Nov. 20, 1962 G. PIAZZOLLA ETAL 3,064,689

WEAVING DEVICE FOR BANDS, BELTS AND LIKE ARTICLES

Filed Feb. 23, 1960 6 Sheets-Sheet 1

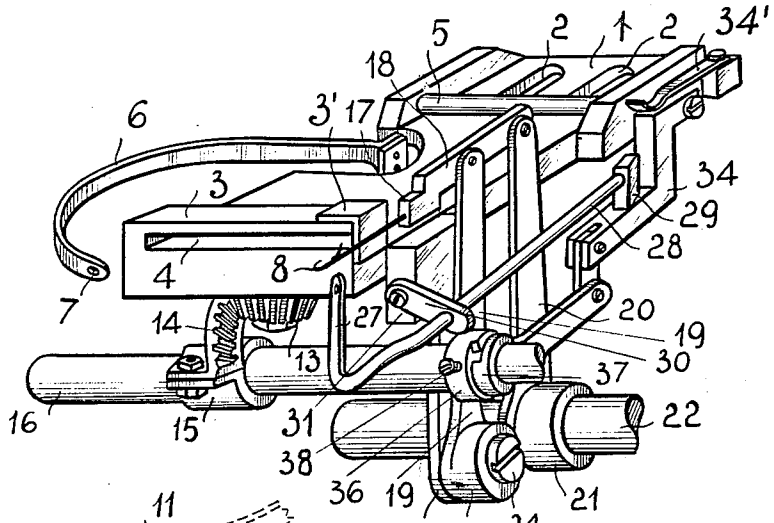



FIG. 1

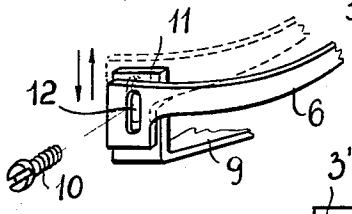



FIG. 2

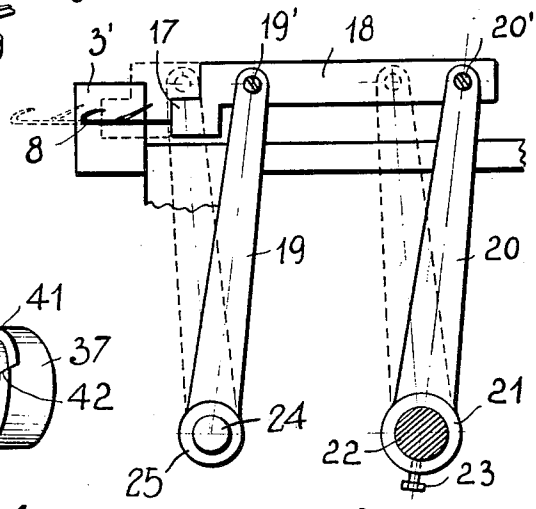



FIG. 3

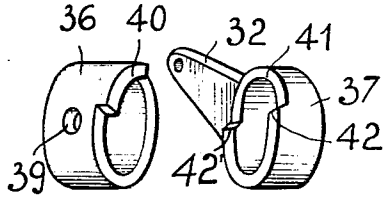



FIG. 4

INVENTORS:
Giovanni Piazzolla
Carlo Villa
by: Michael S. Striker
Attorney

Nov. 20, 1962 G. PIAZZOLLA ETAL 3,064,689

WEAVING DEVICE FOR BANDS, BELTS AND LIKE ARTICLES

Filed Feb. 23, 1960 6 Sheets-Sheet 2

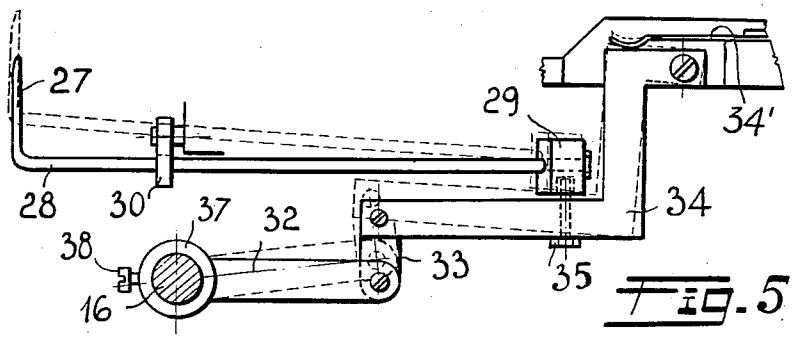



FIG. 5

INVENTORS
Giovanni Piazzolla
Carlo Villa
by: Michael S. Striker
Attorney

Nov. 20, 1962 G. PIAZZOLLA ETAL 3,064,689

WEAVING DEVICE FOR BANDS, BELTS AND LIKE ARTICLES

Filed Feb. 23, 1960 6 Sheets-Sheet 3

