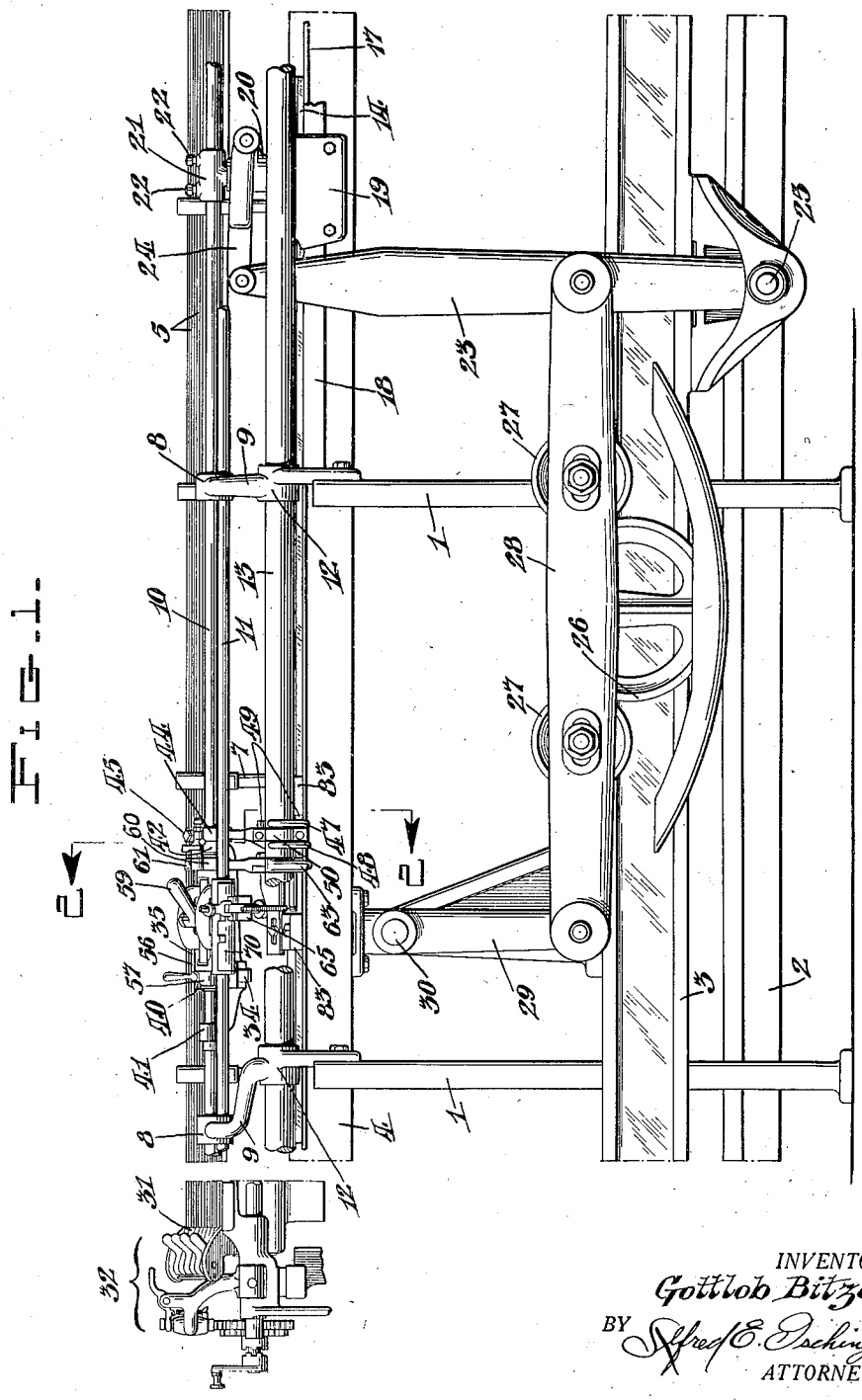
Feb. 18, 1936. G. BITZER 2,031,300

KNITTING MACHINE THREAD CARRIER ACTUATING MEANS

Filed Feb. 7, 1934 4 Sheets-Sheet 1

Fig. 1.



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Feb. 18, 1936. G. BITZER 2,031,300

KNITTING MACHINE THREAD CARRIER ACTUATING MEANS

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FIG. 2.

