

Oct. 17, 1933.

W. COOMBES

1,931,179

MEANS FOR TRAVERSING OR LAYING THREADS, FILAMENTS, AND THE LIKE

Filed Feb. 28, 1929

4 Sheets-Sheet 1

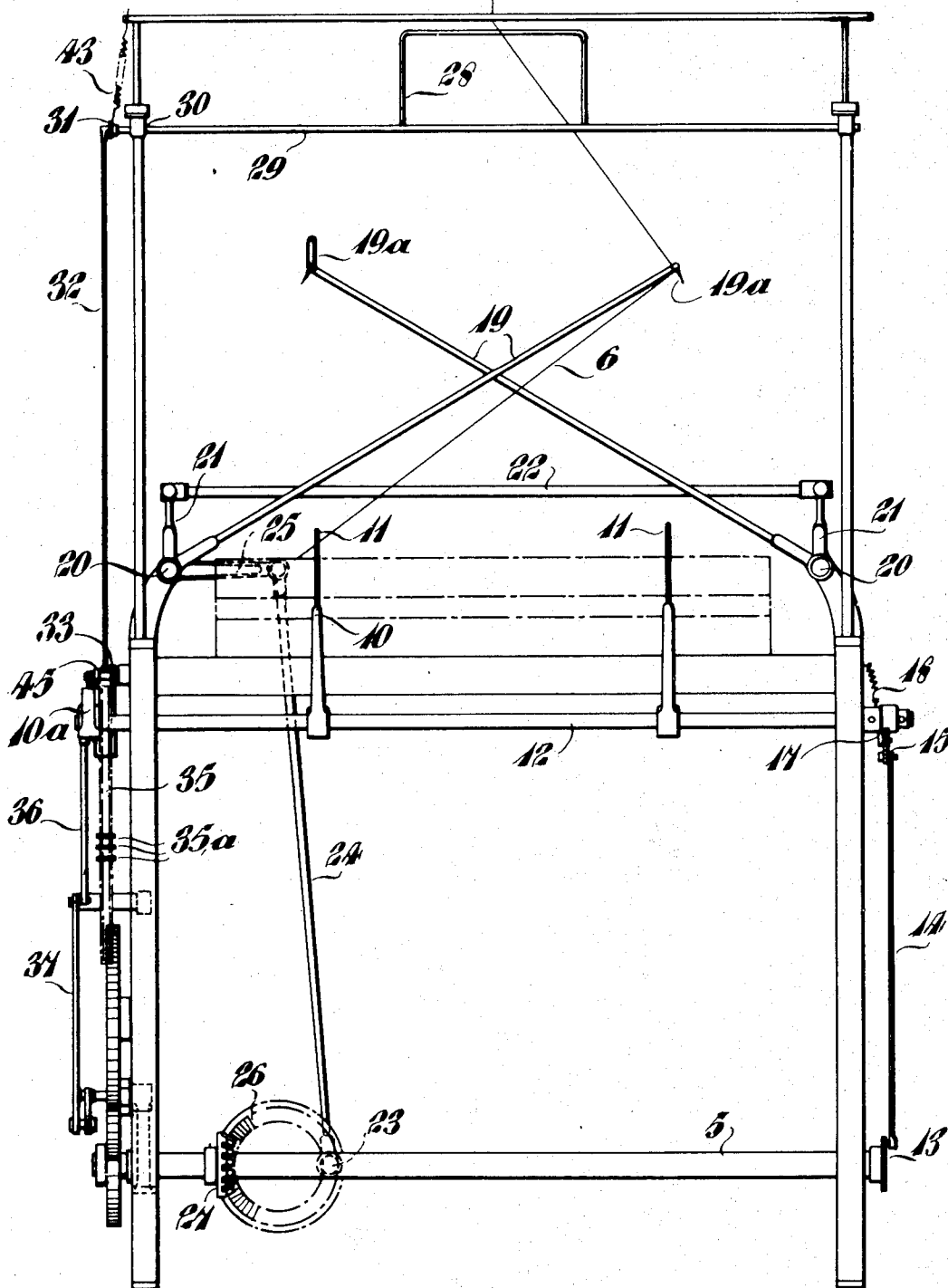


FIG 1.

