United States Patent

Furst

[15] 3,643,471

[45] Feb. 22, 1972

[54] WARP KNITTING MACHINE

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[73] Assignee: Walter Reiners, Gladbach, Germany

[22] Filed: July 9, 1969

[21] Appl. No.: 840,161

[30] Foreign Application Priority Data

July 11, 1968 Germany ..... P 17 60 860.5

[52] U.S. Cl. 66/84

[51] Int. Cl. D04b 23/12

[58] Field of Search 66/83, 84, 85, 86, 125

[56] References Cited

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[57] ABSTRACT

A warp knitting machine having a zone wherein knitting needles are disposed and means for supplying warp threads to the needles includes device for filling a weft having holder members for making the weft ready outside the needle zone, the holder members being disposed in the vicinity of weft reversal locations and being rotatable in closed travel paths, and means for guiding the weft to the warp threads, the holder members having a thread guide cooperating therewith for making the weft ready, the thread guide being displaceable in the closed travel path of one of the holder members.

8 Claims, 9 Drawing Figures

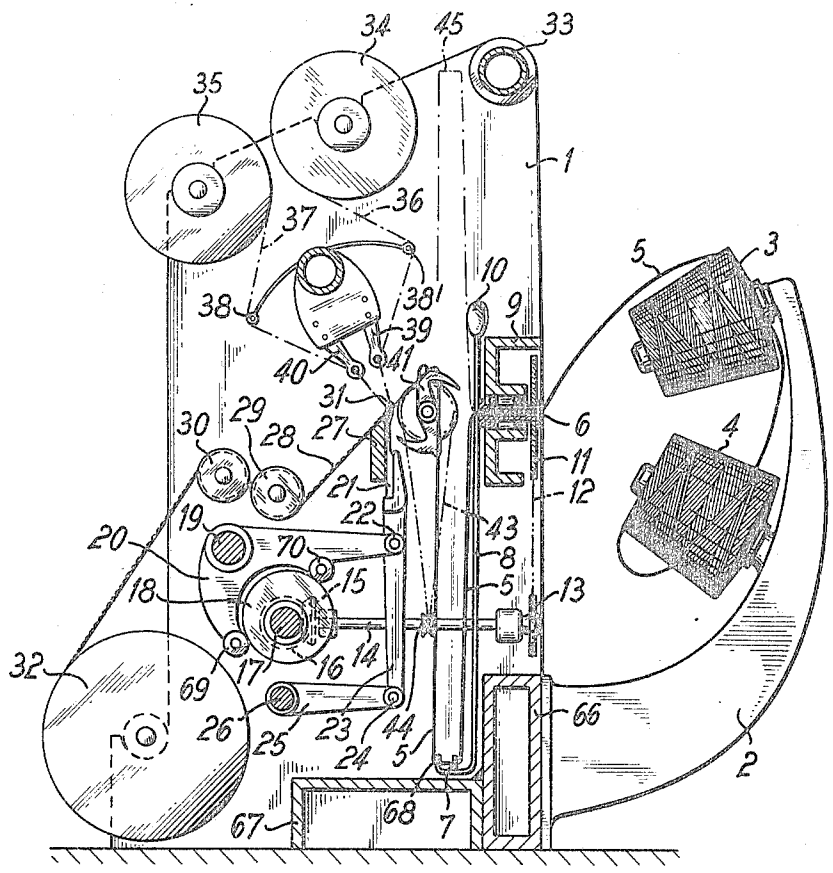

FIG. 1

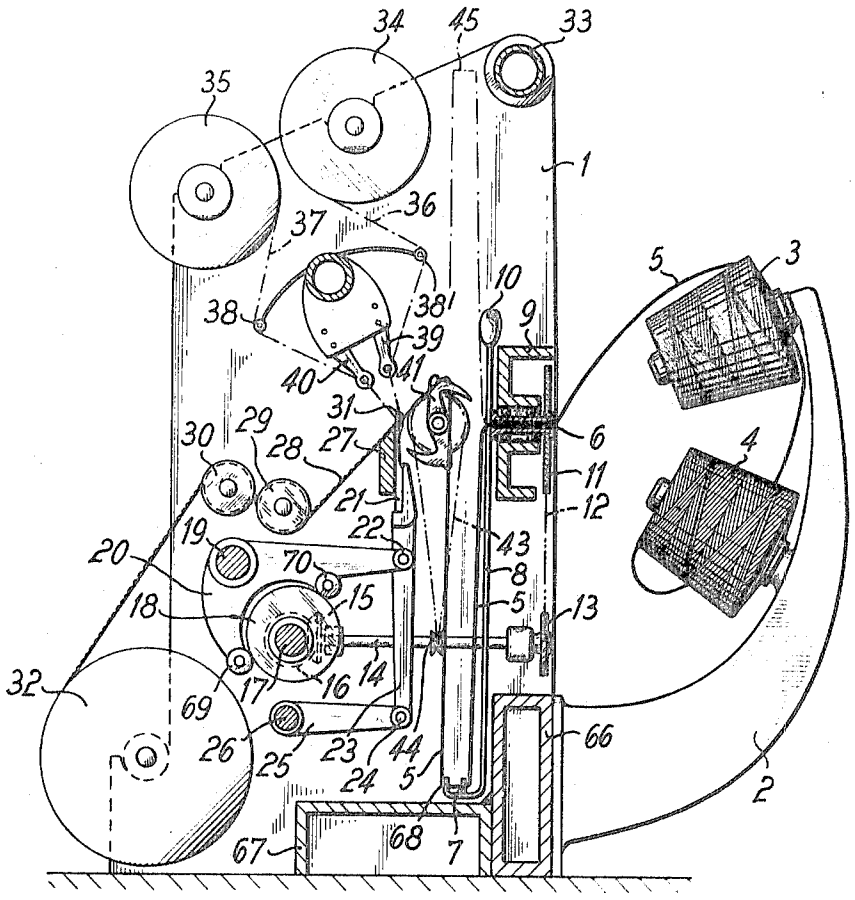
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FIG. 2