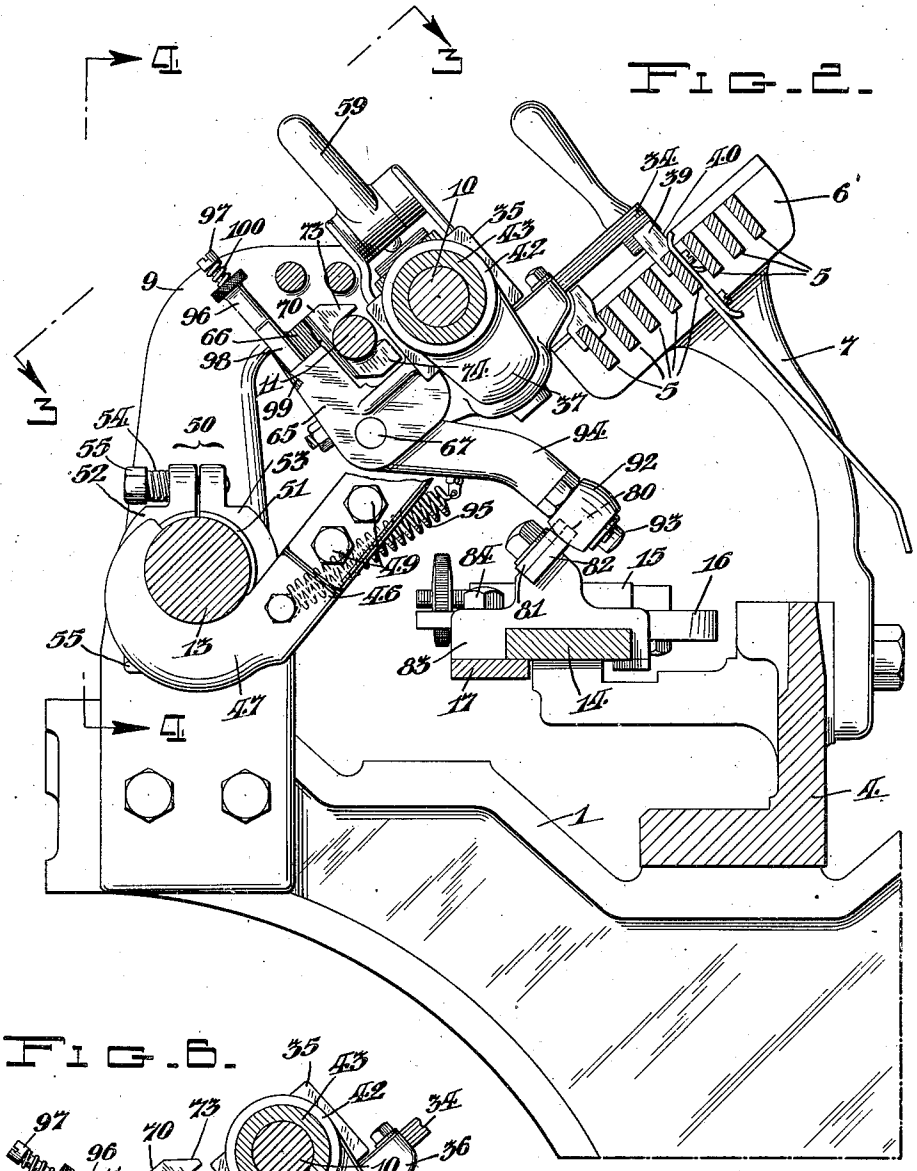
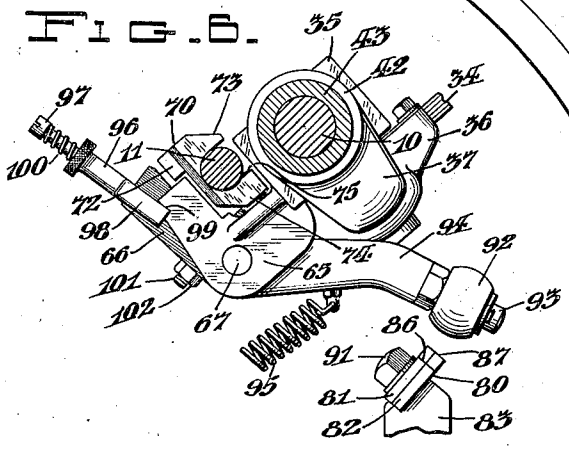


FIG. 6.



