

May 27, 1969

TOSHIAKI INUI

3,446,038

WEFT INSERTING METHOD AND APPARATUS

Filed Feb. 7, 1968

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FIG. 2

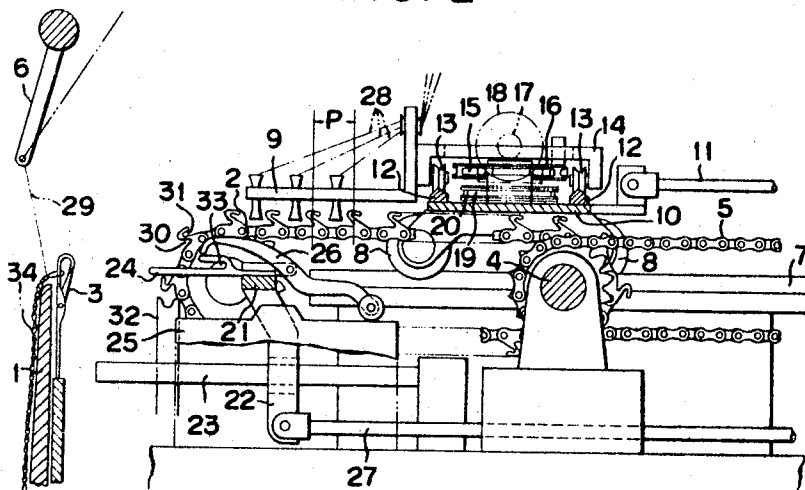
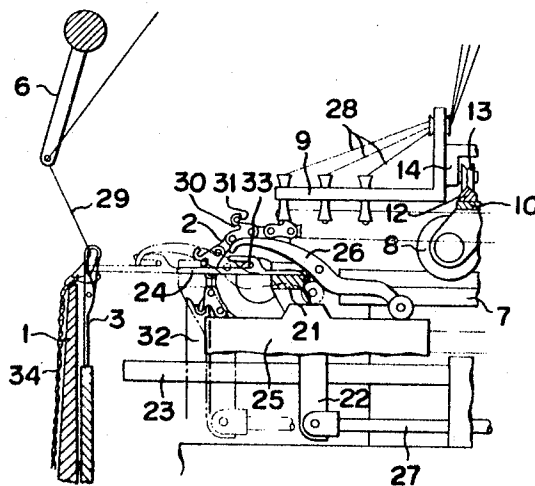


FIG. 3



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FIG. 4

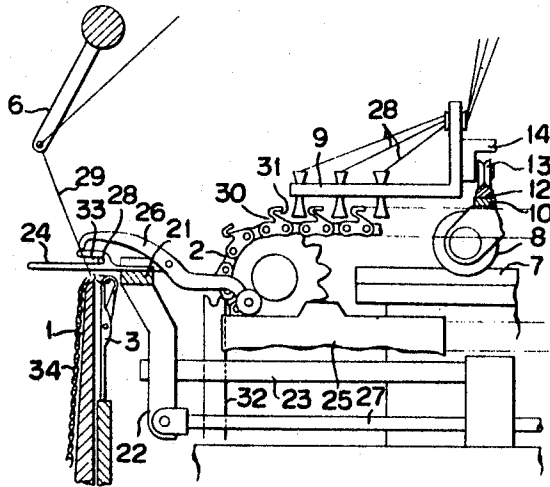
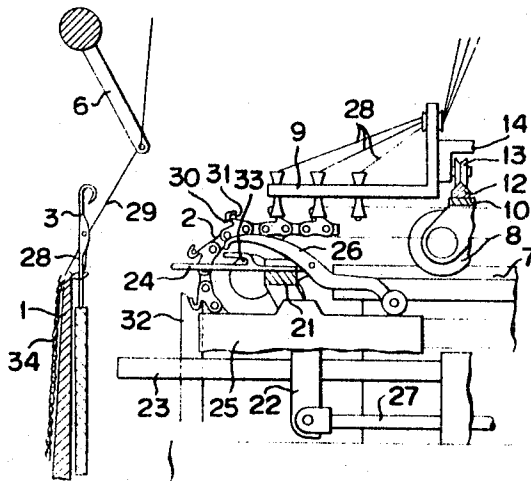


