

May 12, 1936.

V. LOMBARDI
KNITTING APPARATUS

2,040,319

Filed Jan. 31, 1935

3 Sheets-Sheet 1

Fig. 1

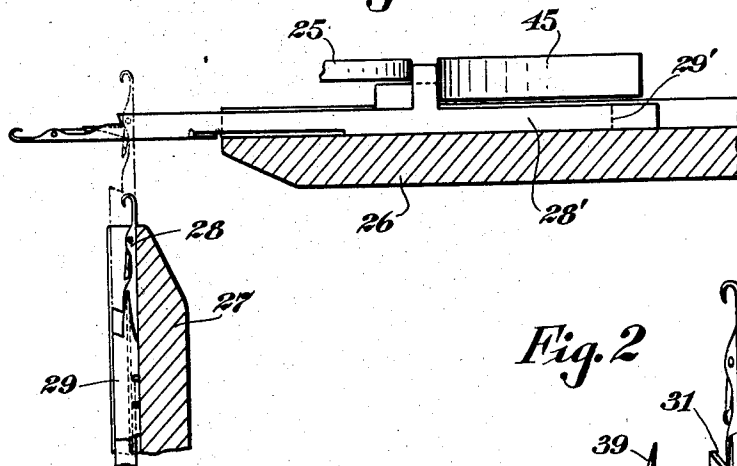


Fig. 2

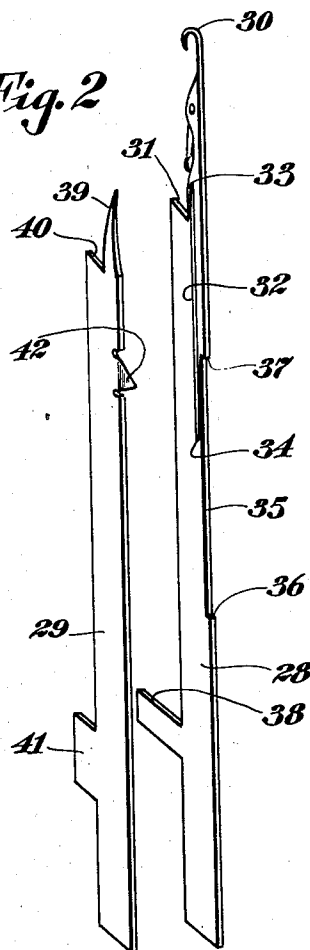
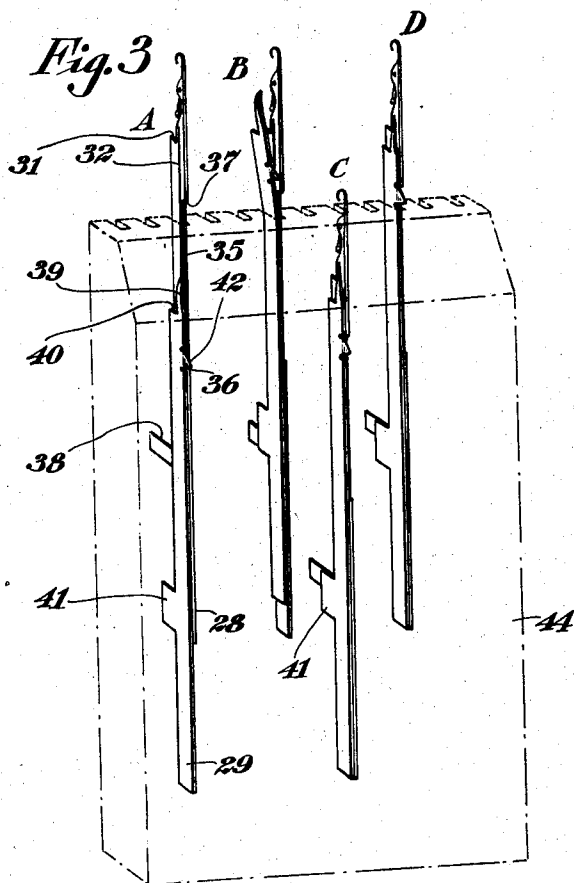


