April 27, 1965 YASUSHI KOBAYASHI 3,180,368

DEVICE FOR PROJECTING WEFT YARNS IN FLUID JET TYPE SHUTTLELESS LOOM

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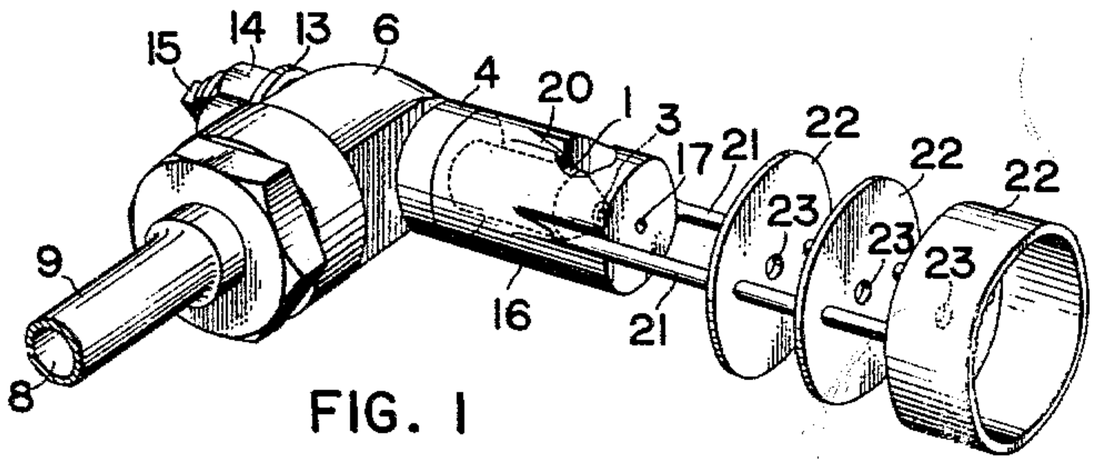

