April 21, 1942. L. A. GOYETTE 2,280,698

CIRCULAR KNITTING MACHINE

Filed Sept. 30, 1941 4 Sheets-Sheet 1

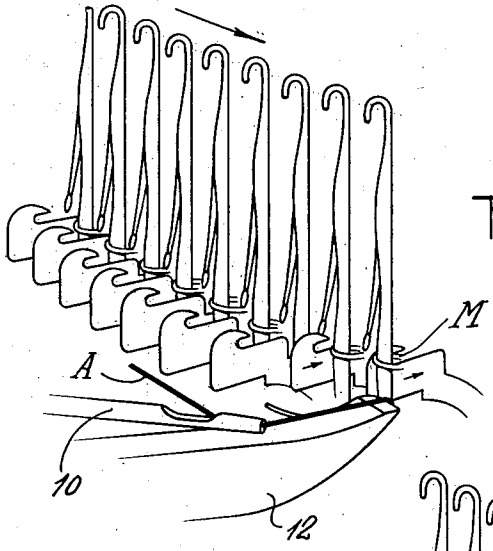


Fig. 1.

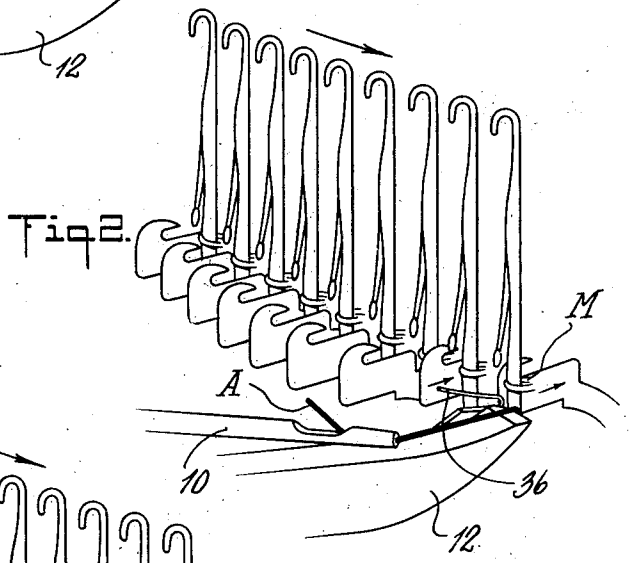


Fig. 2.

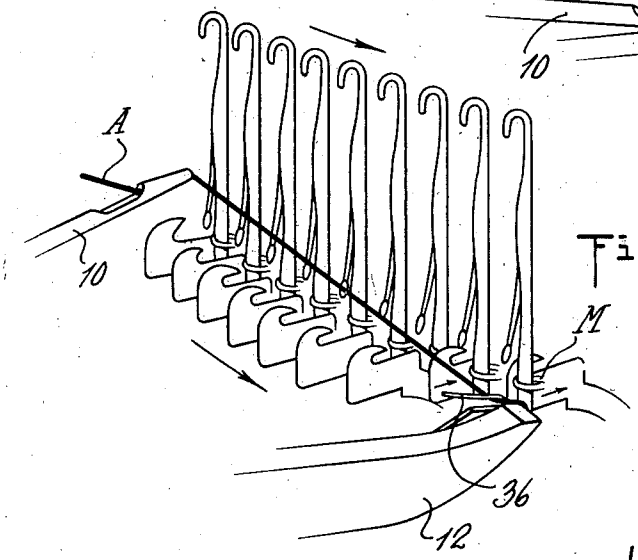


Fig. 3.

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CIRCULAR KNITTING MACHINE

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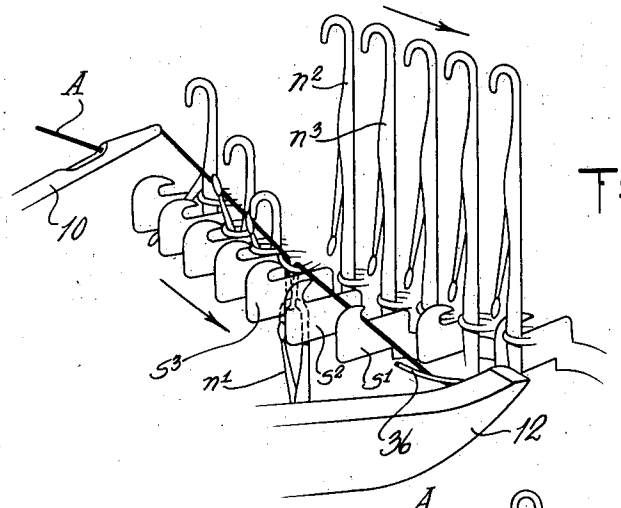


Fig. 4.