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Feb. 18, 1936. G. BITZER 2,031,300

KNITTING MACHINE THREAD CARRIER ACTUATING MEANS

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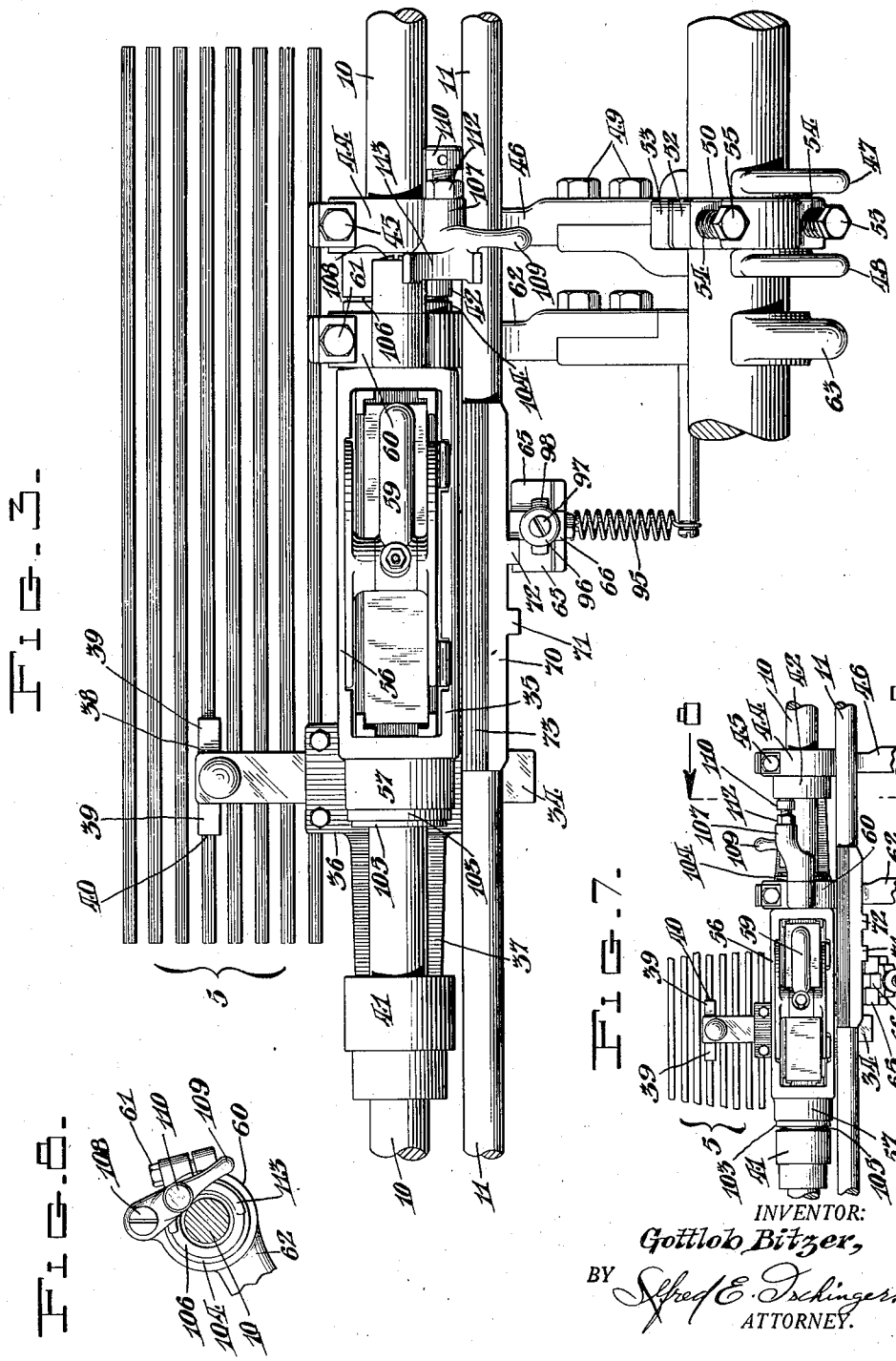


FIG. 3.