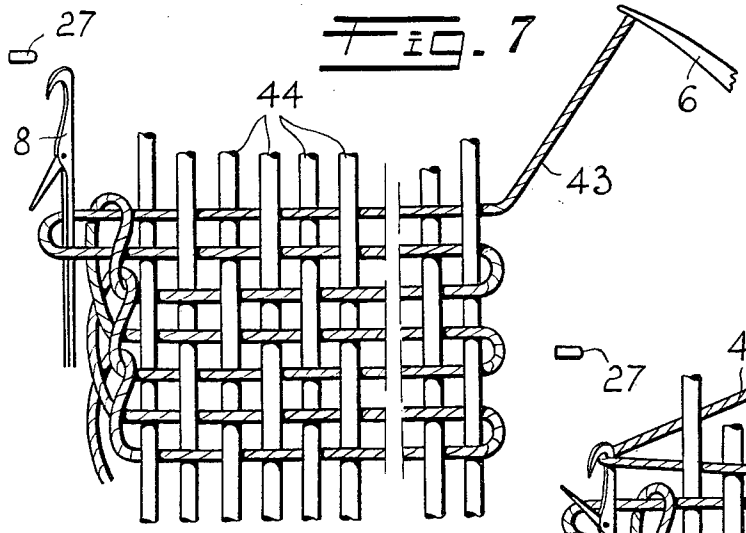



Fig. 7

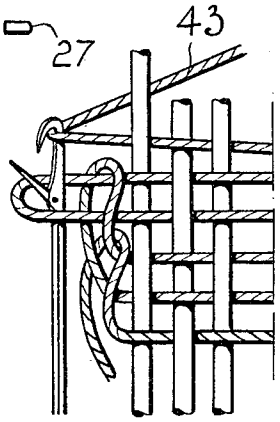



Fig. 9

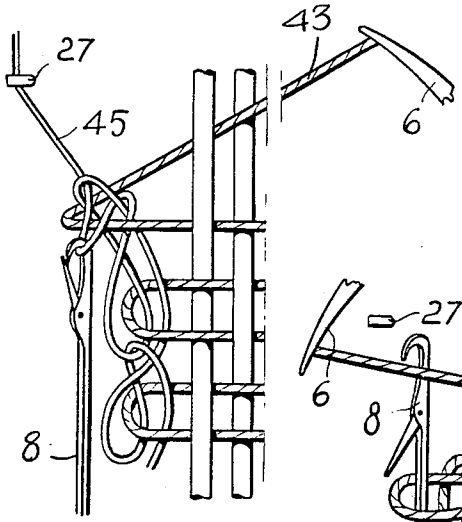



Fig. 6

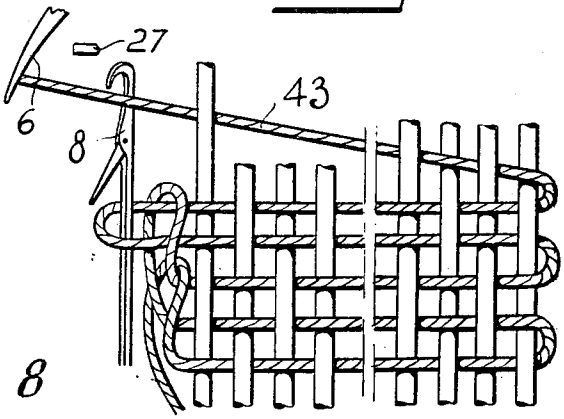



Fig. 8

INVENTORS
Giovanni Piazzolla
Carlo Villa
by: Michael S. Striker
Attorney

Nov. 20, 1962 G. PIAZZOLLA ETAL 3,064,689

WEAVING DEVICE FOR BANDS, BELTS AND LIKE ARTICLES

Filed Feb. 23, 1960 6 Sheets-Sheet 4

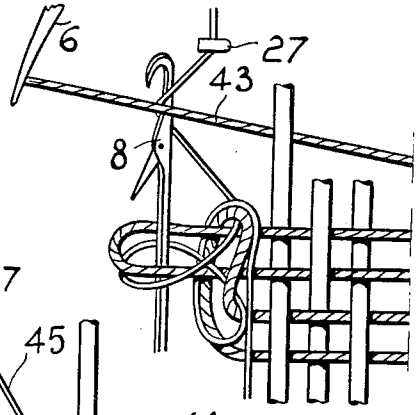



Fig. 12

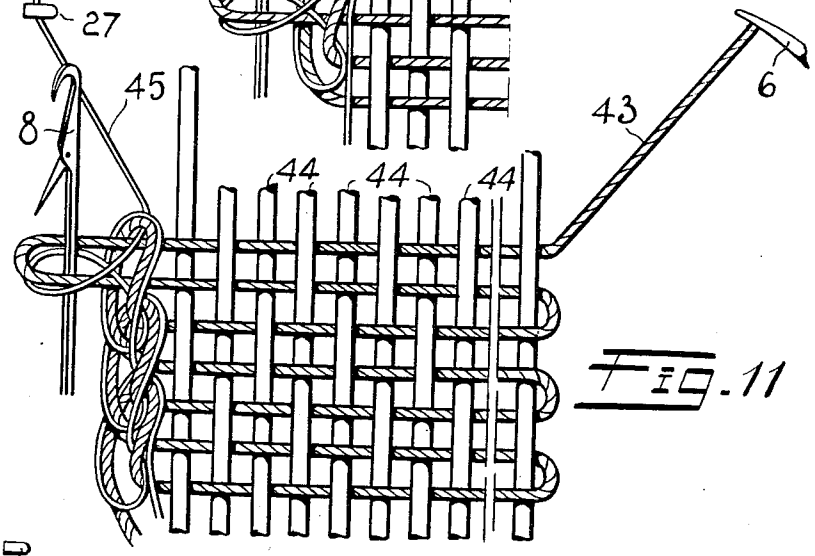



Fig. 11

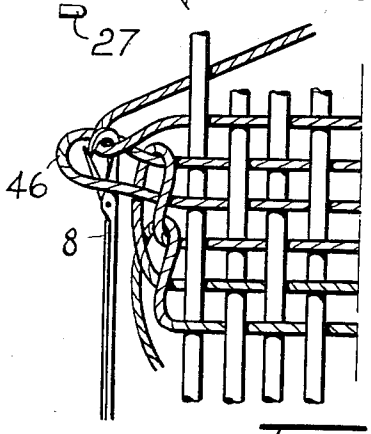



Fig. 10

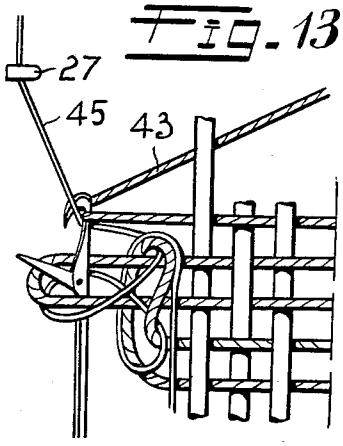



Fig. 13

INVENTORS
Girolamo Piazzolla
Carlo Villa
by: Michael S. Striker
Atty

Nov. 20, 1962 G. PIAZZOLLA ETAL 3,064,689

WEAVING DEVICE FOR BANDS, BELTS AND LIKE ARTICLES

Filed Feb. 23, 1960 6 Sheets-Sheet 5