FIG. 1

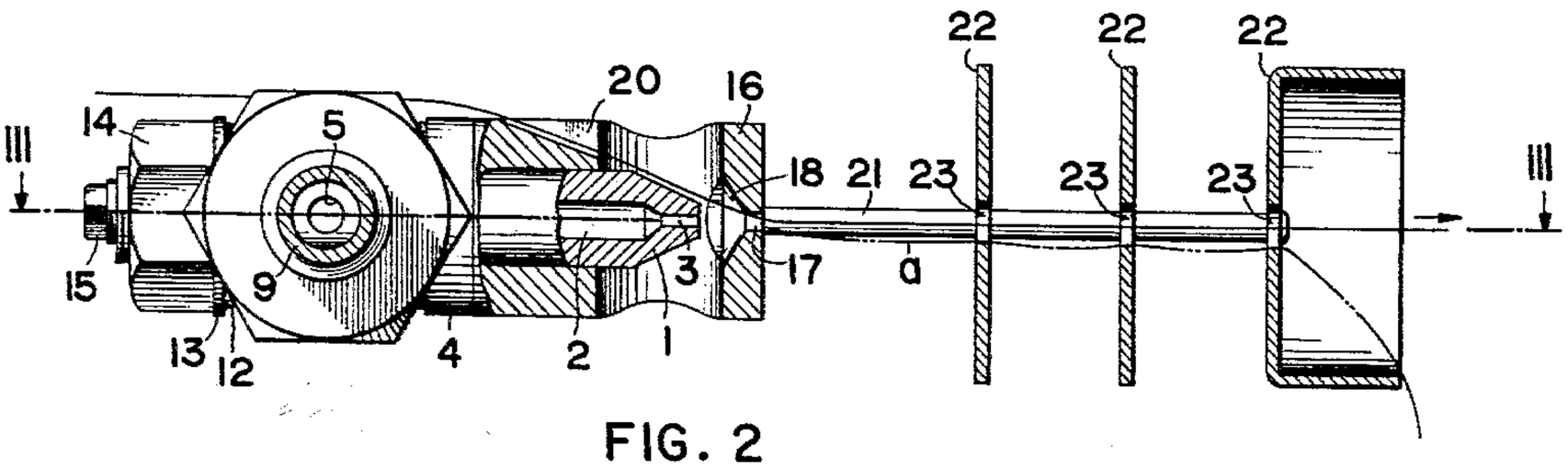

FIG. 2

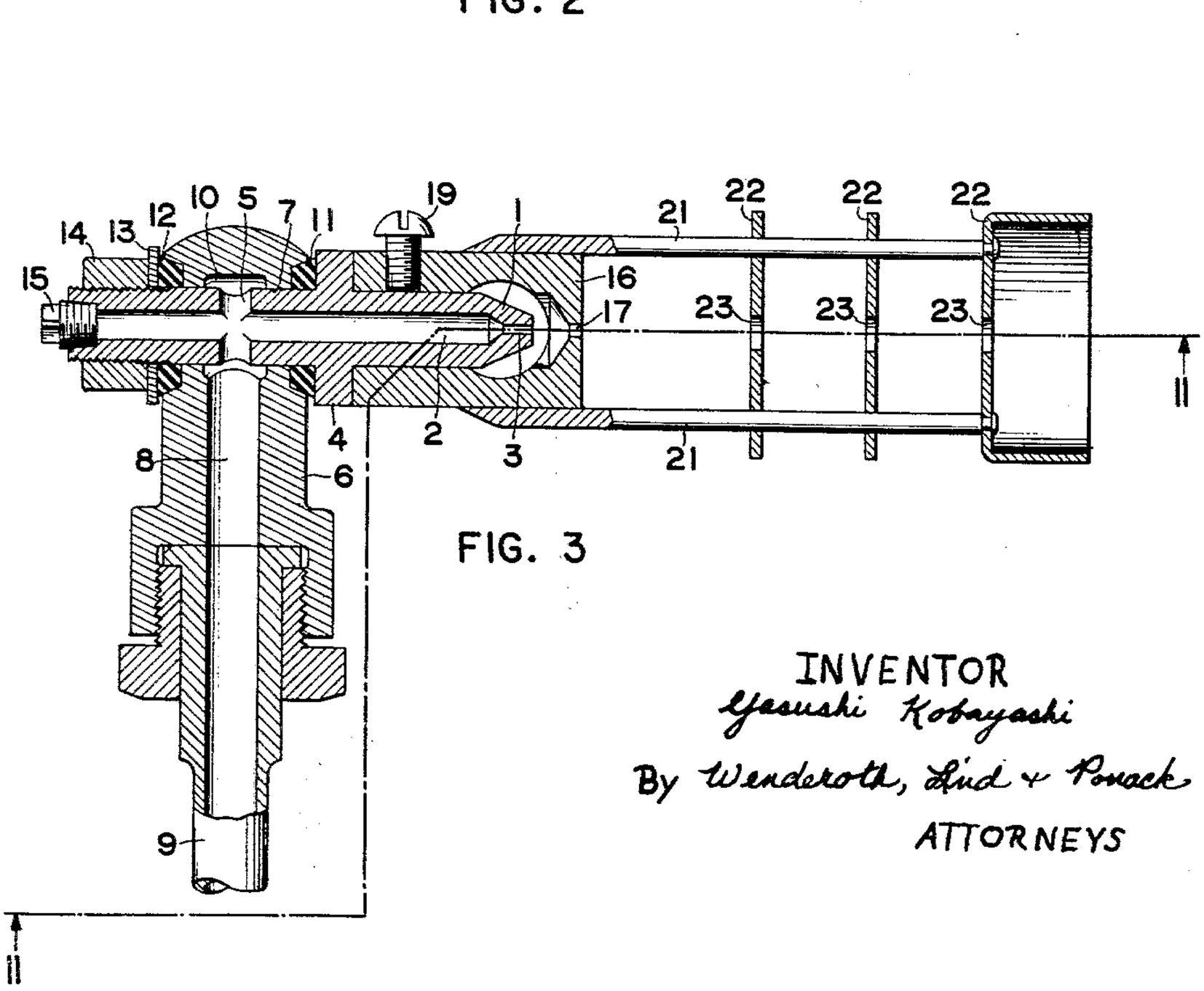

FIG. 3

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DEVICE FOR PROJECTING WEFT YARNS IN FLUID JET TYPE SHUTTLELESS LOOM

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3 Claims. (Cl. 139—127)

This invention relates to a fluid jet type shuttleless loom and more particularly to a device for projecting weft yarn in such loom.

In the fluid jet type shuttleless loom a jet of fluid under pressure is used to project successively lengths of detained yarn predetermined in accordance with a width of a fabric to be produced, as weft yarn to be inserted into a shed formed between an upper and a lower array of warp yarns. In this case, if the length of detained yarn which is being fed by a yarn threading nozzle is arranged to advance by a liquid spouted in the form of a tapered hollow cone through the periphery of the nozzle while the same is surrounded by the spouted liquid. Then the latter liquid collides against the yarn but the entire of the collided fluid can not be continued to advance accompanied by that portion of the yarn collided by the liquid, in such a manner that said yarn portion is surrounded by the liquid as having collided against the same. In fact, the spouted liquid wastes not only a portion of its energy by an impact resulting from the collision against the yarn but also that portion of the liquid separated from the main stream of liquid as a result of the collision will scatter with the result that such a portion of the liquid can not at all be utilized to propel the yarn. In other words, the entire of the spouted liquid can not be utilized effectively and exclusively to advance the yarn.

