Oct. 3, 1933. O. SAMITZ 1,928,704

WARP THREAD DRAWING-IN MACHINE

Filed May 26, 1931 3 Sheets-Sheet 1

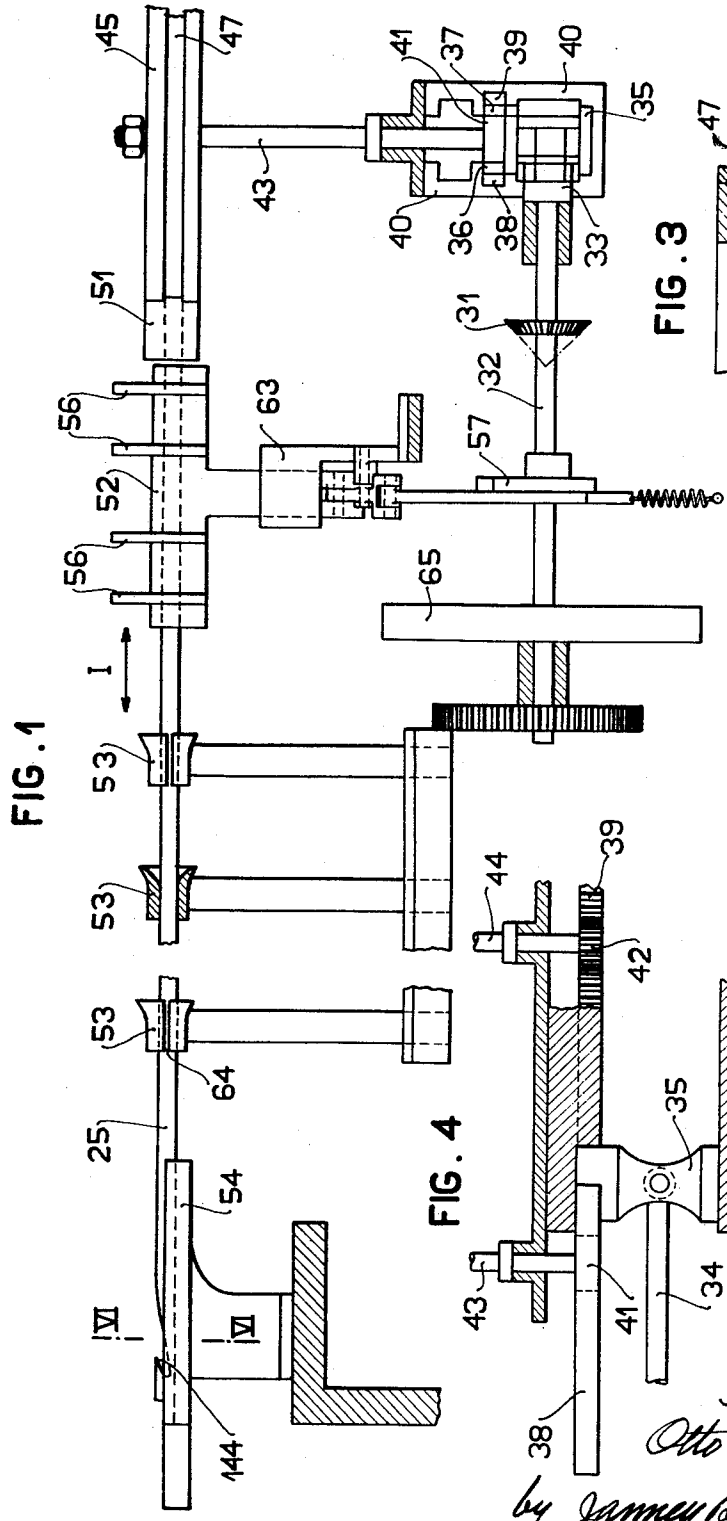


FIG. 1

