Dec. 23, 1952 C. W. MINTON 2,622,421

AUTOMATIC TRANSFER KNITTING APPARATUS

Filed Aug. 6, 1951 2 SHEETS—SHEET 1

FIG. 1

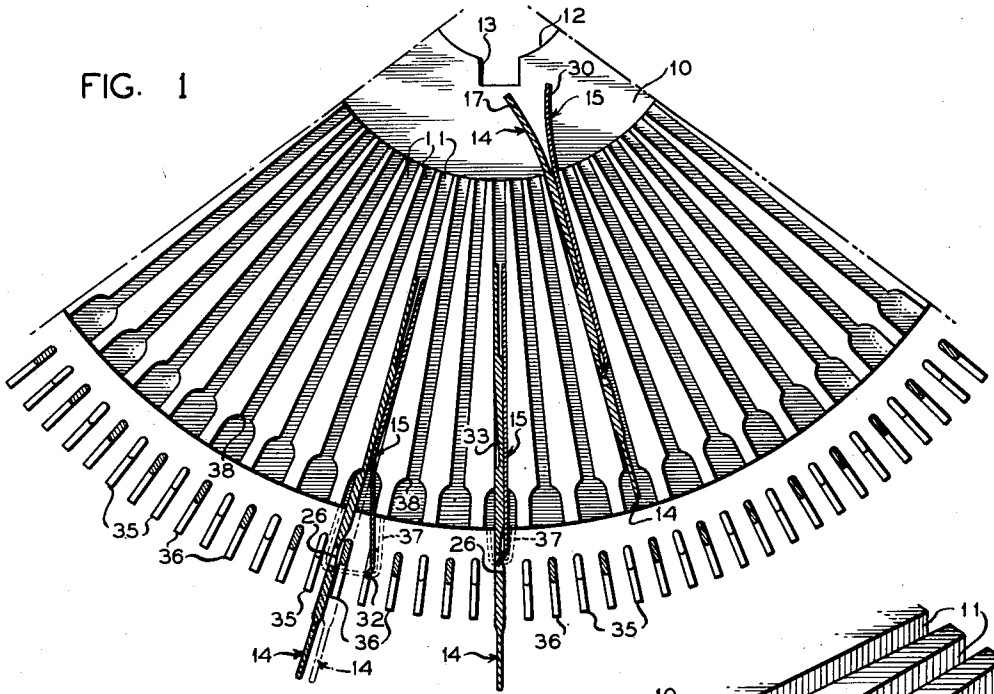
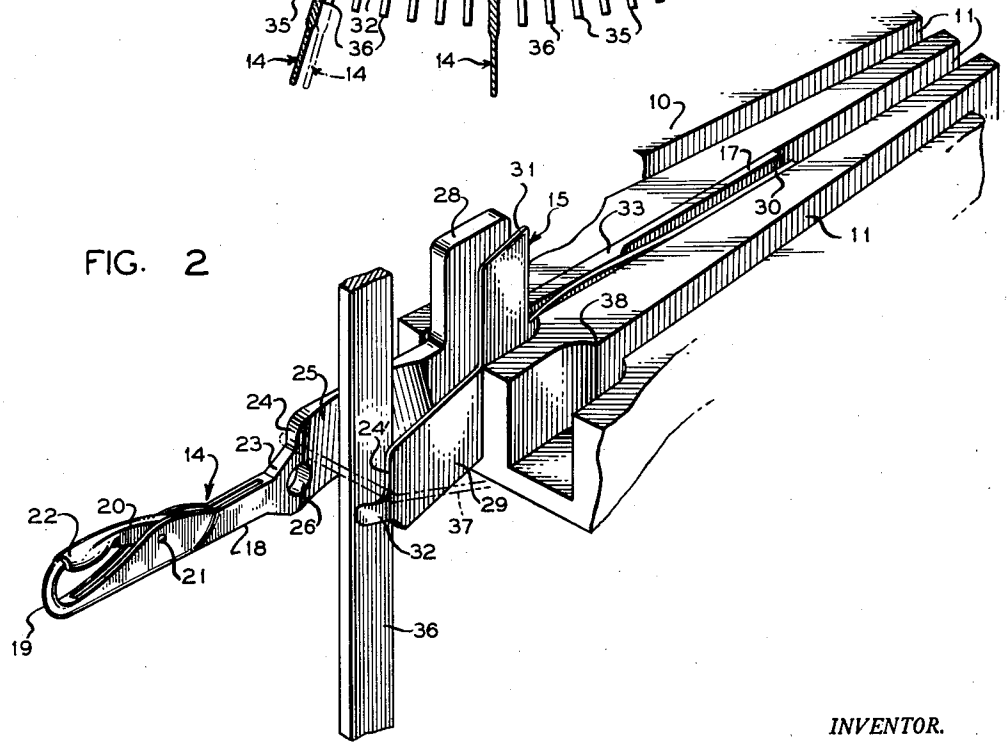


FIG. 2



INVENTOR.

