H. A. HOUSEMAN.

CIRCULAR KNITTING MACHINE MECHANISM FOR CONTROLLING YARN IN PLATING.

APPLICATION FILED APR. 13, 1916.

1,204,445.

Patented Nov. 14, 1916.

3 SHEETS—SHEET 1.

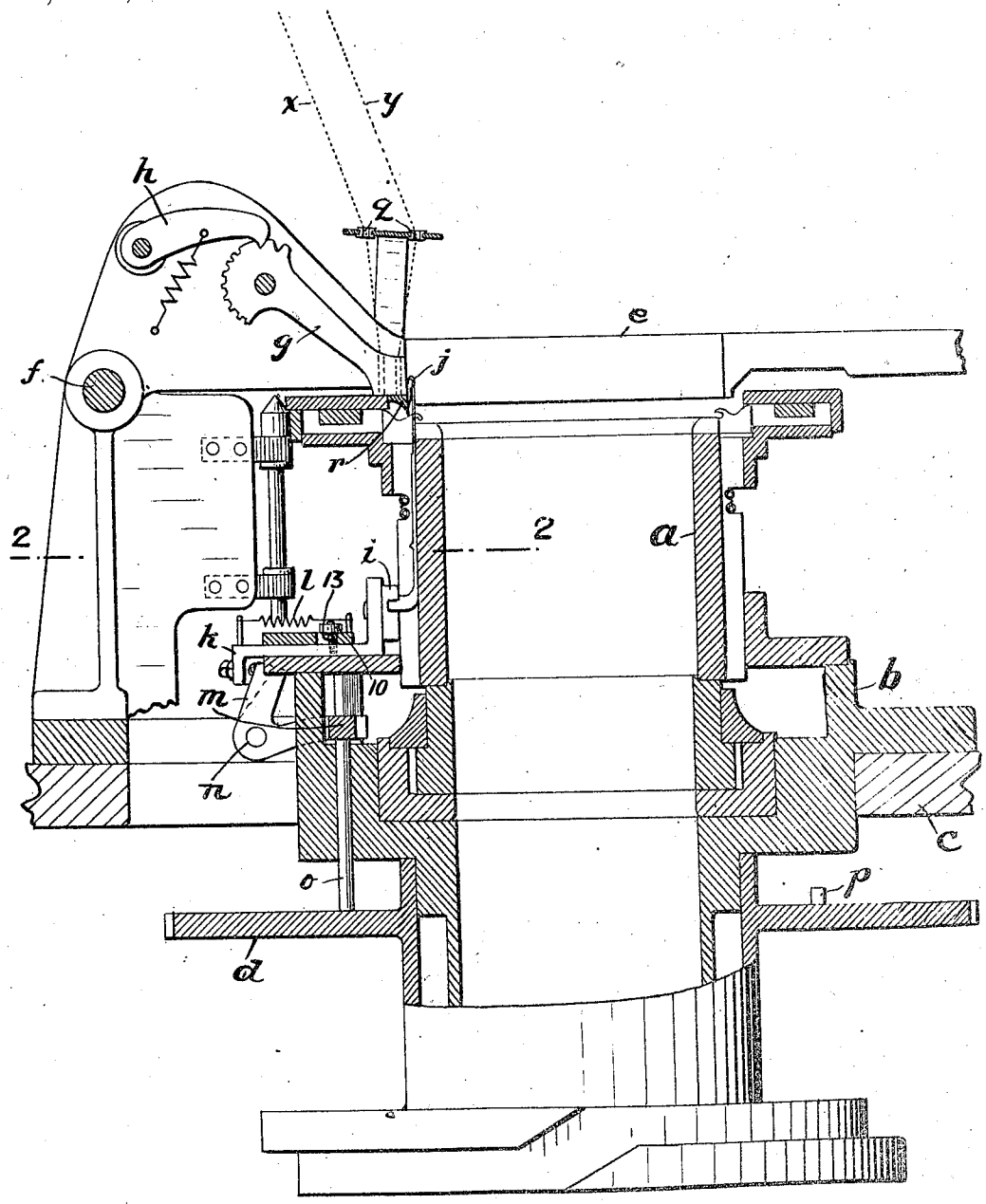


FIG. 1.

