Sept. 1, 1931. J. A. PONS 1,821,848

SELECTIVE CONTROL OF WEBHOLDERS

Filed Aug. 2, 1929 2 Sheets-Sheet 1

Fig. 1.

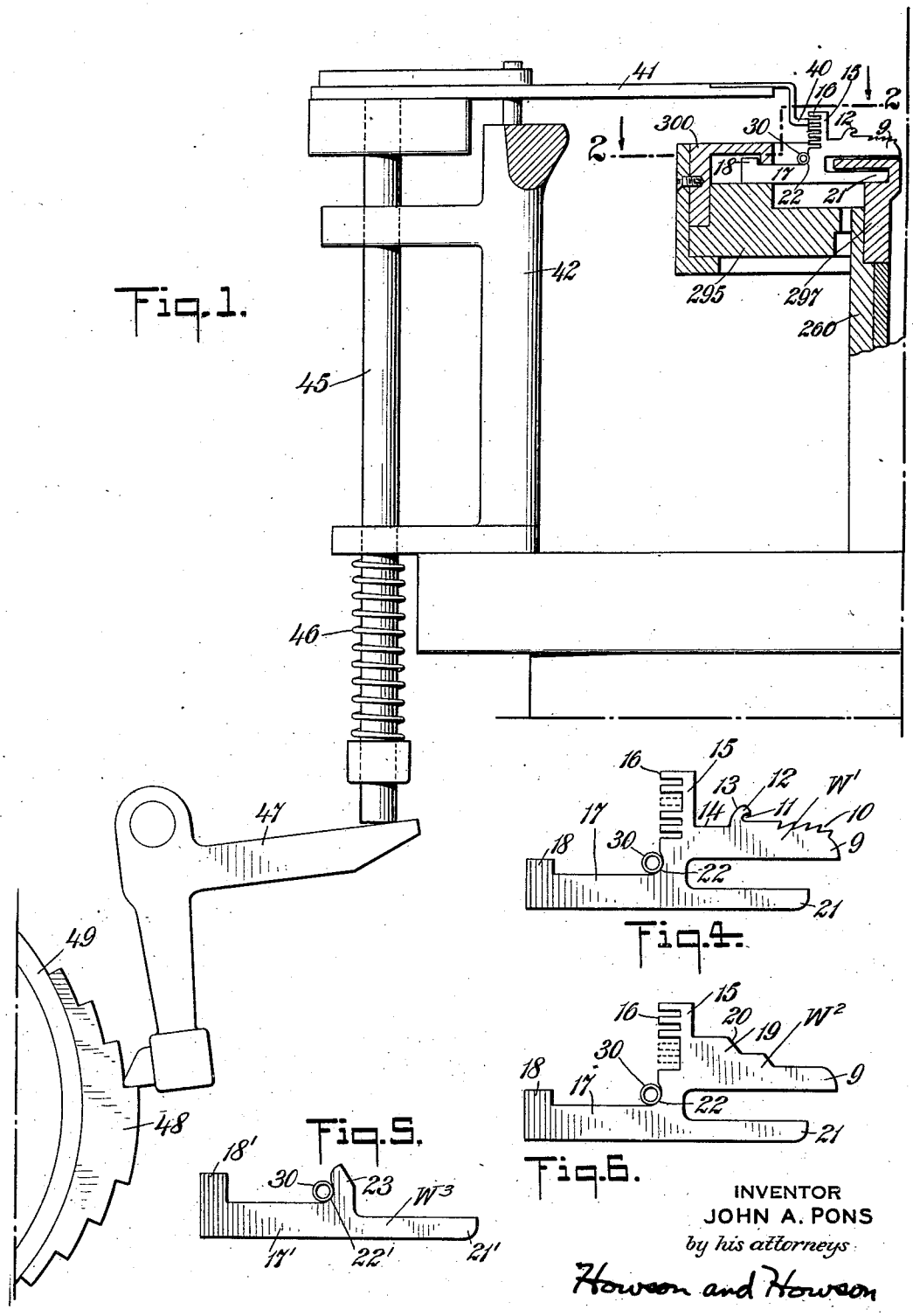


Fig. 4.