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4 Sheets-Sheet 2

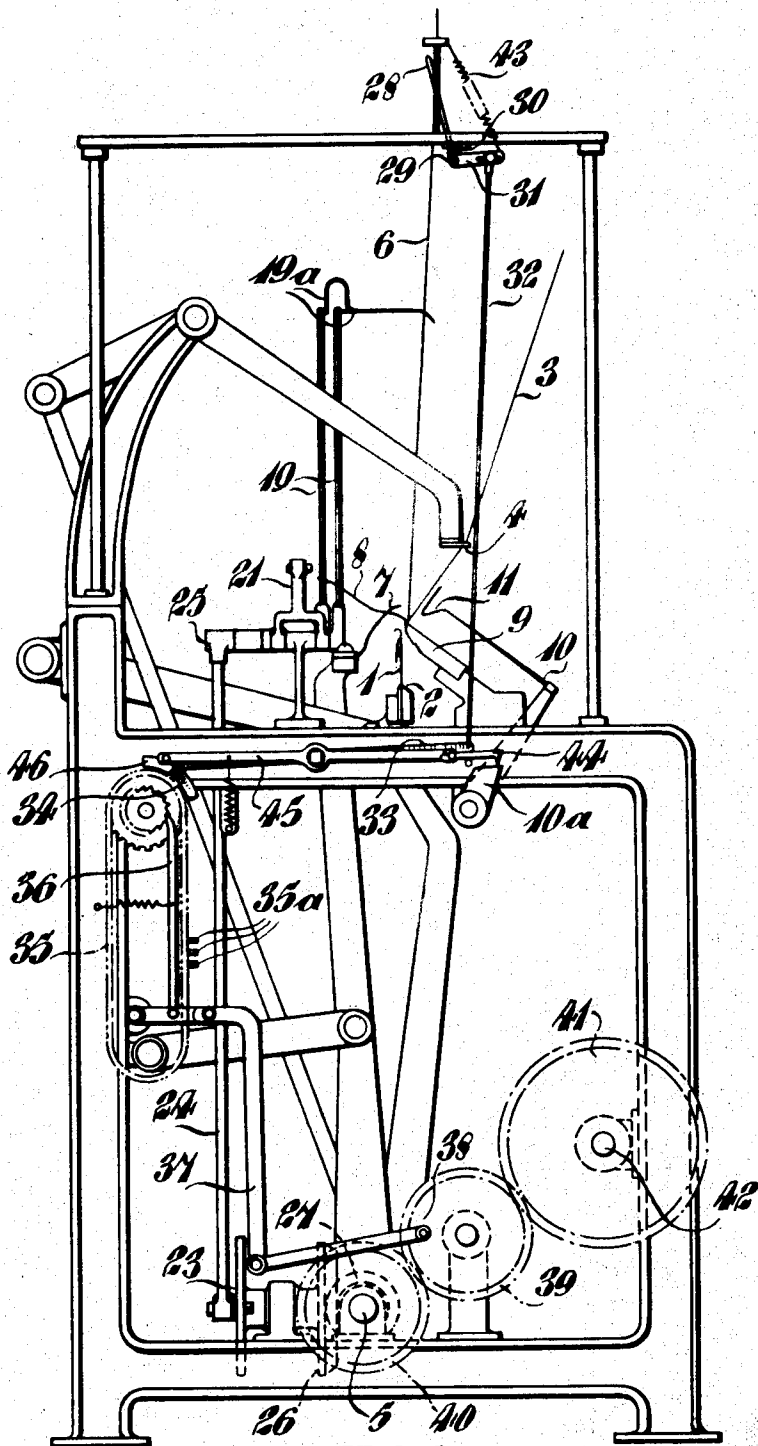


FIG. 2.

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4 Sheets-Sheet 3

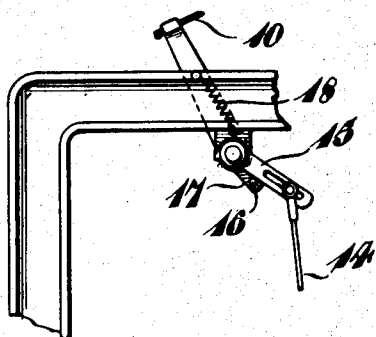


FIG. 3.

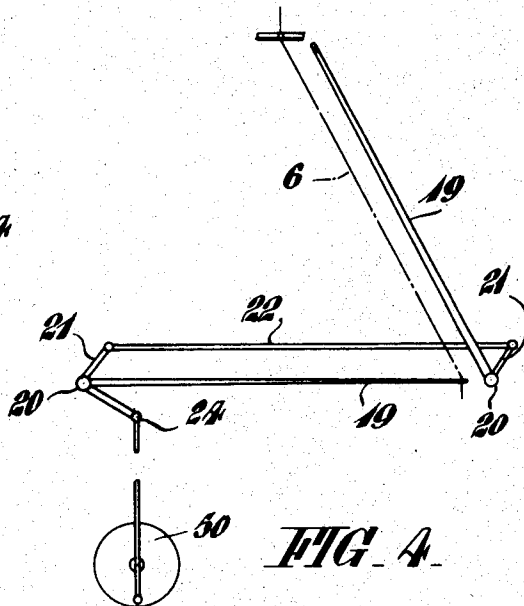


FIG. 4.

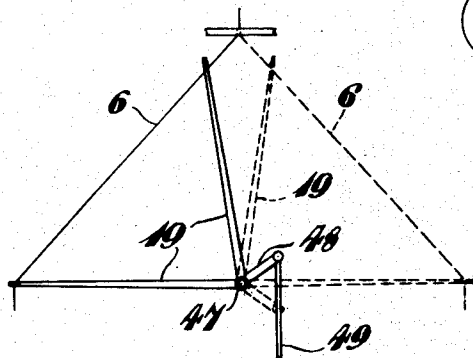


FIG. 5.

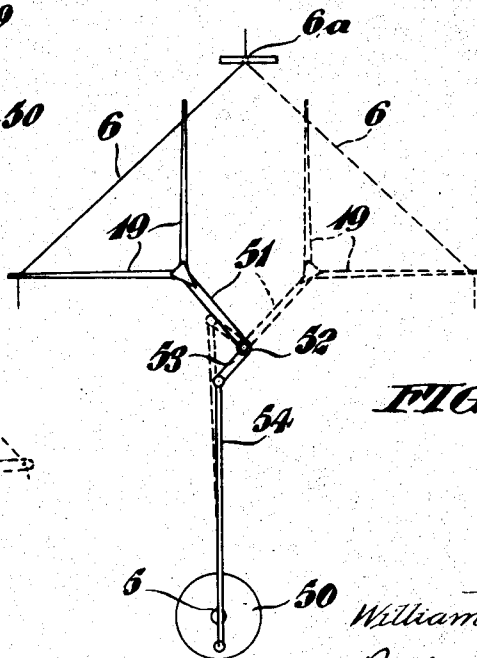


FIG. 6.

