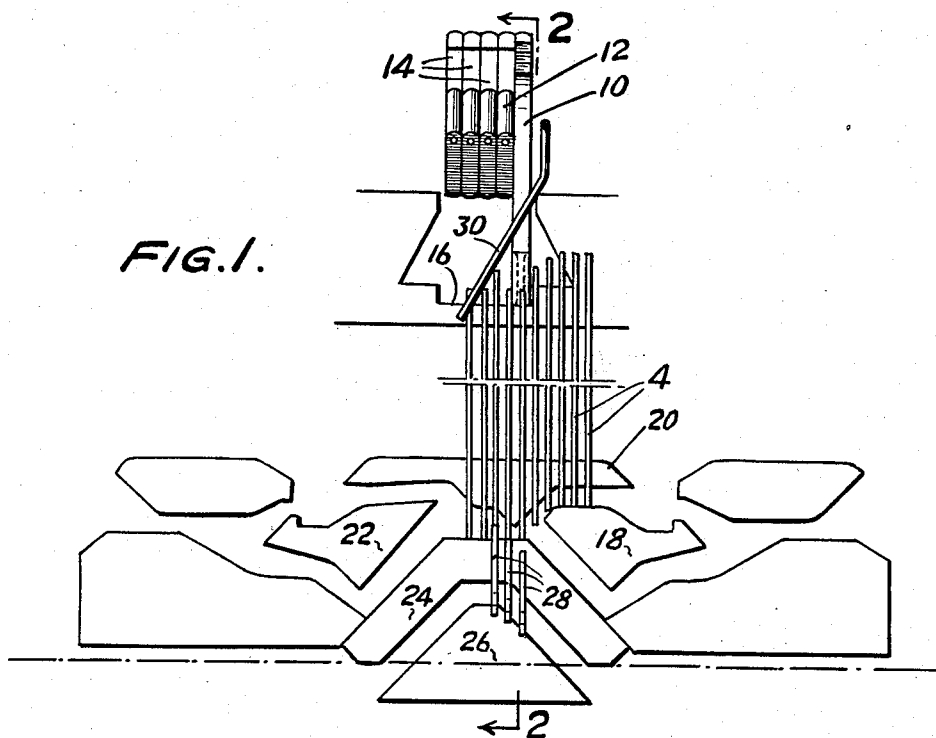
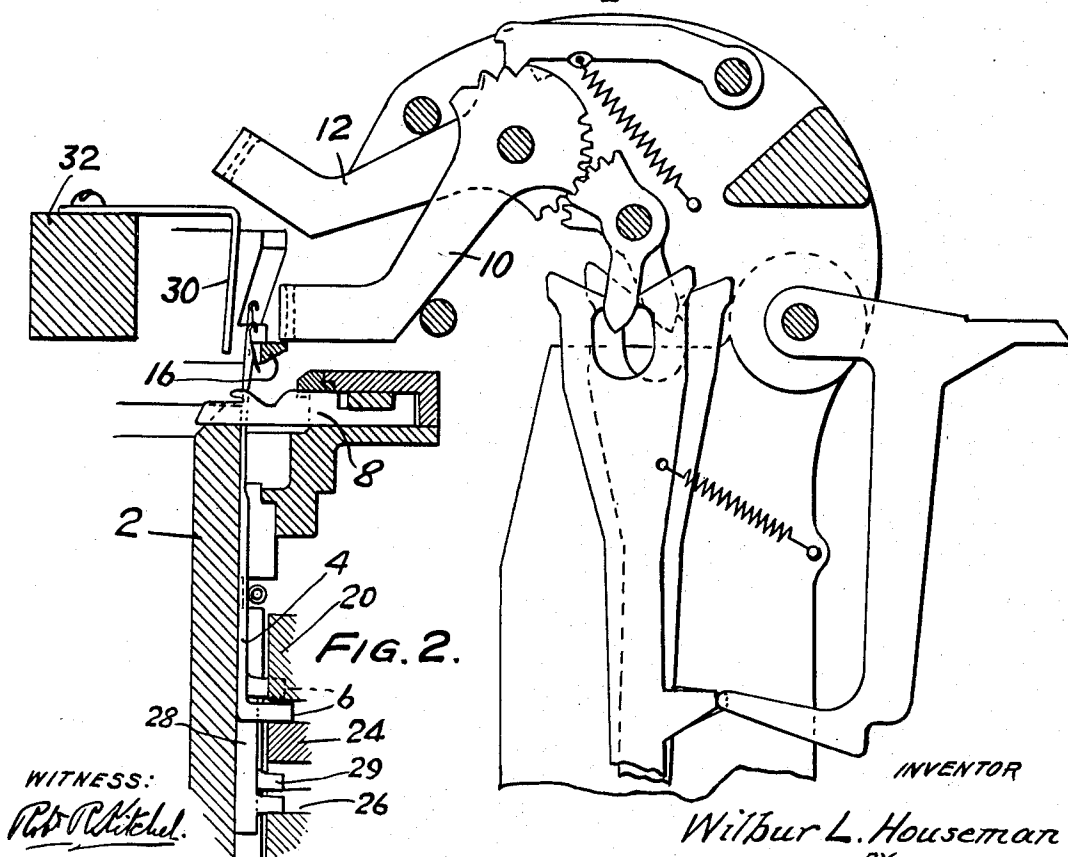