Fig. 6.

Fig. 5.

INVENTOR
JOHN A. PONS
by his attorneys
Howson and Howson

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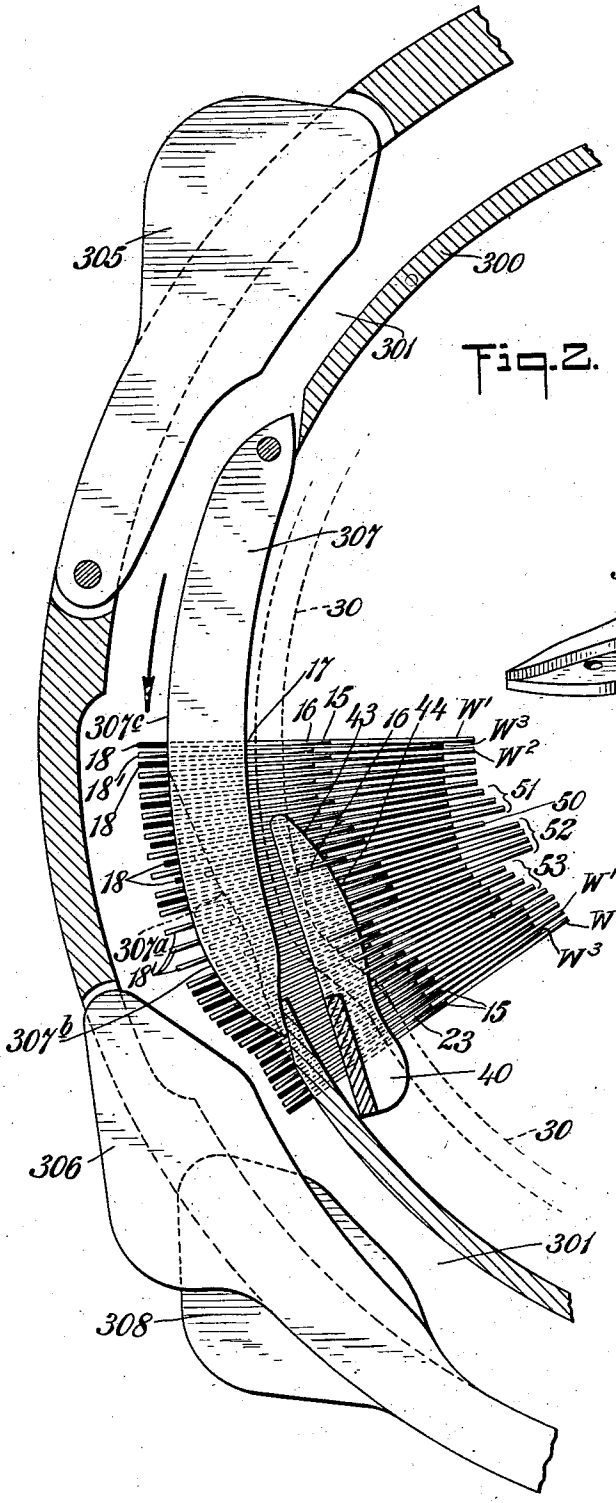


Fig. 2.

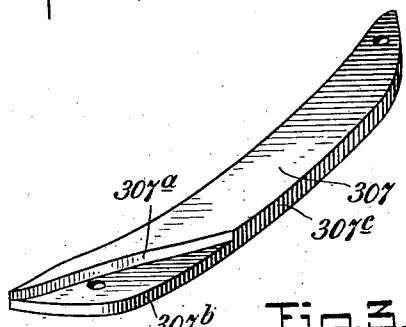


Fig. 3.

INVENTOR
JOHN A. PONS
by his attorneys
Howson and Howson

Patented Sept. 1, 1931

1,821,848

UNITED STATES PATENT OFFICE

JOHN A. PONS, OF VALDESE, NORTH CAROLINA, ASSIGNOR TO SCOTT & WILLIAMS, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF MASSACHUSETTS

SELECTIVE CONTROL OF WEBHOLDERS

Application filed August 2, 1929. Serial No. 382,963.

