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YUKIO MIZUNO ET AL.

3,482,606

MULTI-WEFT FLUID JET LOOM

Filed June 5, 1967

3 Sheets-Sheet 1

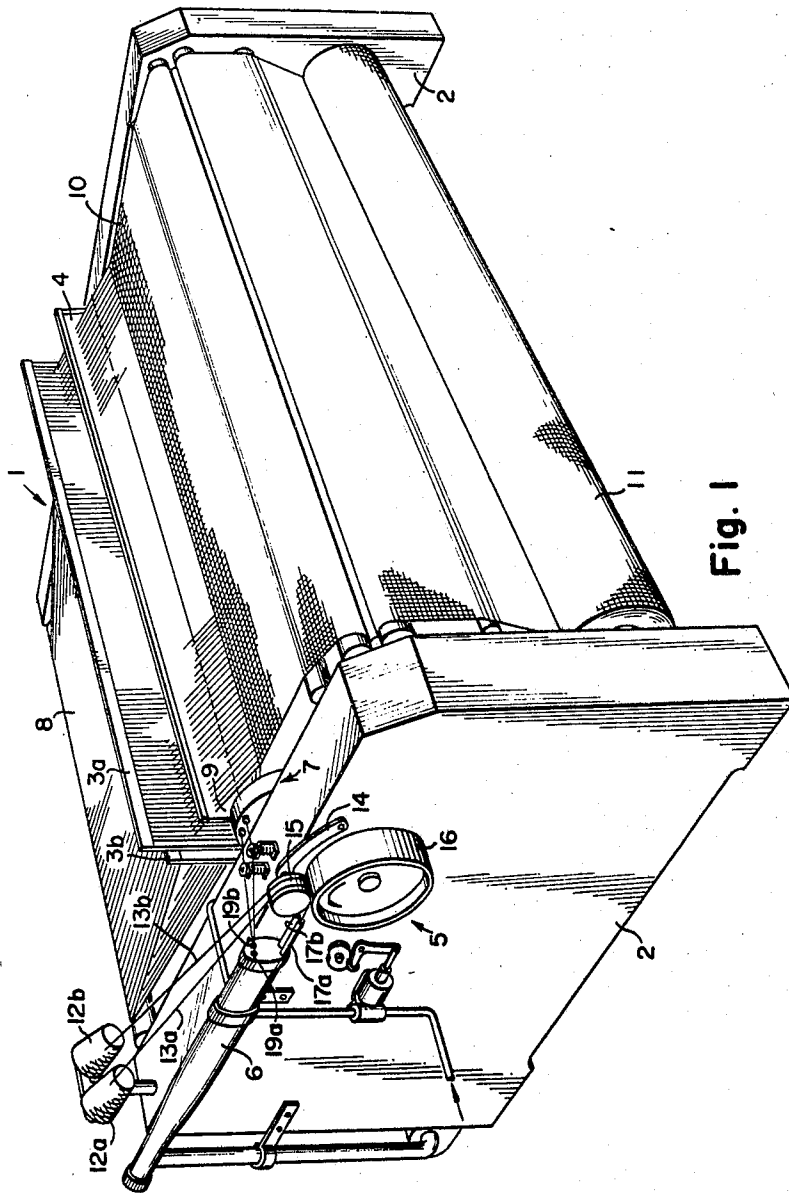


Fig. 1

INVENTORS
YUKIO MIZUNO
BY SHIGENORI TANAKA

Buckman and Archer
ATTORNEYS