FIG. 2.



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3 Sheets-Sheet 2

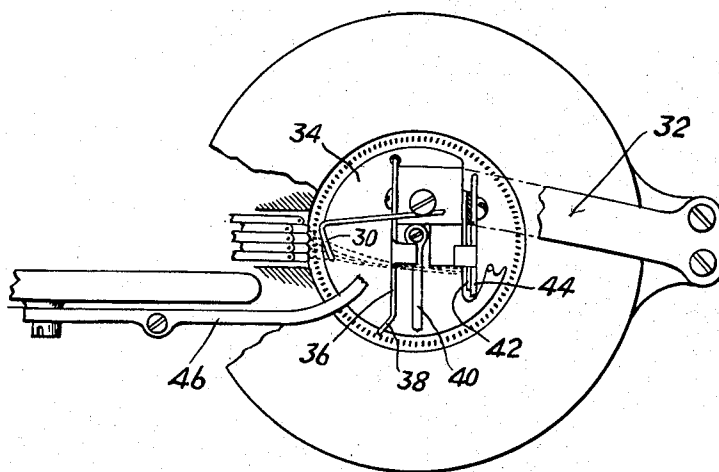


FIG. 3.

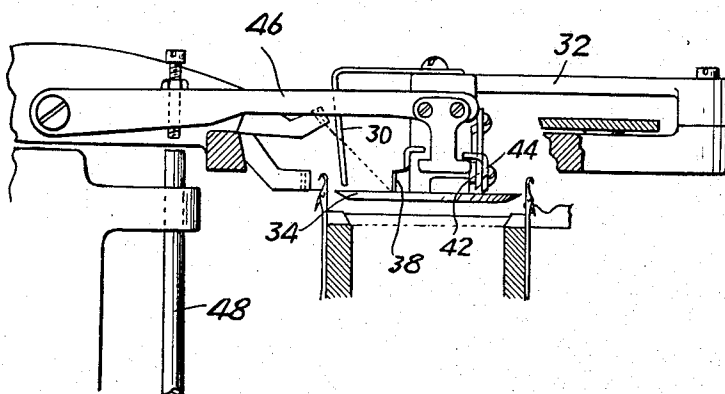


FIG. 4.