C. W. MINTON

BY

A. Yates Dowell

ATTORNEY

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FIG. 3

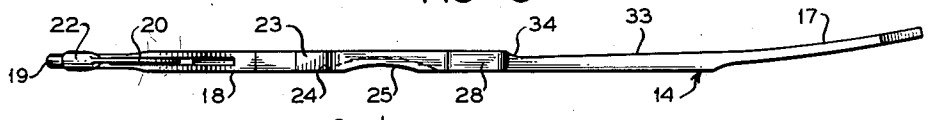
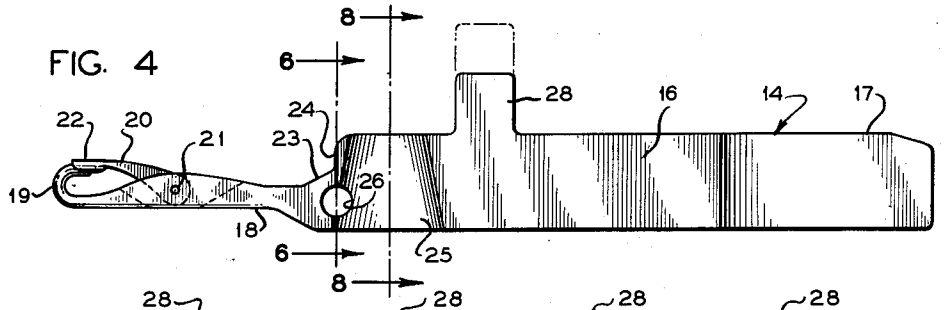


FIG. 4



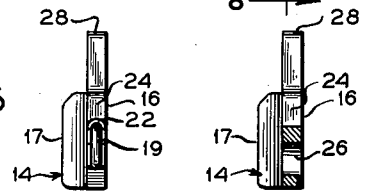


FIG. 5

FIG. 6

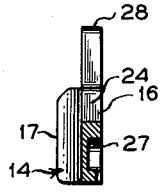


FIG. 7

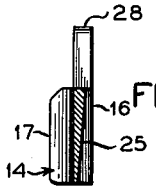


FIG. 8

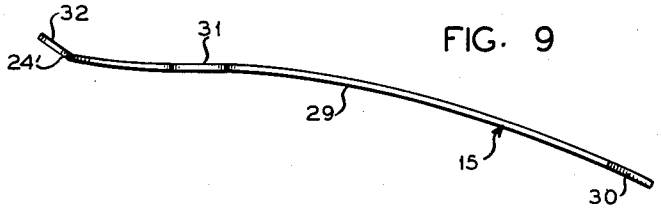
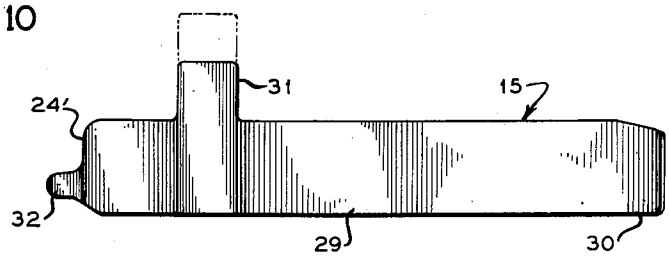


FIG. 9

FIG. 10



INVENTOR.

C. W. MINTON

BY

A. Yates Dowell

ATTORNEY

Patented Dec. 23, 1952 2,622,421

UNITED STATES PATENT OFFICE

2,622,421

AUTOMATIC TRANSFER KNITTING APPARATUS

Clarence W. Minton, Nashville, Tenn., assignor to May Hosiery Mills, Nashville, Tenn., a corporation of Tennessee

Application August 6, 1951, Serial No. 240,463

10 Claims. (Cl. 66—24)

1

This invention relates to textiles, and more particularly to an apparatus for knitting hosiery.

In the knitting industry, particularly in the knitting of hosiery, it has been common practice to use rib knitting for the leg and plain knitting for the foot portions. These operations have commonly been performed on two separate machines, one for the rib knitting, which is termed "a ribber" and one for the plain knitting, which is called "a footer," with the knitted fabric being manually transferred from one machine to the other.