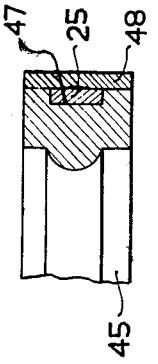


FIG. 3

FIG. 4

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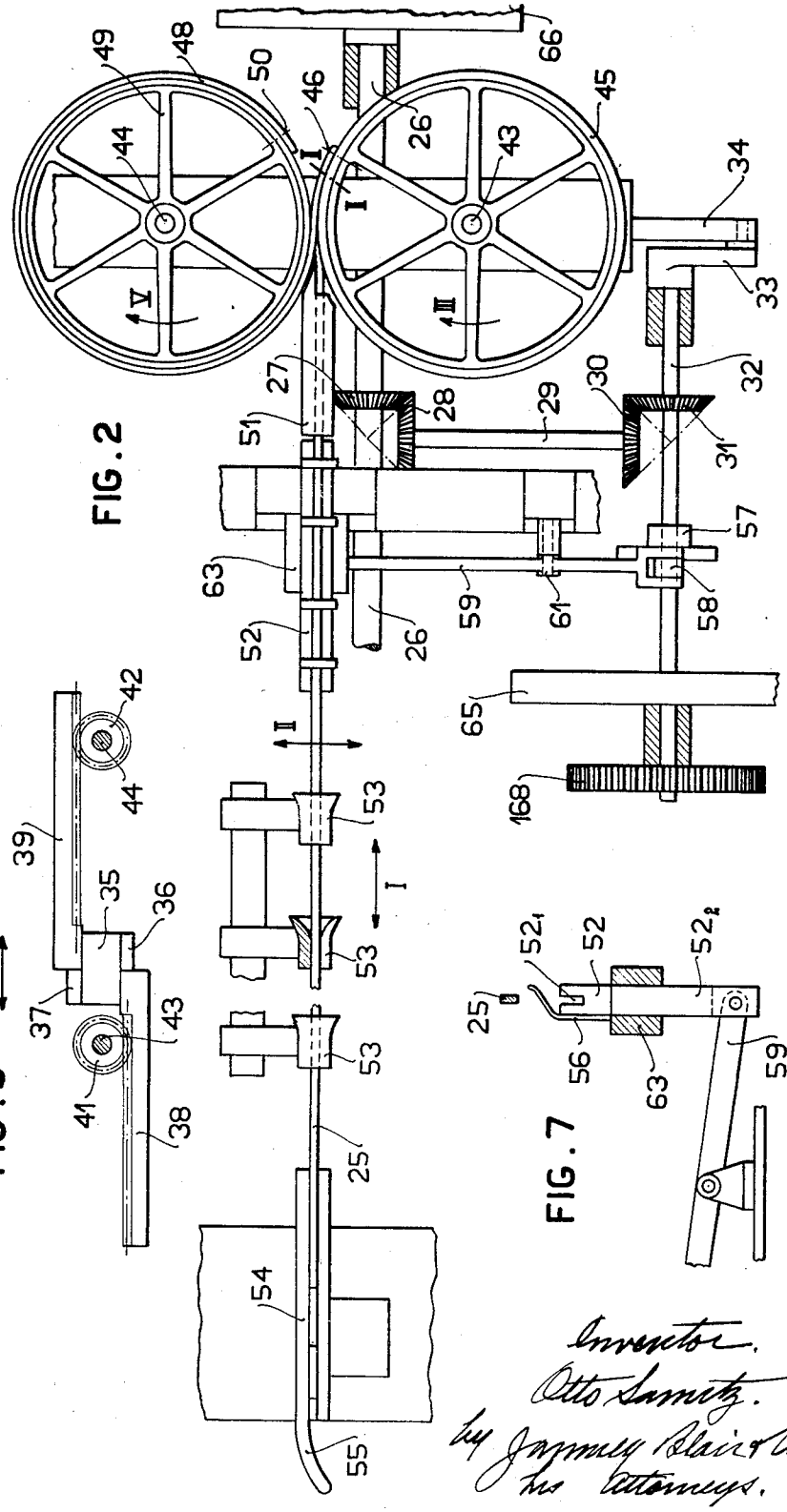