FIG. 8.

FIG. 7.

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Feb. 18, 1936. G. BITZER 2,031,300

KNITTING MACHINE THREAD CARRIER ACTUATING MEANS

Filed Feb. 7, 1934 4 Sheets-Sheet 4

FIG. 4.

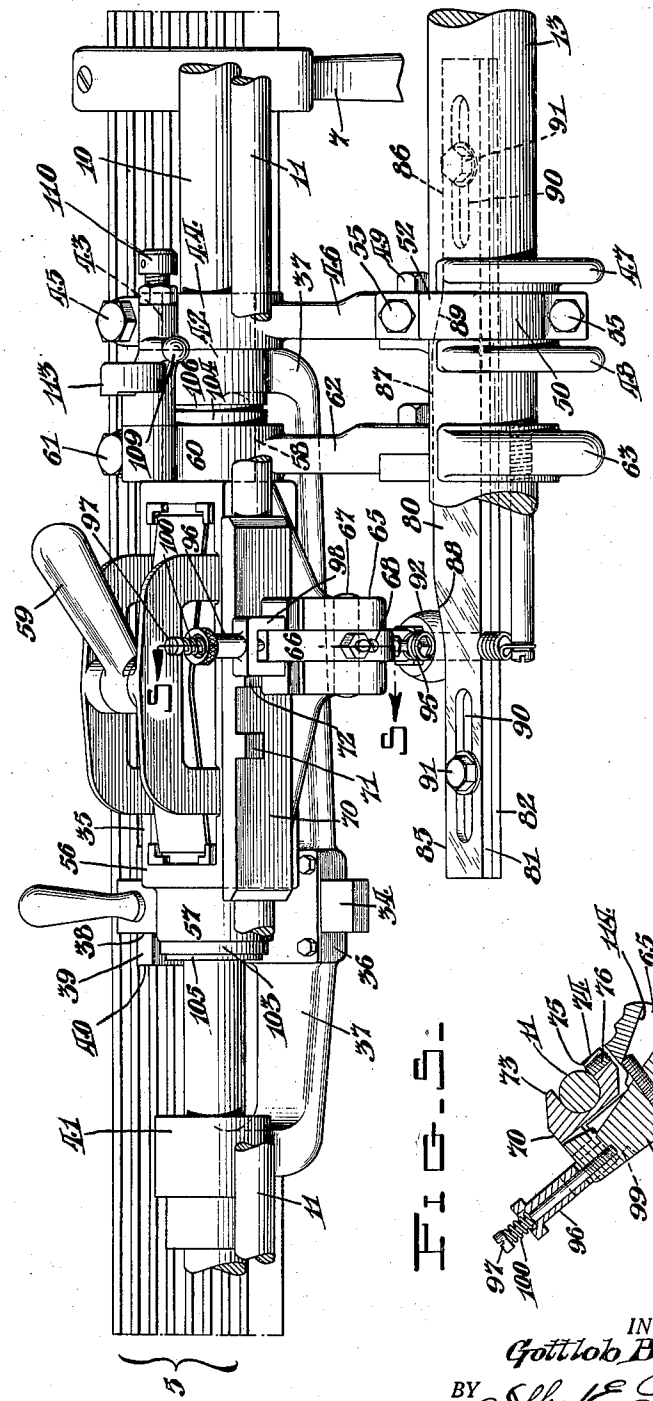


FIG. 5.

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Patented Feb. 18, 1936 2,031,300

UNITED STATES PATENT OFFICE

2,031,300

KNITTING MACHINE THREAD CARRIER ACTUATING MEANS

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Application February 7, 1934, Serial No. 710,126

21 Claims. (Cl. 66—126)

This invention relates to straight or flat knitting machines, and particularly to those employing a longitudinally reciprocable bar, or series of bars, for laying a thread, or a plurality of separate threads, to a bank, or a series of banks, of needles for producing a single flat knitted fabric, or a plurality of similar fabrics simultaneously, as, for example, in a full fashioned hosiery knitting machine of the multiple section type.