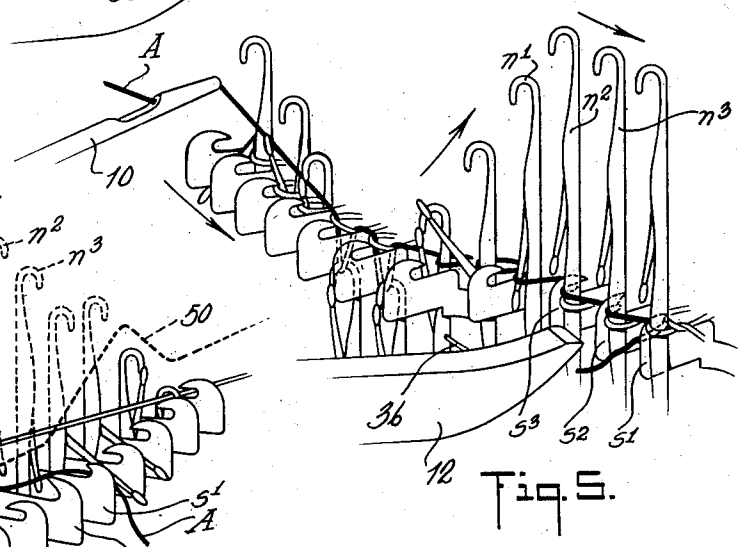


Fig. 5.

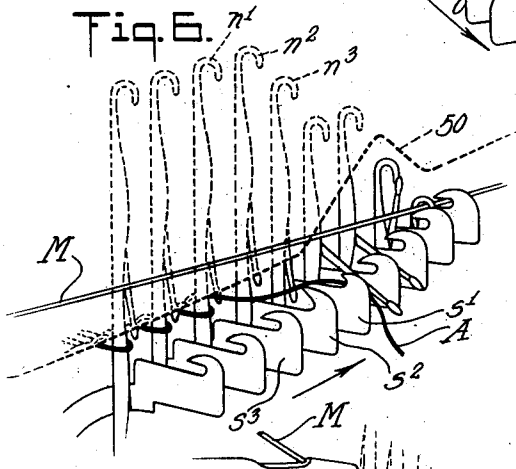


Fig. 6.