FIG. 2

FIG. 5

FIG. 7

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FIG. 8

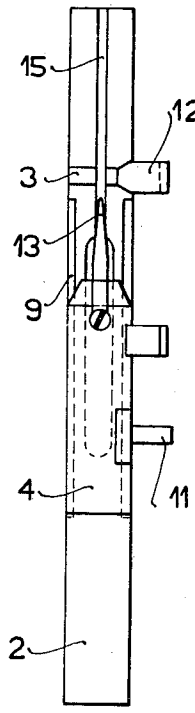


FIG. 9

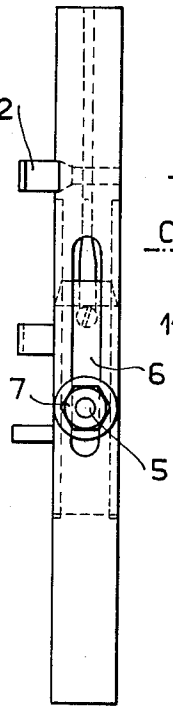


FIG. 10

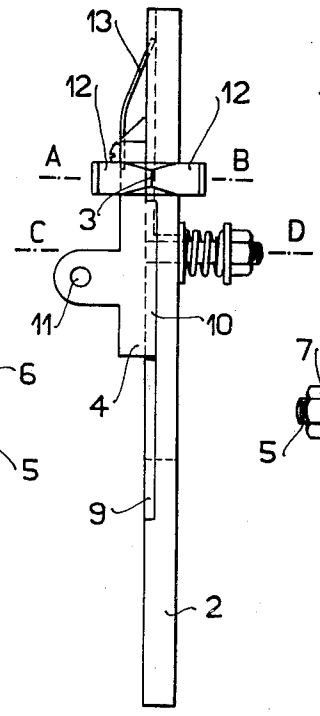


FIG. 11

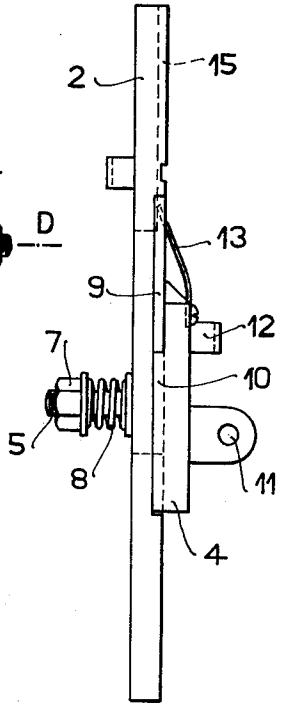


FIG. 12

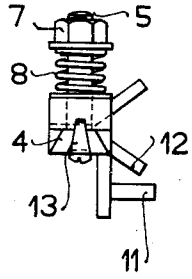


FIG. 13

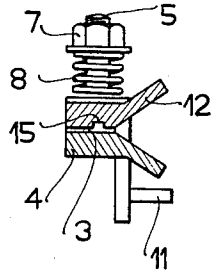


FIG. 14

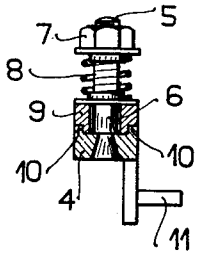


FIG. 6

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UNITED STATES PATENT OFFICE

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WARP THREAD DRAWING-IN MACHINE

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Application May 26, 1931, Serial No. 540,085, and in Austria May 31, 1930

11 Claims. (Cl. 28—44)

This invention relates to warp thread drawing in machines in which the warp threads wound on the beam are drawn automatically and simultaneously, by means of a mechanically operated drawing in hook or needle, through the reed, the heald eyelets of the shafts, and the drop wires of the warp stop motion, and has for its object to improve that part of the mechanism which serves to drive and to guide this drawing in needle.

In drawing in machines of the type concerned the drawing in needle must be of unusually great length (more than half a metre), while at the same time the cross sectional area of the needle must be so small that the needle can pass through the heald eyelets and the spaces of the reed without causing damage. The needle may not be appreciably thicker than approximately half a millimetre, nor higher than about 3–5 millimetres, so that the same is as flexible as a thin strip of metal, and therefore requires to be guided at short intervals during its forward motion, and also necessitates the employment of special driving mechanism, since the needle, on account of its lack of rigidity, cannot be simply thrust forward.