Fig. 3



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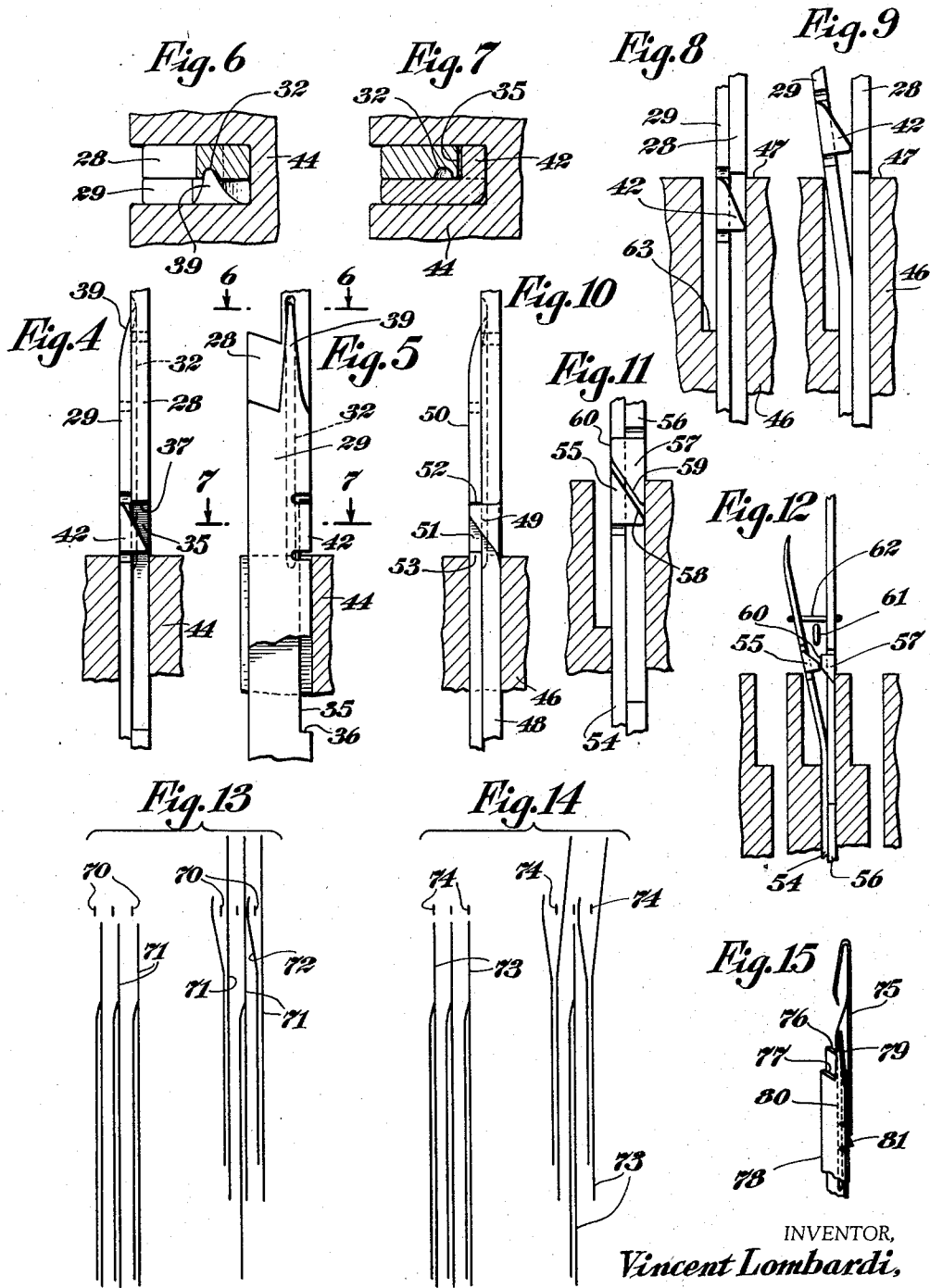
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3 Sheets-Sheet 2