In this type of machine, one of the thread bars with a number of thread guides thereon, one for each knitting section, is adapted to lay main threads to the needles of each and all of the knitting sections simultaneously, while others of the thread bars, also equipped with a thread guide for each knitting section, are adapted for laying plating, splicing or other auxiliary threads to the needles of all the sections simultaneously, with or in definite relation to the laying of the main thread, while still others of the bars may be adapted for laying a substitute thread to the needles in place of the main thread laid by the first said bar, or the first said bar may lay its main thread to one group of needles in each section and another of the bars may lay a main thread to a second group of the needles.

Machines of the type noted employ banks of sinkers, including alternating dividers, which cooperate with the needle banks of the respective knitting sections to press the thread or threads between adjacent needles, for measuring and forming the thread into loops about the needles preparatory to such loops being drawn through and thereby interknit with previously formed loops or stitches hanging on the shanks of the needles.

The thread bars normally are reciprocated by a common actuator, in the form of an axially reciprocable rod or shaft, to which the thread bars are adapted to be independently and selectively connected by and through the medium of separate friction boxes. The friction boxes are respectively connected to the bars rigidly, insofar as relative longitudinal movement between the bars and the friction boxes is concerned. The friction boxes, as the name implies, are frictionally connected to the common actuator in each instance.

The sinkers are adapted to be projected successively between adjacent needles as the thread guides pass the sinkers and lay their respective threads between the needles and the sinkers of each knitting section.

The projecting movements of the sinkers of the several knitting sections are simultaneously effected by slur cocks, of which there is one for each knitting section. Each slur cock traverses the particular bank of sinkers with which it is associated in trailing relation, to the extent of a plurality of needles, behind the thread guide or guides laying thread to the needles of that particular bank.

The slur cocks are each and all connected to a common actuator, in the form of a longitudinally reciprocable bar, which extends substantially parallel to the common actuator for the thread bars.

The common actuators for the thread bars and slur cocks are rigidly connected to a common prime mover, which forms part of what is known as the "Coulier" motion, by which the two common actuators simultaneously receive identical longitudinally reciprocating movements.

The thread bars are each independently controlled, as to the extent of their longitudinal reciprocation by relatively movable stops at the opposite ends of the machine, or by intermediate stops controlled by pattern mechanism, with a view of determining the number of needles to be traversed by the thread guides of each bar, whereby the widths of the fabrics and/or the widths and shapes of reinforced or plated areas formed by the auxiliary threads are controlled. However, the common actuators for the slur cocks and the thread bars receive the same uniform longitudinal reciprocation at all times, hence the reason for the above noted friction boxes for connecting the thread bars to the uniformly moving common actuator therefor, which permits the thread bars to be stopped at any desired point of their reciprocatory movements, in either direction, by the control stops, while the common actuator continues to move to the full extent of its stroke of reciprocatory movement.

At the change of direction of movement of the common actuator during reciprocation thereof, it is necessary, before the frictionally driven thread bars attain a speed of movement corresponding to the speed of movement of the positively driven slur cocks, to overcome the inertia of the friction boxes and thread bar and the attending friction in the mountings of the thread bars. In so doing there is a certain amount of lost motion produced between the common actuator and the friction box, in each instance, caused by the friction box slipping on the common actuator before the dead weight of the friction box and the bar and the friction in the bar mountings is overcome, which makes the lead between

the thread guides and the slur cocks more or less indefinite.

The present invention concerns mechanism by which the inertia of the friction boxes and that of the thread bars controlled by the friction boxes are taken up successively whereby the above noted lead of the thread guides before the slur cocks is definitely controlled.

The present invention is particularly adaptable to the control of thread guides intended for laying splicing or plating threads to the needles of the several knitting sections, for example, those on which the high splice heel and heel tabs of full fashioned stocking blanks are being produced.

The present invention is likewise directed towards providing a novel plating device in which all members, for controlling the lead of the respective carriers, are associated directly with the friction box forming an integral part thereof.

Another object is to provide a novel friction box which is simpler in construction than the usual friction box and also more efficient.

A further object is to provide a dual purpose transmitting device which may be used with equal efficiency either as a plating or a main yarn carrier actuating unit.

With these and other objects in view, which will become apparent from the following detailed description of the illustrative embodiments of the invention shown in the accompanying drawings, my invention resides in the novel elements, features of construction and arrangement of parts in cooperative relationship, as hereinafter more particularly pointed out in the claims.