As is well known in the art, the rib knitting of hose may be performed on a machine utilizing a plurality of vertically reciprocable needles slidably mounted in grooves on the outer surface of a cylinder. These needles may be termed "cylinder needles" and which cooperate with a plurality of horizontal or dial needles which reciprocate radially in grooves in the upper surface of a dial or plate disposed above the upper end of a cylinder. In the simplest form of rib knitting, the cylinder and dial needles are arranged alternately, but any desired combination of cylinder and dial needles may be utilized in order to provide different rib patterns. Plain knitting is performed by the use of the cylinder needles only.

There are many disadvantages in this prior method of making hosiery, among them being the fact that it is necessary to maintain a relatively large supply of ribbed tops in order that the plain knitting machines will always be kept busy. Also, there are numerous problems connected with the shades or colors of the yarn utilized since it is almost impossible to knit the top and foot portion of the hose from the same dye lot of yarn where this is done on different machines and its is likely that the top will be knitted at one time and the foot portion at another time, as much as several weeks or months apart. Obviously, it would not be practical to attempt to make all of these top portions and foot portions from the same dye lot of yarn, consequently, many problems having to do with shading are presented, which have contributed materially to the relatively high cost of production. By production in the prior manner, much yarn is wasted since it is necessary for the ribbed top to have extra or excessive length to make it possible for the operator to transfer the same to the plain knitting machine. Such extra or excessive length is unravelled or "ravelled off" after the transfer operation is finished, and such unravelled yarn is discarded or wasted.

One of the important objections to the present method of manually transferring from the rib knitting machine to the plain knitting machine is that a high degree of skill is required of the operator. Such skilled operators are relatively scarce and many persons do not have the necessary aptitude to permit their being trained as transfer operators. Consequently, the cost of such operation is materially increased and there is always the problem of obtaining sufficient trained operators to maintain production.

2

It is therefore an object of this invention to provide an apparatus for automatically performing a transfer knitting operation.

Another object of the invention is to provide an automatic transfer knitting apparatus which will produce knitted hosiery of high quality and with no apparent change in the knitting when compared with present commonly used manual methods.

Another object of the invention is to provide an automatic transfer knitting apparatus in which the stitch loop carried by the dial needles is spread or enlarged to permit the cylinder needles to pass through and receive the loop from the dial needles in order to complete the transfer operation.

A further object of the invention is to provide an automatic transfer knitting apparatus which may be utilized with conventional knitting machines without substantial alteration of such machines.

A still further object of the invention is the provision of an automatic knitting apparatus which may be economically constructed of readily available materials and one which is not subject to frequent breakdowns and which will perform its intended function over a long period of time without necessitating attention or repair.

Further objects and advantages of the invention will be apparent from the following description taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a fragmentary top plan view showing the dial needle and transfer finger of this invention disposed in the dial groove and further showing such needle and transfer finger in retracted position, in knitting position, and in transfer position;

Fig. 2 a perspective view to an enlarged scale showing the operation of the dial needle and transfer finger during the transfer operation;

Fig. 3 a top plan view of the dial needle of this invention;

Fig. 4 a side elevational view of the needle shown in Fig. 3;

Fig. 5 an end elevational view of the needle shown in Fig. 3;

Fig. 6 a sectional view on the line 6—6 of Fig. 4;

Fig. 7 a sectional view similar to Fig. 6 but showing a slightly modified form of needle;

Fig. 8 a sectional view on the line 8—8 of Fig. 4;

Fig. 9 a top plan view of the transfer finger of this invention; and

Fig. 10 a side elevational view of the transfer finger shown in Fig. 9.

Briefly stated, the invention comprises means whereby a conventional knitting machine may be converted to a transfer knitting machine in which the stitch loops carried by the dial needles are automatically transferred to the cylinder needles. The machine includes the conventional cylinder and needles carried thereby and a dial in which a specially formed needle and a transfer finger are slidably mounted in the upper surface thereof. During the rib knitting operation, a cam reciprocates the dial needles and transfer fingers radially of the dial and during the transfer operation the needles are projected a greater distance radially of the dial than during the knitting operation. During the transfer operation the transfer fingers operate to spread the stitch loop carried by the dial needles and at the same time the dial needles move a short distance laterally of the dial groove, to permit passage of the cylinder needle situated directly below the dial needle upwardly through the loop carried by the dial needle and spread by the transfer finger. Upon completion of the transfer operation the dial needles and fingers are retracted into the dial and remain inoperative during the plain knitting operation and until it is desired to initiate a further rib knitting operation.