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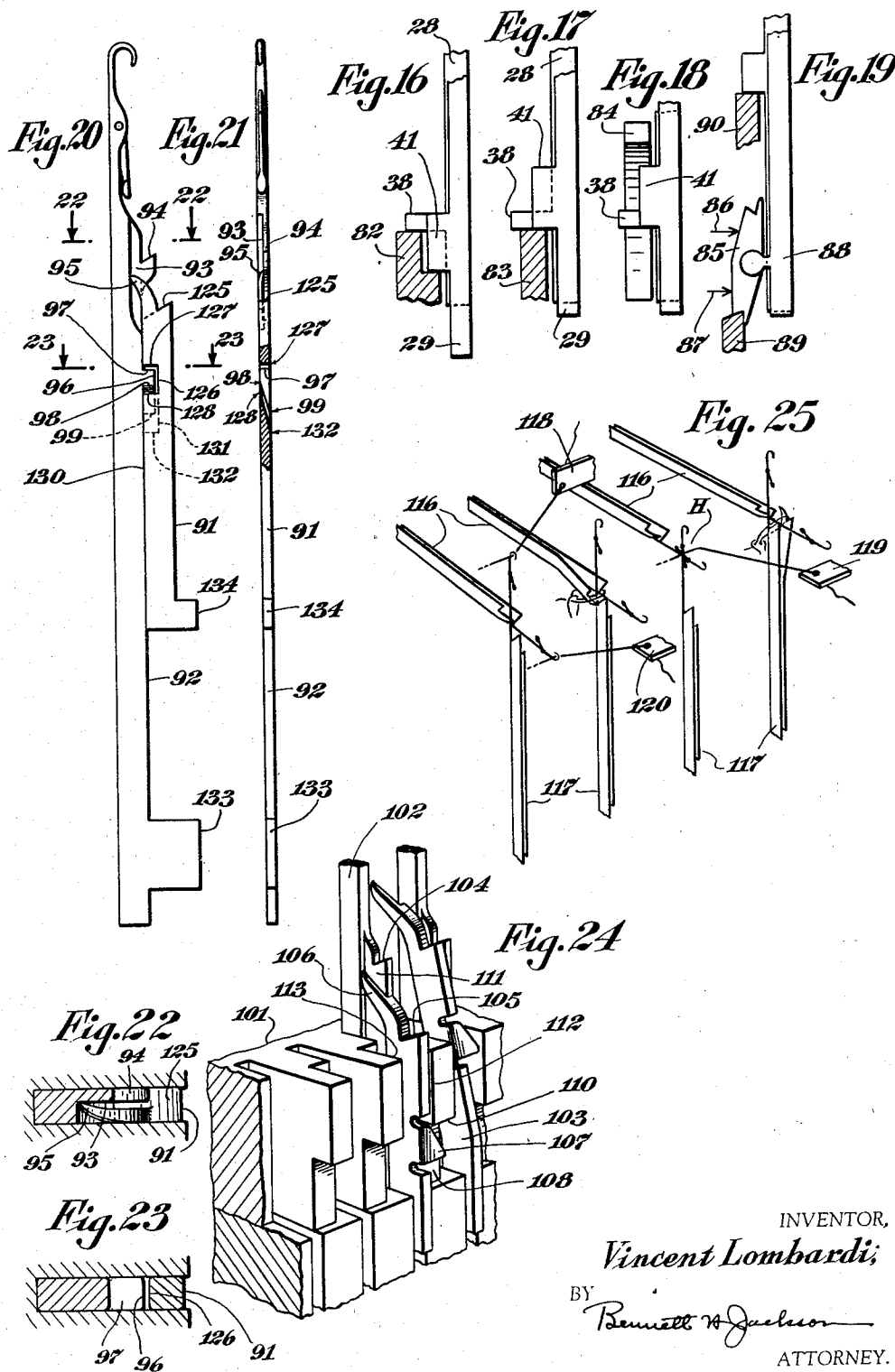
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3 Sheets-Sheet 3



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2,040,319

KNITTING APPARATUS

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Application January 31, 1935, Serial No. 4,234

20 Claims. (Cl. 66—24)

This invention relates to knitting apparatus involving needles and associated elements of special types.

An object of the invention is to provide a needle arrangement for a knitting machine having improved characteristics with respect to controlling operations exercised thereon or exercised by it in the knitting of a fabric. Another object is to incorporate in a needle slot special means for facilitating the transfer of the stitch from one type of needle to a different type as in a machine employing both cylinder and dial needles.

These objects may be accomplished in the following manner in accordance with the preferred embodiment of the invention in the assumed case where it is desired to transfer the stitch from a cylinder needle to a dial needle or vice versa. Each of a plurality of slots in the cylinder or dial contains a needle shank and another strip of metal which may be called a spreader. Normally the needle shank and the spreader are in intimate and sliding contact with each other in the needle slot with the needle shank capable of being advanced or retracted without disturbing its associated spreader. For example the spreader and the needle shank may comprise flat metal strips placed side by side in the needle slot. Means may be provided for advancing simultaneously a needle shank and its spreader and subsequently causing a further advancement of the spreader to produce a separation of the upper ends of the spreader and needle sufficient to permit another needle to be inserted between the spreader and first needle and take over a loop of yarn supported up to that time on correspondingly spaced shoulders on the spreader and first needle. Above this shoulder on the spreader, the spreader may terminate in a curved tongue directed towards the associated needle shank and normally riding in a lengthwise groove in the needle shank except when the stitch is to be transferred. The spreader may also embody a cam turned towards the needle shank and riding in an elongated slot cut into the rear or front edge of the needle shank when the spreader is stationary and the needle is advanced or retracted; but when the spreader is advanced with respect to the needle shank the aforesaid cam rides out of the slot and hence causes the desired separation between the upper ends of the needle and spreader to allow for entrance therebetween of the other type of needle.

This type of construction permits its use in fine gauge machines since both pieces in a slot lie flat against each other for normal knitting and hence require a slot no wider than the combined

thickness of the spreader and needle shank. Also when the spreader operates it opens sideways with a minimum of longitudinal movement. Another advantage is that the spreader when it enters a loop, it does so by opening sideways with very little cutting action as in the prior art where the spreader is usually wedged into the loop as the spreader moves forward.

