United States Patent

Reiners et al.

[15] **3,693,379**

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[54] **METHOD OF OPERATING A WARP KNITTING MACHINE**

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

[51] **Int. Cl.**.....**D04b 23/06**

[58] **Field of Search**.....65/84, 158, 159

[56] **References Cited**

UNITED STATES PATENTS

3,616,656 11/1971 Furst 66/84

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[57] **ABSTRACT**

Method of operating a warp knitting machine includes, after interruption of a weft running to the weft storage and activation of a machine shut-down device, initially controlling slow-down of the knitting instruments of the machine so that when the machine stops, the weft storage has been emptied of all but a predetermined number of weft lengths, severing the drive connection between the weft storage and the knitting instruments, removing from the weft storage the weft remaining therein, automatically filling the weft storage with weft, and the restoring the drive connection for continuing the knitting operation.

3 Claims, 5 Drawing Figures

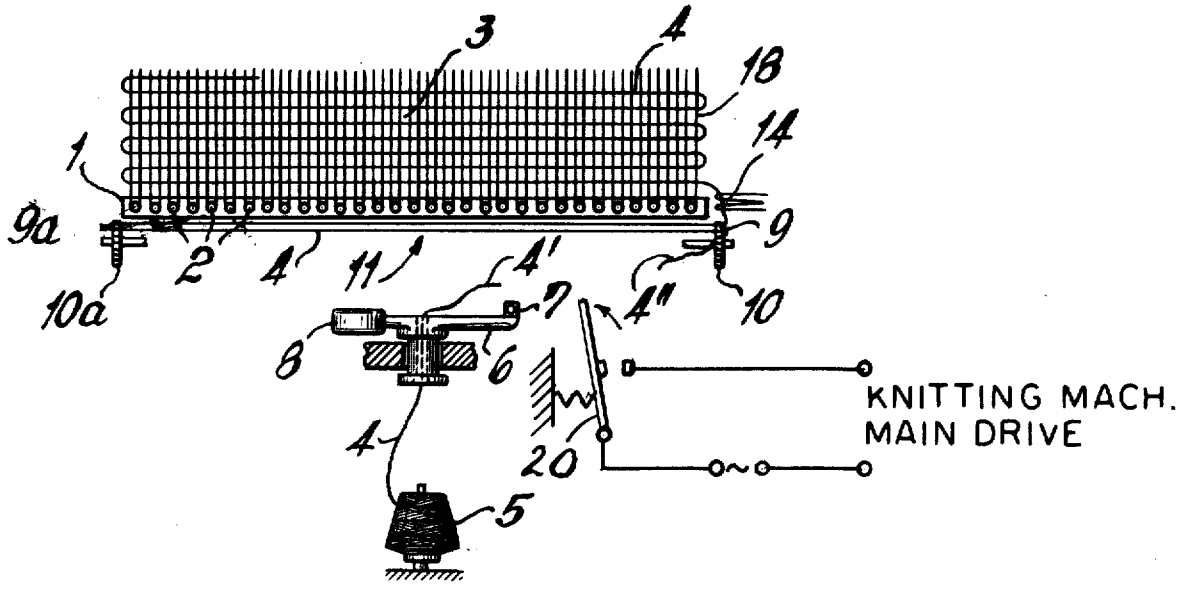


FIG. 1

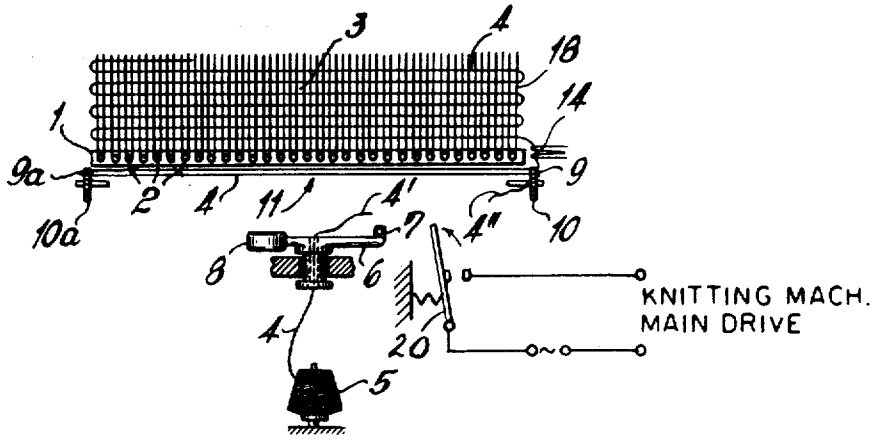


FIG. 2

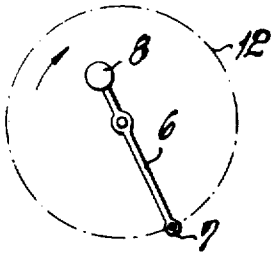


FIG. 3

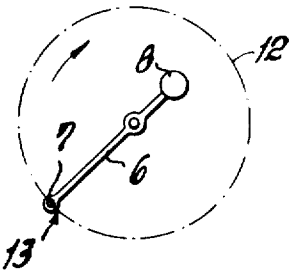


FIG. 4

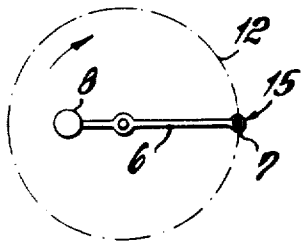
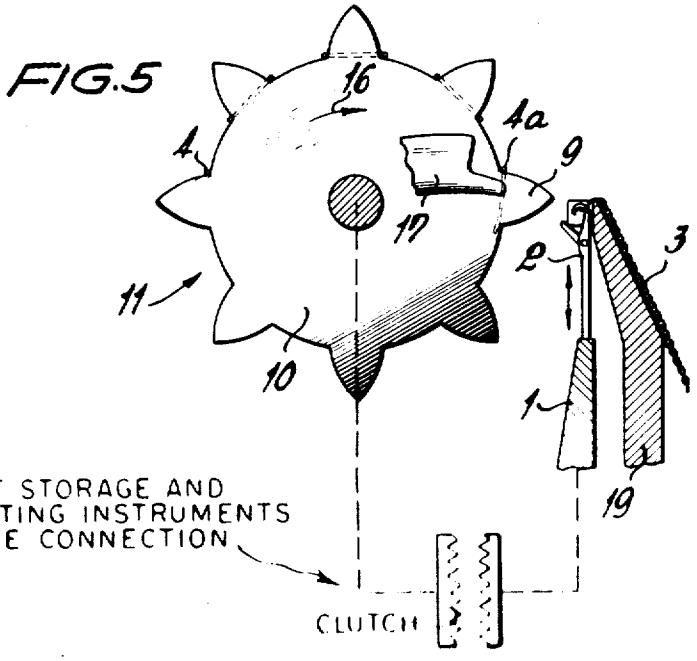


FIG. 5



METHOD OF OPERATING A WARP KNITTING MACHINE

The invention relates to method of operating a warp knitting machine and more particularly such warp knitting machine that has a weft insertion device and a weft storage for the weft being inserted as well as a shut-down device activated at interruption of a weft running to the weft storage.

In warp knitting machines, for example Raschel knitting machines, having devices for the insertion of wefts over the entire width of the knitted fabric, the wefts are advantageously made ready by means of weft storages for transfer to the knitting instruments. By means of the weft supply thus forming, the omission of a weft in the knitted web during the slow-down phase of the warp knitting machine after a break in the weft has occurred, is sought to be avoided. Since weft breaks during the knitting operation can never fully be avoided, care must