With continued reference to the drawing, there is shown in Fig. 1 a dial **10** for a knitting machine, this dial having radial grooves **11** in the upper surface thereof. Dial **10** is mounted on a horizontal plane slightly above the upper end of the cylinder of the knitting machine and in some types of knitting machines the dial and cylinder rotate while in others the dial and cylinder are stationary and movable cams are provided for actuating the needles. The present invention will operate equally well with either type of machine. The dial **10** is provided with a central aperture **12** for receiving a shaft, not shown, there being a keyway **13** in the dial **10** for keying the dial to the shaft and to prevent relative rotation therebetween. Slidably received in the grooves **11** of dial **10** are knitting needles **14** and transfer fingers **15**. These needles and transfer fingers may occupy an inoperative position as shown at the right in Fig. 1 and may be projected to a knitting position as shown in the center of this figure and likewise may be projected a greater distance for performing a transfer operation as shown at the left-hand side of Fig. 1.

With particular reference to Figs. 3 to 8, the needle **14** comprises an elongated flat body portion **16** which is constructed preferably of metal but other suitable material may be employed if desired. One end of body **16** terminates in a tail or tang **17** which, as shown in Fig. 3, is bent at an angle to the body **16** of the needle and the purpose and utility of this bent tang will presently be described. Extending from the opposite end of the body **16** is a reduced shank portion **18** terminating in a hook **19**. Hook **19** may be closed to permit a stitch loop to pass from the shank **18** over the hook without being received within the same by a latch **20** pivotally mounted at **21** on the shank **18**. Latch **20** is provided with a hood **22** which partially embraces the end of hook **19** in order to provide a smooth surface and prevent catching of the yarn thereon. At the inner end of shank **18** there is provided an inclined surface **23** which extends upwardly and terminates in a shoulder **24** at the point of juncture with the body **16**. Body **16** is provided in one face thereof with a tapered concave groove **25** and adjacent this groove is an aperture **26**, the purpose of which will be presently described. In the form of needle shown in Fig. 7, aperture **26** is replaced by a recess **27** which performs the same function. Body **16** is also provided with a cam-engaging butt **28** projecting from one edge thereof and this butt may be either of the low variety as shown in full lines or may be made longer as shown in dotted lines in Fig. 4.

With reference to Figs. 9 and 10 the transfer finger **15** comprises a resilient metallic strip having somewhat the same configuration as the body **16** of the needle **14**. Transfer finger **15** comprises a body portion **29** and a tang or tail portion **30** there being a cam-engaging butt **31** projecting from one edge of the body **29**. Butt **31** is similar in every respect to the butt **28** of needle **14**. The body **29** of the transfer finger **15** is provided at the forward end thereof with a bit **32** which extends at an angle to the body portion **29** as clearly shown in Figs. 2 and 9. The formation of the transfer finger **15** is also clearly shown in Fig. 9 and in effect forms a leaf spring, the purpose of which will be later described.

The body **16** of the needle **14** is reduced in thickness between the butt **28** and the inner end of the tang **17**, the opposite side of the body **16** from the concave groove **25** being provided with an inclined surface **33** which extends from the inner end of the tang **17** inwardly toward the longitudinal axis of the needle and terminates in a curved shoulder **34** adjacent the butt **28**, shoulder **34** providing a camming action which will be later described in connection with the operation of the device.

As shown in Figs. 1 and 2 the dial needles **14** and the transfer fingers **15** are disposed in side by side relation in the grooves **11** of dial **10**. With the needles and fingers in the position shown in the center of Fig. 1 the tang **17** of needle **14** is substantially straight with relation to the body **16** and the curved spring transfer finger **15** is also flat. This results in the needle and transfer fingers bearing against the walls of the grooves **11** and provides sufficient tension to prevent vibration or undesired movement of such needles and fingers. When the needles and transfer fingers are retracted to inoperative position as shown at the right of Fig. 1, the tang **17** of the needle **14** and the tang **30** of the transfer finger **15** due to their resiliency, diverge and retain the needles and transfer fingers in such position until projected by action of a cam upon the butts **28** and **31**.

The operation of the device is best shown in Figs. 1 and 2 and it is to be understood that during a rib knitting operation stitch loops are received on each dial needle and on every other cylinder needle **35**. The cylinder needle **36**, located directly below the dial needle **14**, is in lowered or inoperative position during the rib knitting operation and remains immovable during such operation. When it is desired to transfer from rib knitting to plain knitting it is necessary to transfer the stitch loop **37** carried by the dial needle **14** to the previously inoperative cylinder needle **36**. This operation is accomplished as shown in Figs. 1 and 2 by projecting the dial needle 14 and transfer finger **15** to the position shown on the left hand side of Fig. 1. In this position the