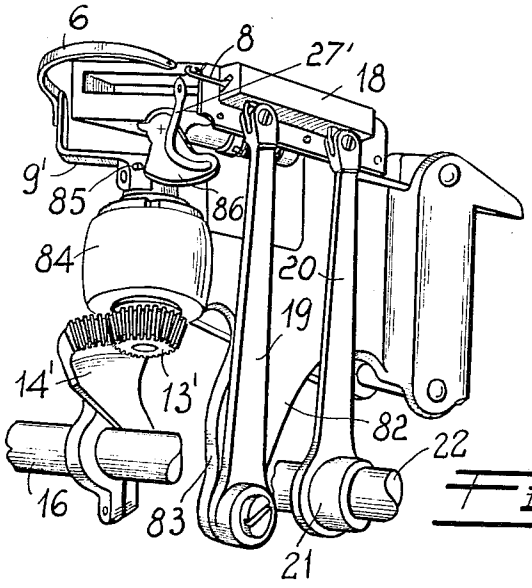



FIG. 15

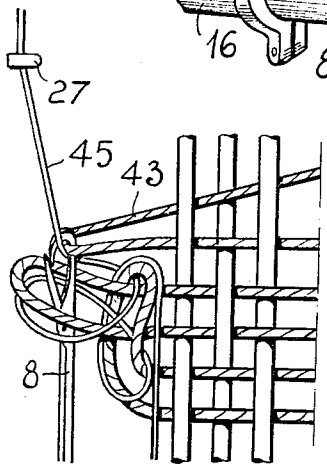



FIG. 14

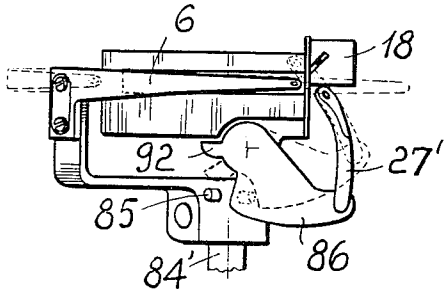



FIG. 16

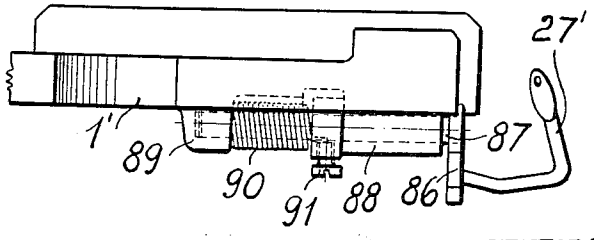



FIG. 17

INVENTORS
Giovanni Piazzolla
Carlo Villa
by: Michael S. Striker
Attorney

Nov. 20, 1962 G. PIAZZOLLA ETAL 3,064,689

WEAVING DEVICE FOR BANDS, BELTS AND LIKE ARTICLES

Filed Feb. 23, 1960 6 Sheets-Sheet 6

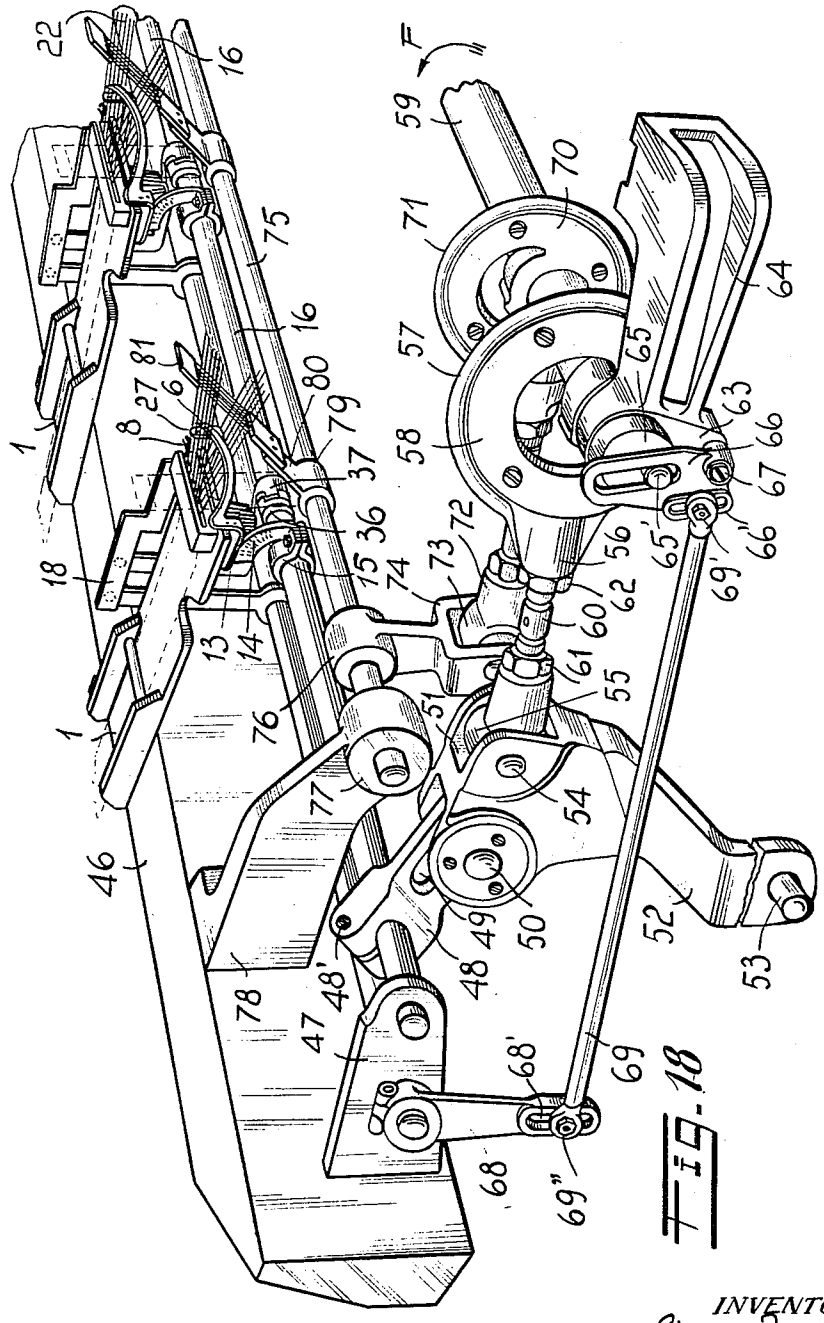



FIG. 18

INVENTORS
Giovanni Piazzolla
Carlo Villa
by Michael C. Striker
Attorney

United States Patent Office

3,064,689

Patented Nov. 20, 1962



3,064,689

# WEAVING DEVICE FOR BANDS, BELTS AND LIKE ARTICLES

Giovanni Piazzolla, Milan, and Carlo Villa, Melzo, Milan, Italy, assignors to Brevitex Etablissement pour l'Exploitation de Brevets Textiles, Vaduz, Liechtenstein