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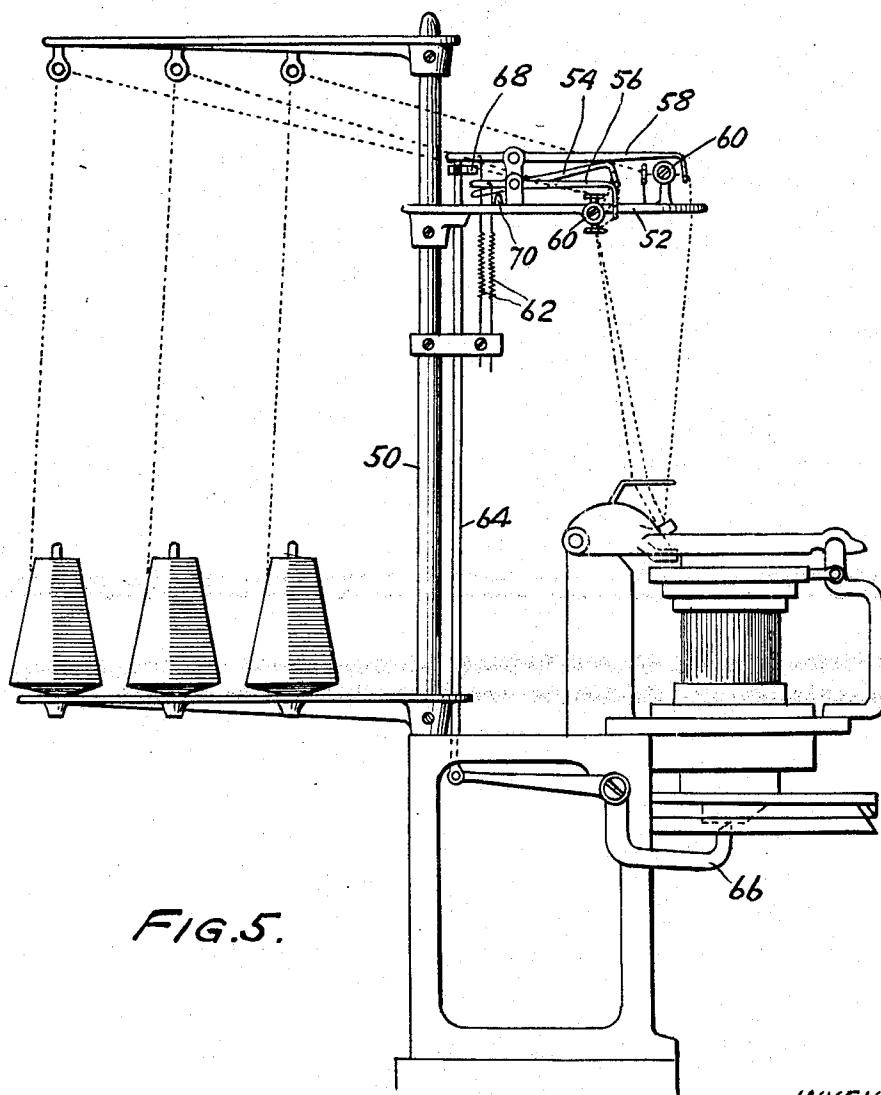
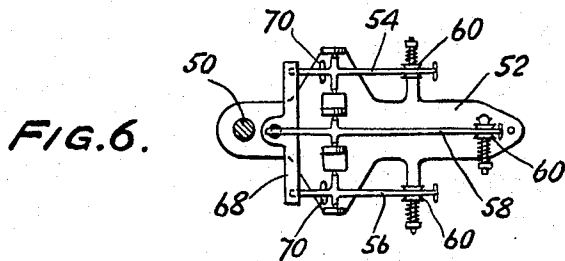
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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,139,754

KNITTING MACHINE

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Application April 27, 1935, Serial No. 18,498

14 Claims. (Cl. 66—140)

This invention relates to a circular knitting machine and has particular reference to mechanism for handling yarns in the production of horizontal stripes.

It is common practice when making stripes in the stocking by frequent yarn changes, to clamp and cut the yarns as they are withdrawn. This results in a stocking having a great number of ends of yarns where the yarns are both inserted and withdrawn. A much neater result is obtained if the yarns are not clamped and cut but are controlled while inactive by take-up sweeps so that when they are reinserted only one float is visible on the inside of the fabric, extending practically vertically from the needle on which a yarn was last knit to the needle where it was again inserted. It is the broad object of the present invention to provide means for accomplishing this latter type of operation, insuring also the definite entering of the yarns on a given needle and the definite removal on another needle, for example, two needles behind the first mentioned needle. It is a further object of the invention to provide an arrangement which, while avoiding the clamping and cutting of the striping yarns during the formation of a leg or foot portion of the stocking, will nevertheless provide for properly clamping and cutting them when, for example, a heel or toe is knit.