curved shoulder 34 of needle 14 is positioned radially outwardly of the outer edge 38 of the grooves 11 in dial 10. This permits the needle 14 to move laterally in the groove the distance of the reduction in thickness of the needle 14 caused by the shoulder 34 and inclined surface 33. Needle 14 is moved laterally in this manner by reason of the resiliency of the transfer finger 15 bearing against the side of the needle 14. This operation is clearly shown at the left in Fig. 1, it being noted that the transfer finger 15 has curved slightly away from the flat condition which is apparent in the position of the needle shown in the center of Fig. 1. At the same time, the outer end of transfer finger 15 carrying the bit 32, springs or moves outwardly away from the adjacent surface of the needle 14 to form a diverging support for the stitch loop 37. At this period in the operation, the stitch loop 37 has moved up the inclined surface 23 and into engagement with the shoulder 24 on the outer end of the body 16 of needle 14. Likewise, the stitch loop 37 is engaged by the upper surface of the bit 32 and by the outer end 24' of the transfer finger 15. As clearly shown in Figs. 1 and 2, this diverging relationship between the outer end of the transfer finger 15 and the needle 14 spreads the stitch loop 37 an appreciable amount and since the needle 14 has moved laterally the previously idle cylinder needle 36 may pass upwardly through the loop 37 and will not contact the needle 14 by reason of the clearance provided by concave groove 25. After the cylinder needle 36 has passed upwardly through the stitch loop 37, the dial needle 14 and transfer finger 15 are retracted into the dial groove 11 and the stitch loop 37 remains on the cylinder needle 36 which then moves downwardly to form a further stitch. The dial needle 14 and transfer finger 15 are retracted to the inoperative position shown at the right of Fig. 1 and at this time the angularly disposed bit 32 is received within the aperture 26 or recess 27 as the case may be in the needle 14 in order to present a flat outer surface for engagement with the wall of the groove 11. During retraction of the dial needle 14 from the position shown at the left in Fig. 1, the outer end 38 of the groove 11 engages the curved shoulder 34 of the needle 14 and provides a camming action to move the needle 14 laterally in the groove to a position where the shoulder will pass inwardly from the end 38 and will remain in such position until the needle 14 is again projected to a point where the shoulder 34 moves outwardly of the end 38 of the groove 11.

It will be seen that by the above described invention there has been provided a relatively simple and economically constructed means for performing a transfer operation during the knitting of fabric and one which is easily adaptable to conventional knitting machines without material change therein. The transfer finger may be formed by a relatively simple and inexpensive stamping operation while the needle is scarcely more difficult to fabricate than the conventional dial needle. All that is necessary is to provide the concave groove 25, the aperture 26 or recess 27 and the reduced portion formed by the inclined surface 33 and the shoulder 34. Aside from these features, the needle is substantially identical to conventional dial needles. In the case of breakage or extreme wear, it is only necessary to replace the needle and transfer finger in the dial grooves and this is as simple an operation as merely replacing a needle.

It will be obvious to those skilled in the art that various changes may be made in the invention without departing from the spirit and scope thereof, and therefore the invention is not limited by that which is shown in the drawing and described in the specification, but only as indicated in the appended claims.

What is claimed is:

1. In an automatic transfer knitting machine, reciprocably mounted cylinder needles, certain of said cylinder needles being reciprocable during a rib knitting operation and all of said cylinder needles being reciprocable during a plain knitting operation, a dial disposed adjacent said cylinder needles, grooves in one surface of said dial, dial needles slidably disposed in said grooves, a transfer finger slidably disposed in each groove in side-by-side abutting relationship with each dial needle, said dial needles and transfer fingers being reciprocable during a rib-knitting operation and retractible to an inoperative position during a plain knitting operation and said dial needles and transfer fingers being movable radially outwardly of said dial during a transfer operation to a position beyond the knitting position, each of said dial needles comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of the body, a reduced portion extending from one end of said body and terminating in a yarn-engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder on the end of said body adjacent said reduced portion, a resilient tang extending from the opposite end of said body, a tapered groove in one side face of said body adjacent said shoulder, a transverse aperture in said body adjacent said groove, said body being reduced in thickness between said butt and said tang and an inclined surface on the opposite side of said body from said groove extending inwardly from said tang toward the longitudinal axis of said body and terminating in an outwardly curved shoulder adjacent said butt, each of said transfer fingers comprising an elongated relatively thin resilient body of appreciable width, said body having a substantially bowed formation when in unstressed condition, a cam engaging butt extending from said last named body and a bit extending from said last named body at an angle thereto, whereby upon movement of said needles and transfer fingers to transfer position said needles will be moved laterally in said grooves by reason of the force exerted by said transfer fingers to bring said inclined surfaces into engagement with the walls of said grooves and said bits will move laterally away from said needles to spread stitch-loops received thereon and permit passage of certain of said cylinder needles through said loops and upon retraction of said needles and said transfer fingers said needles will be moved laterally by the camming action of said curved shoulders engaging the outer edges of said grooves, said bits will be received in said apertures and said loops will be transferred to said certain cylinder needles.