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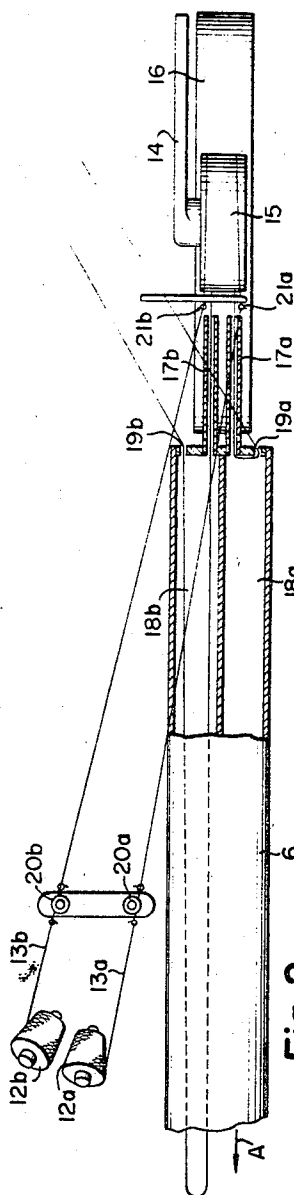


Fig. 2

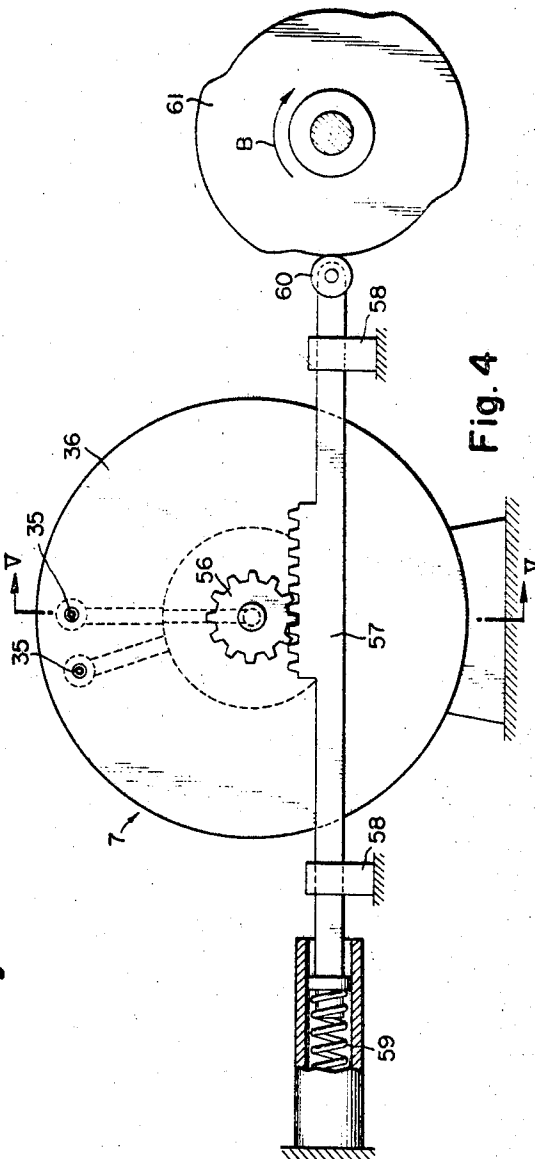


Fig. 4

INVENTORS
YUKIO MIZUNO
BY SHIGENORI TANAKA

Buckman and Archer
ATTORNEYS

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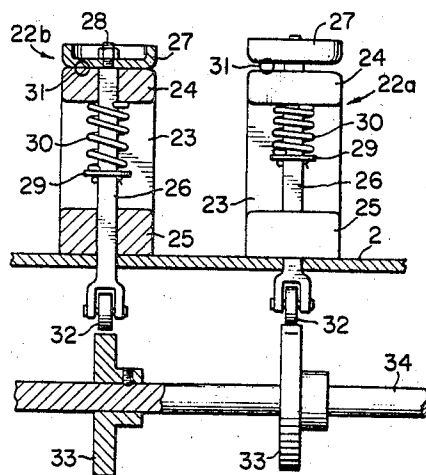


