United States Patent

Strauss

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[54] **GUIDE ARRANGEMENT FOR WEFT THREAD INSERTING ELEMENTS**

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[51] **Int. Cl.** **B03d 47/26**

[58] **Field of Search** .....139/12, 13, 16, 188 R, 344

[56] **References Cited**

UNITED STATES PATENTS

3,500,871 3/1970 Strauss 139/12

FOREIGN PATENTS OR APPLICATIONS

1,136,690 12/1968 Great Britain.....139/12

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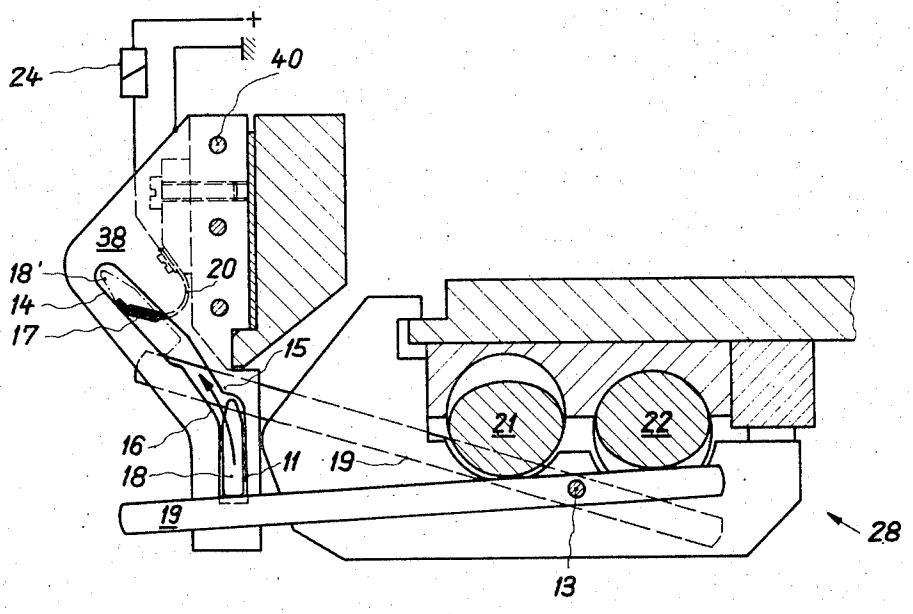
[57] **ABSTRACT**

A guide arrangement for the shuttles on a wave-type loom wherein guide means guide the shuttles across the loom along a predetermined path and drive means operatively associated with the guide means apply a force to each of the shuttles to move the shuttles along the predetermined path, the arrangement further comprising auxiliary guiding means positioned adjacent to the guide means for guiding the shuttles out of the predetermined path and for receiving the shuttles when the force applied to each of the shuttles by the driving means is greater than that required to effect the movement of the shuttles along the predetermined path across the loom, thereby preventing jamming of the shuttles within said guide means.