In the drawings:

Fig. 1 is a rear elevation of sufficient mechanism of a knitting machine of the type above noted to illustrate the application of the device of the present invention thereto;

Fig. 2 is a transverse sectional elevation taken on the line 2—2, Fig. 1, drawn to an enlarged scale;

Fig. 3 is a plan view looking in the direction of the arrows 3, 3, Fig. 2;

Fig. 4 is a rear elevation of the mechanism shown in Figs. 2 and 3 looking in the direction of the arrows 4—4, Fig. 2;

Fig. 5 is a section taken on the line 5—5, Fig. 4;

Fig. 6 is a detail section similar to Fig. 2 showing certain parts in inactive position; certain parts illustrated in Fig. 2 being omitted;

Fig. 7 is a view similar to Fig. 3 showing certain parts in inactive position and others omitted, and

Fig. 8 is a detail cross-sectional view taken on the line 8—8 of Fig. 7.

Figs. 1 to 4 disclose various parts of a Reading full fashioned stocking machine embodying the mechanism and elements of my invention. For the sake of clearness I have illustrated only those parts of the various mechanisms necessary for an understanding of the invention; the various other parts and mechanisms and their manner of operation are well known in the art, and are shown and described in detail in the "Reading" Full Fashioned Knitting Machine Catalogue (copyrighted 1929) published by the Textile Machine Works, Reading, Pennsylvania.

As shown in Fig. 1, the machine includes a plurality of transverse frame members 1, 1, which are rigidly connected by longitudinal front and rear beams 2 and 3 and by a rear bed beam 4. The thread bars 5, 5 extend longitudinally of the machine, above the bed 4, and are slidably mounted, for longitudinal movement, in heads 6 formed on brackets 7 which are rigidly secured to the bed 4.

Extending parallel to the thread bars 5, and slidably mounted for axial movement in bearings 8, 8, is the common actuator 10, also called a friction rod or splicing shaft, for the several thread bars 5. The bearings 8, in each instance, are carried by brackets 9 which are rigidly secured to the transverse frame members 1.

Rigidly secured on the brackets 9 and extending longitudinally of the machine, parallel to the common actuator 10, is a fixed rod 11. Rigidly mounted in bearings 12 formed on the brackets 9 is a shaft 13, which, in the present instance, constitutes the back narrowing shaft of the machine.

Rigidly carried by and extending substantially parallel to the bed 4 is the slur cock guide bar 14, on which the carriages 15 for the slur cocks 16 slide. The slur cock carriages 15 are each and all rigidly connected to a slur cock common actuator, in the form of an operating bar 17.

Rigidly secured to a relatively spaced pair of the transverse frame members 1 is a guide 18 on which the slide box 19 of the "Coulier" motion is mounted for reciprocation longitudinally of the machine. Rigidly secured to the slide box 19 is a base 20 in which is rigidly secured a cross head 21.

The common actuator 10 for the thread bars 5 is rigidly secured in the cross head 21 by set screws 22, 22, whereby reciprocatory movement of the slide box 19 is transmitted to the actuator 10 for the thread bars 5. The common actuator 17 for the slur cock carriages 15 is secured rigidly and directly to the slide box 19.

The slide box 19 is operatively connected to the upper end of the long rocker arm 23 of the "Coulier" motion, by a connecting link 24, the rocker arm 23 receiving an oscillatory movement about its pivot 25 in the usual manner by the "Coulier" cam 26 operating between rollers 27, 27 which are carried by the pitman 28. The pitman 28 is connected at its opposite ends to the long rocker arm 23 and to the free end of a short rocker arm 29 which is pivotally connected, at 30, to the frame of the machine.

By this mechanism known as the "Coulier" motion the common actuators 10 and 17 for the thread bars 5 and slur cocks 16 respectively receive a uniform reciprocation sufficient to effect traversing of the entire bank of the needles and the entire bank of the sinkers in each of the knitting sections of the machine by the thread guides and slur cocks.

The width of the fabric and any narrowing thereof that may be desired is controlled in the usual manner by stops 31 mounted on the usual narrowing heads or carriages 32 disposed at the opposite ends of the machine respectively, said stops 31 functioning to arrest the movement of the thread bars 5 with the thread guides thereon in position adjacent those needles of the bank, in each knitting section, by which the selvage edges of the several fabrics are produced.