This invention has to do with the selective control of web-holders in a machine in which the web-holders are engaged by a spring band or equivalent means tending to move the web-holders inwardly.

According to this invention the portion of the cam for withdrawing the web-holders from operative position is so made that it permits suitably formed web-holders to be returned to their inward operative position in advance of the normal return point or the point at which it is desired to have all of the web-holders back to their operative position. The characteristic feature of the invention is a means for restraining the spring band from moving unselected web-holders inwardly when certain selected ones are inserted in advance of others for some special purpose such as to control the plating relation of yarns.

The preferred form of those parts of a circular knitting machine with which this invention is concerned is described hereinafter and is illustrated in the accompanying drawings to which reference is made in the course of the description.

In the drawings—

Figure 1 is a side view, partly in section, of the part of a circular knitting machine with which this invention is concerned, the section being through one side of the needle cylinder to show the web-holder mounting with which is associated a selective mechanism controlled from the main pattern drum.

Figure 2 is a view, in section on the line 2—2 of Figure 1, showing a part of the web-holder cam and a group of web-holders and associated special instrumentalities.

Figure 3 is a perspective view of a withdrawing cam used in the web-holder cam ring.

Figures 4 and 6 are views in elevation of two types of web-holder used in a machine in which the present invention may be embodied.

Figure 5 is a view of a special instrumentality or "dummy" web-holder used with the regular web-holders in accordance with this invention.

The primary object of the invention is to make it possible, in a machine having a spring band or the like pressing the web-holders or loop-forming sinkers inwardly, to select certain withdrawn web-holders and to insert them before the remaining ones are inserted, while at the same time giving assurance that unselected web-holders will not also be moved inwardly in spite of being free to be moved. The invention aims also to permit the same set of web-holders to be used with several distinct orders of selection which, in the case of selection for the purpose of pattern formation, makes it possible to form several distinct patterns with the same set of web-holders.

In ordinary knitting, a web-holder or loop-forming sinker is not moved inwardly to its operative position with respect to the needles on either side of it until some time after the approaching yarn or yarns are below the point of the neb. The inward movement then places the neb over the loop and causes the latter to pass into the throat so that upon rise of the needle the loop is held down. For certain purposes, such as to control the plating relation of yarns being fed to the needles, web-holders of a special shape are moved inwardly before the end of the normal wave. This invention is concerned with such early inward movement of some of the web-holders but not with the purpose of it or with the particular point at which it occurs.

In its broad aspect the invention consists of a provision for counteracting the effort of the spring band or its equivalent on the unselected web-holders, thus freeing them from its influence while leaving the spring band free to perform its ordinary work. The particular way in which this invention avoids this effect of the spring band is by the provision of a number of special instrumentalities interspersed among the web-holders and designed to take the whole effort of the spring band in the region where it is desired to have some or all of the web-holders independent of the spring band. These special instrumentalities resemble web-holders in point of being radially movable, in having butts at their outer ends adapted to travel on the regular sinker cams, and in being engageable by the spring band in the same relative position as are the web-holders. In other respects

these "dummy" sinkers or web-holders need have no resemblance to a functioning web-holder. It is not necessary that the number of these special instrumentalities be equal to that of the web-holders but since each one preferably is arranged in a groove with a web-holder and since it is easier to mill all of the grooves of equal size, it is found best to provide an equal number of "dummies" and real web-holders.

The invention contemplates, for its commonest application, a so-called sinker cam of the sort that withdraws or moves all of the web-holders outwardly as they come into the region of the throat plate where the needles take the yarn. So far as this invention is concerned it is not material what the precise point is at which this outward movement of the web-holders occurs. It may vary with different machines. The invention also pre-supposes that subsequently all of the web-holders are to be inserted, that is to say, moved back to their inward position and that the cam and the web-holders are so correlated that some or all of the latter are free to be moved inwardly at a point in advance of that at which all of the web-holders are to be back in the inward position. As in the case of the outward movement, this invention is not concerned with or limited to any particular locations of these points with respect to the action of the needles or of the web-holders and it is not limited to any particular function of these movements. Where, however, mention is made of the normal wave, the reference is to that part of the path of the web-holders or that phase of each cycle of their movements in which there is the outward and return movement near the throat plate that is usual in circular knitting machines, the outward movement coming prior to the taking of yarn by the needles and the return being in time to place the neb of the web-holder over the loop after the needle draws it down.