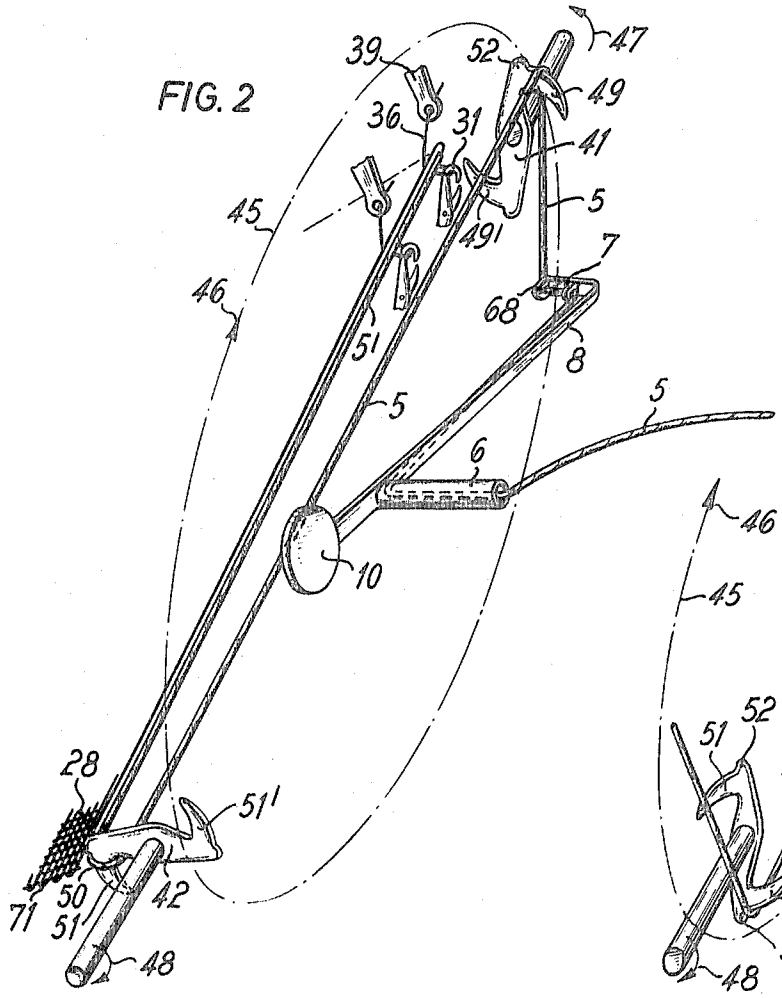

FIG. 3

FIG. 4

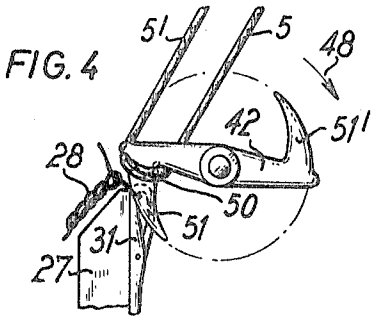

FIG. 5

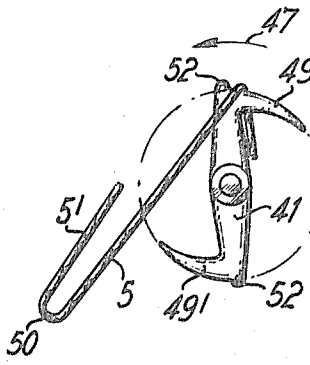

FIG. 6

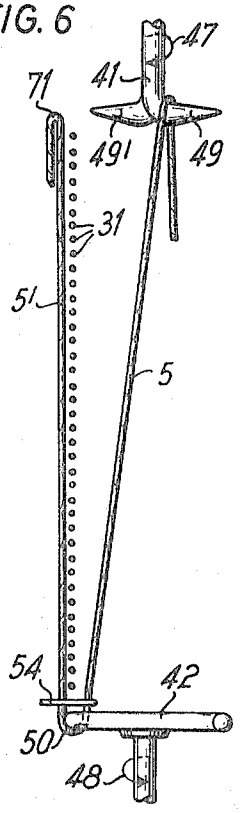

FIG. 7

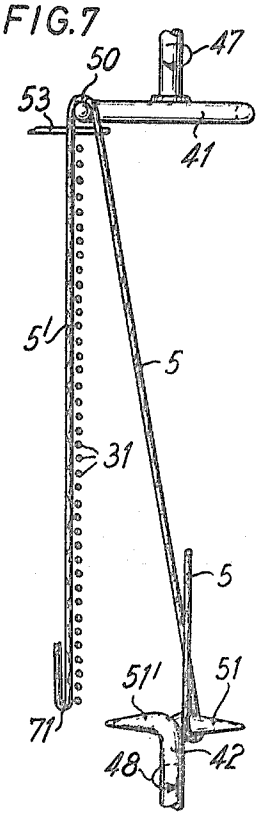

FIG. 8

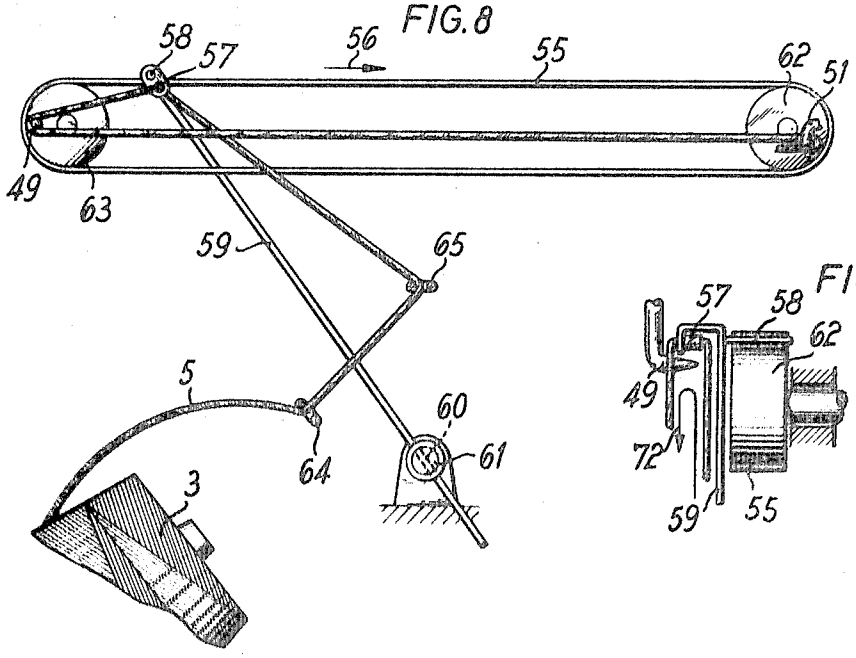

FIG. 9

WARP KNITTING MACHINE

My invention relates to warp knitting machines and especially to Raschel knitting machines with a device for feeding or filling a weft which is made ready outside the needle zone of the machine by means of holder members located in the vicinity of weft reversal points, and is applied to the warp threads in the machine by means of guide members.

In order to insert or fill a weft over part of or the entire work width in warp knitting machines, it has been known to introduce this weft thread, as for weaver's looms, in such a way that it lies up against the warp threads extending from the knitting needles to the eye needles so that it can be interknitted therewith in the next operation. This introduction of the weft has a disadvantage however that the operational speed of the warp knitting machine must be reduced quite considerably so that the speed of operation of the warp knitting machine virtually does not differ from that of a weaver's loom.

In order to increase the operational speed of warp knitting machines wherein weft filling is performed, it has been proposed heretofore to make ready the weft outside the zone wherein the needles are located by means of holder members disposed in the vicinity of the weft reversal points, and to apply the weft at a suitable moment by means of guide members to the warp threads. An effective increase in the operational speed of warp knitting machine with weft filling was, however, unable to be achieved thereby because the time required for making the weft ready is longer than the time required by a high-speed warp knitting machine to form a row of stitches.