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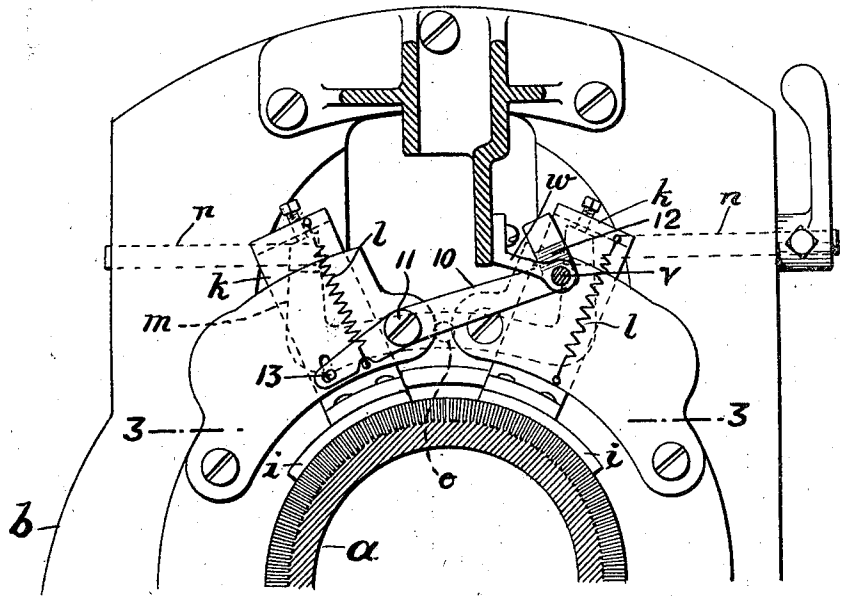


FIG. 2.

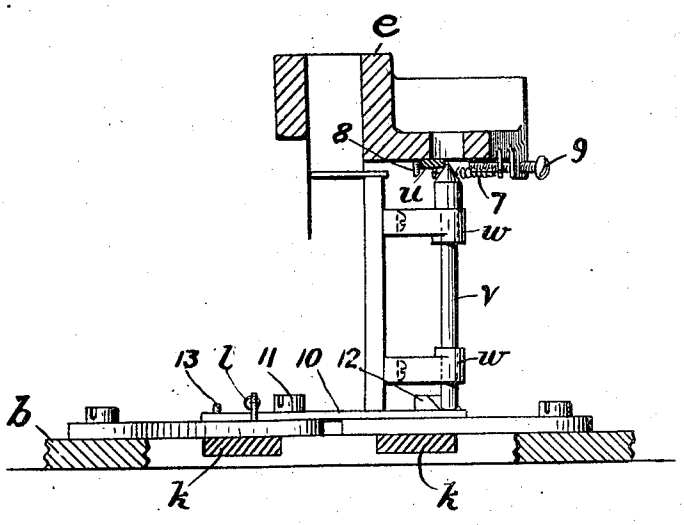


FIG. 3.

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3 SHEETS—SHEET 3.

FIG. 4.

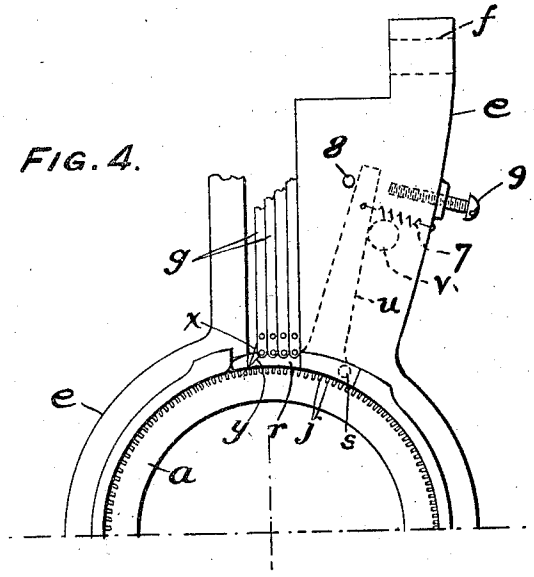


FIG. 5.