This invention will be better understood by reference to the following detailed description taken in connection with the accompanying drawings in which

Fig. 1 is a general view of a fragment of a knitting machine showing one dial needle and one cylinder needle embodying one form of this invention;

Fig. 2 is an exploded view of a needle and its spreader of the type of Fig. 1;

Fig. 3 is a perspective view of a dial or cylinder of a knitting machine showing various positions of the combined spreader and needle shank;

Fig. 4 is an edge detail view and Fig. 5 a side detail view of the needle spreader combination of Fig. 1;

Figs. 6 and 7 are sectional views taken at designated positions on Fig. 5;

Figs. 8 and 9 are further operation views of the needle-spreader combination of Fig. 1;

Figs. 10 and 11 illustrate alternative forms of the invention;

Fig. 12 is an operation view of the form shown in Fig. 11;

Figs. 13 and 14 are schematic views showing relative alignments of the dial and cylinder needles;

Fig. 15 shows this invention applied to a beard needle;

Figs. 16, 17, 18 and 19 show cam operating means for the needle-spreader combination of Fig. 1;

Figs. 20 and 21 are side and end views of another form of this invention;

Figs. 22 and 23 are section views taken on Fig. 20 in the positions shown;

Fig. 24 shows another form of the invention where the separation of the needle and spreader is accomplished by a cam acting on the needle slot; and

Fig. 25 illustrates the manner in which the yarns may be fed to the needles of this invention.

Fig. 1 is a fragmentary view of a knitting machine showing one dial needle slot and one cylinder needle slot each having a needle-spreader combination of this invention. Thus 26 may be

a dial and 27 a cylinder of a knitting machine. The slot in the cylinder comprises a needle 28 and a spreader 29 as shown more clearly in Fig. 2. The dial slot has a corresponding dial needle 28' and spreader 29' separated in a manner to permit the stitch to be transferred from the dial needle to the cylinder needle.

The details of the combination in each slot will be understood by reference to Fig. 2 where the needle shank is terminated in a latched hook 30 and a shoulder 31. One side of the needle shank has a lengthwise groove 32 extending between the points 33, 34. The edge of the needle shank opposite the latch has an elongated slot 35 cut therein between shoulders 36, 37. The lower end of the shank has a long narrow butt 38 for cam operation as will be described later. The associated spreader 29 has a shank of substantially the same width and thickness as the needle shank. The upper end of the spreader terminates in a curved prong or hook 39 bent towards its associated needle, the tip of the hook 39 being designed to normally ride in groove 32 when the needle and spreader are placed side by side in a needle slot. Below prong 39 is a shoulder 40 intended to be aligned with shoulder 31 of the needle when a stitch transfer is taking place, as will be described later. The front edge of the spreader has butt 41 which is short and wide compared to butt 38 of the needle. At a substantial distance below shoulder 40 the rear edge of the spreader has a wedge shaped cam 42 projecting at right angles to the side faces of the spreader. When the needle and spreader are placed side by side in a needle slot this cam 42 is designed to lie in slot 35 as the needle is advanced and retracted. But if we assume that the spreader is advanced with respect to the needle it will be apparent upon inspection of Fig. 2 that the advancement of the spreader will ultimately cause the upper angular face of cam 42 to contact against shoulder 37 and finally cause the outer point of cam 42 to ride on the adjacent face of the needle thereby separating the upper ends of the spreader and the needle a distance equal to the effective height of cam 42.

Various views of the needle-spreader combination of Fig. 2 are shown in Fig. 3. In position A the spreader is in its fully retracted position while the needle is in a fully advanced position. Cam 42 is in slot 35 near shoulder 36 and prong 39 in near the lower end of groove 32. The position A may be secured by the passage of a thin cam which contacts with butt 38 but not butt 41.

Position B shows spreader and needle after both have been advanced by a cam contacting with both of butts 38, 41, with another cam subsequently acting only on butt 41 to further advance the spreader with respect to the needle to produce their separation. This means that cam 42 rides out of slot 35 and the point of cam 42 is in contact with the inside face of the needle shank to get the desired separation between the upper ends of the spreader and needle for stitch transfer, with shoulder 40 on the spreader in alignment with shoulder 31 on the needle. Position B is therefore the position for receiving another needle between needle 28 and spreader 29 for stitch transfer.

Position C shows the needle and spreader both in fully retracted position and shows clearly the difference in height of the bottom faces of butts 38, 41 which permit the greater movement of spreader 29 in arriving at position B. In posi-

tion C the prong 39 is resting in the groove 32 and cam 42 is in slot 35.

When the needle and spreader are in position C an advancing cam of staggered configuration may strike both butts 38, 41 to raise them simultaneously to the position D of Fig. 3 after which another cam acting only on butt 41 may further advance the spreader 29 to the condition of position C, Fig. 3. That is, as soon as the needle has reached the height of position D it is no longer advanced but the spreader is advanced to give the condition of position B.

In Fig. 3 just described the needle holder 44 may be the needle cylinder or the needle dial of a circular knitting machine as will be obvious to those skilled in the art. Of course holder 44 may have a needle spreader combination in each slot.