10 Claims, 3 Drawing Figures



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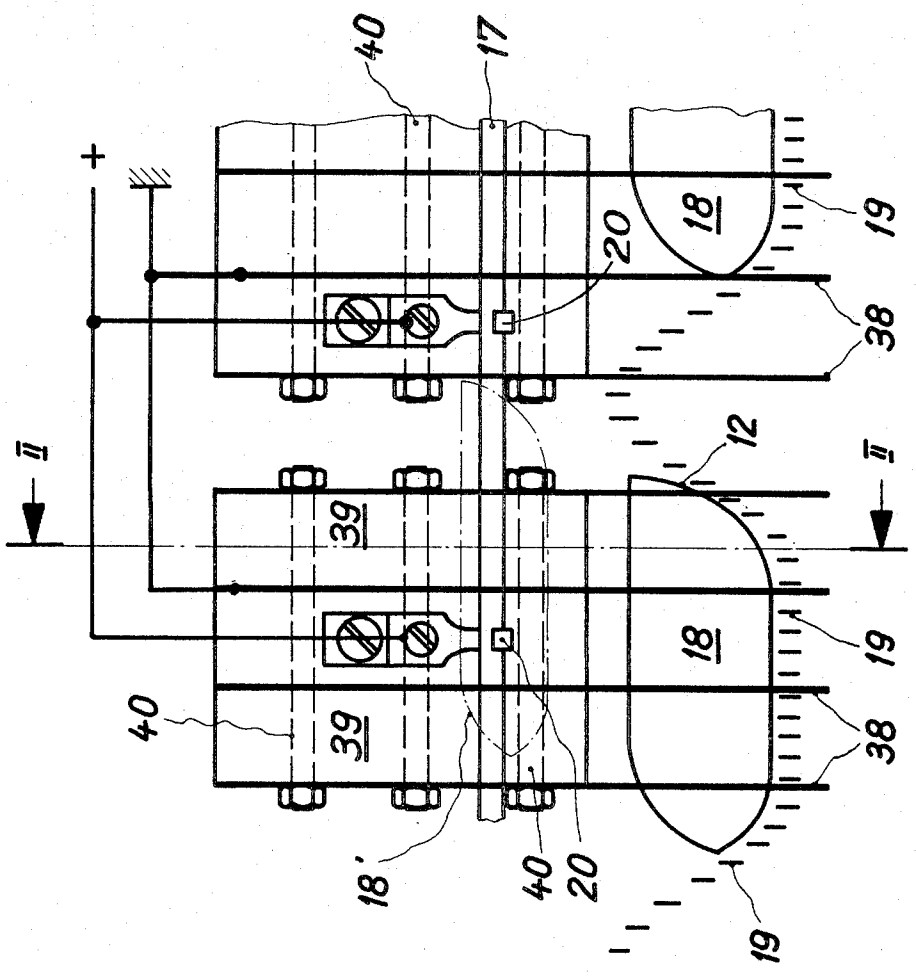
2 Sheets-Sheet 1

Fig. 1



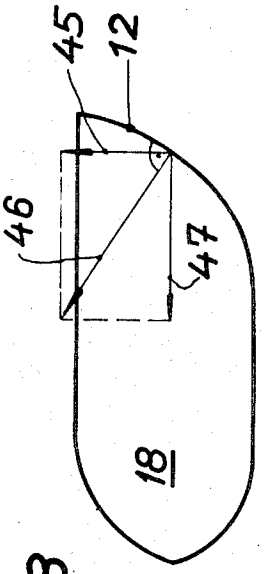


Fig. 3

Fig. 2

GUIDE ARRANGEMENT FOR WEFT THREAD INSERTING ELEMENTS

BACKGROUND OF THE INVENTION

This invention relates to a guide arrangement for weft thread inserting elements or shuttles on a wave-type loom having guide means for guiding the shuttles across the loom along a predetermined path and auxiliary guiding means to prevent jamming of the shuttles within the guide means during operation of the loom.

This invention is an improvement of the guide arrangement for shuttles on a wave-type loom disclosed in U.S. Pat. No. 3,500,871 wherein the guide means of the arrangement includes guide elements having recesses or openings through which the shuttles are guided along a predetermined path and the drive means operatively associated with the guide elements applies a force to an inclined edge of each shuttle at right-angles to the direction of movement of the shuttles to drive the shuttles from one side of the loom to the other.

It has been found that the weft inserting elements or shuttles guided by the guide elements disclosed in U.S. Pat. No. 3,500,871 can occasionally become jammed, though perhaps not very often. This can occur, for example, if a thread running out of the shuttle (also referred to as a laying-in member) has a high breaking strength and becomes wound around the shuttle and remains hanging. Also, damage may occur to a shuttle and this can jam by its damaged part. The shuttle is thereby held back. The drive means for driving the shuttle through the loom are then unable to execute their complete drive movement, and serious damage occurs at some point. Even though jamming of this kind only occurs very rarely, it is nevertheless disadvantageous since the resultant damage can be very considerable. The damage is reduced if defective operation of this kind occurs within the warp threads. In such case, the shuttle at worst breaks only a few warp threads.