Filed Feb. 23, 1960, Ser. No. 10,148
Claims priority, application Italy Feb. 26, 1959
10 Claims. (Cl. 139—124)

The invention relates to improvements of a needle loom of the type particularly adapted for the manufacture of narrow fabrics, such as bands, belts and the like.

Some of the known needle looms can be operated only with great difficulty to weave thick threads as required, for manufacturing bands of hemp, jute, plastic and the like materials.

A first object of this invention is to provide a weaving device that is capable of tying the weft threads with a subsidiary selvedge thread which can be much thinner than the fabric threads, so that it is possible to weave the fabric of thick threads, such as hemp, jute, and plastic threads without a thicker selvedge.

Another object of this invention is to provide a device by means of which three weft binding forms can be obtained, viz.: the tying with a selvedge thread alone; the tying with the weft thread alone; and the tying of the weft thread together with a selvedge thread.

A further object of the invention is to provide a weaving device for the manufacture of bands, belts, and the like, which device can be mounted onto conventional weaving looms, and with which very high speeds of working can be obtained.

Still a further object of the invention is to provide a driving apparatus capable of controlling at a high working speed, for example at 600–1000 beats per minute, a series of band weaving devices mounted on a conventional loom.

In order to attain said objects, a first improvement is attained by a knitting needle which is disposed to oscillate along an arcuate path of limited amplitude. A reciprocable parallelogram linkage permits high frequency oscillations, since friction and shocks are avoided.

A second improvement is attained by the fact that the knitting needle travels above the weft thread at the end of the inserting stroke of a weft inserting needle, just as said weft thread is wholly inserted between the warp threads.

Still another improvement is attained by a thread guiding member driven by the same shaft which provides the movement of the weft thread inserting needle, so as to synchronize the movement of the thread guiding member with that of said weft thread inserting needle, whereby said thread guiding member will be raised above the weft thread only when the weft thread inserting needle or member has inserted said weft thread, thus avoiding any interference between the moving members.

According to a first embodiment of the invention, the thread guiding member is controlled by a regulating device that allows the synchronizing, at will, of the movement of said thread guiding member with the movement of the weft thread inserting member, and the movement of the knitting needle that ties the weft into a selvedge.

According to a second embodiment, the thread guiding member is supported by a swinging reciprocable support means moved by the means supporting the weft thread inserting needle. This second embodiment is suited for very high working speeds, for example 800 to 1000 beats per minute.

Preferably, a beating device for the weft is provided, the purpose of which is to eliminate the batten of conventional looms, and which permits very high beating speeds.



Other objects and advantages will become more fully apparent as reference is had to the accompanying drawings, wherein the invention is illustrated and in which:

FIG. 1 is a perspective view of the device of the invention, according to a first embodiment;

FIG. 2 is a perspective view which shows the method of fastening the weft thread inserting needle on its supporting arm;

FIG. 3 is a side view which represents the mechanism provided for oscillating the selvedge forming needle;

FIG. 4 is a perspective view which shows the elements provided for the synchronization of a subsidiary thread guiding member in accordance with the embodiment of FIG. 1;

FIG. 5 is a side view which shows the mechanism for operating the subsidiary thread guiding member;

FIG. 6 is a plan view illustrating an operational position of the device during a selvedge formation carried out by knitting loops of a selvedge thread;

FIGS. 7, 8, 9 and 10 are plan views which illustrate successive positions of the weaving device for the formation of a selvedge by knitting loops of the weft thread;

FIGS. 11, 12, 13 and 14, are plan views which represent successive working steps of the device for forming a selvedge by knitting the weft thread together with a subsidiary selvedge thread;

FIG. 15 is a perspective view which shows a weaving device for bands, belts and like articles according to this invention, in accordance with another embodiment;

FIGS. 16 and 17 are respectively a front view and a side view of details of the embodiment of the device shown in FIG. 15; and

FIG. 18 is a perspective view of the apparatus for the control of a series of weaving devices mounted on a conventional loom.

As shown in FIG. 1, the weaving device for the production of bands, belts and like articles, comprises a plate **1** having slots **2** at its rear portion, through which screws are introduced in order to fasten said plate to a cross-bar. Said plate has a front part **3** that has a slot **4** whose bottom is located in the plane of the plate. The finished woven band, belt or the like article is guided in slot **4** of part **3** which serves as a warp holding means, and, travelling on a roller **5**, is wound up on a take-up beam, not shown, at a certain distance from the device itself. Slot **4** is closed on its right side by means of a plate **3'** that projects for the whole thickness of its vertical wall and forms a stop for the loops which are formed directly before it in order to aid the separation of the selvedge forming needle **8** from said loops. At one side of plate **1**, there is disposed the weft thread inserting member or needle **6** which performs a transverse reciprocating movement in order to be inserted between the warp threads that open forwardly of the warp holding means **3, 4**. The weft thread inserting member or needle **6** has at its end a hole **7** for the passage of the weft thread that is inserted during the movement of said inserting member or needle **6** into the warp shed, and moves in the horizontal plane of slot **4**.

As shown in FIG. 2, the weft inserting needle **6** is mounted on an arm **9** of a reciprocable support means by means of a screw **10** that engages a threaded hole in a projecting wall portion **11** of said arm, and traverses an elongated hole **12** in one end portion of the welf inserting needle **6**. Screw **10** serves as an adjusting means for varying the level the plane in which needle **6** moves so that it is possible to let the weft thread, held by needle **6**, pass immediately above or immediately below the level of the selvedge forming needle **8**.