FIG. 5



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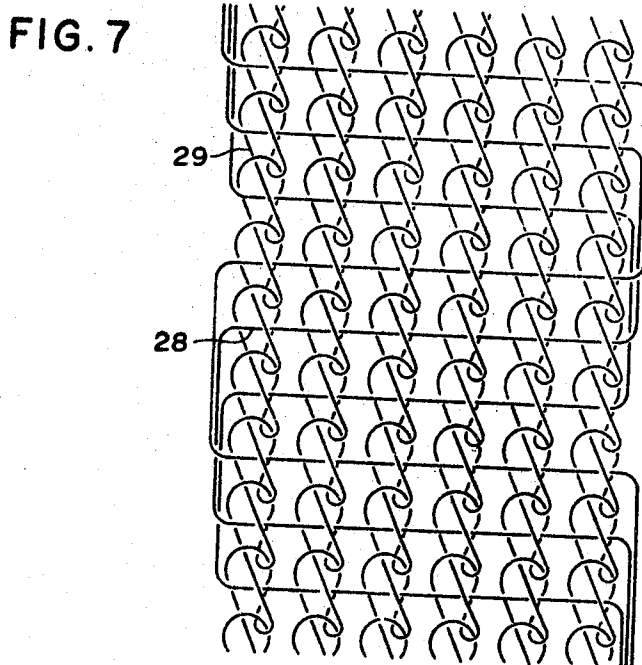
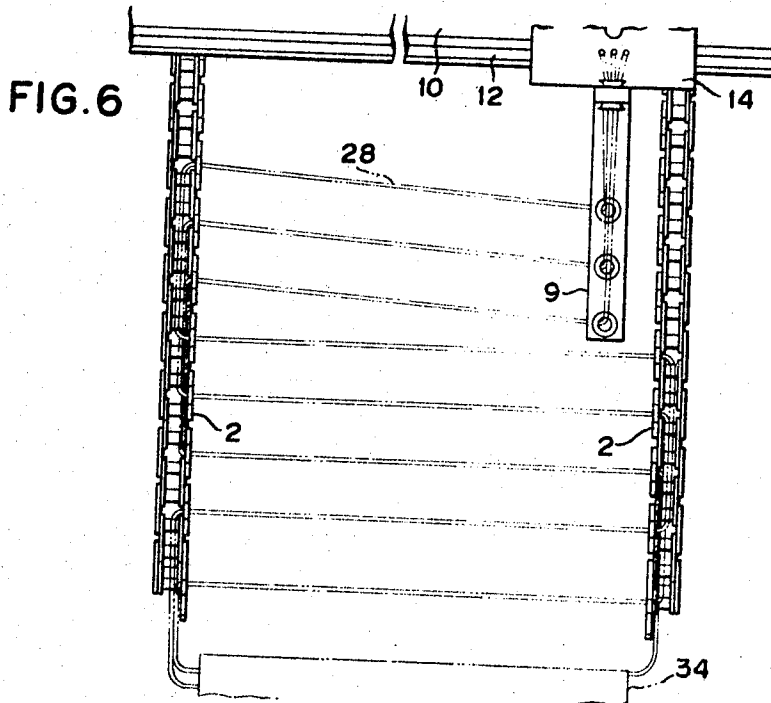
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Sheet 4 of 4



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3,446,038

WEFT INSERTING METHOD AND APPARATUS

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Filed Feb. 7, 1968, Ser. No. 703,735

Claims priority, application Japan, June 16, 1967,
42/38,553

Int. Cl. D04b 23/12, 31/00

U.S. Cl. 66-84

2 Claims

ABSTRACT OF THE DISCLOSURE

A weft inserting method and apparatus feeding to needles the wefts having equal length to the knitted width and hooked on a hooked chain rotatable intermittently in synchronization with knitting motion of the needle by the weft inserting apparatus operated correspondingly to the motion of needle, thereby knitting fabrics at the same knitting speed as of fabric material inserted the wefts over the entire length of the knitted width.

This invention relates to a weft inserting method and apparatus for laterally long knitting wefts in a warp knitting machine.

In knitting wefts in a conventional warp knitting machine, wefts are fed in on the back of needles by rocking rightward and leftward a guide bar to guide wefts by usually utilizing the height difference of a chain cam called a pattern chain. Said pattern chain is a kind of plate cam and is a chain made by connecting many links of different heights. The guide bar is rocked rightward and leftward at one end with this chain. As there is a limit to the height difference of the cam, the rocked amount of the guide bar will be restricted. Therefore, one or more of the wefts of a fabric knitted by means of a warp knitting machine can not be long knitted laterally as in the wefts of a fabric by means of a loom. However, in the case of such fabric as a blanket, as it is napped later, laterally long inserted wefts will be required.

An object of the present invention is to provide a method of obtaining a fabric in which the wefts are knitted laterally long with a warp knitting machine in the same manner as in a fabric woven with a loom.

A further object of the present invention is to provide a warp knitting machine for obtaining a fabric laterally long knitted in the same manner as with a loom.