be taken that, before the knitting machine is restarted after shutdown due to a weft break, a faultless reconnection of the broken weft to the supply thereof remaining in the weft storage is achieved. For this purpose, the thread material from the weft storage that was used up during the slow-down of the machine must be replaced, and the weft supply must be restored to the required number of readied wefts. In the heretofore known machines with devices for storing wefts, the restoration of the interrupted weft filling and the connection or joining thereof to the completed knitted web is possible, however, only after burdensome seeking of the thread ends and by guiding the thread manually about each of the numerous storage members that hold the wefts in readiness. Such an operation results in long periods of inaction and a sharp reduction in the net efficiency of the machine.

It is accordingly an object of the invention to provide method of operating a warp knitting machine which avoids the foregoing disadvantages of the heretofore known methods and which ensures, with warp knitting machines having a weft storage, that after a weft break the weft storage is rapidly refilled and the knitting process is continued free of disturbance.

With the foregoing and other objects in view, there is provided, in accordance with the invention, method of operating a warp knitting machine having a weft insertion device, a weft storage for the weft that is to be inserted, a plurality of knitting instruments drivingly connectible to the weft storage, and a machine shut-down device activated at interruption of a weft being fed to the weft storage, which comprises, after interruption of a weft running to the weft storage and activation of the shut-down device, initially controlling slow-down of the knitting instruments so that when the machine stops the weft storage has been emptied of all but a predetermined number of lengths of the weft stored therein, severing the drive connection between the weft storage and the knitting instruments, removing from the weft storage the weft remaining therein, automatically refilling the weft storage with weft, and then restoring the drive connection between the weft storage and the knitting instruments for continuing the knitting operation.