After the explanation of Figs. 2 and 3 it will be apparent that the dial needle-spreader of Fig. 1 has just been advanced by a cam (not shown) to the position D of Fig. 3 and that the spreader is now being actuated upon by a cam 45 to shift the spreader with respect to the needle to reach the separated condition of position B so that the cylinder needle of Fig. 1 when advanced to the position shown in dotted lines will be prepared to transfer to itself any yarn loop held by the dial needle disclosed.

Cam 25 in Fig. 1 is a cam for holding the needle 28' from further advance while the spreader 29' is pushed forwardly to secure separation from the dial needle to allow for the entrance of the cylinder needle.

Fig. 4 is an enlarged rear edge view of the needle and spreader of Fig. 2 in position D of Fig. 3. Cam 42 is in slot 35 below shoulder 37 and prong 39 rests in groove 32.

In Fig. 5 the needle and spreader are in the same relative position as in Fig. 4 but Fig. 5 is a side view.

Fig. 6 is a cross section taken along the line 6—6 of Fig. 5. It shows the needle slot containing the needle shank 28 and the spreader 29, with the curved prong 39 riding in the bottom of groove 32. Fig. 7 is a cross section taken along the line 7—7 of Fig. 5 at a point adjacent cam 42. It shows cam 42 bent at right angles to the main body of spreader 29 and fitting in slot 35 of the needle.

Fig. 8 is an enlarged view of the needle-spreader of Fig. 2 showing them in a partially advanced position but with cam 42 still riding in slot 35 below the top 47 of the needle slot in needle cylinder 46. Fig. 9 is a further advanced position with cam 42 out of slot 35 and riding on the face of the needle shank producing the desired angular separation between the shank and spreader.

Fig. 10 illustrates an alternative form of the invention in which the separating cam instead of being located on the spreader is located on the needle shank. Thus in Fig. 10 the rear edge of the needle shank 48 has a wedge shaped cam 49 bent at right angles to the main body of the shank and in the direction of the associated spreader 50 which has a slot 51 on its rear edge between shoulders 52, 53. This is just the reverse of Fig. 2 but it will be apparent that the effect will be the same in angularly separating the upper ends of the spreader and needle when shoulder 53 rides over the inclined face of cam 49 resulting in the outer end of cam 49 pressing against the inside face of the spreader as the spreader is acted upon by an advancing cam while the associated needle is stationary.

Fig. 11 discloses still another modification in which the spreader 54 has a separating cam 55 and the needle shank 56 has also a separating cam 57, both cams being wedge shaped and having parallel opposed edges 58, 59. When such a spreader 54 is advanced relative to the needle it is obvious that the contacting cams will separate the spreader and the needle as shown in Fig. 12 where the extreme end of cam 55 is riding on edge 60 of cam 57. The end 61 of another needle is shown in Fig. 12 between the separated needle and spreader ready to remove the loop 62 from needle 56.

In Figs. 1 to 7 inclusive it has been assumed as disclosed in certain of the figures that the slot containing the needle-spreader combination is of uniform width particularly near the top of the needle cylinder. In Figs. 8 to 12 however the upper part of each cylinder needle slot is of increased width for a substantial distance from the top of the cylinder on the side of the slot adjacent the spreader. Thus in Fig. 8 the needle slot is of increased width from the top of the needle cylinder down to the shoulder 63. Therefore when the spreader 29 is moved relative to the needle to bring cam 42 out of the slot the separation of the needle and spreader is due entirely to the bending of the shank of spreader 29 while the shank of needle 28 remains straight as shown in Fig. 9 because of being supported by the vertical wall of the needle slot.

On the other hand if the needle slot is of uniform width as in Fig. 3 the separation cam 42 can not be effective until it is above the top of the needle cylinder so that in such a case the needle shank and the spreader shank bend equally providing that they are of equal stiffness or thickness. This point must of course be taken into consideration in providing the holding cam such as cam 25, Fig. 1, for holding the needle while its associated spreader advances.

If only the spreader shank bends as in Fig. 9 it is apparent that this must be taken into consideration in having the dial needles offset from the cylinder needles. Thus the dial needles 70 of Fig. 13 are slightly offset from their respective cylinder needles 71. When the cylinder needles 71 are advanced as shown at the right of Fig. 13 each cylinder needle remains straight but its associated spreader 72 when advanced is bent to a substantial degree to provide the necessary space for the entrance of the dial needle between the cylinder needle and its spreader.

If both the cylinder needle and its spreader bend away from the vertical then each dial needle should be aligned with the normal position of its cylinder needle as shown in Fig. 14 where to the left of the figure the retracted cylinder needles 73 are in alignment with the dial needles 74 while at the right of the figure it is shown how both the cylinder needle and its spreader both bend away from the vertical to pass on opposite sides of the extended axis of each dial needle 74.