These and other more specific objects of the invention will become apparent from the following description read in conjunction with the accompanying drawings in which:

Fig. 1 is a diagrammatic developed view showing needles, associated cams and yarn fingers and other devices adjacent a yarn feeding point.

Fig. 2 is a fragmentary radial section taken adjacent the yarn feeding point as indicated at 2—2 in Fig. 1.

Fig. 3 is a fragmentary plan view showing a clamping and cutting means used in the knitting machine embodying the invention.

Fig. 4 is a transverse section of the same.

Fig. 5 is a side elevation of the knitting machine showing particularly the take-up sweeps and the controls; and

Fig. 6 is a plan view of the take-up devices.

The circular knitting machine comprises a needle cylinder 2 in slots in which slide latch needles 4 provided with butts 6. Cooperating with these needles for the formation of stitches are conventional sinkers 8. Yarns are fed to the needles by yarn fingers comprising, for example, two striping yarn carrying fingers 10 and 12 and other fingers carrying additional yarns which may be incorporated in various parts of a stocking. It will be clear, of course, that more than two striping yarn fingers may be used. The various yarn fingers are controlled by suitable pattern devices which are diagrammatically indi-

cated in Fig. 2. The particular controlling means for the fingers form no part of the present invention. The yarns are fed through the opening 16 in the latch ring in the usual fashion.

Cams of conventional type serve to control the needles for the formation of stitches. These cams include the stitch cams 18 and 22, the upper center cam 20 and the lower center cam 24. Jacks 28 provided with butts 29 are raised by a jack cam 26 and lowered by a lower cam face on the lower center cam 24. The number of jacks which is used depends upon the desired overlap of the striping yarns. In general, an overlap of three needles is sufficient and accordingly three jacks 28 are illustrated, located below the needles in the needle slots. The jacks 28 are maintained in the slots by a circular ring of cams. As the jacks 28 ride up the cam 26 they serve to raise the needles associated with them to a level above the other needles at the yarn-taking position. As a result of this and the fashion in which the striping yarns are presented to the needles, the yarns are definitely taken by the high-riding needles with a result that the striping yarns go into action on these needles. The arrangement is also such that the yarns are removed from the last of this set of needles by reason of the fact that as the finger carrying the yarn to be removed rises, the yarn is raised so as to miss the needle moving lower than the last of the raised set.

The proper insertion of a striping yarn on the first of the raised needles is effected by the use of a sloping wire indicated at 30 which is carried by the bracket 32 acting as a support for the clamping and cutting mechanism. The wire is so positioned immediately inside the needle circle that the yarns ride down it as the yarn fingers move into action in such fashion that while they are above the needles which are riding at normal levels, they are engaged by the needles which have been raised by the jacks.

The clamping and cutting means is substantially of conventional type and is here shown as of the type described in my Patent 1,462,551, dated July 24, 1923. The present clamping and cutting mechanism differs from that of the patent only by reason of the fact that the clamp 36 is provided with an extension 38 which serves to engage a striping yarn as it is taken out of action to prevent its being dragged into the clamping means. Besides the clamp 36, which is adapted to be opened against the action of its spring by a pattern-controlled lever 46 lifted through the rod 48 controlled by cams on the main pattern disc, the clamping and cutting means includes a spring clamp 40 and a cutting mechanism comprising the fixed blade 42 and movable blade 44. The movable blade 44 is also

controlled by the lever 46 as described in my patent.

To secure proper handling of the striping yarns during their periods of inaction, it is necessary to provide take-up sweeps for them in addition to the main sweep or sweeps which control the yarns used in reciprocatory knitting. A post 50 supports a bracket 52 on which the take-up sweeps and associated elements are mounted. The take-up sweeps for the two striping yarns, herein disclosed, are illustrated at 54 and 56, while the main take-up sweep used during reciprocatory knitting is indicated at 58. Each of these sweeps receives its yarn from the supply through suitable guide eyes and tensions 60. The various sweeps are normally urged toward raised position by springs 62.