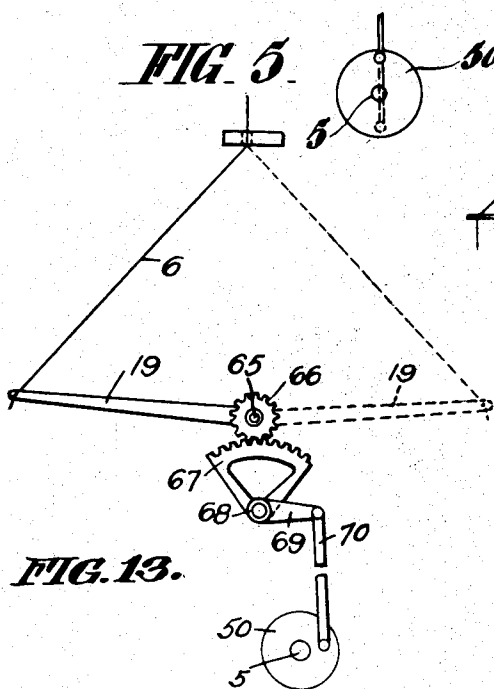


FIG. 13.

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4 Sheets-Sheet 4

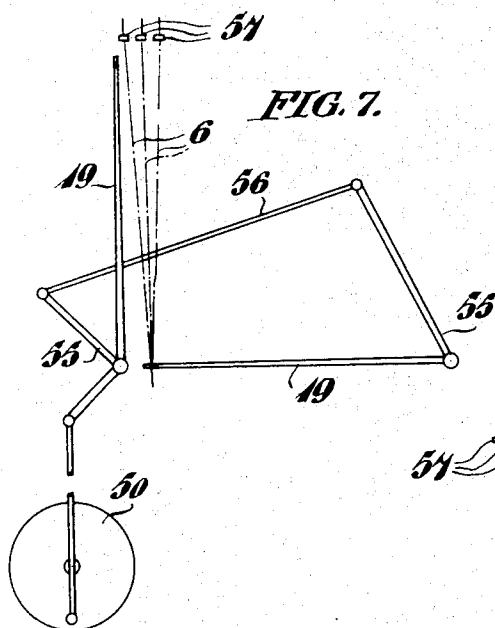
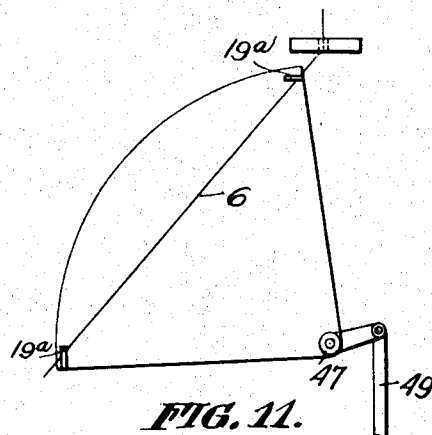


FIG. 8

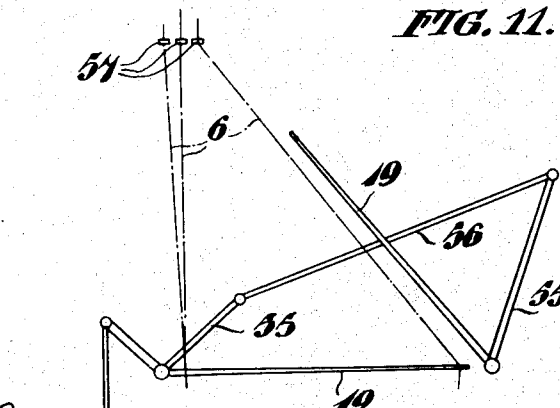
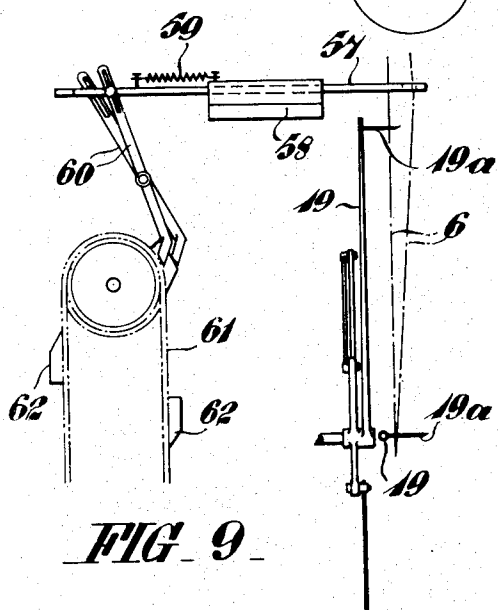


FIG. 9

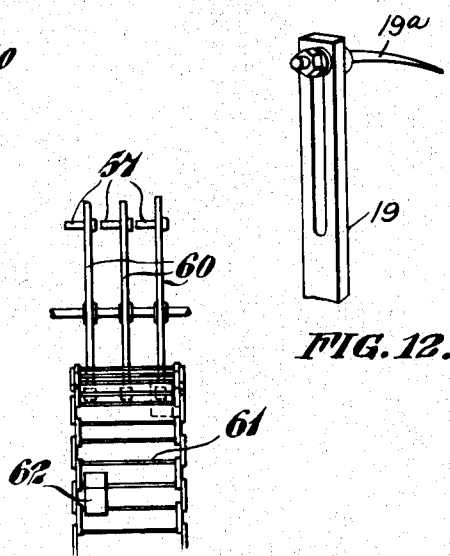


FIG. 12

FIG. 10

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UNITED STATES PATENT OFFICE

1,931,179

MEANS FOR TRAVERSING OR LAYING
THREADS, FILAMENTS, AND THE LIKE

William Coombes, Wollaton, England

Application February 28, 1929, Serial No. 343,406,
and in Great Britain March 1, 1928

15 Claims. (Cl. 66—85)

This invention comprises new or improved means for traversing or laying threads, filaments and the like which are withdrawn or supplied from a non-traversing supply or supply which does not traverse with the thread traversing means, the invention being accordingly differentiated from the laying of threads by traversing shuttles in the manner customary in weaving looms.