Fig. 3

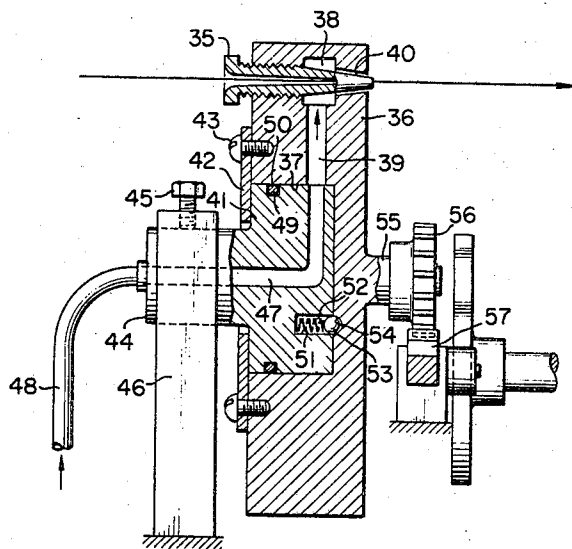


Fig. 5

INVENTORS
YUKIO MIZUNO
BY SHIGENORI TANAKA

Bucknam and Archer
ATTORNEYS

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MULTI-WEFT FLUID JET LOOM

Yukio Mizuno and Shigenori Tanaka, Tokyo, Japan, assignors to Nissan Jidosha Kabushiki Kaisha, Yokohama-shi, Japan

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U.S. Cl. 139—127

10 Claims

ABSTRACT OF THE DISCLOSURE

A fluid jet loom adapted for weaving multi-weft fabrics by continuously throwing a plurality of weft yarns into a plurality of sheds of warp yarns in sequence, wherein the rate of feeding the weft yarns from bobbins into respective weft storage chambers is varied in inverse proportion to the number of weft yarns and nozzles for the respective weft yarns are shifted into a position suitable for throwing the associated weft yarn into the shed of warp yarns and simultaneously is communicated with a pressure fluid supply source, when said weft yarn is to be thrown.

The present invention generally relates to a fluid jet loom and particularly to the weft throwing in a multi-weft loom.

In recent years, looms have made a remarkable progress and, although in the past the shuttleless looms were only used for weaving monochroic fabrics, the application of the same has recently been expanded over the area of multi-weft weaving. In shuttleless looms using a jet of fluid, the weft yarn is once stored in a weft storage chamber in a predetermined length and then ejected by making use of the jet of fluid. In order to use a loom of the type described for multi-weft weaving, it is necessary that weft yarns of different kinds are ejected in a prescribed sequence and, as a result, the ejection nozzles and storage chambers must be provided in a number equal to the number of the weft yarns to be used. However, where the nozzles are arranged in fixed positions with respect to the shed of warp yarns, the number of the nozzles to be used is subjected to limitation, due to the fact that the nozzles must be arranged within a limited range of area within which the weft yarns can be properly thrown into the shed. Furthermore, where measuring drums are to be provided, one for each weft yarn, to measure the length of said weft yarns to be stored in the storage chambers prior to the weft throwing, the structure of the loom is rendered complicated and accordingly the size of the loom becomes very large.

It is, therefore, an object of the present invention to solve the aforementioned problems of the multi-weft shuttleless looms.

It is another object of the present invention to provide a multi-weft fluid jet loom having an ejection nozzle device wherein a plurality of nozzles are shifted into a weft throwing position in sequence, in which position a pressure fluid is supplied to said nozzle to carry out the throwing of the weft yarn.

It is still another object of the present invention to provide a shuttleless loom wherein the length of a plurality of weft yarns is measured by a common measuring drum.

These and other objects, and the advantages of the present invention will become apparent from the following detailed description when taken in conjunction with the accompanying drawings which illustrates an embodiment of the invention and in which:

FIGURE 1 is a perspective view of the multi-weft

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shuttleless loom in which the present invention is embodied;

FIGURE 2 is an enlarged plan view, in cross section, of a measuring device for weft yarns, with a portion broken away;

FIGURE 3 is an enlarged side view, partly shown in section, of a set of weft yarn gripping devices used in a weft throwing mechanism;

FIGURE 4 is an enlarged side view of a nozzle assembly; and

FIGURE 5 is a cross sectional view taken on the line V—V of FIGURE 4.