The present invention relates to a device for driving and guiding the long and flexible drawing in needle, which is of the simplest construction and at the same time ensures a perfectly reliable guidance and positive operation of the drawing in needle, and that without subjecting the latter to any inadmissible breaking strain. In accordance with the invention the drawing in needle, which on the return movement is wound on to the periphery of a disc or drum in a manner known per se, is preferably arranged in a groove provided in the periphery thereof, and is adapted to be covered by an elastic steel band which is wound together with the drawing in needle on to the winding drum and off the same. This steel band which, during the forward movement of the drawing in needle, is wound on to a second or drive strap winding disc or drum takes all the strains during the forward movement of the needle, protects the needle from undue breaking strains, and guides the same with certainty in the direction of the common tangent to the two winding drums to the point at which the needle leaves said drums, at which point the needle is taken over by a system of straight line guides which projects into the angle between the said two winding drums.

An example of a form of construction embodying the present invention is illustrated in the accompanying drawings, in which

Figs. 1 and 2 show the device for driving and guiding the drawing in needle, in side elevation and plan view respectively, only certain parts of the framework of the machine being shown in section;

Fig. 3 shows on an enlarged scale the cross-section of the rim of the needle winding disc or drum;

Figs. 4 and 5 show in side elevation and part longitudinal section and in plan view respectively the device for the driving of the winding drums;

Figs. 6 and 7 show in two different positions a movable guide for the straight line portion of the path of the drawing in needle;

Figs. 8–14 illustrate a second form of construction for the movable guiding member for the drawing in needle;

Figs. 8–11 show a guiding member in elevation from four different sides;

Figs. 12–14 show a plan view of the guiding member, and sections of the same taken on the lines A—B, and C—D, respectively, of Fig. 10.

Referring to the drawings, the very long drawing in needle 25 for the warp threads consists of a strip of steel about half a millimetre thick and 3–4 millimetres high, and is provided at its free end with a drawing in hook 144. At each working cycle of the machine the drawing in needle carries out a reciprocating stroke in the direction of the arrow I (Figs. 1 and 2), during which stroke the needle is guided at short intervals by the guides 51, 52, 53, and 54. In the intermediate spaces between these guides there are arranged on feed devices (not shown) adapted to move in a direction at right angles to that of the movement of the drawing in needle (arrow II, Fig. 2) the drop wires of the warp stop motion, the shafts, and the reed, which are fed forward at each working cycle to the extent of the space between the dents of the reed, of one heald of the shafts, and of one drop wire of the warp stop motion, respectively, while the operating device for the drawing in needle 25 is rigidly mounted in the framework of the machine, and the drawing in needle always carries out its reciprocating movement along the same fixed path. The mechanism proper for the operation and guiding of the drawing in needle, which forms the subject matter of the present invention, will now be described in detail and with reference to the accompanying drawings.

The rear end of the drawing in needle 25 is attached at 46 (see Fig. 2) to a peripheral portion of a rotatable needle carrier, or needle winding drum 45 having a cylindrical needle supporting surface, as provided, for example, by the rim of

a disc or wheel, which is mounted on a vertical shaft 43 and is so dimensioned that its circumference is at least as great as the length of the stroke of the drawing in needle. When the drum 45 is rotated in the direction of the arrow III (Fig. 2), the drawing in needle is wound thereon and lies flush with the outer surface of the rim of the drum in a groove 47 (Fig. 3) provided to receive it. Likewise at 46 (Fig. 2) there is attached to the rim of the winding drum 45 the one end of a suitable strap such as a steel band or strap 48 which is adapted to completely cover the drawing in needle 25 seated in the groove 47 (see Fig. 3) and to be wound on to and unwound from the needle drum 45 simultaneously with the drawing in needle during the reciprocating movement of the latter. The other end of the steel band or strap 48 is attached at 50 (Fig. 2) to the periphery of a second or strap carrying winding drum 49 on to which the steel band 48 is wound during the forward movement of the drawing in needle 25. At the point at which the drawing in needle leaves the needle winding drum 45, the drum 49 is in contact with the steel band or strap 48 (Fig. 2), so that the drawing in needle runs off on the common tangent to the two drums 45 and 49, and up to this point is strictly guided and held in position by the steel band 48. During the forward or unwinding movement of the drawing in needle 25 a positive drive is applied to the strap winding drum 49, which transmits this drive by means of the steel band 48 to the needle winding drum 45, while during the return or winding movement of the needle the drum 45 is driven, and simultaneously winds in the needle and rotates the now idly running strap winding drum 49 through the intermediary of the steel band 48.