It is accordingly an object of my invention to provide a warp knitting machine which avoids the aforementioned disadvantages of the heretofore known warp knitting machines of this general type. More particularly, it is an object of my invention to provide warp knitting machines performing weft filling which have a greater operating speed than heretofore conventional warp knitting machines.

With the foregoing and other objects in view, I provide in accordance with my invention a warp knitting machine with a thread guide for making a weft ready, which is guided or displaced in a closed travel path of a holder device. Such a travel path can be a circular path, for example. It is also possible however to employ an ellipse, an oval or similar closed path as the travel path for the holder members and accordingly for the thread guide.

The essential requirements for the shape of the travel path according to my invention is that, instead of the heretofore commonly used linear movement for inserting or filling a weft, which has been adopted by weaver's looms, a rotary motion is employed. The rotating of a thread is thereby considerably accelerated since the formerly required braking virtually to the point of stopping of the heretofore known weft-introducing devices is dispensed with by the device of my invention.

Due to the constant angular velocity of the thread guide of my invention, a circular travel path per se is most suitable for achieving the best possible thread filling or applying velocities. For this purpose, in accordance with another feature of my invention, the thread guide is located at one end of a rotatably mounted rod bent in the form of a crank. A bearing about which the rod is rotatable is located at the other end portion of the rod, the rod being tubular in construction at least at the bearing thereof. A weft is then guided through the tubular bearing of the rod and thereafter through the thread guide. It is possible however in accordance with the invention to provide a rod which is entirely tubular so that the weft is insertable into one end of the tubular rod while the other end of the rod serves as the thread guide of the invention. In order to reduce or minimize the structural height of the device of my invention, by providing a travel path which is a flatter shape, an elliptical or oval travel path is capable of being produced by making the bearing of the rod displaceable in a direction parallel to the weft travel direction.

In accordance with an additional feature of my invention and in order to achieve the flattest possible travel path, I

mount the thread guide on an endless belt travelling substantially parallel to the row of needles in the needle zone of the machine. It is especially desirable to prevent twisting of the weft that, in accordance with my invention, the thread guide is pivotally mounted on the circulating belt and is connected additionally to a direction stabilizer which extends to a point located outside the travelling belt. In this manner, the thread guide is always held so that the thread can enter and leave the thread guide without coming into the vicinity of any holder member for the thread guide.