10 The invention has particular, although not exclusive, reference to the traversing or laying of weft threads in the production of fabrics.

15 An object of this invention is to provide thread traversing or laying means of a much less complicated and easier operable character than any heretofore known or proposed, and by simplifying mechanism employed, to minimize the wear and tear thereon.

20 Another object of the invention is to provide mechanism which is particularly adaptable for traversing or laying threads across comparatively long distances, thus facilitating the laying of weft threads in the manufacture of comparatively wide fabrics.

25 A further object is to provide means for enabling threads or the like to be traversed or laid more rapidly than heretofore.

30 As is well known the rate of traverse of threads is limited by the following considerations inter alia, the construction of the traversing means, the tensile strength of the thread and the manner in and extent to which the traversing means impart tension to the thread, it being appreciated that if the traverse motion is uneven or imparts rapid change of tension to the thread the tendency to breakage is increased and the economic practicable speed of operation accordingly reduced.

40 Another purpose of the present invention therefore is to provide means for traversing or laying threads whereby the tension and the rate of variation of tension imparted thereto is maintained at a minimum so that the speed of operation is maintained correspondingly high.

45 The present invention consists in traversing or laying threads or filaments across a predetermined path by the pivotal or oscillatory motion of thread carrying or propelling means.

50 Another feature resides in effecting the traverse of threads or the like alternately in opposite directions along the same path by the oscillation of a plurality of thread carrying or propelling members.

55 A further feature consists in transmitting oscillatory motion to one or more thread laying

or traversing members through crank mechanism from a continuously rotating member.

Yet another feature consists in the provision of means whereby one and the same thread or filament or group of threads or filaments to be laid or traversed is alternately engaged by two angularly disposed members oscillating in unison, or parts of one oscillating member, in such a manner that during the oscillatory motion of said thread-engaging members or parts in one direction one of said members traverses or lays the thread or threads and in the oscillatory motion in the direction opposite to which the second of said thread-engaging members traverses or lays said thread or threads.

Several methods of carrying out the invention are hereinafter described by way of example, and means are also included in the invention whereby the thread or threads to be laid can be selected at will from a plurality of different threads.

For the purpose of more fully describing the nature of this invention reference will now be made to the accompanying drawings, wherein:—

Figure 1 illustrates in front elevation a warp knitting machine having weft thread traversing and laying means in accordance with one embodiment of this invention.

Figure 2 is an end elevation of Figure 1.

Figure 3 is a detail view showing in end elevation part of the mechanism shown at the right hand side of Figure 1.

Figure 4 is a diagrammatic view showing the previously illustrated weft laying mechanism in the position occupied on the completion of a traversing or laying motion.

Figures 5 and 6 illustrate diagrammatically modified arrangements of thread laying and traversing devices.

Figures 7 and 8 illustrate at the two extreme positions of its movement a further construction of device particularly adaptable for selectively laying and traversing one or more of a plurality of threads.

Figures 9 and 10 illustrate in side and rear elevation means for selectively traversing and laying threads.

Figure 11 is a detail view illustrating a further embodiment of the present invention in which the carrier arm employed for laying the weft thread is in the form of a quadrant;

Figure 12 is a detail view illustrating the manner of supporting the weft thread-engaging element adjustably in its carrier arm; and

Figure 13 is a detail view illustrating a still

different embodiment of the invention from that shown in any other view.

In carrying out this invention the same will be described, by way of example, as applied to means for traversing and laying weft in the production in a warp knitting machine of fabric wherein the weft extends continuously from selvedge to selvedge.

Such a machine is shown in Figures 1 and 2 of the drawings wherein the needles indicated at 1 are mounted on the needle bar 2, the warp threads 3 being led thereto from a suitable supply and passed through guides 4 which guides are operated from the shaft 5 by eccentrically operated lever mechanism to lap the warps round the needles and produce knitted chains in accordance with known practice. The weft thread 6 drawn from a convenient supply is adapted to be traversed across the machine to lay the thread from selvedge to selvedge of the fabric, said weft being moved over on to the front of the needles, i. e. the plain side, by means of a movable grid 7 operating in conjunction with a stationary grid 8 carried by the work bar 9 over which the fabric is drawn. Both moving and fixed grids 7 and 8 are preferably formed of a series of suitably shaped wires, the wires of one grid being adapted to pass between those of the other so as to press the weft down over the fixed grid on to the front of the needles, and prevent fouling of said needles.

In order to obviate the possibility of the weft fouling the end needles at the commencement of the laying of each course of weft, interceptor members 10 are provided located one beyond each end of the width of fabric. Each interceptor has a nose portion 11 which at the required time is caused to move into a position between the first and last pairs of wires of the movable grid 7 so as to press back the weft thread away from the path of the needles; and as the movable grid recedes to its rearmost position the end loop or portion of the weft is released and, during the traversing of said weft, is caught by the interceptor nose 11. After a sufficient time has elapsed to allow the needles to move down to a position at which fouling cannot occur the interceptor is withdrawn and the end loop or portion of weft released therefrom to form a perfect selvedge.