The vertical shafts 43 and 44 of the two winding drums 45 and 49 are each provided at their lower ends with a pinion 41 and 42, respectively (see Figs. 1, 4, and 5), which engage in racks 38 and 39, each of which is adjustable in relation to the other (Figs. 1 and 5) in a horizontal guide 40. Between the two racks 38 and 39 there is arranged a driving member 35 (Figs. 1, 4, and 5) in the shape of a cross-head to which a reciprocating movement is imparted by means of a connecting rod 34, a crank 33, a shaft 32, bevel wheels 31, 30, a shaft 29, bevel wheels 28, 27, derived from the main shaft 26 and the belt pulley 66 (Fig. 2). The driving member 35 is provided with two stops 36, 37 (Figs. 1 and 5) which are displaced in relation to each other, and which are adapted to engage alternatingly with the racks 38 and 39, respectively, during the reciprocating movement of the driving member 35 (arrow IV, Fig. 5).

For the forward movement of the drawing in needle 25, the stop 37 on the driving member 35 drives the rack 39 (towards the right in Fig. 5), whereby the pinion 42, the shaft 44, and the strap winding drum 49 are positively rotated (arrow V, Fig. 2); the steel band or strap 48 is thereby unwound from the drum 45 and wound on to the drum 49, the band 48 in its turn rotates the drum 45 in the opposite direction to that of the arrow III (Fig. 2), and the drawing in needle 25 is thrust forward. At the same time the pull of the steel band 48 causes the pinion 41 keyed to the shaft 43 to be rotated, and the rack 38 to be displaced (in Fig. 5 towards the right), so that the latter is at once engaged by the stop 36 on the reversal of the movement of the driving member 35. During the following second half of the working cycle the rack 38 is driven by the stop 36 (in Fig. 5 towards the left), whereby through the intermediary of the pinion 41 and of the shaft 43 the needle winding drum 45 is positively turned in the direction of the arrow III (Fig. 2). The drawing in needle 25 is thus wound together with the steel band 48 on to the drum 45, while the drum 49 rotated by the pull of the steel band 48 runs idle and, by means of the pinion 42, thrusts back the likewise idly moving rack 39 into its initial position.

The alternating drive of the winding drums 45 and 49 can clearly be equally well effected in a number of alternative ways.

During the winding on to the drum 45 the drawing in needle 25 is subjected to a perfectly admissible tensile strain, while the tensile strain arising from the driving of the strap drum 49 is taken up by the steel band 48. During the forward movement of the drawing in needle the steel band or strap 48 is again subjected to a tensile strain, and the pressure exercised thereby on the wound portion of the drawing in needle in a radial direction protects this needle from any inadmissible breaking strain or buckling. At the running off or disengaging point or line of tangence (Fig. 2) the steel band 48 is gradually separated from the periphery of the drum 45 and liberates or disengages the drawing in needle 25, which, however, is at once separated or stripped from the band and received into the end opening of a completely enclosed guiding member 51 (Figs. 1 and 2) which projects into the angle between the two winding drums 45 and 49 for the purpose of separating or stripping the needle from the band and guiding it forward into warp engaging position.

For the further guidance of the drawing in needle 25 there is provided immediately in front of the reed (not shown) a guide member 52 having a guiding slot 52_1 (Figs. 6, and 7) for the drawing in needle open at the top, this guide member 52 being adapted to be lowered during the return movement of the drawing in needle, for the purpose of removing the drawn in warp thread from the path of the drawing in needle, and thus of freeing the way for the next working cycle. The lowering of the guide member 52 is effected by a cam disc 57 keyed on the shaft 32, this cam disc being connected through a roller 60, a rod 58, a double-armed lever 59 pivoted at 61, and an articulating bolt 62 with a vertical projection 52_2 on the guide member 52, this projection being vertically guided in a neck or bracket bearing 63 (Figs. 1 and 6). The guide member 52 is provided with a plurality of weak leaf springs 56 which project obliquely over the guiding member 52 for the drawing in needle 25 (Figs. 1, 2, and 6). The guide member 52 is lowered before the drawing in needle 25, on its return stroke, has quitted the guiding funnel 53 next in order to the guide member 52. The very feeble springs 56 on being lowered yield to the drawing in needle which is supported on both sides, and come into a position beneath the drawing in needle, which latter requires no guidance on its return stroke. Before the drawing in needle 25 is thrust forward in the next working cycle, the guide member 52 is lifted again and brought into line with the path of the needle, while the warp thread drawn in during the previous working cycle slides laterally along the obliquely disposed springs 56 and comes into po-

sition along with the previously drawn in warp threads.