A further simplification of the device according to my invention is obtainable by providing holder members that are located in the vicinity of the weft reversal points which serve simultaneously as guide members for introducing or applying the weft to the warp threads. More specifically in accordance with my invention, I provide such guide members in the form of rotary elements that are rotatably driven in opposite rotary directions. By this means, the holder members, in one position thereof, take up the weft which has been made ready by the thread guide and, after a suitable rotation, deliver the weft to the warp threads in the other position of the holder members.

Other features which are considered as characteristic for the invention are set forth in the appended claims.

Although the invention is illustrated and described herein as embodied in warp knitting machine, it is nevertheless not intended to be limited to the details shown, since various modifications and structural changes may be made therein without departing from the spirit of the invention and within the scope and range of equivalents of the claims.

The construction and method of operation of the invention, however, together with additional objects and advantages thereof will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a diagrammatic view partly in section of a Raschel knitting machine constructed in accordance with my invention;

FIG. 2 is an enlarged perspective view of part of FIG. 1 depicting schematically the thread insert or filling operation;

FIGS. 3, 4 and 5 are fragmentary views of FIG. 2;

FIGS. 6 and 7 are fragmentary schematic views of FIG. 1 showing two stages of the thread insert of filling operation;

FIG. 8 is an elevational view of mechanism according to my invention for laying or spreading thread in the form of an oval; and

FIG. 9 is a partial view of FIG. 8 as seen from the right-hand side of the latter.

Referring now to the drawings and first, particularly to FIG. 1 thereof, there is shown a Raschel knitting machine having a projecting arm 2 secured by connecting members or crosspieces 66 and 67 to a frame sidewall 1. A pair of cross wound bobbins or cheeses 3 and 4 are carried by the arm 2, and the threads wound thereon are connected in a conventional manner for the purpose of affording continuous unwinding of a weft 5 therefrom. The weft 5 is guided from the cheese 3 through a tubular shaft 6 and through a thread guide 68 located at an outer or free end 7 of a rod 8 bent like a crank. As shown in the enlarged view of FIG. 2, the tubular shaft or rotary bearing 6 is integral with the rod 8, which is pivotally mounted thereby in bearings provided in a crosspiece holder member 9 (FIG. 1) that is secured to the sidewall 1. The cranklike rod 8 is provided with a counterweight 10 at the end 8 thereof opposite the free end 7.

The cranklike rod 8 is driven through a transmission system which includes a first sprocket or chain wheel 11, a chain 12 and a second chain wheel 13 that is mounted on a shaft 14. The shaft 14 receives its driving power through a bevel gear 15 mounted thereon and meshing with another bevel gear 16 fixed to the main drive shaft 17 of the Raschel knitting machine. The main drive shaft 17 carries a cam 18 by means of which a lever 20, carrying follower rollers 69 and 70 in engagement with the surface of the cam 18, is pivotable about a pivot shaft 19. The lever 20 is connected by an articulating

joint 22 with a carrier rod 23 which supports a needle bar 21 and raises and lowers the latter in accordance with the motion imparted thereto by the rotating cam 18. The carrier rod 23 is connected at its lower end, as viewed in FIG. 1, through an articulating joint 24 to a pull lever 25, which is rotatably mounted on a pin 26 extending from the sidewall 1. A cutting plate 27 is fixed to the sidewall 1 and extends transversely thereto. Material 28 which has been knitted in the Raschel knitting machine of the invention is withdrawn from the needles 31 by rotatably mounted feed rollers 29 and 30 suitably driven, for example, through nonillustrated transmission mechanism from the main drive shaft 17, and is wound on a beam 32. At the upper part of the sidewall 1, as viewed in FIG. 1, a traverse 33 is mounted transversely to the sidewall 1. Furthermore, partial warp beams 34 and 35 are rotatably mounted in the upper part of the sidewall 1, and warp threads 36 and 37 lead therefrom, respectively, through spring seesaws or rocker arms 38 and 38' to the eye needles 39 and 40.

In the vicinity of the weft reversing points 71, holder members 41 (FIG. 1) and 42 (FIG. 2) are located. The holder members 41 and 42 are driven through drive means 43, such as a chain, by a drive or sprocket wheel 44 mounted on the shaft 14.