Another object of the present invention is to provide a warp knitting machine wherein a fabric in which wefts are inserted over the entire length of a knitted width can be knitted at the same knitting speed as a fabric is made with a conventional warp knitting machine.

The present invention is a weft inserting method in a warp knitting machine wherein endless chains provided with hooks having a spacing a little wider than a knitted width are intermittently rotated in front of a needle bed of a warp knitting machine, a weft guide to simultaneously feed a plurality of wefts is moved at a fixed cycle forward, rearward, rightward and leftward so as to alternately engage the wefts with said chains and to disengage the wefts engaged with the hooks and insert them on the back of needles and the above mentioned motion is carried out in series as synchronized with the knitting operation.

Further, the present invention is a weft inserting apparatus wherein a pair endless chains provided with hooks having a spacing a little wider than a knitted width are set as opposed to each other at right angles with a needle row in front of a needle bed of a warp knitting machine so as to rotate intermittently, a carriage is provided so

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that a weft guide to simultaneously feed a plurality of wefts between the chains may be moved at a fixed cycle forward, rearward, rightward and leftward and wefts may be engaged alternately with the right and left chains provided with hooks, weft supporting devices each having an inserting arm to disengage the wefts engaged with the hooks and insert them on the back of the needles are provided as opposed to the front ends of said chains provided with hooks and said chains provided with hooks, carriage and weft supporting devices are so formed as to operate in series as synchronized with the knitting operation of the needles so that one or more wefts may be inserted and knitted over the entire length of the knitted width.

In the accompanying drawings:

FIGURE 1 is a plan view of an embodiment of a warp knitting machine for working the method of the present invention;

FIGURE 2 is a vertically sectional view on line A—A in FIGURE 1;

FIGURE 3 is a detailed view showing a weft supporting device as just before the operation;

FIGURE 4 is a detailed view showing the weft supporting device in the advancing state;

FIGURE 5 is a detailed view showing the state just after retreat of the weft supporting device in which a weft is inserted;

FIGURE 6 is a plan view showing a weft as hung on chains provided with hooks;

FIGURE 7 is a texture view of a fabric knitted with the apparatus according to the present invention.

Now, the method of the present invention shall be explained with reference to the drawings showing an embodiment. A pair of chains 2 provided with hooks having a space a little wider than the knitted width of a fabric are provided at right angles with a row of needles 3 in front of a needle bed 1. Each of these chains 2 provided with hooks is endlessly hung on a pair of front and rear chain wheels and both chain wheels in the front are secured to both ends of a long shaft 4 so that, when a chain 5 provided in the middle of said long shaft 4 is driven with an electric motor, both chains 2 with hooks may intermittently rotate by the hook spacing P as synchronized with the rocking frequency of a warp guide 6. Further, a carriage 10 supporting a weft guide 9 is mounted through wheels 8 on rails 7 provided outside and in parallel with the chains 2 provided with hooks so that the carriage 10 may rock forward and rearward due to feeding levers 11 reciprocating forward and rearward by the drive of a cam not illustrated. A branch carriage 14 is mounted through wheels 13 on rails 12 provided in the lengthwise direction parallel with the needle bed of said carriage 10 and the weft guide 9 which can simultaneously feed a plurality of wefts is provided to project at the front end of said branch carriage 14. A chain 16 hung between chain wheels 15 provided laterally at both ends of the carriage 10 is connected at a part with the branch carriage 14 and a chain 20 is provided between another chain wheel provided coaxially with the chain wheel 15 and a chain wheel 19 having a bevel gear driven by a bevel gear 18 provided on a shaft 17 driven by a motor so that, when the chain 16 is rotated, the branch carriage 14 may move laterally. Therefore, the weft guide 9 can move forward, rearward, rightward and leftward due to the combination of the longitudinal movement of the carriage 10 and the lateral movement of the branch carriage 14.

A guide shaft 23 is provided as passed through a hole made in the middle part of each of both leg rods 22 of a gate-shaped supporting member 21 and a plurality of weft supporting devices each consisting of a set of an inserting

arm 24 and a clamp 26 making opening and closing motions in the forward part of the inserting arm with a cam plate 25 are provided at an equal spacing on the horizontal part of the supporting member and a feeding lever 27 reciprocated forward and rearward by a cam not illustrated is pivoted at the forward end to the lower end of said leg rod 22 so that the weft supporting devices may move forward and rearward and at the time of the advance, wefts may be inserted on the back of the needles 3. Further, a push-up lever 32 for engaging wefts engaged with the hooks is provided as opposed to each chain 2 provided with hooks in the foremost position of the hooks so as to be able to be vertically reciprocated by a cam not illustrated. In the drawings is shown a case of simultaneously feeding three wefts 28 to the weft guide 9. But the number of the guides to be provided can be freely increased or decreased.