The two interceptors are mounted on a common rod 12 and are operated from the eccentric shaft 5 by the disc crank 13 through rod 14 which is connected to a slotted arm 15, see Fig. 3, loosely mounted on said interceptor rod 12, said rod being turned in one direction by drawing the rod 14 downwards against a pin 16 carried by a short arm 17 fixed to the interceptor rod, a spring 18 serving to transmit the opposite or return movement to the said rod 12 and interceptors thereon.

The laying of the weft 6 is effected by two thread carrier arms 19 mounted to oscillate upon two separate pivots 20 located in horizontal alignment beyond each end of the width required to be traversed by the weft. The two pivots 20 are connected for simultaneous rotation by crank arms 21 and a horizontally extending rod 22, and a rotary or oscillatory motion is imparted to one of the pivots from a disc crank or eccentric 23 through connecting rod 24 and crank arm 25. On the crank or eccentric 23 is a bevelled gear 26 intermeshing with another bevel 27 on the eccentric shaft 5 so as to transmit rotary motion to said crank 23.

The carrier arms 19 are preferably of equal length and at the outer end of each arm is a laterally extending thread engaging-pin 19a or its

equivalent so shaped that during the oscillation of the arm in one direction the pin coacts with and carries with same the weft 6 or any number of said wefts which have been fed into the fabric, while on the opposite movement of said arm the pin 19a deflects the weft from its path and passes same without traversing it.

During each half revolution of the driving cranks 23 one of the carrier arms 19 is swung downwards from an upwardly inclined to a horizontal position and the second arm is simultaneously swung upwards from a horizontal to an inclined position, the weft 6 being engaged by each carrier in turn on its downward movement and laid or traversed alternately in opposite directions across the machine. The length of each arm 19 is such as to traverse or lay the thread a little beyond the extent of the needle row at each end so as to be engaged by the aforesaid interceptors 10 and prevented from fouling the end needles.

In the production of warp knitted fabric containing weft it is frequently required that the laying of the weft be interrupted at predetermined intervals while the knitting of the warp threads is continued thereby providing at intervals in the length of the fabric weftless divisions or portions, and in order to enable this to be accomplished means are provided whereby the weft 6 is at the required times deflected out of the path of the fingers 19a of the oscillating arms 19 so as not to be engaged and traversed thereby and subsequently allowed to assume their normal path and be traversed by the carriers.

This deflection of the weft from the path of the carriers may be effected by an upstanding wire portion 28 on a rod 29 pivotally mounted in end bearings 30 on an upstanding portion of the machine frame, said rod 29 having a slotted crank arm 31 to which is connected a downwardly extending rod 32, the lower end of said rod being connected to the forward end of a centrally pivoted lever 33 which lever carries at its rear extremity a bit 34 which coacts with an endless travelling chain 35. This chain 35 is traversed by pawl and ratchet device 36 which is intermittently operated through lever mechanism 37 from a disc crank 38, the latter being conveniently carried by an idler gear wheel 39 which intermeshes with and drives a gear 40 on the eccentric shaft 5. This idler gear 39 also meshes with a gear 41 on a shaft 42 to which latter shaft the drive is transmitted from a suitable motor to the machine. It will thus be seen that the eccentric shaft 5 is driven from shaft 42 through the intermediary of the idler gear 39.

On the chain 35 at suitable intervals are upstanding links or the like 35a which at predetermined intervals coact with the bit 34 on centrally pivoted lever 33 and function through said lever and the rod 32 to rock the horizontal rod 29 and deflect the weft out of the path of the carrier fingers 19a, a spring 43 functioning to return the parts to their normal position after the passage of the raised links 35 from beneath the bit 34.

During the time the laying of the weft is interrupted the interceptors 10 are retained in their operative position i. e. coacting with the end loop or portion of the weft, against the tendency of the spring 18, which, as previously described, normally effects the return movement of the interceptors away from the fabric. This is effected by causing a small pivoted hook 44 at the end of a second centrally pivoted arm 45 to pass over

on to the front of a shoulder 10a on the interceptor shaft 12, the bringing of the hook 44 into its locking position being accomplished by raised links on the chain 35 coacting with an element 46 at the free end of the said centrally pivoted arm 45. When the raised links have passed out of engagement with the element 46 the arm 45 is moved back under spring influence and the hook or catch 44 is lifted to a position in which same will move to and fro over but clear of the shoulder 10a and cannot pass over and grip the front edge of said shoulder.

The operation of the interceptor locking catch 44 is so timed relatively to the operation of the weft deflector 28 that the weft is released for being traversed shortly before the interceptor 10 is released for moving out of engagement with the weft, thus allowing the weft to be traversed a distance sufficient to prevent fouling of the end needles prior to releasing the weft from the interceptor.

The length of the thread carrier arms is such as to traverse or lay the thread beyond the extent of the needle row at each end.

As is well known, threads to be traversed or laid in the production of fabric are fed to the machine under tension, and as such tension usually increases progressively from the supply to the part which adjoins the fabric, it is at this part of the thread that breakages most frequently occur. In the methods of traversing a weft hitherto employed the tension increases as the thread layer approaches the end of its traverse, whereas by traversing the weft in accordance with the method above described the tension is actually decreased as it approaches the end of its traverse.