2. In an automatic transfer knitting machine reciprocably mounted cylinder needles, certain of said cylinder needles being reciprocable during a rib knitting operation, and all of said cylinder needles being reciprocable during a plain knitting operation, a dial disposed adjacent said cylinder needles, grooves in one surface of said dial, dial needles slidably disposed in said grooves, a trans-

fer finger slidably disposed in each groove in side-by-side abutting relationship with each dial needle, said dial needles and transfer fingers being reciprocable during a rib knitting operation and retractible to an inoperative position during a plain knitting operation and said dial needles and transfer fingers being movable radially outwardly of said dial during a transfer operation to a position beyond the knitting position, each of said dial needles comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of said body, a reduced portion extending from one end of said body and terminating in a yarn-engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder adjacent said reduced portion, a resilient tank extending from the opposite end of said body, a tapered concave groove in one side face of said body adjacent said shoulder, a transverse recess in said body adjacent said groove, said body being reduced in thickness between said butt and said tank and an inclined surface on the opposite side of said body from said groove extending inwardly from said tank toward the longitudinal axis of said body and terminating in an outwardly curved shoulder adjacent said butt, each of said transfer fingers comprising an elongated relatively thin resilient body of appreciable width, said body having a substantially bowed formation when in unstressed condition, a cam engaging butt extending from one edge of said last named body and a bit extending from one end of said last named body at an angle thereto whereby upon movement of said needles and transfer fingers to transfer position said needles will be moved laterally in said grooves by reason of the force exerted by said transfer fingers to bring said inclined surfaces into engagement with the walls of said grooves and said bits will move laterally away from said needles to spread stitch loops received thereon and permit passage of certain of said cylinder needles through said loops and upon retraction of said needles and said transfer fingers said needles will be moved laterally by the camming action of said curved shoulders engaging the outer edges of said grooves, said bits will be received in said recesses and said loops will be transferred to said certain cylinder needles.

3. In an automatic transfer knitting machine reciprocably mounted cylinder needles, certain of said cylinder needles being reciprocable during a rib knitting operation, and all of said cylinder needles being reciprocable during a plain knitting operation, a dial disposed adjacent said cylinder needles, grooves in one surface of said dial, dial needles slidably disposed in said grooves, a transfer finger slidably disposed in each groove in side-by-side abutting relationship with each dial needle, said dial needles and transfer fingers being reciprocable during a rib knitting operation and retractible to an inoperative position during a plain knitting operation and said dial needles and transfer fingers being movable radially outwardly of said dial during a transfer operation to a position beyond the knitting position, each of said dial needles comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of said body, a reduced portion extending from one end of said body and terminating in a yarn engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder on the end of said body adjacent said reduced portion, a tapered concave groove in one side face of said body adjacent said shoulder, a transverse aperture in said body adjacent said groove, said body being reduced in thickness between said butt and the opposite end of said body and an inclined surface on the opposite end of said body from said groove extending inwardly from the opposite end of said body toward the longitudinal axis thereof and terminating in an outwardly curved shoulder adjacent said butt, each of said transfer fingers comprising an elongated relatively thin resilient body of appreciable width said body having a substantially bowed formation when in unstressed condition, a cam engaging butt extending from one edge of said last named body and a bit extending from one end of said last named body at an angle thereto whereby upon movement of said needles and transfer fingers to transfer position said needles will be moved laterally in said grooves by reason of the force exerted by said transfer fingers to bring said inclined surface into engagement with the walls of said grooves and said bits will move laterally away from said needles to spread stitch loops received thereon and permit passage of certain of said cylinder needles through said loops and upon retraction of said needles and said transfer fingers said needles will be moved laterally by the camming action of said curved shoulders engaging the outer edges of said grooves and said bits will be received in said apertures and said loops will be transferred to said certain cylinder needles.

4. In an automatic transfer knitting machine reciprocably mounted cylinder needles, certain of said needles being reciprocable during a rib-knitting operation and all of said cylinder needles being reciprocable during a plain knitting operation, a dial disposed adjacent said cylinder needles, grooves in one surface of said dial, dial needles slidably disposed in said grooves, a transfer finger slidably disposed in each groove in side-by-side abutting relationship with each dial needle, said dial needles and transfer fingers being reciprocable during a rib knitting operation and retractible to an inoperative position during a plain knitting operation and said dial needles and transfer fingers being movable radially outwardly of said dial during a transfer operation to a position beyond the knitting position, each of said dial needles comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of said body, a reduced portion extending from one end of said body and terminating in a yarn engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder on the end of said body adjacent said reduced portion, a transverse aperture in said body, said body being reduced in thickness between said butt and the opposite end of said body and an inclined surface on the opposite side of said body from said transfer finger extending inwardly from the opposite end of said body toward the longitudinal axis thereof and terminating in an outwardly curved shoulder adjacent said butt, each of said transfer fingers comprising an elongated relatively thin resilient body of appreciable width, said body having a substantially bowed formation when in unstressed condition, a cam engaging butt extending from one end of said last named body and a bit extending from one end of said last named body at an angle thereto whereby upon movement of said needles and transfer fingers