SUMMARY OF THE INVENTION

Advantageously, the guide arrangement of the invention obviates the drawbacks. Thus, this invention contemplates a guide arrangement for the shuttles on a wave-type loom wherein guide means guide the shuttles across the loom along a predetermined path and drive means operatively associated with the guide means apply a force to each of the shuttles to move the shuttles along the predetermined path, the arrangement being further characterized in that auxiliary guiding means are provided adjacent to the guide means for guiding the shuttles out of said path and for receiving the shuttles when the force applied to each of the shuttles by the driving means is greater than that required to effect the movement of the shuttles along the predetermined path across the loom, thereby preventing jamming of the shuttles within said guide means.

More particularly, this invention is directed to a guide arrangement on a wave-type loom wherein the guide means for guiding the shuttles along the predetermined path includes a plurality of guide elements having recesses or openings through which the shuttles are guided and the drive means operatively associated with the guide means apply a force to an inclined edge of each of the shuttles at right-angles to the direction of the movement of the shuttles along the predetermined path, said arrangement being further characterized in that the recesses have extensions or slots which extend in the same sense of (about the same) direction as the direction of the force applied by the drive means, said extensions being arranged so that the shuttles can be pressed into the extensions only under a force which is greater than the force applied by the drive means at right angles to the shuttle during movement of the shuttles along the predetermined path, but which is less than the maximum force that the drive means is capable of applying to each of the shuttles.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be described in more detail by reference to one of its embodiments and to the accompanying drawing in which:

FIG. 1 is a view of the guide elements from the front, i.e. as seen in the direction of the front side of the wave-type loom;

FIG. 2 is a section taken on line II—II of FIG. 1; and

FIG. 3 is an illustration of the drive forces applied to an inserting element or shuttle on a wave-type loom.

Referring to FIG. 1, the weft thread inserting elements or shuttles **18** move from right to left. The shuttles have already left the last-formed shed, not illustrated, and in this zone of their path of travel through the guide means comprised of guide elements **38** are guided to an outlet means located farther to the left but likewise not shown in FIG. 1. The shuttles are guided by recesses or openings **11** (shown in FIG. 2) in the guide elements **38**. The shuttles **18** are driven by the reed teeth or dents **19** in that as the teeth rise, they push against the rear inclined edge **12** of each of the shuttles **18**. Movement is imparted to the reed teeth **19** by the worm shafts **21** and **22** shown in FIG. 2. These shafts each have an appropriate profile through which the reed teeth **19** are swung in the manner shown in FIG. 1. When the worm shafts rotate, the movement of the teeth **19** progresses from left to right as shown in FIG. 1. During this movement each of the reed teeth **19** swings about the shaft **13**, this swinging movement being governed by the profiles of the shafts **21** and **22**. The two end positions of each of the reed teeth **19** are indicated by the teeth **19** shown in solid and broken lines in FIG. 2. The worm shafts **21** and **22** are supported on the carrier **28** and are mounted therein.

The guide elements **38** are fitted at regular spaced intervals along the path of travel of the shuttles **18**. The guide elements are located or spaced by distance pieces or spacer elements **39** fitted laterally, and are secured by screws **40**. Each guide element **38** contains a recess or opening **11** which has an auxiliary guiding means or shuttle shunting means including a slot or an extension **14**. Between the recess **11** and the extension **14** there is a passage zone or shuttle-directing slot formed by the nose-like projection **15** and the curved portion **16** of the element **38**. Extending transversely through each of the extensions **14** is a contact element or means **17** which is normally not in contact with the guide elements **38**. The contact element is supported by a carrier **20**. The contact element is connected to the positive pole, designated by +, of a current source via the carrier, the other pole of which is grounded. The guide elements **38** are also grounded. The guide elements in this

embodiment each consist of a broad-faced metal sheet which is at least slightly resilient.