This is due to the fact that the pivot or pivots about which the thread-laying arms 19 oscillate are located in or approximately in the horizontal plane including the being-formed edge of the fabric, with the result that the movements of such arms in operation are in the main, if not wholly, above or beyond the said fabric edge, an arrangement making for simplicity in construction and in operation of the machine as well as insuring that irregular and undesirable tension tending to rupture the weft thread shall not be imparted to the latter.

The two pivots or axes of motion of the carrier arms are disposed a suitable distance beyond the selvedge edges of the fabric or beyond the ends of the needle row on which the fabric is knitted, the distance between each arm pivot and the thread-engaging element on said arm being consequently greater than the distance between said thread-engaging element and the edge of the fabric to which the thread extends from said element. By this arrangement, as the carrier arm swings down, a portion of the thread slips back over the carrier element and the tension on the thread is reduced.

In a modified arrangement (Figure 5) two weft thread carrier arms 19 preferably of equal length are mounted to rotate upon a common pivot or axis located centrally or approximately centrally in the width of the machine or of that part of the machine on which a width of fabric is to be produced.

To the pivot 47 of these arms is connected a crank arm 48 which is in turn pivotally connected to the one end, preferably the upper end, of a connecting rod 49 which is at its other end connected to a disc or other crank or eccentric 50 to which rotary motion is imparted from the drive of the machine.

The disc crank or eccentric is so disposed as to impart, when rotated, a rocking or oscillatory motion to the aforementioned two arms through an angle of somewhat more than 90°.

When the oscillating arms are in their normal position, i. e. at the commencement or completion of a weft laying motion, one arm is disposed horizontally and the other approximately vertically the weft thread 6 being engaged by a hook or element at the end of the horizontal arm and being led thereto from a suitable supply over a guide member which at the time is located on the opposite side of the thread-engaging element on the upstanding arm. In this way the thread extends diagonally downwards from the guide member to the horizontal carrier arm and passes beneath the thread-engaging element on the upstanding arm.

When the crank or eccentric is rotated through one half of a revolution, the upwardly extending carrier arm swings downward to a horizontal position and the horizontal arm swings upwards, and during this motion the thread-engaging element on the downwardly moving arm carries with same the weft thread which is thus drawn from the supply and laid across the machine.

The next half revolution of the crank effects a return oscillatory motion of the carrier arms to the position first described and during said motion the thread is traversed and laid in an opposite direction, it being understood that the thread engaging elements on the carrier arms are shaped so as to traverse the weft only when the arms are moving downwards.

It is to be understood that after each oscillatory motion for laying the thread, the machine needles are operated in the customary manner to lock the weft in position, means such as the aforescribed intermittently operable pivotal interceptors 10 being advantageously installed at the two selvages of the fabric for preventing fouling of the end needles by the weft.

If desired, the two carrier arms may be dispensed with and a quadrant shaped member employed having thread-engaging elements suitably formed or provided thereon at the requisite positions to function in the before-described manner (see Fig. 11).

In a further modification the carrier arms 19 extend at an angle to each other of approximately 90° (see Figure 6) and are both fixedly connected to a common shank 51 which shank is pivoted to a fixed pivot 52 located centrally in the width of the machine at a suitable distance below the needle bed, the carriers with said shank thus forming a member of substantially Y-shape. From the pivot 52 extends a short crank arm 53 pivotally connected to a downwardly extending connecting rod 54 which as in the foregoing arrangements is connected to a disc crank 50 driven from the shaft 5.

In operation the carrier arms 19 with shank 51 are oscillated on the pivot 52 and swung through an angle of 90°, thus at each motion moving the horizontally disposed carrier arm into a vertical position and the vertically disposed arm into a horizontal position, it being understood that at each motion the vertically disposed arm engages the weft 6 which is guided through centrally disposed guide 6a and traverses same downwards to the edge of the fabric, the carrier arm in its upward motion being permitted to pass the weft thread without traversing same.

In the last described arrangement the advantage exists in that weft can be traversed across comparatively wide widths of fabric by the employment of carrier arms 19 of comparatively short length. Additionally the distance over which the weft is to be traversed can be variably adjusted to a considerable extent by varying the position of the thread engaging fingers or elements along carrier arms 19, such elements being for this purpose adjustably connected to said carrier arms, as represented in Fig. 12. The thread engaging elements on the carrier arms can, of course, also be adjustably fitted in the arrangement shown in Figures 1 to 5.

In a still further arrangement (Figures 7 and 8) the two carrier arms 19 are pivotally mounted a short distance beyond each end of the needle bed and are connected for simultaneous oscillation by crank arms 55 and connecting rod 56, the oscillation being transmitted from disc crank or eccentric 50 as before described. In this arrangement, however, unequal motion is imparted to the two arms 19, the one being caused to travel through an angle of approximately 90° and the other through an angle of substantially less than 90°, the reason for this being that the weft 6 instead of being fed through a guide positioned centrally in the width of the machine is fed at a position on the one side of said machine, therefore when the weft extends down to the one or left-hand side of the fabric same is approximately vertical while when it extends to the opposite or right-hand edge of the fabric same is disposed diagonally across the machine: therefore the degree of movement imparted to the carriers is such as to bring the thread-engaging elements just beyond the weft at each extreme position thereof.

In this last described arrangement a plurality of weft threads may be fed to the machine and means may be incorporated for enabling any one or more of such threads to be selected and laid at will. To this end the wefts are advantageously guided through independent guides 57 any one of which is adapted to be displaced against spring influence into a position for being engaged by the finger or element on the carriers 19.