FIG. 2 shows schematically and in enlarged perspective view, the rod 8 bent like a crank which is employed for carrying out the thread insertion or filling operation. As can be readily seen in FIG. 2, the outer or free end 7 of the cranklike rod 8 provided with the thread guide 68 describes a circular rotary path 45 in direction of the arrow 46. The holder members 41 and 42 move in direction of the curved arrows 47 and 48, respectively, so that they traverse a quarter rotation in the respective indicated direction of the arrow uniformly or also nonuniformly, when the thread guide 68 traverses a half rotation. This half rotation of the thread guide 68 occurs during each formation of a stitch, i.e., the transmission ratio between the main shaft and the tubular shaft 6 through the transmission system members 13, 12 and 11 is 1:2.

It is furthermore clear from FIG. 2 that the thread guide 68 directs the weft 5 over a tapering nose 49 of the holder member 41, while the loop 50 of the weft 5 is applied by the holder member 42 and the tapering nose 51 thereof to the finished knitted web 28 and behind the latch needles 31 so that the weft 5' is disposed in a position wherein it is tied into the stitches when the latch needles 31 rise and the subsequent conventional stitch-forming movements are carried out by the eye needles 39 and 40. Thus, the holder members 41 and 42 simultaneously serve as guide members for applying the weft 5' to the warp threads.

In FIG. 4 there is illustrated in somewhat enlarged view, the lower part of FIG. 2, showing how the loop 50 of the weft 5' is guided to the finished knitted material 28 and how the readied weft 5' behind the needles 31 is located in its lowermost position. The loop 50 is so large that the high-rising needle locks the weft 5' behind it, yet the weft 5 is not engaged by the forward zones of the needles 31.

When the thread guide 68 has rotated in the direction of the arrow 46 through an angle of about 180° to the position shown in FIG. 3 from the position thereof illustrated in FIG. 2, the weft 5 which is guided along the circulatory path 45, is disposed about the tapering nose 51' that is located opposite the nose 51. When the thread guide 68 has rotated through an angle of 90°, the holder member 42 has further rotated so that the loop 50 has been released from the nose 51, and the nose 51' now stands ready to receive the weft. Protuberances 52 are provided on the holder members 41 and 42 so that the applied weft is retained better thereon.

The alternate transfer of the weft 5 to the position 5' is shown especially clearly in FIGS. 6 and 7.

In FIG. 6, the holder member 42 is shown in delivery position while the holder member 41 has again recaptured the thread from the circulatory path of the thread guide 68.

In FIG. 7, the loop 50 is already interknitted or tied into the stitch, because a new weft 5' has again been placed in readiness behind the needles due to the movement of the holder member 41 in direction of the arrow 47. In the interim and after a further half rotation of the thread guide 68, the nose 51 of the holder member 42 takes up the new loop of the weft 5. In FIGS. 6 and 7, there are also shown strippers 53 and 54 that are provided adjacent the holder members 41 and 42 and serve for facilitating the withdrawal from the noses 49, 49' and 51, 51' of the loop 50 formed by the holder members 41 and 42.

In FIG. 8, there is shown an endless rotation belt 55 forming an oval circulatory path. The belt 55 travels in direction of the arrow 56 and carries a thread guide 57 which is rotatably connected by a pin 58 to the belt 55. The thread guide 57 carries a direction stabilizer 59 which is longitudinally movably mounted in a bore 60 of a pivotable guide member 61. The band 55 is guided over two sheaves 62 and 63 whose drive corresponds to that of the cranklike rod 8. The noses 49 and 51 are shown within the region of the circulatory path formed by the band 55. The nose 51 is shown in FIG. 8 already in the delivery position thereof.

In the embodiment of FIG. 8, the weft 5 is guided from the cross wound bobbin or cheese 3 through stationary thread reversing or diverting members 64 and 65. The weft 5 then passes through the tubular thread guide 57 and is threaded in the direction of the arrow 72. The oval thread guidance embodiment of FIG. 8 and 9 has the advantage of minimizing the structural height of the thread filling mechanism according to my invention.