Before each of the shafts (not indicated in the drawings), and before the drop wires of the warp stop motion which are arranged in rows on one or more rails (not shown) there is provided a needle guide 53 having a conically enlarged or flared entry orifice and a lateral slot 64 through which, on the return stroke of the drawing in needle, the drawn in warp thread can pass out laterally. The point of the drawing in needle 25, the hook 144 (Fig. 1) of which is supplied, after the traversing of the reed, the shafts, and the drop wires of the warp stop motion, with a warp thread by means of a thread separating and bringing up device (forming no part of the present invention), is guided in a slit open at the top in a fixed guide piece 54 (Figs. 1 and 2).

In Figs. 8–14 a form of construction for a needle guiding system is shown which can be substituted for the fixed funnel guides 53 (Figs. 1 and 2), and which has the advantage over the latter that it facilitates the escape of the warp thread from the needle guides after having been drawn through the reed, shafts, and detector hooks, and positively removes this thread from the path of the drawing in needle before the next working cycle commences. In this form of construction the guiding slots for the drawing in needle provided in the fixed guiding members are completely open to one side, and are adapted to be closed over by means of slides which close these slots during the forward movement of the needle, and open the same completely during the return movement of the needle, so that the drawn in warp thread can easily escape. Threads chancing to remain in the slot are ejected by the end of a leaf spring connected to the said slides, and inclined at an angle to the fixed portion of the guides.

Each guiding member, according to this modified form of construction, consists of a vertical rail 2 attached to the framework of the machine and provided with a guiding slot 3 corresponding to the thickness and breadth of the drawing in needle 25. A slide piece 4 is so mounted on the rail 2 as to be vertically slidable, and is adapted in its upper end position (Fig. 10) to completely close over the guiding slot 3, and in its lower end position (Figs. 8 and 11) to completely expose this slot. The slide 4 is attached to the rail by means of a small bolt 5, which passes through a longitudinal slot 6 in the rail 2, and of a nut 7, and is gently pressed against the running surface of the rail 2 by a spiral spring 8. For the better guidance of the slide 4 there are provided on the rail 2 two longitudinal grooves 9 which are adapted to be engaged by projections 10 on the slide 4 (Figs. 8 and 14). During the forward movement of the drawing in needle 25 the slides 4 of all the guide members are lifted (Fig. 10), and during the return movement of the same are consecutively lowered (from the point of the needle 25 towards the fixed guide 51). The operation of each of the slides 4 is effected by means of a short pin 11 (Figs. 8, 10, and 14) which is connected in any suitable manner with a driving member (not shown).

In order to facilitate the entry of the drawing in needle 25 into the needle guide 3 closed by the slide 4, the entry orifice of this guide is conically enlarged (Figs. 8, 10, and 13), and in addition there are provided guiding cheeks 12 on the rail 2 and on the slide 4, these cheeks being adapted to constitute together a guiding funnel (Fig. 13).

At the upper end of each slide 4 there is provided a weak leaf spring 13 which is inclined towards the rail 2 (Figs. 10 and 11), and slides with its end in a vertical groove 15 (Figs. 8, 13, and 14) provided in the running surface of the fixed rail 2. The groove 15 is deeper by about the thickness of the leaf spring 13 than the guide 3 for the drawing in needle (Fig. 13), so that the end of the spring 13 engages beneath a warp thread happening to remain in the needle guide 3 and ejects the same from the path of the needle.

The guiding members for the drawing in needle as shown in Figs. 8–14 require very little space, so that the reed, the shafts, and the guides for the rows of detector hooks or drop wires can be brought up very close to each other, and the drawing in needle 25 is left unguided only for the very short distances between each pair of guides, for which short distances the inherent stiffness of the needle, although slight, is fully sufficient. The thickness of the drawing in needle can in consequence be reduced to a minimum, and a warp thread drawing in machine equipped with the present invention is suitable for the closest warp set occurring in practice.