This invention of course is not limited to needles of the latch type but may be used with other types of needles. Fig. 15 is a fragmentary showing of this invention applied to a beard or spring needle. Except for the beard in place of the latch the construction is the same as in Fig. 2. The beard needle 75 has a shoulder 76 which is aligned with the shoulder 77 on spreader 78 when a stitch transfer is to be made. Prong 79 on the spreader normally rides in a lengthwise groove 80 in the side face of the needle and separating cam

81 rides normally in a slot located in the rear edge of the needle. The method of operation is similar to that previously described.

Figs. 16, 17, and 18, illustrate how cam means may be employed to advance selectively a cylinder needle and its associated spreader and these figures may be assumed to have a needle and spreader of the type of Fig. 2. We may assume that cam 82 is a rotating cam in a circular knitting machine for fully advancing each cylinder needle and its associated spreader to position D of Fig. 3. Thus in Fig. 16 cam 82 contacts simultaneously with butt 38 and butt 41 to fully advance the needle and its spreader to position D of Fig. 3. In Fig. 17 cam 83 operating subsequently to cam 82 contacts with the lower projecting butt 41 to bring the bottom of butt 41 up to the bottom of butt 38 to shift spreader 29 from position D, Fig. 3, to position B, Fig. 3. Fig. 18 shows a retracting cam 84 of such a size as to contact with both butts 38, 41 of each needle in the needle cylinder to first close the spreader 29 against the needle and then to fully retract both elements to the position C Fig. 3.

In some instances it may be desirable to have only certain of the spreaders in the needle row advanced while leaving the remainder of the spreaders retracted. For this purpose as shown in Fig. 19 it may be convenient to remove butt 41 from the spreader shank and substitute a pivoted member 85 suitably mounted near the lower end of the spreader shank 38 for limited clockwise or counterclockwise movement with respect to the spreader shank. A pattern determining mechanism may be provided at desired times to operate at the points 86, 87 to produce the clockwise and counter clockwise movement on desired spreaders without actuating the pivoted members on other spreaders. In Fig. 19 the pivoted member 85 is shown in its clockwise position where the lower end of member 85 lies in the path of an advancing cam 89 to fully advance the spreader to the position shown at B, Fig. 3, while the corresponding needle is being advanced by another cam 90. The spreader of Fig. 19 may be subsequently retracted by a cam (not shown) contacting with the upper arm of pivoted member 85 when the said member is in its counterclockwise position.

Still a different form of the invention is shown in Figs. 20 to 25. In the previous figures the spreader and its needle have been placed side by side in the needle slot while in Figs. 20 to 23 they are placed edge-wise in a narrower slot. Thus in Fig. 20 the spreader 91 is placed edgewise of the needle shank 92, that is the needle and the spreader are in the same plane. The upper portion 93 of the needle shank 92 including shoulder 94 is recessed, that is, it may be only one half as thick as the main body of the needle shank. In this recess 93 rides the prong 95 of the spreader. Lower down on the needle shank is a special butt 96 of full needle shank thickness between points 97 and 98, and tapering in thickness from point 98 to a knife edge at 99. The spreader has a yarn receiving shoulder 125, prong 95 being of reduced thickness so as to lie in recess 93 without protruding. Spreader 91 has a slot in its shank between points 127, 128, the point 128 being a knife edge, the portion of the spreader shank between lines 130, 131 being of increasing thickness until the point 132 where it is of full shank thickness. Slot 126 is adapted to receive the full thickness shoulder 97, 98 of the needle, while tapered portion 128, 132 of the spreader fits into the tapered portion of the butt 96 of the needle to join the spreader and

the needle without increasing the overall thickness at any point where they overlap. The needle shank has a cam operated butt 133 and the spreader a cam operated butt 134 for individual operation when desired.

With such a combination the spreader will normally ride up and down with the needle in ordinary knitting but when a stitch transfer is desired the spreader is individually advanced by a cam operating on butt 134 after the needle is fully advanced. This will cause cam surface 128, 132 on the spreader to ride up tapered slope 98, 99, producing a lateral separation of the upper ends sufficient for the entrance of another needle between the disclosed needle and its spreader when yarn receiving shoulders 94, 125 are aligned. This action of course also spaces prong 95 away from the needle shank. This separation is intended to take place after the upper ends of spreader 91 and needle 92 project beyond the needle slot. The normal overlapping of the spreader and needle shanks does not require any increase in size of the needle slot containing them over that required for an ordinary needle or needle 92, since the overlapping does not result in any increased thickness except when the parts above the needle slot are separated in the manner above described.

Fig. 21 is an edge view of the combination of Fig. 20 and Figs. 22, 23 are sectional views taken along the designated lines in Fig. 20. Further details of these figures are believed unnecessary except to point out that Figs. 22, 23 show very clearly that the maximum thickness of the needle shank and the maximum thickness of the spreader each equal the width of the needle slot.