In the particular embodiment of the invention chosen for illustration here, the series of web-holders is made up of two types, alternating. These are shaped to control the plating relation of two yarns, one type of web-holder being adapted to reverse the normal relation and being termed therefore a "turn-over" while the other type, to which every other web-holder conforms, is a "turn-back", being shaped to restore or to maintain the normal plating relation. The turn-over web-holder is shown as being provided with a toothed nose after the manner of the web-holders shown in the Scott Patent 1,641,101, the purpose of the teeth being to engage the fabric in order to exert a tension on the loops. The common use of such toothed web-holders is in a dial machine as shown in that patent, this being also the sort of machine that affords the most frequent occasion for using a spring band or other resilient means common to all of the web-holders for tending to move them inwardly in their grooves. But as the spring band or its equivalent may be used with other than the toothed web-holders, it will be understood that the invention here is not restricted to use with web-holders of that type.

Each web-holders is mounted in a radial groove in a suitable ring or web-holder bed 295 which rotates with the needle cylinder 260. The stationary cam cap 300, resting over this bed, has a withdrawing cam 307 for acting on the tail butts of the web-holders to move them outwardly in their grooves as they pass in succession. The major part of the cam path formed by the butt groove 301 is concentric with the needle circle and is interrupted only by the outward curvature of the cam 307. The cam 305 at the leading end of the withdrawing cam 307 and the inthrow cams 306, 308 at the tail end are provided as usual. All of this cam cap construction, except for the shape of the withdrawing cam 307, preferably conforms to that shown in the Scott Patent 1,641,101 granted August 30, 1927, although this invention is not limited to use therewith. It is to be understood also that there may be other cams about the circle but for the purpose of illustrating the invention here it is sufficient that there be but the one withdrawing cam.

The withdrawing cam 307 (shown inverted in Fig. 3) has a cutaway portion at its end last passed by the web-holders, thus giving the cam face 307^a which curves inwardly to the circle of the inner face of the concentric part of the groove 301 ahead of the face 307^b which is at a higher level. For the greater part of its length, the outer or active face of this cam is concentric with the circle of the cam groove 301 and with the needle circle, this circular part including the cam face 307^c, which is the same in curvature for the full height of the cam, and also the upper cam portion 307^b toward the end of the cam. The provision of the cut away part makes the whole thing in effect two cams in so far as the holding outward from the normal circle is concerned. One cam is longer than the other and at a higher lever, being made up of the upper half of the portion 307^c and the portion 307^b, while the other is shorter as it is composed of the lower half of the portion 307^c, and an inwardly curved part 307^a which mets the normal circle of the groove 301 before the part 307^b does.

The web-holders, as mentioned above, are of two types. The turn-over type W^1 (Figure 4) has a forward nose 9 with teeth 10 and an upper edge which forms the knocking over ledge. It has also a throat 11 above which is the forward or inward part of the neb 12. The neb has a curved outer or back edge 13 joining the rearwardly ex-

tending horizontal edge 14. Extending up from this horizontal edge is a butt 15 having a vertical series of separate horizontal nibs 16 extending rearwardly. The rear shank 17 of the web-holder has an operating tail butt 18 extending upwardly while the forward shank 21 is plain. At the inner end of the shank 17 is a groove 22 shaped to receive and retain a spring band 30.

Each of the turn-back web-holders W^2 has a tail butt 18, a vertical butt 15 with nibs 16, a plain nose 9, a forward shank 21 and a spring band groove 22 just as the turn-over type has. Instead of a hook neb however there is a peak 19 providing a downwardly and inwardly extending edge 20 forming a part of the knocking over ledge on the forward nose 9.

The dummy web-holder W^3, which is the special instrumentality to be mounted preferably in each radial groove in the bed 295 along with a web-holder, has a rear shank 17′ with a tail butt 18′ identical in its general shape and function with the corresponding parts of the regular web-holders. Likewise there is groove 22′ for the spring band. This groove is located at the same distance from the tail butt of the instrumentality as the corresponding groove 22 on a web-holder is from its tail butt, and is formed on the back edge of a short vertical extension 23 which, in the form shown here, has no other function.