to transfer position said needles will be moved laterally in said grooves by reason of the force exerted by said transfer fingers to bring said inclined surfaces into engagement with the walls of said grooves and said bits will move laterally away from said needles to spread stitch loops received thereon and permit passage of certain of said cylinder needles through said loops and upon retraction of said needles and said transfer fingers said needles will be moved laterally by the camming action of said curved shoulders engaging the outer edges of said grooves, said bits will be received in said apertures and said loops will be transferred to said certain cylinder needles.

5. In an automatic transfer knitting machine reciprocably mounted cylinder needles, certain of said cylinder needles being reciprocable during a rib-knitting operation and all of said cylinder needles being reciprocable during a plain knitting operation, a dial disposed adjacent said cylinder needles, grooves in one surface of said dial, dial needles slidably disposed in said grooves, a transfer finger slidably disposed in each groove in side-by-side abutting relationship with each dial needle, said dial needles and transfer fingers being reciprocable during a rib-knitting operation and retractible to an inoperative position during a plain knitting operation, and said dial needles and transfer fingers being movable radially outwardly of said dial during a transfer operation to a position beyond the knitting position, each of said dial needles comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of said body, a reduced portion extending from one end of said body and terminating in a yarn engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder on the end of said body adjacent said reduced portion, said body being reduced in thickness between said butt and the opposite end of said body and an inclined surface on the opposite side of said body from said transfer finger extending inwardly from the opposite end of said body toward the longitudinal axis thereof and terminating in an outwardly curved shoulder adjacent said butt, each of said transfer fingers comprising an elongated relatively thin resilient body of appreciable width, said body having a substantially bowed formation when in unstressed condition, a cam engaging butt extending from one edge of said last named body and a bit extending from one end of said last named body whereby upon movement of said needles and transfer fingers to transfer position, said needles will be moved laterally in said grooves by reason of the force exerted by said transfer fingers to bring said inclined surfaces into engagement with the walls of said grooves and said bits will move laterally away from said needles to spread stitch loops received thereon and permit passage of certain of said cylinder needles through said loops and upon retraction of said needles and said transfer fingers said needles will be moved laterally by the camming action of said curved shoulders engaging the outer edges of said grooves and said loops will be transferred to said certain cylinder needles.

6. For use in an automatic transfer knitting machine a dial needle and a transfer finger adapted to be positioned in side-by-side relation in a groove of a dial, said dial needle comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of said body, a reduced portion extending from one end of said body and terminating in a yarn engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder on the end of said body adjacent said reduced portion, a resilient tang extending from the opposite end of said body, a tapered concave groove in one side face of said body adjacent said shoulder, a transverse aperture in said body adjacent said groove, said body being reduced in thickness between said butt and said tang and an inclined surface on the opposite side of said body from said groove extending inwardly from said tang toward the longitudinal axis of said body and terminating in an outwardly curved shoulder adjacent said butt, each of said transfer fingers comprising an elongated relatively thin resilient body of appreciable width, said body having a substantially bowed formation when in unstressed condition, a cam engaging butt extending from said last named body and a bit extending from one end of said last named body at an angle thereto whereby upon movement of said needle and transfer finger to transfer position said needle will be moved laterally in said groove by reason of the force exerted by said transfer finger to bring said inclined surface into engagement with the wall of said groove and said bit will move laterally away from said needle to spread a stitch loop received thereon and permit passage of a cylinder needle therethrough and upon retraction of said needle and said transfer finger said needle will be moved laterally by the camming action of said curved shoulder engaging the outer edge of said groove, said bit will be received in said aperture and said loops will be transferred to said cylinder needle.

7. For use in an automatic transfer knitting machine a dial needle and a transfer finger adapted to be disposed in side-by-side relation in a groove of a dial, said dial needle comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of said body, a reduced portion extending from one end of said body and terminating in a yarn engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder on the end of said body adjacent said reduced portion, a resilient tang extending from the opposite end of said body, a tapered concave groove on one side face of said body adjacent said shoulder, a transverse recess in said body adjacent said groove, said body being reduced in thickness between said butt and said tang and an inclined surface on the opposite side of said body from said groove extending inwardly from said tang toward the longitudinal axis of said body and terminating in an outwardly curved shoulder adjacent said butt, said transfer finger comprising an elongated relatively thin resilient body of appreciable width, said body having a substantially bowed formation when in unstressed condition, a cam engaging butt extending from one edge of said last named body and a bit extending from one end of said last named body at an angle thereto whereby upon movement of said needle and said transfer finger to transfer position said needle will be moved laterally in said groove by reason of the force exerted by said transfer finger to bring said inclined surface into engagement with the wall of said groove and said bid will move laterally away from said

needle to spread a stitch loop received thereon and permit passage of a cylinder needle through said loop and upon retraction of said needle and said transfer finger said needle will be moved laterally by the camming action of said curved shoulder engaging the outer edge of said groove, said bit will be received in said recess and said loop will be transferred to said cylinder needle.