The selective displacement of the guides 57 into the path of the thread carrier may be effected by any approved means such as cams, pattern chain or wheel, it being understood that the selection takes place at the one side of the fabric only, that is to say any thread selected and laid by the one carrier arm in one course is also laid in the next succeeding course by the second carrier arm. A plurality of wefts can of course be simultaneously laid by displacing the guides so as to bring a plurality of wefts into the path of movement of the carriers.

One method of selecting the wefts is illustrated in Figures 9 and 10 wherein three guides 57 are shown slidably carried within a suitable bearing 58. Each guide is influenced by a separate spring 59 which functions normally to project the guides 57 into a position wherein the wefts are out of the path of the elements 19a of the pivotal carrier bars 19. Coacting with each slidable bar 57 is a centrally pivoted lever 60 the one end of each of which is maintained in engagement with a travelling pattern chain 61 having thereon upstanding bits 62, the arrangement being such that as said bits 62 travel beneath the levers 60 same are oscillated on their pivots and slidably displace the arms 57 against the springs 59 so as

to bring the wefts 6 into the path of the carrier elements 19a. It will, therefore, be seen that the selection of the wefts is determined by the disposition of the upstanding bits 62 on the chains 61.

In a still further modification, a single oscillating thread carrier arm may be employed pivoted centrally in the width to be traversed by the thread and operated through suitable gearing to swing to and fro through an angle of 180°, such a form of the invention being illustrated in Fig. 13, wherein the thread carrier arm 19 is represented as carried by a shaft 65 on which is supported a gear wheel 66, with which meshes a gear segment 67 carried by a shaft 68. From this shaft projects an arm 69 that is connected as by a rod 70 with a crank 50 on the shaft 5.

It will be seen that in each embodiment of my invention herein presented the arms 19 and the thread-engaging parts 19a which they carry, and the stationary pivot for the arms are so related to the machine producing the fabric that the thread guides 19a moves in planes that include or are close to and parallel with the edge of the fabric that is being formed, and that whatever be the position of a thread-engaging and guiding part 19a at any moment, that position is in or very close to the said plane; in other words, the thread-engaging, guiding and laying parts always move in or close to and parallel with the plane of the being-formed edge of the fabric. This plane, in the embodiments of the invention herein illustrated, is a vertical plane; and when the term "vertical plane" is herein employed it is intended to mean that plane of movement of the thread guides relative to the being-formed edge of the fabric which has just been described, rather than a plane having reference to the horizontal; for if the latter meaning were attached to the term it would be inapplicable unless a given machine were set in a certain position relative to the vertical, or had certain arbitrary positions for the parts which form the fabric; whereas if given the meaning herein intended, the relations of the part of the apparatus to each other which have been specified will be understood, regardless, for instance, of whether the needles are mounted vertically as shown, or horizontally, or in intermediate position.

I claim:—

1. In a mechanism for producing fabrics, means for traversing threads along a predetermined path comprising a thread supplying and guiding means, a pair of pivotally mounted thread carrier arms, the pivots for said arms being spaced apart, link mechanism connecting said arms for simultaneous motion, mechanism for imparting oscillatory movements to the arms, and said arms operating so that at alternate motions one arm oscillates to traverse or lay thread in one direction and at the remaining alternate motion the second arm oscillates to lay thread in an opposite direction.

2. In a mechanism for producing fabrics, means for traversing weft thread along a predetermined path embodying two pivotally mounted thread carrier members, the pivots of said members being spaced apart, link mechanism connecting said pivots so as to produce simultaneous oscillation of the two arms, crank mechanism for imparting said oscillation to the arms the link mechanism connecting the arms being such as to impart unequal motions to the arms, and said arms alternately operating upon the threads to traverse same, first in one direction and then in the other

along a predetermined path and means for incorporating the threads so laid into the fabric being produced.

3. In a warp knitting machine a warp thread supply, warp thread feeding means to the machine needles, means for operating said needles to produce knitted chains from the warp threads, a weft thread supply, pivotally mounted weft carrier arms, crank mechanism operating to oscillate said weft carrier arms so as to lay the weft alternately in opposite directions across the machine, means for positively laying the weft on to the front or plain side of the needles so as to prevent fouling of said needles by said weft, pivotal interceptors arranged one at each end of the distance required to be traversed by the weft, and means for intermittently operating said interceptors to withhold the weft at each end of its traverse from fouling the end needles.

4. In a warp knitting machine a warp thread supply, warp thread feeding means to the machine needles, means for operating said needles to produce knitted chains from the warp threads, a weft thread supply, pivotally mounted weft carrier arms, crank mechanism operating to oscillate said weft carrier arms so as to lay the weft alternately in opposite directions across the machine, means for positively laying the weft on to the front or plain side of the needles so as to prevent fouling of said needles by said weft, pivotal interceptors arranged one at each end of the distance required to be traversed by the weft, means for intermittently operating said interceptors to withhold the weft at each end of its traverse from fouling the end needles, means for deflecting at predetermined intervals the weft from the path of movement of the oscillating weft carrier arms so as to produce at intervals in the fabric a certain amount of fabric void of weft, and means for retaining the weft interceptors in their operative position for engaging the weft during the time said weft is deflected from the path of the carriers.