I claim:—

1. In a warp thread drawing-in machine, the combination of a needle, a plurality of needle guides each provided with a needle path defining passageway open at one side to permit disengagement of a drawn-in warp thread from said guide, and means for effecting diseangaging movement of said drawn-in thread.

2. In a warp thread drawing-in machine, the combination of a needle, a plurality of needle guides each provided with a needle path defining passageway open at one side to permit disengagement of a drawn-in warp thread from said guide, and means movable periodically into and out of the path of the needle to effect disengagement of the thread from the needle guide.

3. In a warp thread drawing-in machine, the combination of a needle, a plurality of needle guides each provided with a needle path defining passageway open at one side to permit disengagement of a drawn-in warp thread from said guide, and spring means movable across the path of the needle to dislodge a drawn-in warp thread therefrom.

4. In a warp thread drawing-in machine, the combination of a needle, a plurality of needle guides each provided with a needle path defining passageway open at one side to permit disengagement of a drawn-in warp thread from said guide, and means for covering said opening during advancing movement of the needle through said passageway and for exposing said opening to permit disengagement of a drawn-in warp therethrough.

5. In a warp thread drawing-in machine, the combination of a needle, a plurality of needle guides each provided with a needle path defining passageway open at one side to permit disengagement of a drawn-in warp thread from said guide, means for covering said opening during advancing movement of the needle through said passageway and for exposing said opening to permit disengagement of a drawn-in warp therethrough, and a thread dislodging member movable transversely across said passageway and said opening.

6. In a warp thread drawing-in machine, the combination of a warp thread engaging needle, a plurality of guides therefor including a fixed guide and a guide adapted to be moved into and

out of operative guiding relation to the operative path of the needle.

7. In a warp thread drawing-in machine, the combination of a warp thread engaging needle, means for advancing and retracting the same, guide members for the needle, including a fixed guide and a movable guide, said fixed guide having a laterally exposed opening through which a drawn-in warp thread may be disengaged therefrom, and said movable guide having an opening exposed in a different direction through which a drawn-in warp thread may be disengaged therefrom.

8. In a warp thread drawing-in machine, the combination of a warp thread engaging needle, means for advancing and retracting the same, guide members for the needle including a fixed guide and a movable guide, said fixed guide having a laterally exposed opening through which a drawn-in warp thread may be disengaged therefrom and said movable guide having an opening exposed in a different direction through which a drawn-in warp thread may be disengaged therefrom, and means on said movable guide for positively deflecting a drawn-in warp thread out of the path of the needle.

9. In a warp thread drawing-in machine, the combination of a rotatable needle winding drum having a cylindrical needle supporting surface, a needle guide arranged with its effective guiding axis tangential to said surface, a flat flexible drawing-in needle including a portion adapted to be wound upon and to be unwound from said surface and, during unwinding, to move tangentially therefrom into effective engagement with said guide, and means for rotating the drum to unwind wound portions of the needle and to advance the same through said guide including a flexible strap having one end secured to the drum and intermediate portions wound upon said drum coextensively and in overlying engagement with wound-on portions of the needle, and means adapted and positioned to pull said strap longitudinally in a direction whereby it causes said drum to rotate to unwind the needle therefrom and progressively disengages the needle substantially at the line of tangence of the latter with said cylindrical surface of the drum.

10. In a warp thread drawing-in machine, the combination of a rotatable needle winding drum having a cylindrical needle supporting surface, a needle guide arranged with its effective guiding axis tangential to said surface, a flat flexible drawing-in needle including a portion adapted to be wound upon and to be unwound from said surface and, during unwinding, to move tangentially therefrom into effective engagement with said guide, and means for rotating the drum to unwind wound portions of the needle and to advance the same through said guide including a tension member having an end portion secured to the drum and intermediate portions wound upon the drum and overlying wound-on portions of the needle, and means for pulling said member endwise to press radially upon the wound portions of the needle and to cause needle unwinding rotation of the drum.

11. Apparatus according to claim 9 and in which a strap winding drum is arranged and adapted to pull said strap longitudinally and is mounted with its periphery spaced from the periphery of the needle winding drum by the thickness of the flexible strap.

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