Referring to the drawings and first to FIG. 1, a shuttleless loom is generally indicated by numeral 1, which includes a frame 2, healds 3a and 3b, a reed 4, a weft yarn measuring device 5, a weft yarn storage tube 6 and a nozzle assembly 7 for throwing the weft yarns there-through. Warp yarns 8 are arranged longitudinally of the loom and a shed 9 is formed by the healds 3a and 3b. The weft yarn thrown into the shed 9 through the nozzle assembly 7 is beaten by the reed 4 with the warp yarns to form a fabric 10, which is wound up into a roll as at 11.

The general construction of shuttleless loom as described above is already known and therefore will not be described in further detail.

The present invention, which is applicable to a multi-weft shuttleless loom, enables a plurality of weft yarns to be thrown into the shed of warp yarns in a prescribed sequence. The invention will be described more practically hereinafter with reference to an embodiment wherein two different weft yarns are to be thrown into the shed alternatively. Two bobbins 12a and 12b are mounted on the frame 2. The weft yarns 13a and 13b having been drawn out from the bobbins 12a and 12b trail around a press roller 15 which is rotatably mounted on the exterior face of the frame 2 by way of an arm 14 and, after passing through the nip between the roller 15 and a measuring drum 16, are fed into a storage tube 6 through yarn inlet pipes 17a and 17b respectively. The drum 16 is driven at a predetermined rate from a suitable drive means not shown.

The interior of the storage tube 6, as shown in FIG. 2, is divided longitudinally into elongate chambers 18a and 18b in a number corresponding to the number of weft yarns (which is 2 in this embodiment), each of said chambers being provided with the aforementioned inlet pipe 17a or 17b and a yarn outlet aperture 19a or 19b. Air interior of the chambers 18a and 18b is sucked in the direction of the arrow A, so that the weft yarns 13a and 13b are drawn in the same direction by the resultant air flow in the respective chambers. As may be seen in FIG. 2, tension adjusting means 20a and 20b are provided in the respective paths of the weft yarns from the bobbins 12a and 12b to the press roller 15, whereby the weft yarns are forwarded to the press roller 15 under a suitable tension. Also provided in the respective paths of the weft yarns at points in the proximity of the pressroller 15 are yarn guides 21a and 21b, by means of which the weft yarns are guided such that they are positively brought into contact with the peripheral surface of said press roller.

The weft yarns 13a and 13b leaving the storage tube 6 are led into a nozzle assembly 7 through yarn gripping devices 22a and 22b respectively. The detail construction of said yarn gripping device is shown in FIG. 3, in which it will be seen that each gripping device includes a bracket 23 fixed on the frame 2. The bracket 23 has an upper and lower flanges 24 and 25 integrally formed therewith. A sliding rod 26 extends vertically through said upper and lower flanges 24 and 25 and frame 2, and its top end is secured to a gripping plate 27 by means of a nut 28. The sliding rod 26 is urged downwardly under

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the bias of a spring 30 which is mounted on said sliding rod between the undersurface of the upper flange 24 and a spring seat 29 which is fixedly mounted on said sliding rod between the upper and lower flanges. The weft yarn is passed between the gripping plate 27 and the upper surface of the upper flange 24. A yarn guide 31 is provided to fix the path of the yarn.

Each sliding rod 26 has a roller 32 rotatably mounted to the lower end thereof for engagement with a cam 33. The cam 33 is fixedly mounted on a drive shaft 34 which is connected to drive means for the measuring drum 16 through suitable mechanism not shown, so that said drive shaft is driven cooperative with said drum. Thus, it will be appreciated that, when the cam follower roller 32 rides on a lobe of the cam 33, the sliding rod 26 is moved upwardly against the bias of the spring 30, bringing the gripping plate 27 out of contact with the upper surface of the upper flange 24 so as to release the weft yarn therebetween.