The arm 9 is keyed on the shaft of a bevel gear 13 that receives a rotating reciprocating movement from a toothed segment 14 fastened by a ring shaped clamp 15 to an oscillatable control shaft 16 which is driven to perform a rotary reciprocating movement. The shaft of bevel gear 13 has an axis substantially passing through the center of curvature of the curved needle 6.

Referring now to FIGS. 1 and 3, the needle 8 is mounted on the projection 17 of a horizontal link 18 of an articulated parallelogram linkage formed by link 18, and by two parallel levers 19 and 20 that are articulated to link 18 by pivot screws 19' and 20', respectively.

The lever 20 is fixed, by means of a sleeve 21, to an oscillatable control shaft 22 driven in a rotary reciprocating movement through small angular displacements, shaft 22 being engaged by a screw 23 that passes through a radial hole of sleeve 21. Lever 19 oscillates about a pivot 24 passing through a sleeve 25, said pivot being fastened by screws to a bracket 26 depending downwardly from plate 1. Due to the oscillations of shaft 22, the parallelogram linkage will make oscillations that cause the link 18 to effect an arcuate reciprocating movement, providing thus a reciprocable support means for needle 8 as shown by dotted lines in FIG. 3.

Referring now to FIGS. 1, 4 and 5, a subsidiary thread guiding member or means 27 is disposed on the raised end of an elongated rod 28 that terminates at a swinging block 29 and passes through a hole of a lever 30 which is reciprocable about a pivot fastened to a small block 31 which is secured to plate 1. Said rod 28 may be constrained, by the lever 30, to move along part of an imaginary conical surface so that thread guiding member 27 travels along an arcuate trajectory and, while raising, passes from one side to the other of the axis of the needle 8 in order to lay the thread guided thereby onto said knitting needle, as will be explained hereinafter.

The movement of the rod 28 is derived from shaft 16 that causes the oscillation of a lever 32 which, through a crank 33, raises an elbow arm 34 on which the small block 29 is mounted turnable about a pivot 35. The amplitude of the oscillation of the reciprocable support means 32, 33, 34, 29, and the synchronism of said oscillation with the oscillation of the needle 8, and the movement of the weft inserting needle 6, is obtained by two coupling sleeves 36 and 37, both mounted on shaft 16. Sleeve 36 is fixed on said shaft 16 by means of a screw 38 located in the radial hole 39 of sleeve 36 while sleeve 37 is freely turnable on said shaft and is integral with the lever 32. The sleeve 36 has, at its end confronting the sleeve 37, a projection 40 extending for a small circular arc, and capable of performing an oscillating movement within a cutout portion 41 of sleeve 37, such cutout portion extending over a wider arc than projection 40, so that when the shaft 16 makes its reciprocating movement, projection 40 is moved between the limits of the cutout portion 41 until blocked off by the step 42 or the step 42', causing in this manner the reciprocation of the sleeve 37. The movement of the sleeve 37 covers a much lesser angle than that of the sleeve 36. Of course, by suitably positioning sleeve 36 with respect to the sleeve 37, it is possible to vary the timing of the movement of the sleeve 37 with respect to the movement of the needle 8, and the movement of the weft thread inserting needle 6, and it is furthermore posside to avoid any movement of said sleeve 37, by removing screw 38, and rendering the sleeve 36 idle. The arm 34 is raised against the resistance of leaf spring 34' biassing arm 34 to move to its lowest position, when not submitted to the action of the lever 32.

FIG. 6 shows an operational position of the device when the weft thread is tied only by a subsidiary selvedge thread. In the position of FIG. 6, the weft thread inserting needle 6 has almost terminated its return travel, the selvedge knitting latch needle 8 is completely retracted after knitting a loop about weft thread 43, while thread guiding member 27 has returned to its starting position.



FIGS. 7, 8, 9 and 10 illustrate successive steps of the operation of the device if the selvedge is formed by knitting the weft thread only. In the position of FIG. 7, the selvedge needle 8 is fully advanced, while the thread inserting needle 6 begins its travel within the warp shed in order to insert the weft thread 43. In this case, the thread inserting needle 27 is not used, and therefore it remains always in its rest position. The adjusting means 10, 11, 12 of needle 6 is adjusted to raise needle 6 to a position located at a higher level than needle 8 so that weft 43 is carried by needle 6 over and above needle 8. Consequently, when the selvedge knitting needle 8 returns in an arcuate movement, it is raised sufficiently in order to catch the weft thread 43, thus drawing it backwards, and drawing it to pass through the previously formed loop (FIGS. 9 and 10). When the knitting needle 8 has moved out of the preceding loop 46, drawing with it the weft thread 43, it returns in forward direction in order to form a second loop in accordance with the movement of the weft thread inserting needle 6.

FIGS. 11, 12, 13 and 14 illustrate the operation in which the selvedge edge of the band is provided by knitting the weft thread together with a subsidiary or reinforcing selvedge thread. In this case the support means of the weft thread inserting needle 6 is adjusted so that the weft thread 43 is moved above the knitting needle 8. When the weft thread inserting needle 6 is advanced within the warp shed, and weft thread 43 passes over the hook of the knitting needle 8, thread guiding member 27 (FIG. 12) is moved to its upper position and to the other side of the knitting needle 8 to lay the subsidiary selvedge thread onto said knitting needle 8, so that when the knitting needle 8 returns to its starting position, it will catch at the same time (FIG. 13) the subsidiary selvedge thread 45, and the weft thread 43, so that said two threads 43 and 45 will be guided into the preceding loop, while weft inserting needle 6 is moved out of the warp shed. Now, after said threads have been knitted in the aforesaid manner, the knitting needle 8 moves forward, after the thread guiding member 27 has gone back to its starting position (FIG. 11).

The selvedge of the weft thread obtained by loop knitting the sole subsidiary thread only, as shown in FIG. 6, is advantageous when bands, belts or like articles made of thick threads, e.g. hemp, jute, plastic threads and like materials, have to be manufactured, and a very thin subsidiary thread can be used so that a noticeable increase of thickness will be avoided at the selvage edge of the band.