When the wave-type loom or multi-phase weaving machine is operating and the shuttles 18 are moved to the left in FIG. 1 because of the upward vertical pressure of the reed teeth 19 against the inclined edges 12, then as previously mentioned, there is a possibility of the shuttles 18 becoming jammed in the guide elements 38, so that the risk of possible damage exists. The reed teeth 19 as well as the worm shafts 21 and 22 could be destroyed. To prevent such extensive damage, each guide element 38 contains an extension 14 which runs upwards at an obtuse angle from the longitudinal vertical axis of the recess 11, i.e. in the same sense of direction as that of the force applied by the drive means 19, 21, 22 and 28. If a shuttle 18 jams in the guide elements, its movement to the left (in FIG. 1) ceases. Thus, vertical upward movement of the reed teeth 19 can no longer take place. If, however, the extensions 14 are present, they provide a side track or side path into which the shuttles 18 can be pressed. A shuttle that has been pressed or shunted into the side track in this manner is shown in broken lines in the drawing and is designated by reference numeral 18'. It can be seen that the shuttle 18' has moved completely from its normal path of travel so that the following shuttle can move along said path without hindrance.

To insure proper operation, the passage or shuttle-directing zone formed by boundaries 15, 16 must be appropriately designed. In particular, it is important that the nose or projection 15 should initially extend from the recess 11 along an almost horizontal line or edge which serves to guide the shuttles 18 in the normal way, i.e. this edge is matched to the cross-section of the shuttles and serves to guide them. The leading edge of the projection extends in the longitudinal direction of the extension. At the boundary 16, opposite the projection 15, is a portion or zone which also bends or curves in the longitudinal direction of the extension 14. The distance between the boundary 16 and the projection 15 is such that each of the shuttles 18 can just slip through into the extension 14. The distance of the projection 15 from the boundary 16 is at least approximately equal to the greatest thickness of one of the shuttles 18 (which are identical).

FIG. 3 shows the form of the rear inclined edge 12 of a shuttle 18. The forces applied to this rear edge, and the direction of each, are also indicated in the drawing. An upwardly moving reed tooth applies the force 45 to the edge 12. This force provides the resultant 46 with its direction substantially at right-angles to the edge 12, and the component 47 of this resultant 46 effects forward movement of the shuttle 18 along its normal path across the loom.

The first curve of the projection 15 beyond the recess 11 is so selected that the component 45 is compensated thereby. As long as the shuttle 18 is moving along its normal path of travel, the force exercised by the reed teeth 19 is reduced so that the component force 45 is not so great that it could move the shuttle out of the recess 11. If the shuttle 18 is stuck or jammed for any reason, however, greater forces are applied to it by the drive means. In particular, the reeds bearing against the horizontal lower edge of the shuttle 18 commence their upward movement in these conditions and therefore press with full force against this edge and thus exert vertical upward pressure on the shuttle 18. The forms or shapes of the boundaries or edges 16 and 15 are so selected that when these greater forces become effective, the shuttle slips between the boundaries 16 and 15 and is diverted into the extension 14.

It is particularly advantageous to use shuttles 18, the side walls of which yield in a resilient manner. Such shuttles 18 offer the advantage that they are guided in a reliable manner in normal circumstances, that excessively great forces are not required for pushing the shuttles into the extensions 14, and that after they have slipped through the passage zone defined by boundaries 15, 16, the shuttles are fully contained in the extensions 14. It is also advantageous if the guide elements 38 are made of a material that is at least slightly resilient. If this is the case, the boundary portion 16 and the projection portion 15 can move or bend in opposite directions from the plane in which the guide element 38 is disposed so that the shuttles are again enabled to slip through more easily. The shuttles are also enabled to slip through more readily and the danger of their jamming in the guide elements 38 is also reduced if the shuttles 18 or the guide elements 38 or both are made of plastic materials. Plastic shuttles and metal guide elements have, however, also proved successful.