In FIGS. 4 and 5, there is shown an embodiment of the nozzle assembly according to the present invention. The nozzle assembly 7 includes a support disc 36 which carries peripherally thereof a plurality of nozzles 35 (two are shown) in a suitable spaced relation. The support disc 36 is formed in the center on one side thereof with a substantially cylindrical bore 37 which is in communication with an annular pressure fluid chambers 38, formed around the respective nozzles 35, through fluid passages 39. Each nozzle 35 has its tip end tapered defining a fluid ejection passage 40 peripherally thereof which is in communication with the fluid chamber 38.

In the bore 37 in the support disc 36 is rotatably fitted a fluid distributor block 41 which is retained in said bore by a holding annulus 42 which is fixed to the support disc 36 by means of screws 43. The block 41 has a boss 44 projecting outwardly from the center thereof, at which it is fixed to a fixed bracket 46 by a bolt 45. In the block 41 is formed a substantially L-shaped fluid passage 47 extending from the cylindrical wall surface to the outer end of the boss 44 and this fluid passage is communicated with a pressure fluid supply tube 48 at the outer end of the boss 44. In order to prevent fluid leakage through the gap between the contacting surfaces of the support disc 36 and the block 41, an annular groove 49 is formed in the cylindrical peripheral wall of the block 41, with an O-ring 50 fitted therein. The block 41 also has a hole 51 bored in the right end wall, in which a ball 53 is disposed while being urged towards the right under the bias of a spring 52. The arrangement is such that the ball 53 engages one of a series of hemispherical recesses 54 formed in the bottom wall of the bore 37 in the support disc 36 when any one of the fluid passages 39 is brought into communication with the fluid passage 47. The weft yarn when drawn to length is stored in the storage chambers 18a, 18b) and the fluid utilized to eject same is preferably a liquid such as water.

The support disc 36 has a boss 55 formed on the right end face thereof and a pinion 56 is securely mounted thereon. Below the pinion 56 is arranged a rack 57 which is supported laterally slidably by a pair of bearing blocks 58, with its teeth intermeshing with the teeth of the pinion 56. The rack 57 is constantly urged towards the right as viewed in FIG. 4 by the bias of a compression spring 59 provided at the left end extremity of said rack. At the right end extremity of the rack 57 is mounted a cam follower roller 60 for engagement with the peripheral surface of a cam 61. Such being the arrangement, the rack 57 is moved laterally as the cam 61 rotates in the direction of the arrow B, thus causing the pinion 56 and accordingly the support block 36 to rotate, and thereby the series of fluid passages 39 for the respective nozzles 35 are brought into communication with the fluid passage 47 one after another. The arrangement described above enables the nozzles 35 to be brought into a prescribed

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position for weft throwing, regardless of the number of the nozzles provided.

In operating the loom, the measuring drum 16 is driven at a predetermined rate to feed the weft yarns 13a and 13b into the respective storage chambers 18a and 18b. The nozzle support disc 36 is rotated through the cam 61, rack 57 and pinion 56, bringing the nozzle for the weft yarn 13a and the nozzle for the weft yarn 13b into the weft throwing position alternatively and thus the weft yarns 13a and 13b are ejected into the shed 9 alternatively. It will be appreciated therefore that the measuring drum 16 is driven at such a rate that a predetermined length of weft yarns may be sent into the storage chambers during a period between the two successive ejections of the weft yarn. In other words, the rate of rotation of the measuring drum is one half of that at which the measuring drum is required to be rotated in a single-weft shuttleless loom. Thus, it will be seen that, after the weft yarn, say 13a, has been ejected, a predetermined length of the weft yarn 13a equal in length to one pick will be drawn in the storage chamber 18a during the period from the time of the succeeding ejection of the weft yarn 13b to the time at which the weft yarn 13a is to be ejected again.