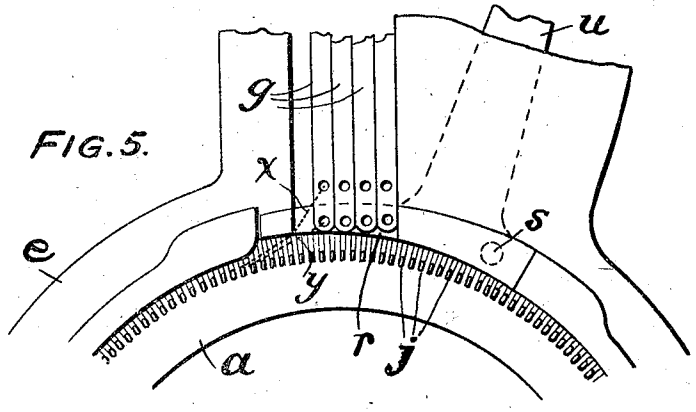
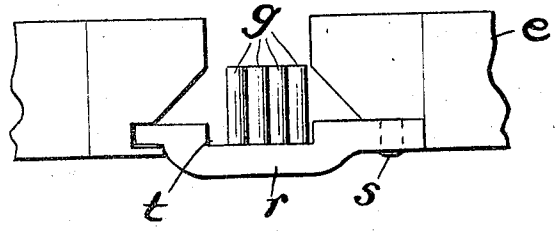


FIG. 6.



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HARRY A. HOUSEMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO STANDARD MACHINE COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

CIRCULAR-KNITTING-MACHINE MECHANISM FOR CONTROLLING YARN IN PLATING.

1,204,445. Specification of Letters Patent. Patented Nov. 14, 1916.

Application filed April 13, 1916. Serial No. 90,809.

To all whom it may concern:

Be it known that I, HARRY A. HOUSEMAN, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Circular-Knitting-Machine Mechanism for Controlling Yarn in Plating, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

In the manufacture of hosiery the knitting of plated stockings is well known. It is also well known that the plating effect can be produced by causing two threads to be fed to the needles side by side. This is usually accomplished by providing a yarn carrier with two holes, one back of the other, through which the two threads are delivered to the needles. It is unnecessary to explain precisely the reasons why the introduction of the threads to the needles in this manner produces the plated effect, the fact being well known in the art and a comprehension of the theory of the operation being unnecessary to an understanding of my invention.

Difficulties are encountered in practically operating machines to successfuly produce the plated work. At the end of the transfer operation, and at the start of the tubular fabric in the making of the next stocking, the yarn must be properly guided to the needles. To this end the yarn should be introduced to the needles at such an angle to the periphery of the needle bank as to be more or less nearly tangential thereto. If, however, the two threads which are to be delivered to the needles side by side be initially fed to the needles in that relation, there is danger that the outside thread will not properly engage the needles. If, on the contrary, the outside thread is so fed to the needles as to insure its proper engagement therewith, it is difficult to actually direct it to the needles outside the other thread, or sufficiently far outside the other thread to insure the production in the finished fabric of the desired plating effect. Notwithstanding these difficulties, the ordinary expedient is an attempt at a compromise whereby the outside yarn will be sufficiently far in to insure engagement with the needles and sufficiently far out to insure its proper coöperation with the yarn to produce the plated effect. The result is unsatisfactory and uncertain. Efforts have been made to overcome the difficulty in other ways. Thus it has been proposed, at the beginning of the needle-threading operation, to press out the needles toward the yarn carrier, but it is obvious that this imposes a strain on the needles that tends to permanently distort them and at the least to shorten their life.

In my invention, the desired result is effected by means, independent of the needles, whereby the outside yarn, in the needle-threading operation, is delivered to the needles sufficiently far in to absolutely insure its proper engagement therewith and preferably at the same angle at which the other yarn is so guided to the needles, while immediately thereafter, the direction of delivery of the yarn to the needles is changed so that it passes to the needles, throughout the remainder of the knitting operation, as far outside the other yarn as is desirable to enable the plating operation to be successfuly carried out with absolute certainty. More specifically, the result is accomplished by providing a yarn guide or deflector which may be moved toward and from the needles and which, while preferably having no effect upon the inside yarn will shift the angle of the outside yarn relatively to the periphery of the back of needles so as to cause the yarn to be initially delivered to the needles at the angle best adapted to insure proper engagement therewith and to thereafter be delivered to the needles as far outside the other yarn as may be desired. I prefer to utilize, as such yarn guide or deflector, the needle-latch guard, but to reconstruct the same in such manner that it will be movable and will operate to so guide or deflect the yarn. I have also arranged this device, whether it be the latch guard or a special device performing solely the yarn guiding function, so that it will be operated automatically at the proper time and to this end have associated and connected it with the ordinary stitch cam so that it will be operated thereby or in unison therewith.