Also, in order to cause a liquid spouted in the form of an annulus to effectively act upon the yarn, a yarn threading nozzle should be provided on its longitudinal axis with a yarn guiding bore, on one hand, having preferably a diameter as small as possible and on the other hand, having a diameter sufficiently large to permit a yarn to be freely passed therethrough even though the same would include knots or burls whose dimensions are within the normally allowable limits. Thus the prior art type of fluid jet shuttleless loom is seriously disadvantageous in that the same is restricted by the conditions inherently contradicting each other.

An object of the invention is, accordingly, to provide an improved device for projecting the lengths of weft yarn in a fluid jet type shuttleless loom wherein aforesaid disadvantages are substantially eliminated.

This object and other objects of the invention which will become apparent as the description proceeds are accomplished by the invention characterized by means for spouting a yarn propelling liquid in the form of a thin column or filament from a spouting nozzle, and means for supplying laterally a length of yarn so as to ensure that the free end portion of the yarn contacts the column of spouted liquid whereby the length of yarn is advanced while the same is wet adhered to the column of spouted liquid.

The invention will become more readily apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

FIG. 1 shows a perspective view of a yarn projecting device constructed in accordance with the teachings of the invention.

FIG. 2 shows a side elevational view, partly in section of the device illustrated in FIG. 1 with the section taken along the line II—II of FIG. 3; and

FIG. 3 shows a plan view, partly in section of the device illustrated in FIG. 1 with the section taken along the line III—III of FIG. 2.

The invention is based upon the fact that a liquid under high pressure spouted in the form of a thin filament by a nozzle has a tendency to entrain a yarn by reason of wet adhesion within the region of the length of the jet column of liquid.

Referring now to the drawings, there is illustrated a yarn projecting device constructed in accordance with the teachings of the invention. The device illustrated comprises a liquid spouting nozzle member 1 including a liquid guiding bore 2 centrally formed therein over the substantial portion of its length and a liquid spouting nozzle 3 of small diameter formed at one extremity and communicating with the liquid guiding bore 2. The diameter of the spouting nozzle 3 is preferably as small as possible but large sufficiently to permit a yarn to be freely passed therethrough even if the same would have knots or burls the sizes of which are within the normally allowable limits. Disposed intermediate the ends of the spouting nozzle member 1 is an outwardly projecting flange 4 preferably integral with the same. In the rear of the flange 4 as viewed at the nozzle 3 the device is provided with at least one pair of radial openings 5 diametrically facing each other and communicating with the fluid guiding bore 2.

As best shown in FIGS. 1 and 3, a housing 6 is disposed adjacent to the flange 4 on the nozzle member 1 and substantially at right angles to the nozzle member for the purpose of supplying to the latter a liquid under high pressure. The housing 6 is provided on one end portion with a cross hole 7 extending throughout its width and adapted to snugly receive the nozzle member 1 and includes a longitudinal bore 8 centrally formed therein. The central bore 8 has an open end connected to a liquid reservoir represented by a liquid supply pipe 9 and the other end closed. When the rear portion of the nozzle member 1 is fitted into a cross hole 7 on the housing 6 followed by fastening of the housing to the nozzle member as will be described hereinafter, the longitudinal bore 8 is arranged to communicate with the radial openings 5 and hence with the liquid guiding bore 2 through an annular passage 10 formed on the closed end portion of the bore 8.

An apertured packing 11, the receiving hole 7 of the housing 6, an apertured packing 12 and a washer 13 are fitted onto the nozzle member 1 in the order named and from the rear of lefthand end thereof as viewed in FIG. 3 and then pressed against the rear surface of the flange 4 of the nozzle member 1 by a nut 14 threaded onto the screw-threaded rear end portion of the nozzle member. In this way, the housing 6 is rigidly secured in place and in liquid-tight relationship to the nozzle member 1.

That end of the liquid guiding bore 2 opposite to the nozzle 3 can be closed by an end plug 15.

Fitted onto the front or righthand portion (as viewed in the drawings) of the nozzle member 1 is a guide sleeve 16 having in its free end face a guiding hole 17 somewhat larger in diameter than the nozzle 3 and a conical recess 18 concentric to the guiding hole 17. The guide sleeve 16 is rigidly secured to nozzle member 1 by a set screw 19 with a suitable distance maintained between the front end of the nozzle 3 and the rear end of the guiding hole 17 aligned with the spouting nozzle 3. This distance can be adjusted by controlling the position of the sleeve 16 relative to the nozzle member 1. As shown in FIGS. 1 and 2, the guide sleeve 16 is also provided with an inclined slot or hole 20 opening into a longitudinal bore centrally formed therein for the purpose as will be apparent hereinafter. The bottom surface of the slot or hole 20 and an extension of a generatrix for

the outer conical surface of the nozzle member 1 have preferably the substantially same inclination with respect to the common longitudinal axis.