The device for filling a weft according to my invention can be constructed so that the weft is inserted or filled over the entire width of the web of material being knitted. It is also possible however, to dispose several of such devices adjacent one another in order to produce several separate knitted webs of material simultaneously on a wide warp knitting machine. Instead of a single weft, also several wefts can be inserted or filled simultaneously by one thread guide. In addition, the drive for the device for inserting a weft according to my invention can be transmitted in such a way that the weft for each row of stitches, is inserted instead in any interrupted sequence.

As for the heretofore known weft filling or insertion devices, the conventional additional means employed for supporting and stabilizing the weft, can also be employed with the device of my invention.

I claim:

1. In a warp knitting machine having a zone wherein needles are disposed and means for supplying warp threads to the needles, a device for filling a weft having a pair of means for making the weft ready outside the needle zone and guiding the weft to the warp threads, said pair of means being disposed in the vicinity of weft reversal locations, respectively, and including a holder member located at one weft reversal location and a guide member for guiding the weft to the warp threads located at the other weft reversal location, a single thread guide cooperating with said weft make-ready means for making the weft ready, said thread guide being displaceable in a closed travel path between said weft reversal locations and intercepting said holder member and said guide member at the respective weft reversal locations, said thread guide being located at one end of a rod bent in the form of a crank, said rod having a bearing portion adjacent the other end thereof and being of hollow tubular construction at least at said bearing portion thereof, said rod being rotatable about said bearing portion.

2. Warp knitting machine according to claim 2 including means defining a path of travel for the weft in a given direction, said bearing portion being displaceable in a direction parallel to the given direction of said weft travel path.

3. In a warp knitting machine having a zone wherein needles are disposed and means for supplying warp threads to the nee-

dles, a device for filling a weft having a pair of means for making the weft ready outside the needle zone and guiding the weft to the warp threads, said pair of means being disposed in the vicinity of weft reversal locations, respectively, and including a holder member located at one weft reversal location and a guide member for guiding the weft to the warp threads located at the other weft reversal location, a single thread guide cooperating with said weft make-ready means for making the weft ready, said thread guide being displaceable in a closed travel path between said weft reversal locations and intercepting said holder member and said guide member at the respective weft reversal locations, the needles in the zone thereof being arranged in a row, and said thread guide being mounted on an endless rotating band, said endless band extending substantially parallel to the row of needles, the thread guide being pivotally mounted on said endless band and including a direction stabilizer connected to said thread guide and passing through a point located outside said endless band.

4. In a warp knitting machine having a zone wherein needles are disposed and means for supplying warp threads to the needles, a device for filling a weft having a pair of means for making the weft ready outside the needle zone and guiding the weft to the warp threads, said pair of means being disposed in the vicinity of weft reversal locations, respectively, and including a holder member located at one weft reversal location and a guide member for guiding the weft to the warp threads located at the other weft reversal location, a single thread guide cooperating with said weft make-ready means for making the weft ready, said thread guide being displaceable in a closed travel path between said weft reversal locations and intercepting said holder member and said guide member at the respective weft reversal locations, both of said pairs of weft make-ready means comprising holder members simultaneously serving as guide members for applying the weft to the warp threads, said guide members being rotatable.

5. Warp knitting machine according to claim 4 including means for rotating said guide members in opposite rotary directions.

6. In a warp knitting machine having a zone wherein needles are disposed and means for supplying warp threads to the needles, a device for filling a weft having a pair of means for making the weft ready outside the needle zone and guiding the weft to the warp threads, said pair of means being disposed in the vicinity of weft reversal locations, respectively, and including a holder member located at one weft reversal location and a guide member for guiding the weft to the warp threads located at the other weft reversal location, a single thread guide cooperating with said weft make-ready means for making the weft ready, said thread guide being displaceable always in the same direction in a closed travel path between said weft reversal locations and intercepting said holder member and said guide member at the respective weft reversal locations.

7. Warp knitting machine according to claim 6 wherein both of said pairs of weft make-ready means comprise holder members simultaneously serving as guide members for applying the weft to the warp threads.

8. Warp knitting machine according to claim 6 wherein the needles in the zone thereof are arranged in a row, and said thread guide is mounted on an endless rotating band, said endless band extending substantially parallel to the row of needles.

* * * * *