A fuller understanding of the invention

will be had by reference to the accompanying drawings, in connection with the description thereof, and in which—

Figure 1 shows the knitting head of a circular knitting machine, principally in cross section, with my invention applied thereto. Fig. 2 is a partial plan view in section on line 2—2 of Fig. 1. Fig. 3 is a partial sectional view on line 3—3 of Fig. 2. Fig. 4 is a partial plan view of the top frame and parts connected therewith. Fig. 5 is a view similar to Fig. 4, on a larger scale with parts in a different relative position. Fig. 6 is a front view of the portion of the top frame shown in Fig. 5.

The mechanism constituting the knitting head consists, briefly, of the needle cylinder *a*, rotatably mounted in a base *b* secured to the frame *e* of the machine. Upon base *b* is also mounted a rotatable cam disk *d*, below the needle cylinder and concentric therewith, which is given a predetermined step by step motion by a pattern chain not shown.

The top frame *e*, pivotally supported at *f*, carries thread carriers *g*, which, as shown, are in the active position, and may be raised out of action, there usually being but one thread carrier active at a time. The thread carriers are actuated by mechanism not shown, as it bears no relation to the present invention. They are held either active or inactive by spring pressed detent arms *h*, Fig. 1.

Knitting cams *i* act upon the needles *j*, in the rotation of the needle cylinder, to raise and lower them in the well known operation of knitting a tubular fabric.

In the manufacture of half-hose, to which my invention is particularly applicable, at the beginning of the operation the needles must be leveled, *i. e.*, the entire circular set of needles must be brought to the same horizontal level. This is for the purpose of admitting of the transfer thereto of an already-formed tubular elastic portion known as the rib top. In order to thus level all the needles it is necessary to render the before mentioned knitting cams inoperative. These cams *i* are carried by radially movable slides *k*, which normally hold the cams in operative position by means of springs *l*. A double bell-crank lever *m*, turnable on alined axes *n* in the bed *b*, serves to withdraw slides *k* and cams *i* out of action, as fully set forth and described in my application, Serial No. 51,939, filed September 22, 1915. As shown, the upstanding arms of the bell crank lever bear against the inner sides of turned down flanges on the outer side of slides *k*, while the connected arms of said lever rest upon a vertical rod *o*, which passes through the bed *b* and rests upon the cam disk *d*. At the time the needles are to be leveled, a cam *p* on the cam disk is caused to underride rod *o*, thereby raising it and tilting the bell crank lever, which in turn withdraws the knitting cams as desired.

In knitting plated stockings, that is, stockings in which two threads are knitted simultaneously, it is necessary, as hereinbefore stated, to feed the threads to the needles in such a way that they lie side by side. It is necessary to accomplish this positively in order that one of the threads shall appear continuously upon the outside of the stocking and the other upon the inside. The threads *x*, *y* are brought from the cops (not shown) through eyes *q*, and are threaded through two holes in one of the yarn fingers or carriers, in an old and well known manner. From the yarn carriers the threads pass over the edge of a recess in the ring-shaped element called the latch guard, directly to the needles. In order to accomplish the result desired I have taken a section of the latch guard and made it as a separate and movable piece *r*, pivoted at *s* to frame *e*, and therefore movable back out of the circular inner line of said frame, as shown in Fig. 5, and performing the function of a yarn guide or deflector. I have also so constructed and arranged this yarn guide that it carries at its outer end a raised portion forming a shoulder or corner *t*, by which threads *x*, *y* are guided and deflected in their passage from the yarn carriers to the needles. As shown in Fig. 4, when the yarn guide *r* is in its forward position, *i. e.* right against the needles, both threads *x* and *y* pass together around shoulder *t*, and it is necessary to start the operation with the guide *r* in this position in order to properly thread the needles. After six or eight needles have thus caught the thread, the yarn guide *r* may be moved back into the position shown in Fig. 5. For purposes of clearness the yarn guide is shown as having been moved back farther than is ordinarily desirable in practice, a receding movement of about one sixteenth of an inch at the point of the corner *t* being usually sufficient to free one of the threads *y* from said corner, but not the other thread, thus separating the threads at this point and insuring their deliverance to the needles side by side as desired.