The tying of the weft by knitting the weft thread only is best suited for bands of fine quality, made of silk, flax, and the like. The binding of the weft thread together with a reinforcing or subsidiary thread is best if bands are to be manufactured with a reinforced or thicker selvage, for example for slide fasteners.

The modified embodiment of FIGS. 15, 16 and 17 employs a different method of controlling the thread guiding member 27', and is particularly suited for operations where the working speed is over 800 beats per minute, where the rod 28 of FIGS. 1 and 5 could not be used on account of the whip lash to which it would be subjected, and of considerable working stresses which would break it. According to this embodiment, the weaving device has a vertical plate 82, shaped in such a way as to form a bracket 83 for pivotally mounting a lever 19, and another forwardly-extending bracket 84 which supports a small shaft 84' oscillated by the bevel gear 13' driven by the shaft 16 through the toothed segment 14', and causing an arm 9' which supports the weft thread inserting needle 6'. On said supporting arm 9' there is fastened a pawl 85 performing an oscillating angular movement together with arm 9'. Said pawl acts on a swinging arm 86 supporting the thread guiding member 27'. Said swinging arm 86 is secured to a pivot 87 so as to rotate together with said pivot relative

to a bushing 88 disposed underneath the horizontal plate 1' of the device. Said pivot 87 projects from the opposite side of bushing 88, into an end bearing 89, and is surrounded by a helicoidal spring 90 located in the space between said end bearing and the bushing 88, said spring having one end fastened beneath the plate 1', and the other end anchored on a projecting collar of said pivot 87, and fastened by means of a screw 91. The purpose of this spring is to urge downwards said swinging arm 86 downward into its position, together with thread guiding member 27'.

When weft thread inserting needle 6', is in its stroke end position, outside of the warp threads, it is spaced from said swinging arm 86 a certain angle so as to come into contact with said swinging arm only when the weft inserting needle 6' has travelled the greater portion of its inserting stroke so that, when the swinging arm is displaced by the pawl 85, the weft thread has already passed over thread guiding member 27', which can move upward within the space between the needle 6', and the weft thread, without any danger of interfering with thread guiding member 27' and the weft thread.

Spring 90 retracts the swinging arm 86 downwards, together with the thread guiding member 27'. The lower position of the swinging arm 86 is defined by a stop means 92 which stops the return stroke of said swinging arm due to the action of the spring 90, and determines the distance between said swinging arm and the pawl 85, in their respective rest positions.

As it may be seen in FIGS. 15, 16 and 17, the control means of the thread guiding member is reduced to a swinging arm of little weight and having small inertia so that the same may be subjected to an oscillating movement of considerable frequency. The other parts of the embodiment of FIG. 15 operate in the manner described with reference to FIGS. 1 and 3. The parallelogram linkage 18, 19, 20 is reciprocated by a shaft 22 to which the sleeve portion 21 of lever 20 is secured, as shown in FIG. 3.

FIG. 18 shows the apparatus for simultaneously controlling a series of needle loom devices of the type illustrated in FIG. 1 or 15. On an elongated beam 46 there are mounted, side by side, several weaving devices, generally limited in their number by the length of said beam 46. Only two of said devices are shown in FIG. 18, it being understood that a much greater number of said devices will be simultaneously used.

At each end of the beam 46 there is disposed a supporting member 47 that holds the oscillatable control shaft 16 for driving the weft thread inserting needle 6, the thread guiding member 27, and the oscillatable control shaft 22 that controls the knitting latch needle 8.

An arm 48 is mounted on shaft 16 and fixed thereon by means of a screw 48'. Said arm is provided with an elongated longitudinal slot 49 through which a pivot 50 passes, said pivot being held by a mobile fork-shaped member 51 held by an arm 52 that rotates about a fixed pivot 53 at the lower end portion. Member 51 also carries a pivot 54 that passes through the sleeve 55 at the end portion of a ram rod 56 formed of two parts joined by a threaded means 60 by means of which said two parts can be moved toward and away from each other so as to change the length of said ram rod. The adjusted position of said two parts can be fixed by means of nuts 61 and 62. The head 57 of the rod 56 is mounted on an eccentric 58 that rotates with the motor driven main shaft 59. Upon rotation of the eccentric 58 the rod 56 makes a reciprocating movement thus causing the arm 52 to oscillate with pivot 50, which, sliding within the slot 49 of the arm 48, oscillates arm 48 in a vertical plane, causing angular oscillation of control shaft 16. Members 58, 56, 60, 52, 50, 48 constitute an adjustable transmission means connecting main shaft 59 with control shaft 16. The amplitude of oscillation of arm 48, and therefore the angle of rotation of shaft 16, can be varied by varying the stroke of the first 50 within the slot 49, by changing the length of the rod 56 in the aforesaid manner. The variation in the length of rod 56 also serves to determine the end positions of the angular stroke of the arm 48, and therefore to synchronize the phase of the oscillating movement of the shaft 16 with the movements of the other shafts, that is to say to synchronize the movement of the weft thread inserting needle 6 with the motions of the selvedge-knitting latch needle 8.



Shaft 22 is oscillated by a crank lever 68, which is moved through a rod by a slotted link 66 oscillating about a pivot 67, and driven through by a pivot 65' which is eccentrically fixed on a wheel 65 mounted at the end of main shaft 59, which is supported by a bearing support 63, on a fixed arm 64.

The amplitude and the phase of the oscillation of the crank lever 68, and therefore of the oscillation of the shaft 22, can be adjusted by varying the position of the rod 69 which, to this end, has openings at both ends, wherein pivots 69' and 69'' can be disposed and fixed in any corresponding position along a slot 66' provided on the slotted link 66, and along a slot 68' on the crank lever 68. Members 65, 66, 68, 69 constitute an adjustable transmission means connecting main shaft 59 with control shaft 22.

Supposing that main shaft 59 rotates in the sense indicated by arrow F, it is evident that the slotted link 66 moves faster during its stroke in one direction while pivot 65' engages the slot in its portion nearer to the pivot 67, and slower during its stroke in the opposed sense, that is when the pivot 65' engages the slot more distant from the pivot 67. As a consequence, shaft 22, by means of the rod 69 and of the crank lever 68, will be angularly moved in one sense more rapidly than in the opposite sense of rotation. The faster rotation of shaft 22 corresponds to movement of the needle 8 toward the weft thread, while the slower rotation corresponds to the return stroke of needle 8, in order to assure the catching of the weft thread or of the selvedge thread by said needle 8, and to facilitate the formation of the loops forming the selvedge.