Fig. 24 illustrates an arrangement whereby the separation of the spreader and needle is secured by a cam on the spreader acting against a shoulder on the needle cylinder instead of on the associated needle shank. Thus a fragment of a needle cylinder 101 is disclosed, each slot therein having a needle shank 102 and a spreader 103. The needle shank has a shoulder 104 which is aligned with shoulder 105 on the spreader when preparing for transfer of a yarn loop as shown at the right in Fig. 24. The needle shank and the spreader are placed edge to edge in the slot as in Fig. 20, with prong 106 of the spreader riding in a recess 111 in the needle shank as in Fig. 20. However the spreader of Fig. 24 and its needle always move together in the normal advancement and retraction of the needle for ordinary knitting as compared with spreader 29 which remains stationary under those conditions. Additional cam means may be used to raise the spreader to provide the separation. The rear edge of each spreader has a wedge shaped cam 107 turned at right angles to the face of the spreader and adapted to lie normally in a notch 108 in the needle cylinder below shoulder 110. The needle slot is not of uniform width but at the top has a forward section of increased width (as in Figs. 8 and 9) between faces 112, 113. When the spreader 103 is advanced from the position shown at the left of Fig. 24 the upper angular face of cam 107 will contact with the inside edge of shoulder 110 causing the spreader to be bent angularly away from its needle as shown at the right in Fig. 24, where shoulders 104, 105 are aligned but separated by a gap wide enough for a dial needle to enter for stitch transfer purposes. The separation of the needle and spreader in Fig. 24 is therefore due to the action of cam 107 on a projection of the needle cylinder.

Fig. 25 represents a desirable way of feeding yarns to a machine in which both the dial and the cylinder needles are of the needle-spreader combination of this invention permitting yarn to be transferred from the cylinder needles to the dial needles or vice versa. Needles 116 are dial needles each with a spreader as provided herein. Needles 117 are cylinder needles each with a spreader as provided herein. 118 represents a yarn feed positioned to feed yarn to the cylinder needles when the cylinder needles are in their maximum advanced position; 120 represents a yarn feed positioned to feed yarn to the dial needles when the dial needles are in their maximum advanced position; and 119 represents a yarn feed adapted to feed yarn either to the dial needles or the cylinder needles when they are partially advanced as shown at position H for example. This combination of the three yarn feeds just described and the needle-spreader arrangement of this invention is capable of producing many attractive features in the fabric knitted thereby.

What is claimed is:

1. In a knitting machine slot, a needle shank having a hook, a yarn receiving shoulder below said hook, a stitch transfer bar slidably mounted in said slot alongside said needle, a lengthwise groove in said shank, a prong on said bar normally riding in said groove, a yarn receiving shoulder on said bar below said prong, and means for laterally separating said shoulders when relative longitudinal motion occurs between said shank and said bar.

2. In a knitting machine slot, a needle shank having a hook and a yarn receiving shoulder below said hook, a stitch transfer bar slidably mounted in said slot alongside said needle for longitudinal movement independent of said shank, a lengthwise groove in said needle, a prong on said bar normally riding in said groove, a yarn receiving shoulder on said bar below said prong, said bar shoulder being longitudinally displaced from said needle shoulder when said prong is in said groove, said groove being of insufficient length to receive said prong when said bar is moved to align said shoulders, and means for laterally separating said shoulders when said shoulders are in alignment.

3. In a knitting machine needle slot, a needle shank having a yarn receiving shoulder near one end thereof, a transfer bar having a shank in intimate contact with said needle shank over the major portions of their lengths and being slidably mounted in said slot for longitudinal movement independent of said needle, said bar having a yarn receiving shoulder near one end thereof, and means for causing an angular separation of said ends when said ends project beyond said needle slot.

4. In a knitting machine needle slot, a needle shank having a yarn receiving shoulder near one end thereof, a stitch transfer bar having a shank in intimate contact with said needle shank over the major portions of their lengths and having a yarn receiving shoulder near one end thereof, and means on one of said shanks for angularly separating said ends when relative motion occurs between said shanks at a time when said ends project beyond said slot.

5. In a knitting machine needle slot, a needle shank, a stitch transfer bar shank, said shanks having their longitudinal axes parallel with said shanks normally in intimate contact with each

other, a yarn receiving shoulder on each of said shanks, a cam operated butt on one of said shanks, a cam operated butt of a different configuration on the other of said shanks, and means on one of said shanks acting on the other of said shanks for angularly displacing said shoulders with respect to each other when relative motion occurs between said shanks.

6. In a knitting machine needle slot, a needle shank and a stitch transfer bar shank placed side by side in said slot, a yarn receiving shoulder on each of said shanks, said shoulder on said bar shank normally being at a different level than said needle shoulder, and means on one of said shanks for causing an angular separation of portions of said shanks when relative motion occurs between said shanks to bring said shoulders to approximately the same level.

7. In a knitting machine, a needle shank having a yarn receiving shoulder near one end and having a guide groove on one side thereof extending lengthwise of the shank, a stitch transfer bar shank movable alongside said side of said needle shank and having an intumed prong slidable in said groove, a yarn receiving shoulder on said bar shank below said prong, and means for angularly separating said shanks at their ends adjacent said shoulders.