The retraction of the yarn guide does not affect its efficiency as a latch guard, for though it does not hold the latches of the needles wide open, it still prevents any possibility of their closing. The yarn guide has an operating arm *u* by which it is opened and closed in the following manner: A vertical rod *v* is slidably mounted in brackets *w* attached to a fixed part of the machine. Rod *v* carries a conical cam head in position to act upon an arm *u* of the yarn guide *r*, so that by raising rod *v*, arm *u* may be moved to close the said guide, and by low-

ering rod v, arm u, by means of spring 7, moves said guide into its open position. A pin 8, projecting from the top frame serves as a stop to prevent the guide being thrown in against the needles, and an adjusting screw 9 serves to limit its outward motion, the extent of which may be adjusted as desired. Rod v rests upon one end of a lever 10, pivoted at 11 to a fixed part, and carrying a cam 12, which may be made to underride and raise rod v when desired. The other end of lever 10 has a hole through which projects a pin 13 carried by one of the slides k. By this arrangement when slides k are moved outward to withdraw the knitting cams and allow the leveling of the needles at the beginning of a stocking, lever 10 is thereby turned and cam 12 raises rod v, which in turn causes arm u to move in the yarn guide r, so that the threads are subsequently insured a correct delivery to the needles, as shown in Fig. 4. After the needles are leveled and the machine stopped, and the machine is again started, the last described position of the yarn guide is maintained only momentarily, while cam p upon the cam disk is moving beneath rod o. As soon as this passes, springs l bring the knitting cams into action again. At the same time lever 10 is moved to free rod v from cam 12 and spring 7 is allowed to pull arm u over to the adjusting screw 9. This retracts the yarn guide and the knitting of the stocking proceeds with the two threads x, y delivered to the needles side by side, as indicated in Fig. 5, forming the plated effect required.

It will be understood that the plating work may be applied to a stocking throughout any part of its length and that, for this reason, the additional yarn required to produce the desired effect may be introduced to the needles, at any point from a separate yarn finger. My invention permits of the certain introduction of the thread to the needles at any point, although it will be understood that it may be often impracticable to automatically operate it from the stitch cams, and my invention is therefore not limited to such mode of operation. It will also be understood that the invention is applicable to any situation where it is desirable or necessary to at intervals introduce a thread to the needles but to normally cause it to be fed thereto at a substantially greater angle to the tangent of the circle of needles than is desirable to effect with certainty the initial engagement of the thread with the needles.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In a circular knitting machine, the combination with the needles, of a yarn carrier, a pivotally mounted deflector extending in the direction of the circumference of the needle bank along and outside and in close proximity to the needles, and adapted to engage the yarn in its passage to the needles; said deflector being movable on its pivot to cause its free end to move inward toward the needles and thereby move the yarn into such an angle to said circumference as to insure its proper engagement with a series of needles, and means independent of the yarn carrier to swing the free end of the deflector outward away from the needles.

2. In a circular knitting machine, the combination with the needles, of a yarn carrier, a pivotally mounted deflector extending in the direction of the circumference of the needle bank and along and outside and in close proximity to the needles, said deflector having a shouldered portion adapted, when the yarn carrier is in operative position, to engage a yarn in its passage to the needles, said deflector being movable on its pivot to cause its shouldered portion to deflect the yarn into such an angle to said circumference as to insure its proper engagement with a series of needles, and means independent of the yarn carrier to actuate the deflector.

3. In a circular knitting machine, the combination with the needles, of a yarn carrier movable into and out of feeding position, a deflector extending outside a part of the periphery of the needle bank and pivoted at one side of the yarn carrier on a vertical axis, said deflector having on the other side of the yarn carrier an upwardly turned portion adapted to engage the yarn between the carrier and the needles, and means to swing the deflector on its pivot to cause its upturned end to move toward the needles and thereby deflect the yarn into position to insure its engagement with a series of needles.

4. In a circular knitting machine, the combination with the needles, of a yarn carrier movable into and out of operative position, and a deflector interposed between the yarn carrier and the needles and so positioned as to continuously engage and deflect a yarn fed by the carrier while the latter is in operative position, and means to move the deflector independently of the yarn carrier to vary the angle at which the yarn is fed to the hooks of a series of needles.

5. In a circular knitting machine, the combination with the needles, of a yarn carrier movable into and out of operative position, a latch guarding member adapted to engage the yarn between the carrier and the needles, and means to move said member to deflect the yarn in its passage from the carrier to the needles and thereby insure its proper engagement therewith.