When set up in the machine, the web-holders and the special instrumentalities rest in the grooves in the bed 295 with the forward extensions 21, 21′ reaching into the usual recesses in the ring 297 at the upper end of the needle cylinder. The tail butts 18, 18′ extend from beneath into the groove 301 in the under surface of the web-holder cam cap 300 and for the greater part of each revolution they are clear of the walls of the groove. They engage the leading end of the cam 307 however and are moved outwardly thereby as they pass the said cam. The spring band 30 surrounds all of the web-holders and special instrumentalities, engaging each one in the groove 22 (or 22′ as the case may be). The arrangement and action of the spring and its relation to the web-holders is fully described in the Scott Patent 1,467,691 dated September 11, 1923.

The web-holders and the cams are so correlated that the former are free to be inserted at an earlier point than that at which it is desired to have all of them inserted after the withdrawal effected by the leading end of the cam 307. In the form here shown this correlation is between the height of the tail butts and the heights of the cam portions 307^a and 307^b and consists in providing all of the web-holders of both types with vertical tail butts 18 of such height that they engage the lower part of the withdrawing cam face 307^c, and only the lower part 307^a of the face of the withdrawing cam 307 beyond the face 307^c. Since they are too short to touch the upper cam face 307^b when they pass beyond the face 307^c there is nothing then to restrain the web-holders from inward movement if any force be applied in that direction. The butts 18′ on the special instrumentalities are likewise correlated with the withdrawing cam portions, these butts being long enough to engage the face of the long outwardly curved cam portion 307^b, 307^c for its full length. These instrumentalities therefore can not move inwardly until they have gone beyond the end of the long withdrawing cam. Hence the special instrumentalities are controlled by the longer withdrawing cam which is at the higher level.

The action of the special instrumentalities is to hold the spring band 30 outward as long as any web-holder is to be held outward, thus freeing the web-holders from the effort of the spring during the period when they are passing the cut-away part of the cam 307 with their low butts clearing the outer cam face 307^b. During this period certain selected web-holders may be moved inwardly to perform whatever special function they are designed for. The spring band 30 tends, of course, to move in these spring holders and also the web-holders not previously inserted, after they have passed the said cam.

In the instance chosen for illustration here, the special function of the web-holders is to control the plating relation of yarns by engaging them before they are drawn down to the part of the knocking over ledge where they are held during stitch formation. This function is well known, both of the turn-over web-holders W′ which reverse the plating and of the turn-back type W^2 which maintain or restore the normal relation of the yarns, and is fully described in the co-pending application of Albert E. Page and Frank R. Page, Serial Number 136,141, filed September 17, 1926.

The selection of the web-holders to be inserted at an early point is effected by a mechanism which, in itself, is not a part of this invention. It consists of a selector finger vertically adjustable and under the control of a series of cam lugs on a pattern drum turning in timed relation to the knitting. This finger acts on the nibs 16 on the vertical butts 15 of the web-holders. A wide range of selection is afforded by reason of the facts that some of the nibs 16 can be broken away and that the finger which acts on the retained nibs can be moved from the level of one circular series of nibs to another in the course of the knitting.

In its present form, the selector finger is formed as a flat piece of metal 40 carried on a downward extension from the end of an arm 41 that is vertically movable with

respect to a fixed post 42 which supports it. The operative position of the finger 40 is such that the curved forward end 43 of it intersects the path of the outer edges of the web-holder butts 15, as the web-holders move along the circular part of the cam 307, at a point on a radial line beyond (in the direction of rotation) the leading end of the cam face 307^b. In other words, the cam face 43 acts on the selecting butts 15 after the tail butts 18 are free of the cam face 307^c. The inner edge 44 of this cam finger 40 curves inwardly from the circular path which the outer edges of the selective butts 15 travel up to the point where they engage the cam, the curvature being such that a web-holder having a butt 15 engaged by the edge 44 is moved inwardly to its operative position.