By this method of the invention, there is never an omission of a complete weft length in the knitted web when a break of the weft occurs in the path thereof between the weft supply and the weft storage.

Moreover, seeking or searching for the broken weft end is dispensed with because the weft remainder in the weft storage can always be severed from the last interknitted or filled weft in the vicinity of a readily accessible edge of the knitted web and can then be completely removed.

In accordance with another feature of the invention, the severing and restoration of the drive connection between the weft storage and the knitting instruments is effected at a predetermined clutch position so that, after a weft interruption or break, the knitting instruments, such as the needle bar, insertion bar, knocking-over bar and the like, tend to remain in a position which affords the best starting position for re-inserting the weft from the newly filled weft storage and for continuing the knitting process.

In accordance with a further advantageous feature of the invention, for newly filling or refilling the weft storage, a weft inserter or folder, which serves to insert the weft, is brought into a starting position, then the weft is threaded into the weft inserter, and thereafter deposited at the weft storage in folded lengths. For this purpose, a thread guide traveling in a circular revolving path may serve as the weft inserter or folder, the thread guide coming to a stop at a selected point of the revolving path thereof, after the slow-down of the machine has terminated. The starting position of such a weft inserter is advantageously located in the vicinity of the edges of the knitted web since it is most readily accessible thereat and the broken thread end coming from the weft supply is able to be threaded into the weft inserter thereat and secured to a holder element of the weft storage in an especially simple manner. After the weft end has been deposited at the weft storage, the filling of the weft storage can be effected fully automatically by the weft inserter or folder.

Depending upon the capacity of the weft storage, the weft inserter carries out a predetermined number of revolutions and fills with the corresponding number of thread lengths, the weft storage which is displaced simultaneously in direction toward the still stationary knitting instruments. When the weft initially inserted or deposited in the storage is subsequently located in the delivery position thereof at the knitting instruments, the aforementioned predetermined clutch position is attained simultaneously therewith and the drive connection between the weft storage and the knitting instruments can be restored. The knitting process per se is then resumed.

Advantages deriving from the invention of this application are that the filling of a weft storage after interruption of the weft supply is fully automatic and that only few manipulations are required for carrying out the method invention.

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 method of operating a 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 drawing, in which:

FIG. 1 is a simplified diagrammatic plan view of part of a Raschel knitting machine with weft storage and weft filler shown in reduced scale;

FIGS. 2, 3 and 4 are diagrammatic longitudinal views of the weft filler of FIG. 1 shown in three different stages; and

FIG. 5 is an enlarged elevational view of a detail of the weft storage of FIG. 1 showing the knitting instruments in cross section.

Referring now to the drawing, and first particularly to FIG. 1 thereof, there is shown a needle bar 1 having knitting needles 2 and a knitted web 3 into which a continuous weft 4 is knitted. The weft 4 comes from a supply coil 5 and, during the knitting operation, is alternatingly placed by a continuously revolving thread or weft filler 6 about the individual holder members 9 and 9a of the weft insert wheels 10 and 10a of a weft storage 11 and, in the embodiment shown in FIG. 1, is knitted into the web with each course. In the interest of clarity, and so as not to obstruct the illustrated details, those components which deliver the individual weft behind the knitting needles 2, are omitted from the figure. FIG. 1 shows, furthermore, the ends 4' and 4'' of the broken thread 4 which have come out of the guiding eye 7 during the slow-down movement of the thread feeder 6. The diagrammatic view of FIG. 1 shows all of the cooperating members in stationary position attained after the occurrence of a thread break and the attendant slow-down phase. It is readily apparent that during the slow-down of the machine, the supply of weft in the weft storage 11 is not fully used so that the last completely knitted course possesses the entire weft thereof.

From the diagrammatic view of FIG. 2, it can be readily seen that the thread feeder 6, with the guiding eye 7 and the counterweight 10 thereof, can assume any position on the circular, rotary path 12 thereof at the moment the machine comes to a stop.