Ordinarily, a manually operable slide is mounted in a guideway on the friction box for selectively connecting the box to any one of two or more thread bars, so that, when thus connected, no movement of the box relative to the selected bar is permitted.

However, in the structure of the invention, such slide 34, instead of being mounted on the box 35, is similarly mounted in a guideway 36 on

a yoke 37 having movement relative to the box 35 along the friction rod 10.

The outer end of each connecting slide 34 is adapted to be positioned in a slot 38 formed between the upstanding legs 39, 39 of a U-shaped member 40 which is rigidly secured to the thread bar 5 with which the yoke 37 is adapted to function.

The yoke 37 is provided at its opposite ends with relatively spaced bearings 41 and 42 respectively, which are mounted for relative axial sliding movement on the common actuator 10. The bearing 42 is reduced in diameter and is extended axially, as indicated at 43 in Fig. 4, for the reception of a split collar 44 which is adapted to be rigidly clamped to the bearing 42, by means of a clamp screw 45.

Formed integral with the split collar 44 is an arm 46 which comprises laterally spaced hook-like ends 47 and 48 which constitute a forked end on the arm 46, the fork member 48 being separable from the arm 46 and secured thereto by bolts or screws 49.

Mounted on the shaft 13, intermediate the forked arms 47 and 48, is a split collar 50. The bore of the split collar 50 is provided with friction material 51, for engagement with the surface of the shaft 13, by which, when the two halves 52 and 53 respectively of the split collar 50 are pressed toward each other under the influence of compression springs 54 encircling the screws or bolts 55, by which the two halves of the split collar are joined together, the split collar is maintained in any position to which it may be moved along the shaft 13, consequently, with the fork arms 47 and 48 disposed at the opposite sides respectively of the split collar 50, the yoke 37 is maintained in any position to which it may be moved by and along the common actuator 10, under circumstances hereinafter recited.

In the present instance, the friction box 35, which is of usual construction and need not be here described in detail, is slidably mounted on and for movement with respect to, the common actuator 10, intermediate the bearings 41 and 42 of the yoke 37. The friction box 35, as usual, comprises a main housing 56 at the opposite ends of which are provided bearings 57 and 58 through which the common actuator 10 slides.

In the present instance, the frictional connection between the box 35 and the common actuator 10 is made effective or ineffective in the usual manner by actuation of the frictional control lever 59.

In the present instance, the bearing 58 is encircled by a split collar 60 which is rigidly clamped to the bearing 58 by a bolt 61. The collar 60 is provided with an integral guide arm 62 having a detachable hook end 63 engaging the shaft 13, whereby rotation of the friction box 35 about the common actuator 10 is prevented and relative longitudinal movement is permitted.

The arm 46 with its hooked ends 47 and 48 engaging the shaft 13 in a like manner prevents rotation of the yoke 37 about the common actuator 10 and thereby maintains the connecting slide 34 in the slot 38 of the thread bar 5 with which the yoke is connected.

Formed on the main housing 56 of the friction box 35, and extending laterally therefrom and around the fixed rod 11 is a pair of L-shaped brackets 65, 65 between which is mounted an element or lever 66. The element 66 is adapted for pivotal movement about a pin 67 extending between the brackets 65, 65 and mounted at its opposite ends therein, said pin 67 being secured to the catch lever 66 by a bolt or screw 68.

Mounted on the fixed rod 11, within the angles of the brackets 65, 65 and rigidly secured to said rod against relative longitudinal and rotary movement with respect thereto, is a stop plate 70; it being understood that there is one of these stop plates for each plating thread carrier actuator. On the outer face of the stop plate 70 is provided a pair of laterally extending lugs or detents 71 and 72 which are spaced laterally, with respect to each other, longitudinally of the plate 70.

The lugs 71 and 72, under conditions hereinafter described, are adapted to be engaged by the element 66, whereby movement of the friction box 35 with the common actuator 10 is arrested during a predetermined portion of the initial movement of said common actuator in each of its opposite directional movements of reciprocation.

The plate 70 is provided with longitudinally extending ribs 73 and 74 which form a slot 75 for the reception of the rod 11; and the plate 70 is secured to the fixed rod 11 by means of set screws 76, in the present instance carried by the rib 74, as shown in Fig. 5.