A vertical rod 45 engages the outer end of the arm 41 that carries the cam finger 40 and is urged by a spring 46 downwardly against a lever 47 which serves as a cam-follower acted on by the cam lugs 48 on the pattern drum 49. The cams 48 are of as many heights as there are levels of nibs 16 on the web-holders, or that many less one if the face of the drum itself is used to position the selector finger at one nib level.

It will be clear enough that, when in operative position at any nib level, the selector finger 40 acts on every web-holder having a nib 16 at that level and moves it inwardly in advance of the point at which all of the web-holders are put back in operative position. Such web-holders as have no nib at that level remain undisturbed and continue to the end of the wave, being free of any tendency of the spring band 30 to move them at the same time because the dummies W^3, with their long tail butts 18′ riding on the cam face 307^b, hold the spring band outwardly to the curvature of the normal wave. The unselected web-holders therefore are not re-inserted until they reach the end of the cam 307 and are engaged along with the dummies by either of the inthrow cams 306, 308 or are moved in by the action of the spring band alone.

The action just described is illustrated in Figure 2. The web-holder 50, not having a nib 16 at the level at which the cam finger 40 is set, is not moved inwardly after passing the cam face 307^c in spite of being free to be moved by reason of having a low tail butt 18 that rides below the level of the cam face 307^b. The web-holders 51 and 52 however are being moved inwardly. The web-holders of the group 53 were not engaged by the cam 40 and therefore are moving inwardly in the normal way at the end of the cam 307. It will be observed that the special instrumentalities W^3 follow the normal wave as their tail butts 18′ ride on the cam face 307^b which holds them against the effort of the spring band 30. The result is that the spring band is held to the normal wave and does not move the web-holders 50, 53 which were not moved inwardly at the early point by the selector cam 40.

There is no intent to represent in Figure 2 the formation of a particular pattern but merely to illustrate that some web-holders may be inserted in advance of the point at which others are inserted because of the special instrumentalities which free the unselected web-holders of the effort of the spring band.

It is possible to vary in a great many respects the particular embodiment of the invention just described. Not all of the web-holders need be so correlated with the web-holder cams that they are free to move inward in advance of the normal return point since it may be that there are some which are never involved in the special function requiring early insertion, nor is it necessary that the selected web-holders be moved in at any particular advance point in so far as this invention is concerned. Likewise the function of the early return of the web-holders to operative position need not be for controlling the plating relation of yarns although that is the common use of the idea at the present time. The only requisites for the practice of the invention are that they be a group of web-holders removed from their operative position, that at least some be free to be returned during a material extent of their rotative movement while in the outer position and that certain of these free web-holders be moved inwardly in advance of others so that there may be occasion for counteracting the effort of the spring band to keep the unselected web-holders from being inserted at the same time as the selected ones. The details of the selector mechanism, of the web-holders cams and other parts may be varied as well. Within the broader aspect of the invention, the means for resisting the action of the spring band or its equivalent may assume various forms while, within the narrow aspect characterized by the use of a series of special instrumentalities, there is a considerable latitude of variation in the shape, location and operation of the instrumentalities and in point of additional function imposed on them. These and all other variations coming within the fair scope of the following claims, I wish to include within the protection afforded by a patent.

I claim—

1. In a circular knitting machine having a needle cylinder and a series of radially movable web-holders intercalated among the needles, a resilient means common to said web-holders tending to move them inwardly and a cam means adapted to move them outwardly at a desired point, said cam means and said web-holders being so correlated that at least some web-holders are free to be

moved inwardly in advance of the point where others are to be inserted, the combination of means for selectively moving certain of said free web-holders inwardly and means for resisting the effort of said resilient means to move other web-holders in at the same place.

2. In a circular knitting machine having needles and web-holders intercalated thereamong, a resilient means urging all of said web-holders inwardly and a cam means for guiding said web-holders in an outward wave, said cam means being adapted to permit inward movement of suitably shaped web-holders before the normal end of the wave, the combination of means for selectively moving certain of said web-holders inwardly in advance of others and means resisting the tendency of said resilient means to move the other web-holders in at the same place.