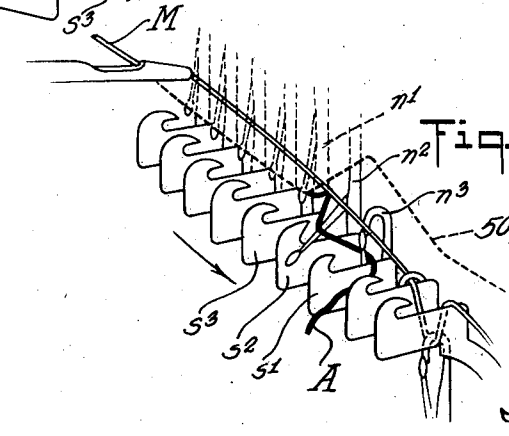


Fig. 7

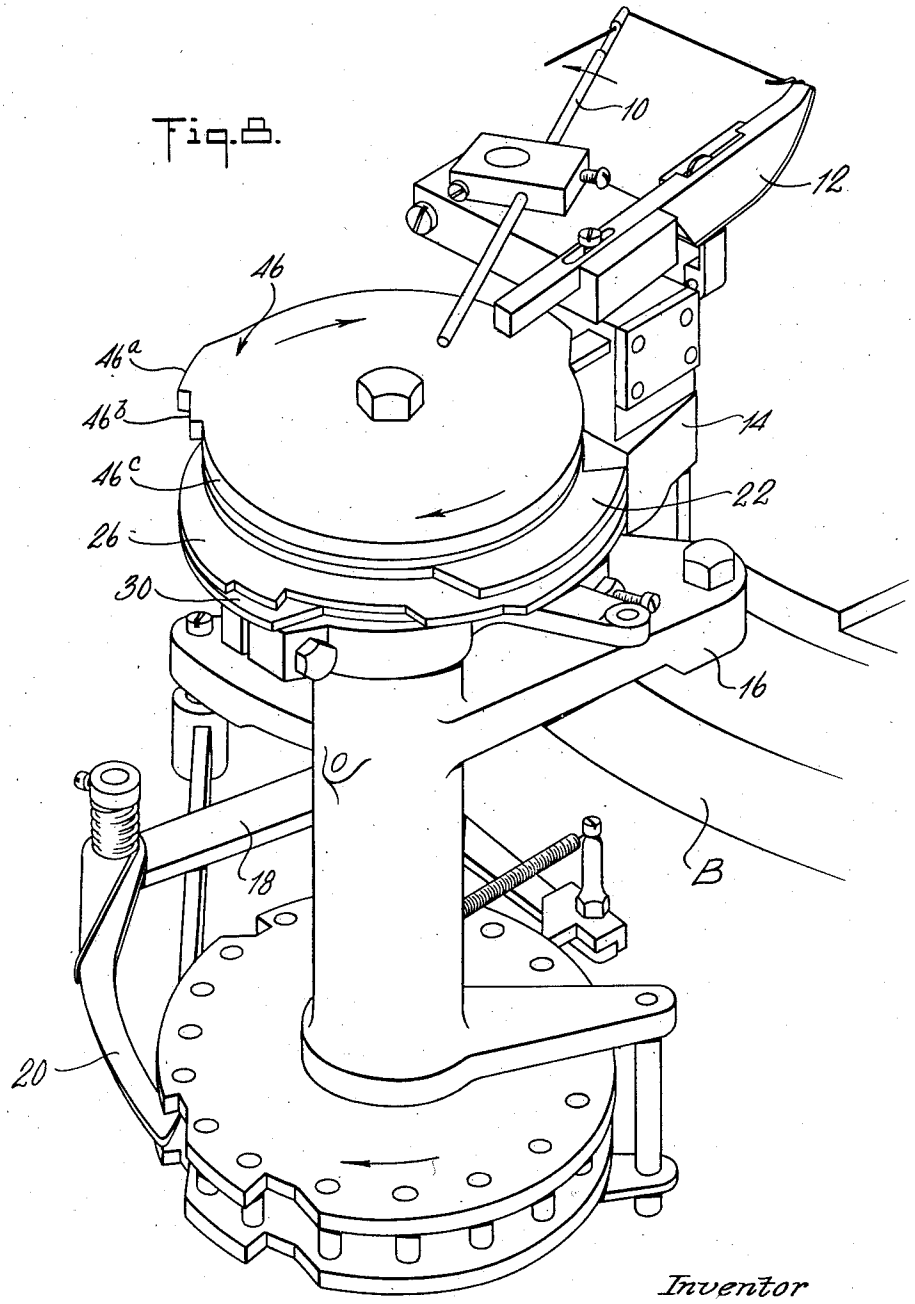
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Fig. 8.



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Fig. 9.

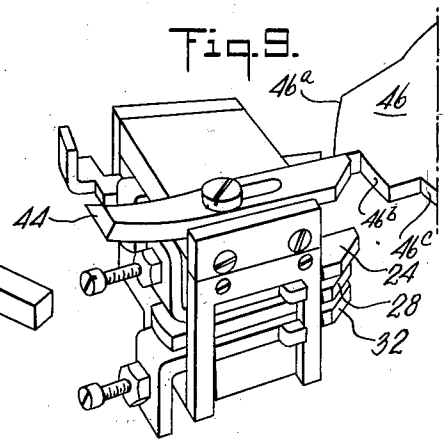


Fig. 10.

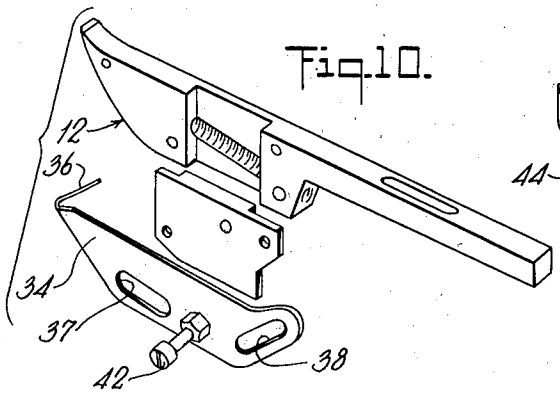


Fig. 11.