The main take-up sweep 58 is held in lower position during rotary knitting by a plunger 64 controlled by a lever 66 which is acted upon by cams on the main cam disc. When the plunger 64 releases the main sweep 58 for action, a bracket 68 carried by it engages the tails of the sweeps 54 and 56 moving them upward to positions limited by stops 70. The plunger 64, either by its weight or by the provision of suitable springs insures that the sweeps 54 and 56 are maintained in their raised position during reciprocatory knitting, thereby insuring that the yarns are not pulled out of the clamping means when the clamping means is opened to release the heel and toe yarn.

During rotary knitting of the leg or foot of a stocking in which striping is taking place, the fingers 10 and 12 are alternately lowered into action. The yarn from the raised finger, during the formation of such portions of the stocking, is drawn through the finger as the cylinder revolves. In the ordinary type of machine this action would result in such yarns being drawn into the clamping and cutting mechanism. In the present case, however, the extension 38 of the clamping lever 36 engages the yarn, which extends between the last loop in which it was knit formed by the trailing one of the three raised needles and the raised yarn finger, and serves to deflect it in such fashion that it will pass below the bevelled edge of the disc 34. The action of the corresponding sweep 54 or 56 controls it so as to maintain it in taut condition to prevent its accidentally becoming engaged and broken by any part of the mechanism. When a striping yarn change takes place, the finger carrying the yarn which is to go into action causes it to ride down the wire 30 in position to be engaged by the first of the raised needles. Immediately thereafter, the finger holding the yarn which was being knit will be raised and its yarn will be withdrawn from the last of the raised needles.

Such action, without the operation of the clamping and cutting means, takes place during the continuance of the striping. When a yarn change is to take place to form the heel, the clamp 38 is raised and the cutter is opened by the action of the arm 46. At the same time, the yarn finger carrying the heel yarn is brought down into action and the heel yarn is engaged by the first of the raised needles. As the last striping yarn is raised, it, together with the yarn trailing from the striping finger which is already raised, will pass below the clamp 38 and spring clamp 40 and as the first reciprocation proceeds will enter the cutter to be immediately thereafter cut. Simultaneously with the introduction of the heel yarn, the take-up sweep 58 is permitted to become active. The downward movement of the rod 64, which effects

this, raises the sweeps 54 and 56. The striping yarns are not at this time clamped but are still running to the fabric. Sufficient yarn is drawn from the supplies to take care of this motion of the sweeps if either of them is not already in its uppermost position. As a consequence of the fact that the take-up sweeps are thereafter in their raised positions (which they will retain even after rod 64 is again raised and until their respective yarns are again seized by the needles), they will not exert any pull on the striping yarns when the clamp is next opened to permit a yarn change, the striping yarns being held by the spring clamp 40 during the opening of clamp 38. If the sweeps were not in their raised position, it is obvious that at the end of reciprocatory knitting, when one of the striping yarns was again to be reinserted and the clamp 38 was opened, the other yarn might be snapped by its sweep out of the clamping and cutting means so as not to be reinsertable.

It is obvious that following reciprocatory knitting the striping yarns may be successively brought into action at the proper times and will move under the disc 34 so as not to be engaged by the clamping and cutting elements.

If an extended toe is being knit, the toe yarn will be inserted to form it and the striping yarns will be clamped and cut. Their sweeps, however, will still be under tension until the machine starts reciprocatory knitting. Since the toe yarn is used for the extended toe, the clamp will not open at the transition from rotary to reciprocatory knitting and will continue to hold the striping yarns as the sweeps 54 and 56 are raised by the depression of the rod 64. It is found that the clamps 36 and 40 will hold the yarns during such action.

Although one control is shown for all three sweeps, it is obvious that two or even three separate controls could be used if, for instance, the striping yarns should, for any reason, be clamped and cut during the leg knitting at a time when the heel yarn sweep would not be released.

It will be clear that variations in the invention may be made without departing from the scope of the invention as defined in the following claims:

What I claim and desire to protect by Letters Patent is:

1. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, clamping and cutting means inside the needle circle, means for alternately feeding at least two yarns to the needles at the same feed point, means for taking up a yarn which is not knitting but which extends to the fabric while its end connected to the fabric makes a substantially complete revolution relative to the feeding means, and means for deflecting such idle yarn beneath the clamping and cutting means to avoid engagement thereby.

2. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point, means for differentiating during a single rotation of the cylinder a small group of adjacent needles from others preceding and following the group as they pass the feed point to cause the yarns to enter on the first needle of the group and go out of action from the last needle of the group, and means for guiding the yarns to said group of needles to cause yarns from feeding means located in different active positions to move substantially identically downwardly relatively to the needle circle between needles thereof when going into action, whereby a definite overlap corresponding to the width of the group is provided.

3. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point in one portion of a fabric, means for taking up a yarn which is not knitting, but which is connected to the fabric, during the formation of said portion of the fabric, and means for clamping said yarns during the formation of another portion of the fabric.

10 4. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point in one portion of a fabric, means for taking up a yarn which is not knitting during the formation of said portion of the fabric, means for clamping said yarns during the formation of another portion of the fabric, and means for relieving take-up strain on said yarns while they are clamped.

20 5. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point in one portion of a fabric, means for taking up a yarn which is not knitting during the formation of said portion of the fabric, means for clamping said yarns during the formation of another portion of the fabric, and means for relieving take-up strain on said yarns prior to their being clamped and cut.

30 6. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point in one portion of a fabric, means for taking up a yarn which is not knitting during the formation of said portion of the fabric, means for clamping said yarns during the formation of another portion of the fabric, and means for relieving take-up strain on said yarns after they are clamped and cut and prior to subsequent opening of the clamp.

40 7. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point in one portion of a fabric, means for taking up a yarn which is not knitting during the formation of said portion of the fabric, means for clamping said yarns during the formation of another portion of the fabric, and means for effecting positioning of the take-up means at the take-up limit while the yarns are clamped.

50 8. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point, and means for guiding the yarns to said needles to cause yarns from feeding means located in different active positions to move substantially identically downwardly between the needles when going into action and prior to engagement by a needle whereby the yarns are caused to enter on the same needle.

65 9. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding a plurality of yarns to the needles at the same feed point in one portion of a fabric to produce limited overlaps thereof where one is taken out of and the other brought into action, means for taking up any of such plurality of yarns while it is not knitting and while, during knitting of another of said yarns in said portion of fabric, it extends from the feeding means to the last loop formed

thereof, and means for clamping said yarns during the formation of another portion of the fabric.

10. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, clamping and cutting means inside the needle circle, means for alternately feeding a plurality of yarns to the needles at the same feed point in one portion of a fabric to produce limited overlaps thereof where one is taken out of and the other brought into action, means for taking up any of such plurality of yarns while it is not knitting and while it extends to the fabric during the formation of said portion of fabric, and means for deflecting such idle yarn beneath the clamping and cutting means to avoid engagement thereby and while it is under the control of said take up means.

11. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point in one portion of a fabric, each of the two yarns being fed to the needles in each alternation to enter one or more substantially complete courses, means for taking up throughout the formation of one or more substantially complete courses a yarn which is not knitting during the formation of the fabric, and means for clamping said yarns during the formation of another portion of the fabric.

12. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point in one portion of a fabric, means for introducing both yarns on the same needle and for removing them from another needle following by a relatively short distance the first mentioned needle to produce a limited overlap of the leaving and entering yarns, means for taking up in said portion of the fabric a yarn which is not knitting and which extends continuously from the feeding means to the fabric, and means for clamping said yarns during the formation of another portion of the fabric.

13. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means for alternately feeding at least two yarns to the needles at the same feed point, and means fixedly located with respect to the feeding means providing a guiding edge over which the yarns slide when going into action to cause yarns from feeding means located in different active positions to move substantially identically relatively to the needle circle downwardly between the needles when going into action and prior to engagement by a needle whereby the yarns are caused to enter on the same needle.

14. A knitting machine including a circle of needles, a cylinder slidably supporting said needles, means relatively to which the cylinder rotates for alternately feeding at least two yarns to the needles at the same feed point, and means inside the needle circle and closely adjacent thereto for guiding the portion of an entering yarn adjacent the needle circle prior to its engagement by a needle downwardly in a predetermined path extending generally lengthwise of the axis of said cylinder whereby the yarns are caused to enter on the same needle.