3. In a circular knitting machine having needles and web-holders intercalated thereamong, a spring band urging all of said web-holders inwardly and cam means for guiding said web-holders in an outward wave, said cam means being adapted to permit inward movement of suitably shaped web-holders before the normal end of the wave, the combination of means for selectively moving certain of said web-holders inwardly in advance of others and instrumentalities interspersed among said web-holders and engaged by said spring band, said instrumentalities being adapted to be guided through the normal wave to restrain said band from moving unselected web-holders inwardly where the selected ones are inserted.

4. In a circular knitting machine having a needle cylinder and web-holder ring, said ring having a series of radial grooves, a web-holder and a special instrumentalitiy in each of certain of said grooves, a spring band around said web-holders and special instrumentalities to urge them inwardly, together with cam means for guiding said web-holders and special instrumentalities in an outward wave, said cam means and said web-holders and instrumentalities being so correlated that at least some of the web-holders may move inwardly before the normal end of said wave while the said instrumentalities may not.

5. In a circular knitting machine having a needle cylinder and web-holder ring, said ring having a series of radial grooves, a web-holder and a special instrumentality in each of certain of said grooves, a spring band around said web-holders and special instrumentalities to urge them inwardly, together with cam means for guiding said web-holders and special instrumentalities in an outward wave, said cam means and said web-holders and instrumentalities being so correlated that at least some of the web-holders are free to move inwardly before the normal end of said wave while the said instrumentalities may not, and means for selectively moving some of said free web-holders inwardly before the normal end of the wave.

6. In a circular knitting machine having yarn feeding means and a circular series of needles and radially movable web-holders, a spring band urging said web-holders inwardly, cam means guiding said web-holders, said cam means and said web-holders being correlated so that the latter are moved outwardly before their associated needles draw down the yarn and so that at least some of said web-holders are free to move inwardly before the point where all are to be returned to their inward position, a selective mechanism for inserting certain of said free web-holders in advance of said point and means resisting the effort of said band to move unselected web-holders inwardly from their outer position where selected ones are being inserted.

7. In a circular knitting machine, a circular series of radially movable web-holders, a circular series of radially movable special instrumentalities interspersed among said web-holders, a spring band tending to move said web-holders and instrumentalities inwardly, an outwardly faced cam having an outwardly curved portion formed in parts at different heights and of different lengths, said instrumentalities having butts adapted to engage the longer part of said outward portion, and at least some of said web-holders having butts adapted to clear the longer part of said outward portion, whereby certain of said web-holders may be moved inwardly before others.

8. In a circular knitting machine having a circular series of needles and radially movable web-holders, means for feeding yarns in a plating relation to said needles, a spring band tending to move said web-holders inwardly and a cam moving them outwardly at a predetermined point, said cam and web-holders being so correlated that at least some of said web-holders are free to move inwardly in advance of the point at which all are to be returned to their normal position, and at least some of said free web-holders being adapted to control the plating relation of said yarns when moved inwardly in advance of the normal return point, the combination of means for selectively moving certain of said plating control web-holders inwardly in advance of others and means restraining said band from moving the unselected ones in at the same place.

9. In a circular knitting machine having a needle cylinder with needles and radially movable web-holders, a series of radially movable spring holders interspersed among said web-holders adapted when withdrawn to resist the effort of the spring band to move radially inward the web-holders associated

with said spring holders, a spring band engaging said web-holders and spring holders and tending to move them inwardly, cam means for withdrawing said spring holders and web-holders, said web-holders and cam means being so correlated however that at least some of the web-holders are free to be inserted before said spring holders are free to be so moved, and means for selectively inserting certain of said free web-holders in advance of others.

10. In a circular knitting machine having vertically movable needles and co-operating radially movable web-holders, a web-holder cam groove with an outward wave, said web-holders having tail butts riding in said groove and so correlated with said cams that at least some are free to move inwardly before the end of the wave, a series of radially movable spring-holders each arranged in a groove with a web-holder and having a tail butt adapted to ride in said cam groove and through the full wave, said web-holders and spring-holders having spring band grooves in the same relative positions, a spring band resting in said grooves and a selective means for moving certain of said free web-holders inwardly before the end of the wave.

In testimony whereof I have signed my name to this specification.

JOHN A. PONS.