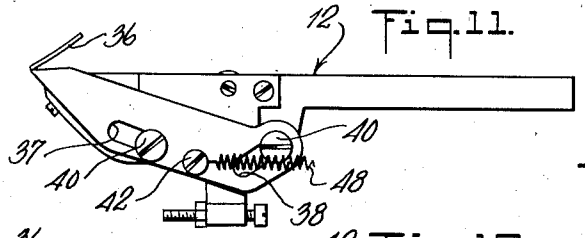


Fig. 12.

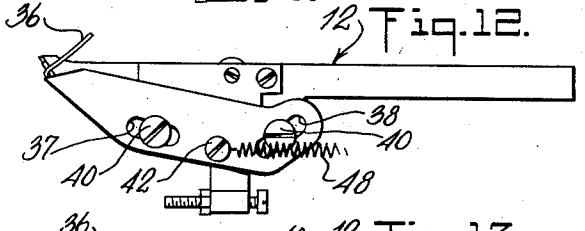


Fig. 13.

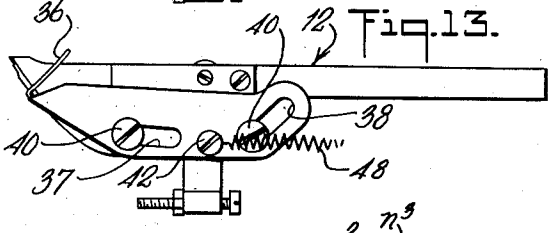


Fig. 14.

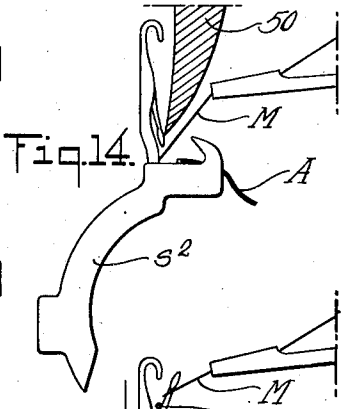


Fig. 15.

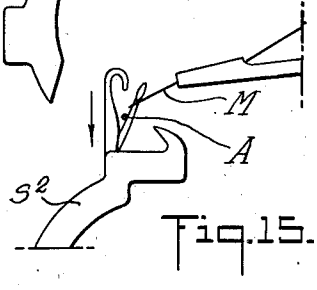


Fig. 17.

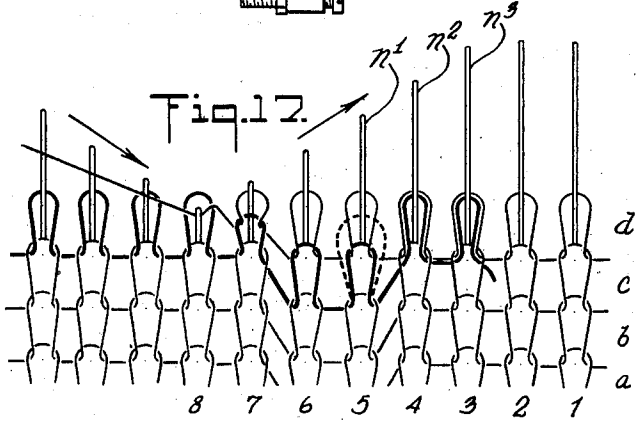
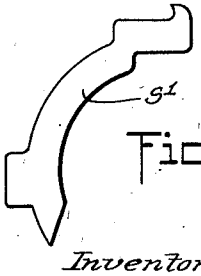


Fig. 16.



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UNITED STATES PATENT OFFICE

2,280,698

CIRCULAR KNITTING MACHINE

Lucien A. Goyette, Lowell, Mass., assignor to Scott & Williams, Incorporated, Laconia, N. H., a corporation of Massachusetts

Application September 30, 1941, Serial No. 413,053

12 Claims. (Cl. 66—14)

This invention relates to circular knitting machines and more particularly to circular knitting machines having yarns or threads fed and knit at a plurality of points in the needle circle and it is an object of this invention to provide means in a circular knitting machine of the type described for preventing the formation of a loose stitch when an auxiliary or second yarn is introduced at a second or auxiliary feed to needles knitting another yarn at another or main feed point. It is also an object of this invention to provide a method of knitting a yarn introduced at a second or auxiliary feed whereby the loose stitch usually formed at the first needle taking such yarn as the auxiliary feed is prevented.