The rate of rotation of the measuring drum varies depending upon the number of the weft yarns to be interwoven and, when the number of weft yarns to be interwoven is represented by n , the rate of rotation of the measuring drum is set at $1/n$ of that in the case of interweaving a single weft yarn. With the inventive shuttleless loom of the construction described above, it is possible to carry out yarn measuring of a plurality of weft yarns in an effective manner and accordingly it is possible to simplify and to reduce the size of the yarn measuring device.

The yarn gripping devices 22a and 22b obviously operate such that they release the weft yarns respectively by the action of the cam 33 only when the weft yarns 13a and 13b are to be ejected and grip the yarns during the remaining period.

What is claimed is:

1. A fluid jet loom comprising a frame, a plurality of healds for shedding warp yarns, a reed, means to support a plurality of weft bobbins, means continuously feeding a pair of weft yarns by drawing each of said weft yarns off of said weft bobbins at a predetermined rate, independent storage chambers for receiving and temporarily storing therein the respective weft yarns being drawn by said weft feeding means, and cooperatively associated fluid actuated nozzles to eject one at a time the weft yarns from said respective storage chambers into the successive sheds of warp yarns, said nozzles being arranged on a nozzle assembly and are shifted into a weft throwing position in sequence by rotary means so as to alternately throw the weft yarns into said successive sheds and said feeding means being driven at a rate which draws the weft yarn to be temporarily stored to pick length in said storage chambers during the time elapsed between two successive ejections of the weft yarn.

2. A fluid jet loom according to claim 1, in which said feeding means comprises drive means driving a measuring drum and a press roller in pressure contact with the peripheral surface of said drum, said drum being rotated at an operating speed in r.p.m. inversely proportional to the number of the weft yarns to feed the weft yarns through a nip between said drum and said press roller, each weft yarn being stored in said respective storage chambers in pick length before said weft yarn is thrown into said sheds through the associating nozzle.

3. A fluid jet loom according to claim 1, in which spring loaded yarn gripping plates are provided in the paths of the respective weft yarns from the respective storage chambers to the associating nozzles and each

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spring loaded yarn gripping plates is operated such that it releases the associating weft yarn when said yarn is to be thrown into said sheds and grips the same during the remaining period.

4. A fluid jet loom according to claim 3, in which each yarn gripping plates are normally held in a yarn gripping position but are brought into a yarn releasing position alternately by the action of camming means mounted on a drive shaft mutually cooperatively associated with said feeding means.

5. A fluid jet loom according to claim 1, in which said nozzle assembly comprising a rotatable support member fixedly maintaining said nozzles in a predetermined spaced relation, said support member when rotated alternately bringing any one of said nozzles into a yarn throwing position, said nozzle which is arranged for throwing the weft yarn into the shed being in communication with a pressure fluid supply source for practically carrying the weft yarn through said sheds.

6. A fluid jet loom according to claim 5, in which the rotatable movement of said support member is effected by cam means.

7. A fluid jet loom according to claim 5, in which said support member is a disc carrying the nozzles in peripherally spaced positions and said disc is rotated through a mating pinion and rack, the rack being reciprocated by said cam means.

8. A nozzle assembly for fluid jet looms, a comprising a disc shaped support member adapted to carry a plurality of weft ejection nozzles therein in a peripherally spaced relation, means to rotatably support said

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support member in a manner such that said nozzles are alternately shifted into a position suitable for throwing weft yarn into the sheds of wrap yarns in the loom, means to impart a reciprocatory motion to said support member comprising rotating cam means and gear means operatively associated with said support member and said cam means, and means to supply a pressure fluid only to that one of the nozzles which is located in said position suitable for weft throwing.

9. A fluid jet loom according to claim 5, wherein the fluid used to eject said weft yarn is a liquid.

10. A fluid jet loom according to claim 5, wherein the fluid is water.

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HENRY S. JAUDON, Primary Examiner

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