If a shuttle 18 is pushed into an extension 14, it impinges upon the contact element 17 and moves this element into contact with one or more guide elements 38. In this embodiment, these guide elements are made of an electrically conducting material. Thus, the shuttle pushing against the contact element 17 closes the electrical circuit between the positive lead, designated +, and earth or ground. A control signal produced by closing the circuit in this manner can be used to stop the loom and to give a warning signal or alarm, for example, by the signal actuating an electrical relay 24 through which the appropriate control operations are carried out.

It will be understood that the operation and construction of the shuttles, the drive means, and the guide means on a wave-type loom are more fully described in U.S. Pat. No. 3,500,871, which disclosure is incorporated by reference in this application.

What is claimed is:

1. In a guide arrangement for shuttles on a wave-type loom provided with guide means for guiding the shuttles across the loom along a predetermined path and drive means operatively associated with the guide means to apply a force to each of the shuttles to move the shuttles along the predetermined path, the improvement which comprises shunting means positioned substantially coextensive with and adjacent to said guide means along said path for guiding the shuttles out of said path and for receiving the shuttles when the amount of force applied to any of the shuttles by the drive means is greater than that required to effect the movement of such shuttle or shuttles along the predetermined path across the loom, thereby preventing jamming of the shuttles within said guide means.

2. In a guide arrangement on a wave-type loom provided with guide means for guiding the shuttles along a predetermined path, the guide means including a plurality of guide elements each having a recess through which the shuttles are guided, and a drive means opera-

tively associated with the guide means for applying a component of its maximum available force to an inclined edge of each of the shuttles at right-angles to the direction of the movement of the shuttles to move the shuttles along the predetermined path, the improvement which comprises open extensions adjacent to the recesses of said guide elements, said extensions extending in substantially the same sense of direction as the direction of the force applied by the drive means and being arranged so that the shuttles are each pressed into the extensions when the amount of force applied by said drive means is greater than said component of force applied at right-angles to the shuttle during movement of the shuttles along the predetermined path, the amount of force pressing the shuttle into said extension being less than the said maximum available force that the drive means is capable of applying to each of the shuttles.

3. The guide arrangement of claim 2, in which each of the shuttles has an elongate body capable of yielding in a resilient manner over its width and side walls compressable upon being pressed into the extensions.

4. The arrangement of claim 2, in which the said guide elements each comprise a broad-faced sheet made of a material that is slightly resilient.

5. The guide arrangement of claim 2, in which the guide elements are made of metal and the walls of the shuttles are made of plastic material.

6. The guide arrangement of claim 2, in which the recesses in said guide elements each take the form of an elongate slot that is matched to the cross-section of each shuttle and that in its longitudinal direction extends at least approximately parallel to the force applied by the drive means to effect movement of the shuttle across the loom, each extension also taking the form of an elongate slot which provides a space sufficient to receive the shuttles and the longitudinal direction of each extension forming an obtuse angle with the longitudinal direction of the recess.

7. The guide arrangement of claim 6, in which one of the lateral boundaries of each of the recesses merges with one of the side boundaries of each of the extensions via a curved portion, and the other lateral boundary of each of the recesses merges with the other lateral boundary of each of the extensions via a projection which cooperates in the guiding of the shuttles.

8. The guide arrangement of claim 7, in which the initial portion of the projection extending away from the recess has boundaries which match the cross-section of each of the shuttles and which cooperate in the guiding of the shuttles, the one lateral boundary approaching the opposite lateral boundary to a point at which the distance between these lateral boundaries is equal at least approximately to the maximum thickness of each of the shuttles.

9. The guide arrangement of claim 2, in which each said extension forms a side track for the shuttles, a monitoring means provided for monitoring the presence of a shuttle in said track, and said monitoring means being actuatable by one of the said shuttles after the shuttle has been moved into the side track, to produce a signal indicating the presence of said shuttle in said side track.

10. The guide arrangement of claim 9, in which said monitoring means includes an electrically conductive element that is brought into contact with at least one guide element made of electrically conductive material by the shuttle located in the side track, said electrically conductive element extending through each extension.

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