After the machine shuts down, it travels thereafter, for example at crawling speed, until it reaches a predetermined clutch position at point 13 on the revolving path 12 which corresponds to the position of the guiding eye 7 of the thread feeder 6, as shown in FIG. 3, and is held in that position. When the thread feeder 6 is accordingly held in the position shown in FIG. 3, all of the knitting instruments are also located in a position advantageous for again inserting a weft. Such position of the knitting instruments is shown, for example in FIG. 5, wherein one of the knitting needles 2, of the latch type in the illustrated embodiment, and part of a conventional stitch comb 17 are clearly seen. In the clutch position thus attained, severance of the drive connection between the knitting instruments and the weft storage 11 is effected with the thread feeder 6. Moreover, at the severing location 14, at which suitable shears (FIG. 1) are provided, the severence of the weft present in the knitted web 3 from the remainder thereof located in the thread storage 11 can now occur. The weft remainder is then completely removed.

To automatically fill the weft storage 11 by means of the thread feeder 6, the latter is then brought into the starting position thereof wherein the guiding eye 7 assumes the position of the point 15 in FIG. 4. In this readily accessible position, the end 4' of the weft 4 extending from the supply coil 5 is threaded through the guiding eye 7 and is secured to a holder member 9 of a weft insertion wheel 10 of the machine.

The subsequent refilling of the thread storage 11 is seen especially clearly in the view of FIG. 5. In the particular embodiment shown in FIG. 5, each of the two weft insertion wheels 10 and 10a (note FIG. 1) has eight holder members 9, respectively. Only the, weft insertion wheel 10 located in the vicinity of the edge 18 of the knitted web shown in FIG. 1 is illustrated in FIG. 5. After four complete revolutions of the thread feeder 6, counted from the clutch location at the point 13 of FIG. 3, with the simultaneous revolving of the weft insertion wheels 10 and 10a in the direction of the arrow 16, eight wefts 4 become stored. As a result thereof, the initially fed weft 4a is already located in insertion position so that, with the restoration of the drive connection which occurs also at the point 13 of FIG. 3, it can be immediately fed or placed behind the knitting needles 2 by the stitch comb 17 shown in FIG. 5 and can be knitted into the knitted web 3 that is located above the knocking-over bar 19 in FIG. 5.

The severance and restoration of the drive connection between the knitting instruments, on the one hand, and the thread storage 11 and the thread feeder 6, on the other hand, occur expediently through jaw clutch couplings or gear couplings with search gearing or toothing. Such couplings or clutches only engage in a specific position which can be selected so that it corresponds, for example, to the clutch location at point 13 of FIG. 3. The required number of revolutions of the thread feeder 6 can be controlled, in accordance with the number of holder members 9, through conventional electrical or mechanical counting devices.

In FIG. 5 there is shown quite schematically the drive connection for the weft storage 11 and knitting instruments 1, 2, 19 as intersecting dot-dash lines, a clutch of the aforementioned type being connected between the weft storage and the knitting instruments. Also shown very schematically in FIG. 1 is a feeler or sensing member 20 normally engaging the weft 4 and releasable by the breaking of the weft 4 to open the power circuit to the knitting machine and thereby shut down the machine.

For more specific details regarding the structure of warp knitting machines which may be utilized or modified for use in carrying out the method of operation in accordance with the invention of the instant application, reference may be had, for example, to application Ser. No. 19,431 of S. Furst, filed March 13, 1970 and assigned to the same assignee as that of the instant application, as well as to application Ser. No. 58,008 of S. Furst, filed July 24, 1970 and also assigned to the same assignee.

We claim:

1. Method of operating a warp knitting machine having a weft insertion device, a weft storage for the weft that is to be inserted, a plurality of knitting instruments drivingly connectible to the weft storage, and a machine shut-down device activated at interruption of a weft being fed to the weft storage, which comprises, after interruption of a weft running to the weft storage

and activation of the shut-down device, initially controlling slowadown of the knitting instruments so that when the machine stops, the weft storage has been emptied of all but a predetermined number of lengths of the weft stored therein, severing the drive connection between the weft storage and the knitting instruments, removing from the weft storage the weft remaining therein, automatically refilling the weft storage with weft, and then restoring the drive connection between the weft storage and the knitting instruments for continuing the knitting operation.

2. Method according to claim 1 wherein severance of the drive connection between the weft storage and the knitting instruments is effected by disengaging a clutch connected therebetween, and restoring the drive connection is effected by reengaging the clutch, both the severance and restoration of the drive connection being effected when the clutch members are at a predetermined position.

3. Method according to claim 1 wherein the weft storage is refilled by bringing a weft inserter into a starting position, threading the weft into the weft inserter, and depositing the weft at the weft storage with the weft inserter.

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