5. In a warp knitting machine a warp thread supply, warp thread feeding means to the machine needles, means for operating said needles to produce knitted chains from the warp threads, a weft thread supply, pivotally mounted weft carrier arms, crank mechanism operating to oscillate said weft carrier arms so as to lay the weft alternately in opposite directions across the machine, means for positively laying the weft on to the front or plain side of the needles so as to prevent fouling of said needles by said weft, pivotal interceptors arranged one at each end of the distance required to be traversed by the weft, means for intermittently operating said interceptors to withhold the weft at each end of its traverse from fouling the end needles, an intermittently operated pattern chain, lever mechanism coacting with said chain and functioning at predetermined intervals to deflect the weft out of the path of movement of the weft carrying arms so as to discontinue the laying of said weft, spring means for returning said weft into the path of movement of said carrier arms, further lever mechanism coacting with the said pattern chain and operating at predetermined intervals to retain the weft interceptors in a position coacting with said weft, and means whereby said interceptors are retained in the operable position until after the weft deflecting means have been moved out of operation and the laying of the weft recommenced.

6. In a warp knitting machine, a warp thread supply, warp thread feeding means to the machine needles, means for operating said needles

to produce knitted chains from the warp threads, a plurality of weft threads supplied to the machine, a plurality of individually displaceable guides for said wefts, pivotally mounted weft carrier arms, crank mechanism operating to oscillate said weft carrier arms so as to lay the weft alternately in opposite directions across the machine, means for selectively moving any one or more of the weft threads into and out of the path of the thread carrier arms so as to permit of said weft being selectively laid in the fabric, means for positively laying the weft to the front or plain side of the needles so as to prevent fouling of said needles by said weft, pivotal interceptors arranged one at each end of the distance required to be traversed by the weft and means for intermittently operating said interceptors to withhold the weft at each end of its traverse from fouling the end needles.

7. In a mechanism for producing fabrics, knitting needles arranged in a straight row, means for supplying such needles with thread, means for traversing additional threads along a predetermined path in proximity to the knitting needles and transversely of the fabric being produced, comprising a thread supply, pivoted lever thread-carrying mechanism for engaging with the thread and laying it, a stationarily supported pivot on which the said thread-carrying mechanism is mounted, and mechanism for imparting oscillatory motions to the said thread-carrying mechanism, the said oscillatory motions of the said thread-carrying mechanism serving wholly to effect the laying of the thread along the predetermined path.

8. In a warp knitting machine, the combination with knitting needles and means for guiding and feeding warp threads thereto, of weft thread supply means, means for laying the weft thread along a predetermined path so as to be knit into the fabric, each said means movable about a stationarily supported pivot whereby the thread is laid wholly by pivoted action of said means, and means acting upon said weft thread to cause it when laid to be properly positioned relative to the needles so as to be knit into the fabric thereby.

9. A machine such as set forth in claim 8 wherein the weft-thread-laying means comprise a pair of arms supported upon stationary pivots located beyond the respective opposite edges of the fabric, and means for oscillating the arms upon their pivots to cause them to alternately lay the threads, one in one direction and the other in the other direction, from selvedge to selvedge of the fabric.

10. A machine such as described in claim 8 characterized by the weft-thread-laying means consisting of two arms supported upon a common stationary pivot located approximately centrally between the edges of the fabric.

11. A machine such as described in claim 8 characterized by the weft-thread-laying means consisting of an arm supported upon a pivot located substantially mid-way between the edges of the fabric and below the needle bed, the thread-laying arms extending from the upper end of the said pivoted arm and being at right angles to each other whereby the pivoted weft-thread-laying means is of substantially Y-shape.

12. In a mechanism for producing fabric, a pair of pivotally mounted thread carrier arms, means for supplying and guiding thread thereto, mechanism for imparting simultaneous oscillation to the two arms to lay the thread from edge

- to edge of the fabric, thread engaging means upon one arm for engaging said thread only during motion of said arm in one direction to carry it across the fabric but to release the thread upon motion in the reverse direction, and thread engaging means upon the other arm for engaging said thread upon such reverse motion to carry it across the fabric in the reverse direction and then to release it.
- 10 13. In a mechanism for producing fabric, a pivotally mounted thread carrier arm for laying a thread from edge to edge of the fabric in one direction, a second pivotally mounted thread carrier arm for laying said thread from edge to edge in the reverse direction, means for supplying and guiding thread to said arms, mechanism for oscillating said arms together and in the same direction to and fro across the fabric, and thread-engaging means upon each arm for engaging the thread alternately the one during motion in one direction and the other during motion in the reverse direction.
- 15 14. In a machine for producing fabrics, means for laying transversely from margin to margin of the fabric thread that enters into the composition thereof, comprising two arms of a length to lay the threads from margin to margin of the fabric wholly by oscillatory movement about pivots for them, one arm laying thread in one direction and the other laying the same thread in the reverse direction, thread-engaging means on said arms, a stationary pivot for each arm, located one to each side of the fabric and beyond the margin thereof, which pivots and the arms are so related that the thread-engaging means at all times operate in vertical planes that are parallel with the being-formed edge of the fabric and include or are very close to said plane, and that said means at all times move, in the main, above or beyond the being-formed edge, and means for oscillating said arms upon their pivots simultaneously and in the same direction to and fro across the fabric.
- 20 15. In a warp knitting machine, a line of needles, means for feeding warp thread thereto, means for operating such needles to produce knitted warp chains, a pair of pivotally mounted weft-thread carrier-arms, means for supplying and guiding weft thread thereto, mechanism for oscillating the two arms simultaneously to lay the weft from margin to margin of the fabric being produced, thread-engaging means upon one arm for engaging the weft only during motion of said arm in one direction to carry said weft across the fabric but to release said weft upon movement of the arm in the reverse direction, and thread-engaging means upon the other arm for engaging the weft and laying it only during movement of such other arm in said reverse direction.
- 25 WILLIAM COOMBES.

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