In the drawings in which the invention is shown in connection with a Scott & Williams' Komet circular knitting machine, only such parts of the machine being shown as is necessary to illustrate the invention.

Figure 1 is a diagrammatic view showing the relation to each other and to the needles at an auxiliary feed of the auxiliary yarn finger, the sinkers, the placer for the auxiliary yarn and the cutting and clamping mechanism for the auxiliary yarn when the auxiliary yarn is not being fed to the needles;

Figure 2 is a view similar to Figure 1 but showing the yarn placer raised in position to engage the auxiliary yarn;

Figure 3 is a view similar to Figure 1 but showing the auxiliary yarn finger moved to engage the auxiliary yarn with the needles and the auxiliary yarn engaged by the yarn placer;

Figure 4 is a view similar to Figure 1 but showing the auxiliary yarn drawn down by the first needle to take the auxiliary yarn in its hook and the yarn placer drawn down to place the auxiliary yarn in engagement with the sinkers;

Figure 5 is a view similar to Figure 4 but showing the loose end of the auxiliary yarn released from the cutting and clamping mechanism and engaged by the sinkers about the shanks of needles in advance of the first needle to take the auxiliary yarn in its hook;

Figure 6 is a diagrammatic view showing the relations of the needles, sinkers and yarns as they approach the knitting point for the main yarn, the sinkers having carried out the free end of the auxiliary yarn to permit of the needle latches passing down in back thereof;

Figure 7 is a view similar to Figure 6 showing the needles of Figure 6 moved from the position of Figure 6 and the free end of the auxiliary yarn being carried into the hooks of the needles by the raising of the needle latches;

Figure 8 is a view in perspective of the means for operating the auxiliary yarn finger, yarn placer, cutter and clamp mechanism and the stitch cam at the auxiliary yarn feed;

Figure 9 is a perspective view of portion of the operating means of Figure 8;

Figure 10 is a perspective view of the cutting and clamping means and placer for the auxiliary yarns, the parts thereof being shown separated;

Figures 11, 12 and 13 are views in elevation of the placer mounted on the cutting and clamping means; Figure 11 showing the placer when raised to receive the auxiliary yarn; Figure 12 showing the placer when partly retracted from the position of Figure 11 and in position to place the auxiliary yarn on the sinkers; and Figure 13 showing the placer in its fully retracted and inactive position;

Figure 14 is a diagrammatic view showing the relations of the sinkers, needles and latch guard as the needles are lowered, as in Figure 6, to place their latches in back of the free end of the auxiliary yarn;

Figure 15 is a view, similar to Figure 14 and showing the relation of the needles and sinkers as the latches carry the free end of the auxiliary yarn into the hooks of the needles;

Figure 16 is a view in elevation of a sinker having a neb shortened to facilitate receiving the auxiliary yarn; and

Figure 17 is a diagrammatic view, drawn to an enlarged scale and showing the relations of the loops of the main and auxiliary yarns at the point where the auxiliary yarn is added in a fabric knit in accordance with this invention.

In circular knitting machines having independent needles arranged to knit separate yarns at different feeding points the introduction of an auxiliary yarn at the auxiliary or second feeding point causes an eyelet or small opening to be formed as the result of the looseness or greater length of the stitch formed by the first needle taking the auxiliary yarn. The looseness or greater length of the stitch is due to the fact that the free end of the auxiliary yarn, when released from the cutting and clamping mechanism, is not held or kept under tension and can feed to the needle freely. After the first stitch is knit and the free end of the auxiliary yarn thus secured, the subsequent stitches are of the normal length.

In order to insure the loop drawn by the first needle taking the auxiliary yarn being of the

normal length, means are provided whereby the free end of the auxiliary yarn will be held so as to be taken into the hooks of needles in advance of the first needle taking the auxiliary yarn at the auxiliary feeding point and knit with the main yarn at the main feeding point, the knitting taking place from the loose end back to the loose stitch or eyelet.