8. In a knitting machine the combination in accordance with claim 7 in which said means comprises a notch in said needle shank and a projection on said bar shank normally riding in said notch, and cam means for advancing said bar shank to cause said projection to move out of said notch to laterally separate said shoulders.

9. In a knitting machine, the combination in accordance with claim 7 in which said means comprises a notch in said bar shank and a projection on said needle shank normally riding in said notch, and cam means for advancing said bar shank to cause said projection to move out of said notch to laterally separate said shoulders.

10. In a knitting machine needle slot, a needle shank, a stitch transfer bar shank placed edge to edge with said needle shank, a yarn receiving shoulder on each of said shanks, and means responsive to relative movement of said shanks for laterally separating said shoulders.

11. In a knitting machine needle slot, a needle shank, a stitch transfer bar shank placed edge to edge with said needle shank in said slot, a yarn receiving shoulder on each shank, an elongated recess on said needle shank, a prong on said bar shank normally riding in said recess, and means responsive to relative movement between said shanks for laterally separating said shoulders.

12. In a knitting machine, a needle slot, a needle shank in said slot having a hook, a yarn receiving shoulder below said hook, a cam operated butt below said shoulder, a stitch transfer bar shank mounted in said slot side by side with said needle shank, a groove in one side of said needle shank, a prong on said bar shank normally riding in said groove, a yarn receiving shoulder on said bar shank below said prong, means for advancing said bar shank while said needle shank is held stationary, and means responsive to said advancement for laterally separating said shoulders.

13. A stitch transfer bar for mounting alongside a needle in a needle slot, said bar comprising a thin metallic strip with parallel sides, one end of said bar having a curved prong angularly dis-

posed with respect to said sides, a yarn receiving shoulder below said prong, a cam below said shoulder projecting from an edge of said strip substantially at right angles to said sides, and a cam operated butt on said bar projecting from said strip in a direction substantially parallel to said sides.

14. A stitch transfer bar for mounting alongside a needle in a needle slot, said bar comprising a thin metallic strip with parallel sides, one end of said bar having a curved prong angularly disposed with respect to said sides, a yarn receiving shoulder below said prong, a cam below said shoulder protruding from one of said sides in a general direction substantially perpendicular to one of said sides, and a cam operated butt on said bar projecting from said strip in a direction substantially parallel to said sides.

15. In combination, in a needle slot, a needle shank having a yarn hook at one end, a lengthwise groove in one side of said shank near said hook, a cam operated butt on said needle shank, a stitch transfer bar shank mounted alongside said needle shank, said bar shank having a curved prong at one end normally riding in said groove, a cam operated butt on said bar shank of a different configuration than said first mentioned butt, a yarn receiving shoulder on each of said shanks, one of said shanks having a cam projecting towards the other shank, said other shank having a recess for receiving said cam, said cam registering with said recess when said prong rides in said groove, and means for longitudinally moving one of said shanks relative to the other shank for causing said cam to ride out of said recess to produce an angular separation of said shanks adjacent said shoulders.

16. In a knitting machine, a needle slot, a needle shank in said slot having a yarn receiving hook at one end thereof, a guide groove on one side of said shank extending lengthwise of said shank, a stitch transfer bar shank mounted in said one slot and movable alongside said one side of said needle shank and having an intumed prong slidable in said groove, a yarn receiving shoulder on said bar shank below said prong, and means for angularly separating said shanks at their ends adjacent said hook and said prong.

17. In a knitting machine, a needle slot, a needle shank in said slot, a stitch transfer bar shank in said slot and placed edge to edge with said needle shank, a yarn receiving shoulder on one of said shanks, and means responsive to relative longitudinal movement of said shanks for laterally separating said shanks at a point adjacent said shoulder.

18. In a knitting machine, a needle slot, a needle shank in said slot and having a yarn receiving hook which projects at times beyond said slot, a transfer bar shank slidably mounted in said one slot alongside said needle for longitudinal movement independent of said needle shank, said bar having an end which projects at times beyond said slot, one of said shanks having a yarn receiving shoulder, and means for angularly separating said shanks at a point adjacent said shoulder when relative longitudinal motion occurs between said shanks.

19. In a knitting machine, an elongated slot, a knitting element having a shank in said slot, a loop spreader having a shank slidably mounted in said slot alongside said element shank, a lengthwise groove in said element shank, a prong on said

5 spreader shank normally riding in said groove, a yarn receiving shoulder on each of said shanks and means for laterally separating said shoulders when relative longitudinal motion occurs between said shanks.

20. In a knitting machine an elongated slot, a knitting element having a shank in said slot, a loop transfer bar having a shank slidably mounted

in said slot for longitudinal movement independent of said element, said shanks being in intimate contact over the major portion of their lengths, each of said shanks near one end thereof having a yarn receiving shoulder, and means for causing an angular separation of said ends when said ends project beyond said slot.

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