A second eccentric 70 is provided on the driving shaft 59 spaced from eccentric 58, and surrounded by the head 71 of a ram rod 72 that is also adjustable in its length. The end 73 of said ram rod is articulated in a forked member 74 which effects oscillation of an actuating shaft 75 and is keyed on said shaft by a key in a sleeve 76. Members 70, 71, 72, 73, 74 constitute an adjustable transmission means connecting main shaft 59 with actuating shaft 75. Shaft 75 is supported by a supporting element 77 held by a fixed arm 78.

For each needle loom device, a sleeve 79 is provided an actuating shaft 75 having a projection or wing 80 receiving a comb 81 through which the warp threads are guided. Each one of said combs is a means for beating the weft of the respective needle loom device after said weft has been inserted by the weft thread inserting needle 6. The adjustment of the length of the rod 72 allows the regulation of the extreme limits of the oscillation stroke of the weft beating means 81. The weft beating device formed by single combs of little weight and limited angular movement, replaces a conventional batten which cannot be operated at high working speeds due to its great mass and cannot beat uniformly the wefts of all weaving devices because, above a certain high speed, it is subjected to elastic vibrations during the beating of the wefts. On the other hand, single combs are of limited mass and can be operated at high speeds; furthermore, a uniform beating of all the wefts depends only the adjustment of the positions of said combs on the actuating shaft 75.

Of course, this invention can be realized in different forms, with different but equivalent means compared with those dissolved in this specification, and represented in the attached drawings.

What we claim is:

1. A needle loom, comprising, in combination, warp holding means for holding a set of warps; a latch needle located on one side of said warp holding means; a reciprocable support means for reciprocating said latch needle to and from an advanced position; a weft inserting needle having an end portion for guiding a double length of a weft into sheds of the warps; a reciprocable support means supporting said weft inserting needle and including adjustable means for mounting said weft inserting needle in said first position for reciprocation in a plane located above, and in a second position for reciprocation in a plane located below said latch needle to and from a loop-forming position located on the side of said latch needle remote from said warp holding means so as to form a weft loop on said one side of said warp holding means; thread guiding means located on said one side of said warp holding means for positioning a selvedge thread relative to said latch needle; a reciprocable support means supporting said thread guiding means for movement between a first position located between said end portion and said latch needle and below said needles, and a second position located between said latch needle and said warp holding means and above said latch needles; and drive means for reciprocating said three above mentioned reciprocable support means in timed relation so that, when said weft inserting needle is in said first or second position, said latch needle forms of said selvedge thread chain loops passing through said weft loops, and so that said latch needle also forms loops of the wefts when said weft inserting needle is in said first position.

2. A needle loom, comprising, in combination, warp holding means for holding a set of warps; a latch needle located on one side of said warp holding means and having an upwardly directed latch; a reciprocable support means including a parallelogram linkage having a pair of turnable parallel levers and a horizontal link connecting the ends of said levers, said link supporting said latch needle for reciprocating said latch needle parallel to itself to and from an advanced position along a curved path so that said latch needle is raised when moving out of said advanced position; a weft inserting needle having an end portion for guiding a double length of a weft into sheds of the warps; a reciprocable support means supporting said weft inserting needle and including adjustable means for mounting said weft inserting needle in a first position for reciprocation in a plane located above, and in a second position for reciprocation in a plane located below said latch needle to and from a loop-forming position located on the side of said latch needle remote from said warp holding means so as to form a weft loop on said one side of said warp holding means; thread guiding means located on said one side of said warp holding means for positioning a selvedge thread relative to said latch needle; a reciprocable support means supporting said thread guiding means for movement between a first position located between said end portion and said latch needle and below said needles, and a second position located between said latch needle and said warp holding means and above said latch needle; and drive means for reciprocating said three above mentioned reciprocable support means in timed relation so that, when said weft inserting needle is in said first or second position, said latch needle forms of said selvedge thread chain loops passing through said weft loops, and so that said latch needle also forms chain loops of the wefts when said weft inserting needle is in said first position.

3. A needle loom, comprising, in combination, warp holding means for holding a set of warps; a latch needle located on one side of said warp holding means; a reciprocable support means for reciprocating said latch needle parallel to itself to and from an advanced position; a weft inserting needle having an end portion for guiding a double length of a weft into sheds of the warps; a reciprocable support means supporting said weft inserting needle and including adjustable means for mounting said weft inserting needle in a first position for reciprocation in a plane located above, and in a second position for reciprocation in a plane located below said latch needle to and from a loop-forming position located on the side of said latch needle remote from said warp holding means so as to form a weft loop on said one side of said warp holding means; thread guiding means located on said one side of said warp holding means for positioning a selvedge thread relative to said latch needle; a reciprocable support means supporting said thread guiding means for movement between a first position located between said end portion and said latch needle and below said needles, and a second position located between said latch needle and said warp holding means and above said latch needle; and drive means for reciprocating said three above mentioned reciprocable support means in timed relation so that, when said weft inserting needle is in said first or second position, said latch needle forms of said selvedge thread chain loops passing through said weft loops, and so that said latch needle also forms chain loops of the wefts when said weft inserting needle is in said first position, and so that said latch needle forms only chain loops of said wefts when said weft inserting needle is in said first position and said thread guiding means is rendered inoperative.