6. In a circular knitting machine, the combination with the needles, of a yarn

carrier, a pivoted yarn guide movable into and out of position to direct the thread passing from the yarn carrier into position to insure its engagement with the needles, a vertically movable rod adapted to operate the yarn guide, a pivoted lever adapted to operate the rod, a knitting cam adapted to operate the lever, and pattern mechanism governing the operation of the knitting cam.

7. In a circular knitting machine, the combination with the needles, of the yarn carrier, a pivoted latch guard movable into and out of position to direct the thread passing from the yarn carrier into and out of position to insure its engagement with the needles, a vertically movable rod adapted to move the latch guard in one direction, a spring adapted to move the latch guard in the other direction, a pivoted lever adapted to lift the rod, a knitting cam adapted to swing the lever on its pivot in one direction, a spring adapted to return the lever, and pattern mechanism governing the operation of the knitting cam.

8. In a circular knitting machine, the combination with the needles, of means to deliver to the needles a plurality of threads side by side in the proper relation to produce a plating effect, and other means, movable relatively to the needles and the thread delivery means, to temporarily deflect the outside thread toward a position tangential to the direction of the extension of the needle bank when the hooks of the needles descend into thread engaging position.

9. In a circular knitting machine, the combination with the needles, of means to deliver to the needles a plurality of threads side by side, and other means movable relatively to the needles to temporarily cause said threads in their passage to the needles to be fed to a series of needles at the same angle, thereby insuring their proper engagement with the needles at the beginning of the knitting operation.

10. In a circular knitting machine, the combination with the needles, of yarn delivery means movable into and out of operative position and adapted to simultaneously deliver to the needles a plurality of threads, a deflector arranged in proximity to the needles and adapted to engage one of the threads fed from the yarn delivery means when the latter is in operative position, said deflector being movable independently of the yarn delivery means to change the angle of feed of said thread to the needles, thereby allowing said thread to be initially delivered to the needles at an angle different from that at which it subsequently passes to the needles.

11. In a circular knitting machine, the combination with the needles, of a yarn carrier adapted to be moved into feeding position and cause a plurality of threads to be fed to the needles side by side, a deflector arranged in proximity to the needles and adapted to engage the thread normally assuming the outside position and deflect it to insure its proper engagement with the hooks of a series of needles, and means to withdraw the deflector from its operative position while the yarn carrier remains in feeding position, thereby allowing the threads to be fed to the needles in their normal side by side relation.

12. In a circular knitting machine, the combination with the needles, of a yarn carrier adapted to be moved into feeding position and cause a plurality of threads to be fed to the needles side by side, a deflector arranged in proximity to the needles and adapted to engage both threads between the yarn carrier and the needles and so deflect them as to insure their proper engagement with the hooks of a series of needles, and means to withdraw the deflector from its operative position while the yarn carrier remains in feeding position, thereby allowing the threads to be fed to the needles in their normal side by side relation.

13. In a circular knitting machine, the combination with the needles, of yarn carrying means adapted to carry a plurality of threads and adapted to be moved into and out of feeding position and when in the feeding position to cause said threads to be fed to the needles side by side, a movable deflector interposed between the yarn carrying means and the needles and movable toward the needles into position to deflect the outside yarn as it travels toward the needles into position to insure its proper engagement with a series of needles, the stitch cams, pattern mechanism governing the movement of the stitch cams into and out of normal operative relation with the needles, and mechanism controlled by the stitch cams and adapted to govern the position of the deflector.

14. In a circular knitting machine, the combination with the needles, of a yarn carrier having two holes therein, one behind the other, through which two threads are adapted to respectively pass on their way to the needles, said yarn carrier being movable into and out of feeding position, a deflector interposed between the carrier and the needles and adapted to be moved into position to deflect the thread from the rear hole as it travels toward the needles into needle engaging relation with a series of needles, and means independent of the yarn carrier to retract the deflector, after said engagement is effected, into position to allow the two threads to thereafter pass to the needles side by side to produce a plating effect.

15. In a circular knitting machine, the

combination with the needles, of a yarn carrier adapted to be moved into feeding position and cause a plurality of threads to be fed to the needles side by side, a latch guarding member, and means to move said member to deflect the thread adapted to assume the outside position on its passage from the carrier to the needles and thereby insure its initial engagement therewith, said latch guard being retractable to permit the threads to assume said side by side relation during the subsequent knitting operation.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, on this 7th day of April, 1916.

HARRY A. HOUSEMAN.