In the drawings the circular knitting machine, parts only of which are shown to illustrate the invention, is shown provided with auxiliary yarn and needle control means at the auxiliary feed as shown in the patent to Deans, No. 2,101,494, Dec. 7, 1937. Such yarn and needle control means comprise a yarn finger **10** for the auxiliary yarn and cutting and clamping means **12** for the auxiliary yarn, both mounted upon a bracket **14** which is adjustably mounted upon a bracket **16** carried by the bed plate B. Cam disks mounted upon a shaft (not shown) rotatably mounted in the bracket **16** are operated step by step by lever **18** and pawl **20** from a cam (not shown) on a rotating part of the machine. Cam disk **22** through engagement with the cam follower **24** serves to operate the cutting and clamping means **12** to cut and clamp the auxiliary yarn when it is withdrawn from the needles and to release the yarn when it is again presented to the needles. Cam disk **26** operates cam follower **28** to operate a bolt cam (not shown) to place a stitch cam (not shown) in position to render the needles active at the auxiliary knitting point while cam disk **30** operates the cam follower **32** to operate the auxiliary yarn finger **10** all as shown in the Deans Patent No. 2,101,494.

To one side of the cutter and clamp **12** for the auxiliary yarn there is slidably secured a plate **34** having at one end a wire angularly disposed with respect to the plate **34** and forming an engaging member or placer **36** for the auxiliary yarn. The plate **34** is provided with angularly disposed slots **37** and **38** which receive the screws **40** by which the plate **34** is secured to the cutting and clamping means **12**. The slots **37** and **38** are so arranged that movement of the plate **34** towards the needles causes the placer **36** to be moved upwardly, as well as towards the needles, so that the placer is moved from a position below the level of the upper surface of the cutting and clamping mechanism **12** to a position above its upper surface. Mounted in the plate **34** is an abutment **42** positioned so as to be engaged by a cam follower **44** which is operated by a cam disk **46** assembled to be rotated with the cam disks **22**, **26** and **30**. A spring **48** attached to the abutment **42** and a fixed portion of the machine biases the plate **34** to a position away from the needles and in which the placer **36** is lowered.

In the operation of a machine in accordance with this invention the needles knit the main yarn M at the main knitting point prior to the introduction of the auxiliary yarn A and at the auxiliary knitting point the needles are raised as shown in Figure 1, so that the loops of the main yarn on the needles are below the needle latches. The end of the auxiliary yarn is held by the cutting and clamping means **12** and the auxiliary yarn finger **10** is adjacent the cutting and clamping means **12** in a position in which the auxiliary yarn A is not presented to the needles.

Just prior to the presenting of the auxiliary yarn to the needles the cam disks are stepped around bringing a cam surface **46a** of the cam disk **46** into engagement with the cam follower **44** and operating the yarn placer **36** so as to raise the placer above the cutting and clamping mechanism **12** as shown in Figure 2. The auxiliary yarn finger **10** is then operated by the cam disk **30** to present the auxiliary yarn A to the needles while at the same time, the cam disk **26** is being operated to position the stitch cam at the auxiliary knitting point to draw down the needles to take the auxiliary yarn and cast off the loops of the main yarn then below the latches of the needles. Needle n' shown in Figure 4 as the first of the needles taking the auxiliary yarn in its hook to knit may be the first of a group of needles having medium length butts which are drawn down by the stitch cam when partially inserted by the operation of the disk cam **26** during the passage of a group of short butt needles immediately in advance of the medium butt needles. During the passage of the medium butt needles the stitch cam is inserted all the way so as to operate all needles to take the auxiliary yarn.

With the drawing down of the needle n' to draw the first loop of the auxiliary yarn, the cam disk **46** is rotated bringing the cam surface **46b** into engagement with the cam follower **44** and permitting the spring **48** to partially retract the plate **34** and yarn placer **36**, the placer **36** assuming a position in which it bears upon the auxiliary yarn which is still held by the cutting and clamping means **12** and causes the auxiliary yarn to engage the knocking-over surfaces of several sinkers in advance of the needle n'. The leading sinker s' engaged by the auxiliary yarn when drawn down by the placer **36** is being advanced at that time and in order to insure the yarn being placed below the sinker neb the neb, is altered, preferably by being shortened, as shown in Figure 16, although the neb may be bent upwardly. The following sinker s^2 is also altered, preferably by having the neb bent upwardly although the neb of this sinker may be shortened as was the neb of the sinker just ahead. A third sinker s^3, which is just in advance of the needle n', is preferably of the usual construction.