4. A needle loom, comprising, in combination, warp holding means for holding a set of warps; a latch needle located on one side of said warp holding means; a reciprocable support means for reciprocating said latch needle parallel to itself and from an advanced position; a weft inserting needle having an end portion for guiding a double length of a weft into sheds of the warps; a reciprocable support means supporting said weft inserting needle and including adjustable means for mounting said weft inserting needle in a first position for reciprocation in a plane located above, and in a second position for reciprocation in a plane located below said latch needle to and from a loop-forming position located on the side of said latch needle remote from said warp holding means so as to form a weft loop on said one side of said warp holding means; thread guiding means located on said one side of said warp holding means for positioning a selvedge thread relative to said latch needle; a reciprocable support means supporting said thread guiding means for movement between a first position located between said end portion and said latch needle and below said needles, and a second position located between said latch needle and said warp holding means and above said latch needle; drive means for reciprocating said three above mentioned reciprocable support means in timed relation so that, when said weft inserting needle is in said first or second position, said latch needle forms of said selvedge thread chain loops passing through said weft loops, and so that said latch needle also forms chain loops of the wefts, when said weft inserting needle is in said first position; and means for disconnecting said support means of said thread guiding means from said drive means so that said thread guiding means is rendered inoperative whereby said latch needle forms only chain loops of said wefts when said weft inserting needle is in said first position.

5. A needle loom, comprising, in combination, warp holding means for holding a set of warps; a latch needle located on one side of said warp holding means; and having an upwardly directed latch; a reciprocable support means including a parallelogram linkage having a pair of turnable parallel levers and a horizontal link connecting the ends of said levers, said link supporting said latch needle for reciprocating said latch needle parallel to itself to and from an advanced position along a curved path so that said latch needle is raised when moving out of said advanced position; a weft inserting needle having an end portion for guiding a double length of a weft into sheds of the warps; a reciprocable support means supporting said weft inserting needle and including adjustable means for mounting said weft inserting needle in a

first position for reciprocation in a plane located above, and in a second position for reciprocation in a plane located below said latch needle to and from a loop-forming position located on the side of said latch needle remote from said warp holding means so as to form a weft loop on said one side of said warp holding means; thread guiding means located on said one side of said warp holding means for positioning a selvedge thread relative to said latch needle, said thread guiding means including an elongated rod having at one end an upwardly projecting finger formed with an opening for the selvedge thread; a reciprocable support including a member turnable about a horizontal axis, a block mounted on said member for turning movement about a vertical axis and supporting the other end of said elongated rod so that the same is movable in vertical and horizontal directions, a lever turnable about a horizontal axis and having a free end connected to a portion of said rod located between said ends, and a drive lever connected to said support for reciprocating the same so that said finger moves along an arcuate path between a first position located between said end portion and said latch needle and below said needles, and a second position located between said latch needle and said warp holding means and above said latch needle; and drive means for reciprocating said drive lever and said reciprocable support means of said latch needle and of weft inserting needle in timed relation so that, when said weft inserting needle is in said first or second position, said latch needle forms of said selvedge thread chain loops passing through said weft loops, and so that said latch needle also forms chain loops of the wefts when said weft inserting needle is in said first position.

6. A loom as set forth in claim 5 wherein said drive means include a shaft, and a lost-motion coupling connecting said drive lever with said shaft and being adjustable for adjusting the stroke of said drive needle.

7. A loom as set forth in claim 6 wherein said lost-motion coupling includes a ring secured to said shaft and being adjustable between a plurality of turned positions, said ring having an axially extending projection, and another ring turnable on said shaft and having an arcuate recess receiving said projection and extending through a longer arc than the same, said other ring being fixedly secured to said drive lever and mounting the same on said shaft.

8. A needle loom, comprising, in combination, warp holding means for holding a set of warps; a latch needle located on one side of said warp holding means and having an upwardly directed latch; a reciprocable support means including a parallelogram linkage having a pair of turnable parallel levers and a horizontal link connecting the ends of said levers, said link supporting said latch needle for reciprocating said latch needle parallel to itself to and from an advanced position along a curved path so that said latch needle is raised when moving out of said advanced position; a weft inserting needle having an end portion of guiding a double length of a weft into sheds of the warps; a reciprocable support means supporting said weft inserting needle and including adjustable means for mounting said weft inserting needle in a first position for reciprocation in a plane located above, and in a second position for reciprocation in a plane located below said latch needle to and from a loop-forming position located on the side of said latch needle remote from said warp holding means so as to form a weft loop on said one side of said warp holding means; thread guiding means located on said one side of said warp holding means for positioning a selvedge thread relative to said latch needle; a reciprocable support means supporting said thread guiding means for movement between a first position located between said end portion and said latch needle and below said needles, and a second position located between said latch needle and said warp holding means and above said latch needle; spring means urging said last mentioned support means to a position in which said thread guiding means is in said first position; and drive means for reciprocating said three above mentioned reciprocable support means in timed relation and moving said last mentioned support means to another position in which said thread guiding means is in said second position so that, when said weft inserting needle is in said first or second position, said latch needle forms of said selvedge thread chain loops passing through said weft loops, and so that said latch needle also forms chain loops of the wefts when said weft inserting needle is in said first position.

9. A multiple weaving arrangement comprising a plurality of needle looms as set forth in claim 2; an elongated beam supporting said needle looms in a row; an actuating shaft extending parallel to said beam; and a plurality of weft beating means secured to said shaft spaced from each other so that each weft beating means is located opposite one of said needle looms for beating the wefts inserted by said weft inserting needles against the crossing warps of the respective shed, each beating means including a comb through which the warps are guided; said actuating shaft being connected to said drive means for operating said weft beating means in timed relation with the movements of said weft inserting needle.

10. An arrangement as set forth in claim 2 wherein said drive means include a first oscillatable control shaft extending parallel to said beam and being operatively connected to said support means of said weft inserting needles and of said thread guiding means of said needle looms for effecting reciprocation of said needles and thread guiding means; a second oscillatable control shaft extending parallel to said beam and being fixedly connected to one of said turnable levers of said parallelogram linkages of said needle looms for reciprocating said latch needles; a main shaft adapted to be driven by a motor; first transmission means connecting said main shaft with said first control shaft and being adjustable for adjusting the angular stroke of said first control shaft; second transmission means connecting said main shaft with said second control shaft and being adjustable for adjusting the angular stroke of said second control shaft; and adjustable third transmission means connecting said main shaft with said actuating shaft.

**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 1,296,025 | Waite | Mar. 4, 1919 |
| 1,604,365 | Mutzberg | Oct. 26, 1926 |
| 2,552,317 | Hart | May 8, 1951 |
| 2,758,614 | Silberman et al. | Aug. 14, 1956 |
| 2,777,470 | Vallaguzza | Jan. 15, 1957 |