Further, the guide sleeve 16 is provided with a pair of supporting rods 21 extending in diametrically facing relationship in the righthand direction as viewed in the drawings. The pair of supporting rods 21 includes a plurality of parallel plates 22 mounted thereon at suitable intervals and having central holes 23 nearly equal in diameter to the guiding hole 17.

The device thus far described is operated as follows: Any suitable liquid under high pressure is periodically supplied by a reservoir (not shown) through the supply pipe 9, the annular passage 10, the radial openings 5, and the guiding bore 2 to the spouting nozzle 3 under control of any suitable control mechanism (not shown). Then the spouting nozzle 3 spouts the liquid supplied thereto in the form of a thin column and under high pressure at a high speed. The column of liquid thus formed travels through the guiding hole 17 in the guide sleeve 16 and a plurality of the aligned hole 23 provided in the respective parallel plate 22 toward a shed formed between an upper and a lower array of warp yarns (not shown).

On the other hand, a weft yarn *a* supplied from a supply bobbin (not shown) disposed behind the nozzle member 1 is passed through the inclined opening 20 in the nozzle member 1 and along the outer conical surface of the front end portion thereof to thereby gradually approach to the longitudinal axis of the spouting nozzle 3 (see FIG. 2). Thereafter the yarn *a* is normally threaded into the conical recess 18 and guiding hole 17 in the guide sleeve 16 insuring that the column of liquid spouted by the nozzle 3 contacts one portion of the supplied yarn *a*.

Upon spouting each column of liquid under high pressure from the spouting nozzle 1, the length of yarn *a* is passed through the aligned holes 23 as previously described and inserted between the upper and lower arrays of warp yarns while the same is entrained by the column of liquid by its tendency to wet adhere to the yarn as previously described. Immediately after the length of yarn has been inserted between the upper and lower arrays of warp yarns the yarn is broken and ready for the subsequent insertion. The plurality of the apertured plates 22 are provided in order to prevent the remaining portion of the yarn from hanging down as a result of that break of yarn, and to cause the same to be continued to face substantially front as shown by dotted-and-dashed line in FIG. 2. It is to be noted that the holes 23 of the plates 22 are dimensioned and disposed such that they do not interfere with travel of the spouted liquid and permit the yarn to be easily surrounded by the spouted liquid. To this end, at least one of the intermediate plates 22 may be preferably adjusted as to its position relative to the adjacent ones along the common axis.

From the foregoing it will be appreciated that the invention has provided a device for projecting weft yarn in such a manner that a liquid for propelling a length of yarn is spouted from a spouting nozzle without reducing the energy imparted thereto by its collision with the yarn and that its characteristics are utilized to entrain the yarn by the spouted liquid whereby the desired insertion of weft yarn is effected.

What I claim is:

1. In a device for projecting weft yarn in a fluid jet type shuttleless loom, the combination of means for jetting a yarn propelling liquid under high pressure in the form of a thin solid column, said means comprising a nozzle, and means connected to said jetting means for supplying a length of yarn laterally of the column along the outside of said nozzle so as to ensure that the free end portion of the yarn contacts the column of the jetted liquid whereby the length of yarn is advanced while the same is entrained by said column of jetted liquid.

2. In a device for projecting weft yarn in a fluid jet type shuttleless loom, the combination of a nozzle member having in one end portion a nozzle for jetting a yarn propelling liquid in the form of a thin solid column, said one end portion of said nozzle member having its outer peripheral wall in the shape of a conical surface, a member having a guiding hole therein adjacent and in the front of the said nozzle with said guiding hole aligned with the nozzle and adapted to permit a yarn to be projected and said column of jetted liquid to be freely passed therethrough, guiding means including said conical peripheral wall of said one end portion of the nozzle member to guide the length of yarn to said guiding hole, and a plurality of parallel plates in the front of said guiding hole having therein guiding openings aligned with each other and with both said nozzle and said guiding hole, said guiding openings being nearly equal in diameter to said guiding hole, the arrangement being such that the length of yarn is advanced by said column of jetted liquid by being entrained in said liquid.

3. A device as claimed in claim 2, wherein at least one of said parallel plates is adjustably mounted relative to the adjacent ones along a common axis.

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