The rotation of the needle cylinder carries the sinkers towards the cutting and clamping mechanism **12** and causes the sinkers to be advanced. As the sinker s' approaches, the cutting and clamping mechanism **12** is operated by the cam disk **22** to release the auxiliary yarn allowing the free end thereof to be drawn from engagement with the placer **36**. Further rotation of the cam disk **46** brings the cam surface **46c** to the cam follower **44**, permitting the spring **48** to retract the yarn placer **36** to its inactive position as shown in Figures 5 and 13. Continued operation of the sinkers s', s^2, s^3 with the rotation of the needle cylinder causes these sinkers to engage the yarn A in their throats and to form bights of the auxiliary yarn A about the shanks of needles n^2 and n^3 and below the latches thereof as shown in Figure 5.

As the needles approach the main knitting wave, the sinkers are retracted, the sinkers s', s^2, s^3, carrying with them the free end of the auxiliary yarn A so that when the needles n^3, n^2 are drawn down to take and knit the main yarn, M the end of the auxiliary yarn A has been carried from the needles n^3 and n^2 sufficiently far to permit of the latches of these needles passing down in back of the auxiliary yarn, as shown in Figure 6. At this point, the latch guard **50** is cut away to permit of the raising of the needle latches by the loops of yarn being cast from the needles. The latches of needles n^3 and n^2 as they are raised by the loops being

cast off, engage the loose end of the auxiliary yarn A and carry the loose end of the auxiliary yarn into the hooks of the needles n^3 and n^2 so that loops of the loose end of the auxiliary yarn are drawn with the new loops of the main yarn.

It will be noted that at the main knitting wave the auxiliary yarn is knit from the free end thereof back towards the first loop knit of the auxiliary yarn by the needle n', that is, a loop is first drawn by the needle n^3 and then by the needle n^2. However, as the needle n^3 also draws a loop of the main yarn M, the loop of the auxiliary yarn is secured by the friction of the yarns and as the loop of the auxiliary yarn is drawn by the needle n^2 there is a tendency for yarn to be drawn from the auxiliary yarn loop drawn by the needle n' and to reduce this loop to the normal size. Upon completion of the loops of both the main and auxiliary yarns by the needles n^3 and n^2 the auxiliary yarn is secured against slipping and enlargement of the auxiliary yarn loop drawn by the needle n' is prevented.

From the diagrammatic showing of the loops in Figure 17, it will be seen that while the first loop knit of the auxiliary yarn by the needle n' occurs as a single yarn loop as at the wale 5 in course c, the loops knit of the free end of the auxiliary yarn by the needles n^3 and n^2 occur as part of the two-yarn loops in wales 3 and 4, respectively of course d.

This invention is of particular use in connection with the knitting of hosiery on two-feed machines where the auxiliary yarn is introduced for the knitting of the leg and for the knitting of the foot after coming off the heel. While the invention has been shown in connection with a two-feed machine of a particular construction, it is to be understood the invention is not limited to use with machines of the construction shown, but may be used with two-feed machines of other constructions.

While the invention has been shown and described as in connection with a knitting machine having a main and an auxiliary yarn feeds and a knitting wave for each yarn feed, it is to be understood that the invention is not limited to such machines, but is equally applicable to a machine having a plurality of auxiliary feeds and knitting waves or a plurality of cycles of main and auxiliary feeds and the corresponding knitting waves.

What is claimed is:

1. In a circular knitting machine having independent needles, sinkers cooperating with said needles, main and auxiliary knitting waves for knitting main and auxiliary yarns at the respective knitting waves, means for feeding an auxiliary yarn to the needles and means for engaging the free ends of the auxiliary yarn with sinkers in advance of the first needle knitting said auxiliary yarn at the auxiliary knitting wave.

2. In a circular knitting machine having independent needles, sinkers cooperating with said needles, main and auxiliary knitting waves for knitting main and auxiliary yarns at the respective knitting waves, means for feeding an auxiliary yarn to the needles and means for engaging the free end of the auxiliary yarn with sinkers in advance of the first needle knitting said auxiliary yarn at the auxiliary knitting wave, said sinkers holding said auxiliary yarn for engagement by needles at the main knitting wave.