In the above mentioned apparatus, if the operation wherein, while the chains 2 provided with hooks are rotated intermittently synchronously with the motion of the warp guides 6 of hanging the warps 29 on the needles 3, while the carriage 10 is being advanced, the branch carriage 14 is moved toward one chain provided with hooks and the wefts 28 are hung on the hooks and then, while the carriage 10 is being retreated, the branch carriage 14 is moved toward the other chain provided with hooks and the wefts 28 are hung on the hooks is made one cycle and is repeated, as the chains are rotating, while the wefts 28 are being hung alternately on the hooks of the right and left chains are shown in FIGURE 7, the chains will rotate intermittently. Further, each hooks of the chain 2 provided with hooks is provided with two weft engaging concaves 30 and 31 so that the wefts may be hung on the right and left hooks in engaging states different from each other. That is to say, when the weft is hung on the front engaging concave 30 in the hook on one side, the weft will be hung on the rear engaging concave 31 in the hook on the other side.

On the other hand, when the hook is in the foremost position, the weft rotated by the chain in parallel with the needle row over the knitted width as hung between the chains 2 provided with hooks as mentioned above will be disengaged from the hook by the weft supporting device and will be inserted on the back of the needle 3. That is to say, just before a mesh is formed of the warp 29 and the needle 3 reaches the bottom dead center as shown in FIGURE 3, by the operation of the feeding lever 27, the supporting member 21 will begin to advance and the weft engaged with the front engaging concave of the hook will engage with the concave 33 of the inserting arm 24 and will be disengaged from the hook. Further, in case the weft is engaged with the rear engaging concave 31 of the hook, by the upward movement of the push-up lever 32, the weft will be pushed up, will be disengaged from the hook and then will be engaged with the inserting arm 24. While the inserting arm 24 having had the weft engaged with the concave 33 advances, the lower end of the clamp 26 will ride on the high place of the cam plate 25, the concave 33 will be closed by the clamp 26 so as to prevent the weft from being disengaged as shown by the chain line in FIGURE 3. When the lower end of the clamp 26 comes again into contact with the lower place of the cam plate, the concave 33 is opened and the engaged weft reaches the back of the needle 3, the inserting arm 24 will stop (FIGURE 4). As soon as the needle

3 begins to move upward, the inserting arm 24 will retreat (FIGURE 5) and the next mesh will be formed of the warp. By repeating the above mentioned operation, the weft of a length covering the knitted width will be fed to the knitting part of the warp knitting machine and the warps will be knitted. Therefore, the texture of a thus knitted fabric 34, as shown in FIGURE 7, will have one weft inserted over the entire length of the knitted width and will be knitted as if it were a fabric made with a loom.

In the present invention, as mentioned above, the wefts hung over a length equal to the knitted width on the chains provided with hooks and rotating intermittently as synchronized with the knitting motion of the needles are fed into the needles with the weft supporting devices operating with the motion of the needles and therefore a fabric in which wefts are inserted over the entire length of the knitted width and which has been impossible to make with a conventional warp knitting machine can be made at the same knitting speed as a fabric is made with a conventional warp knitting machine.

What is claimed is:

1. A weft inserting method in a warp knitting machine wherein endless chains provided with hooks having a spacing a little wider than a knitted width are intermittently rotated in front of a needle bed of a warp knitting machine, a weft guide to simultaneously feed a plurality of wefts is moved at a fixed cycle forward, rearward, rightward and leftward so as to alternately engage the wefts with said chains and to disengage the wefts engaged with the hooks and insert them on the back of needles and the above mentioned motion is carried out in series as synchronized with the knitting operation.

2. A weft inserting apparatus in a warp knitting machine comprising a pair of intermittently rotatable endless chains provided with hooks having a spacing a little wider than a knitted width and set as opposed to each other at right angles with a needle row in front of a needle bed of a warp knitting machine, a weft guide to simultaneously feed a plurality of wefts between said chains, a carriage to move said weft guide at a fixed cycle forward, rearward, rightward and leftward so as to engage wefts alternately with the right and left chains provided with hooks and weft supporting devices opposed to the front ends of said chains provided with hooks and each having an inserting arm to disengage the wefts engaged with the hooks and guide them to the back of the needles, said chains provided with hooks, carriage and weft supporting devices being so formed as to operate in series as synchronized with the knitting operation of the needles, whereby one or more wefts may be inserted and knitted over the entire length of the knitted width.

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U.S. Cl. X.R.

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