8. For use in an automatic transfer knitting machine, a dial needle and a transfer finger adapted to be disposed in side-by-side relation in a groove of a dial, said dial needle comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of said body, a reduced portion extending from one end of said body and terminating in a yarn engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder on the end of said body adjacent said reduced portion, a tapered concave groove on one side face of said body adjacent said shoulder, a transverse aperture in said body adjacent said groove, said body being reduced in thickness between said butt and the opposite end of said body and an inclined surface on the opposite side of said body from said groove extending inwardly from the opposite end of said body toward the longitudinal axis thereof and terminating in an outwardly curved shoulder adjacent said butt, said transfer finger comprising an elongated relatively thin resilient body of appreciable width, said body having a substantially bowed formation when in unstressed condition, a cam engaging butt extending from one edge of said last named body and a bit extending from one end of said last named body at an angle thereto whereby upon movement of said needle and transfer finger to transfer position said needle will be moved laterally in said groove by reason of the force exerted by said transfer finger to bring said inclined surface into engagement with the wall of said groove and said bit will move laterally away from said needle to spread a stitch loop received thereon and permit passage of a cylinder needle through said loop and upon retraction of said needle and said transfer finger said needle will be moved laterally by the camming action of said curved shoulder engaging the outer edge of said groove, said bit will be received in said aperture and said loop will be transferred to said cylinder needle.

9. For use in an automatic transfer knitting machine a dial needle and a transfer finger adapted to be positioned in side-by-side relation in a groove of a dial, said dial needle comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of said body, a reduced portion extending from one end of said body and terminating in a yarn engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder on the end of said body adjacent said reduced portion, a transverse aperture in said body, said body being reduced in thickness between said butt and the opposite end of said body and an inclined surface on the opposite side of said body from said transfer finger extending inwardly from the opposite end of said body toward the longitudinal axis thereof and terminating in an outwardly curved shoulder adjacent said butt, said transfer finger comprising an elongated relatively thin resilient body of appreciable width, said body having a substantially bowed formation when in unstressed condition, a cam engaging butt extending from one edge of said last named body and a bit extending from one end of said last named body at an angle thereto whereby upon movement of said needle and said transfer finger to transfer position said needle will be moved laterally in said groove by reason of the force exerted by said transfer finger to bring said inclined surface into engagement with the wall of said groove and said bit will move laterally away from said needle to spread a stitch loop received thereon and permit passage of a cylinder needle through said loop and upon retraction of said needle and said transfer finger said needle will be moved laterally by the camming action of said shoulder engaging the outer edge of said groove, said bit will be received in said aperture and said loop will be transferred to said cylinder needle.

10. For use in an automatic transfer knitting machine a dial needle and a transfer finger adapted to be positioned in side-by-side relation in a groove of a dial, said dial needle comprising an elongated relatively thin body of appreciable width, a cam engaging butt extending from one edge of said body, a reduced portion extending from one end of said body and terminating in a yarn engaging hook, a latch pivotally mounted on said reduced portion and engageable with said hook to close the same, a shoulder on the end of said body adjacent said reduced portion, said body being reduced in thickness between said butt and the opposite end of said body and an inclined surface on the opposite side of said body from said transfer finger extending inwardly from the opposite end of said body toward the longitudinal axis thereof and terminating in an outwardly curved shoulder adjacent said butt, said transfer finger comprising an elongated relatively thin resilient body of appreciable width, said body having a substantially bowed formation when in an unstressed condition, a cam engaging butt extending from one edge of said last named body and a bit extending from one end of said last named body whereby upon movement of said needle and transfer finger to transfer position said needle will be moved laterally in said groove by reason of the force exerted by said transfer finger to bring said inclined surface into engagement with the wall of said groove and said bit will move laterally away from said needle to spread a stitch loop received thereon and permit passage of a cylinder needle through said loop and upon retraction of said needle and said transfer finger said needle will be moved laterally by the camming action of said curved shoulder engaging the outer edge of said groove and said loop will be transferred to said cylinder needle.

CLARENCE W. MINTON.

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