3. In a circular knitting machine having independent needles, sinkers cooperative with said needles, main and auxiliary knitting waves for knitting main and auxiliary yarns at the respective knitting waves, means for feeding an auxiliary yarn to the needles, clamping means for holding the free end of the auxiliary yarn and a yarn placer for engaging said auxiliary yarn with sinkers in advance of the first needle taking said auxiliary yarn at the auxiliary knitting wave while said clamping means holds said auxiliary yarn.

4. In a circular knitting machine having independent needles, sinkers cooperating with said needles, main and auxiliary knitting waves for knitting main and auxiliary yarns at the respective knitting waves, means for feeding an auxiliary yarn to the needles and a yarn placer for engaging said auxiliary yarn with sinkers in advance of the first needle taking said auxiliary yarn at the auxiliary knitting wave, said sinkers being operated to engage said auxiliary yarn in the throats of the sinkers to position said yarn for engagement by needles at the main knitting wave.

5. In a circular knitting machine having independent needles, sinkers cooperating with said needles, main and auxiliary knitting waves for knitting main and auxiliary yarns at the respective knitting waves, means for feeding an auxiliary yarn to the needles and a yarn placer for engaging said auxiliary yarn with sinkers in advance of the first needle taking said auxiliary yarn at the auxiliary knitting wave, said sinkers being operated to engage said auxiliary yarn in the throats of said sinkers and position said auxiliary yarn to be carried to the needles by the needle latches at the main knitting wave.

6. In a circular knitting machine having independent needles, sinkers cooperating with said needles, main and auxiliary knitting waves for knitting main and auxiliary yarns at the respective knitting waves, means for feeding an auxiliary yarn to the needles and a yarn placer for engaging said auxiliary yarn with sinkers in advance of the first needle taking said auxiliary yarn at the auxiliary knitting wave, said sinkers being operated to engage said auxiliary yarn with the needle shanks to carry said auxiliary yarn into the sinker throats and to withdraw said yarn from the needle shanks for engagement by the needle latches as the latches are closed at the main knitting wave.

7. In a circular knitting machine having independent needles, sinkers cooperating with said needles, main and auxiliary knitting waves for knitting main and auxiliary yarns at the respective knitting waves, means for feeding an auxiliary yarn to the needles and a yarn placer for engaging said auxiliary yarn with sinkers in advance of the first needle taking the auxiliary yarn at the auxiliary knitting wave, said sinkers being operated to position said auxiliary yarn to be engaged with needle hooks by the closing of needle latches at the main knitting wave.

8. In a method of knitting fabric of a plurality of yarns the steps of feeding one yarn to the needles at one kniting wave, feeding a second yarn to the needles at a second knitting wave, engaging the free end of said second yarn with sinkers in advance of the first needle taking said second yarn, securing said free end of said second yarn in the throats of said sinkers and knitting said free end of said second yarn with said first yarn at said first knitting wave.

9. In a method of knitting fabric of a plurality

of yarns, the steps of feeding one yarn to the needles at one knitting wave, feeding a second yarn to the needles at a second knitting wave, engaging the free end of said second yarn with sinkers in advance of the first needle taking said second yarn and presenting said free end of said second yarn by said sinkers at the first knitting wave to needles in advance of the first needle taking said second yarn at said second knitting wave.

10. In a circular knitting machine having independent needles operated in a plurality of knitting waves, sinkers cooperating with said needles, means for feeding a yarn to the needles at a knitting wave and means engaging the free end of said yarn with sinkers in advance of the first needle taking said yarn at said knitting wave, said sinkers holding said yarn for engagement by needles at a following knitting wave.

11. In a circular knitting machine having independent needles operated in a plurality of knitting waves, sinkers cooperating with said needles, means for feeding a yarn to the needles at a knitting wave and means engaging the free end of said yarn with sinkers in advance of the first needle taking said yarn at said knitting wave, said sinkers holding said yarn for engagement by needles in advance of said first needle at a following knitting wave.

12. In a circular knitting machine having independent needles operated in a plurality of knitting waves, sinkers cooperating with said needles, means for feeding a yarn to the needles at a knitting wave and means engaging the free end of said yarn with sinkers in advance of the first needle taking said yarn at said knitting wave, said sinkers holding said yarn for engagement by needles of said first needle for knitting said yarn and another yarn at a following knitting wave.

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