The arresting element 66 is adapted to be released from the stop plate 70 at predetermined times, to permit the friction box 35 to travel with the common actuator 10, by means of a cam element 80, which, in the present instance, comprises a pair of similar cam bars 81 and 82 mounted in flat parallel engagement with each other on slide brackets 83, 83 which are rigidly secured to the slur cock operating bar 17 in spaced relation to each other longitudinally thereof, by screws or bolts 84 (see Fig. 2).

As shown in Fig. 4, the members 81 and 82 of the cam 80 are identical, in that each comprises a corresponding low cam surface 85 at one end and a correspondingly low cam surface 86 at its opposite end, between which is a relatively high cam surface 87. The high cam surfaces 87 are connected to the low surfaces 85 and 86 by inclined surfaces 88 and 89 respectively.

Each of the cam bars 81 and 82 is provided with a pair of longitudinally elongated slots 90, for the reception of clamp screws 91 by which bars 81 and 82 are rigidly secured to their carrier brackets 83, 83. By releasing the screws 91, 91, the cam bars 81 and 82 may be adjusted as a whole longitudinally with respect to the slur cock operating bar 17, or the cam bars 81 and 82 may be adjusted individually with respect to each other and to the connecting bar 17, whereby the length of the high portion 87 of the cam 80 may be increased or decreased as desired.

The cam 80, being secured to the common actuator 17 for the slur cocks, moves with the common actuators 10 and 17 and the cam is positioned in such relation to the slur cocks that, as the slur cocks approach the thread guides which are being held in a stationary position by the arresting element 66, one of the inclines, 88 or 89 as the case may be, engages a cam roller 92 which is rotatably mounted on a pin 93 carried by an arm 94 of the element 66 and rocks the same about its pivot 67, in opposition to the tension of the spring 95, whereby the arresting element is released from the holding lug, 71 or 72 as the case may be, of the plate 70. Upon release of the arresting element 66, in the manner noted, and as a result of the common actuator 10 having been moving through the friction box 35 prior

to the release of the element 66, the friction box will immediately move with and at the same speed as the common actuator 10, the inertia of the friction box being taken care of by reason of the initial movement of the common actuator 10 through the friction box. However, the thread bar 5 adapted to be operated by the friction box remains stationary during the initial movement of the friction box occurring immediately after the release of the friction box from the holding plate 70.

The yoke 37 to which the thread bar 5 is connected, due to the braking action of the split collar 50, is held against longitudinal movement until such time as the outer end of one of the friction box bearings, 57 or 58 as the case may be, comes in contact with one of the yoke bearings, 41 or 42 as the case may be and the sudden impact of the moving friction box with the quiescent yoke immediately overcomes the inertia of the yoke and the thread bar to which the yoke is connected and the attending friction in the thread bar mountings, whereby the yoke and the thread bar move immediately with and at the same speed as the friction box 35. Thus the thread guide is carried along in a definite leading relation to the slur cock which is acting to sink around the needles the thread which has been laid, by the thread guide, between the needle and the sinkers.

The cam roller 92 remains quiescently on the high surface 87 of the cam 80 during the concurrent movement of the thread bar, the yoke, the friction box and the two common actuators 10 and 17, until such time as the thread bar engages one of the control stops 31, which arrests the thread bar against further longitudinal movement in that particular direction in which it has been moving.

Stopping of the thread bar stops the yoke and the friction box simultaneously therewith and also causes the cam roller 92 to assume a fixed position while the cam 80 continues to move with the common actuators 17 and 19, whereupon the roller 92 will pass down the inclined surface at the trailing end of the cam 80 permitting the arresting element 66 to drop back of the second of the lugs on the plate 70, whereby the friction box and the yoke will be retained in a definite position until, on the return stroke of the common actuators 10 and 17 and the cam 80, the cam roller 92 again rides on to the high portion 87 of the cam 80 to release the arresting element from the engaged lug of the holding plate 70.

The mechanism and its operation as above described is particularly adapted for controlling the thread bars which lay plating or splicing threads to relatively small groups of the needles in each of the knitting sections, such, for example, as in forming a high splice heel and in the knitting of the heel tabs of a full fashioned stocking blank, whereby the thread guides laying the threads at each side of each blank are picked up at exactly the proper time and carried along in definite relation to the main thread guides and to the slur cocks for laying a splicing or plating thread to the needles in proper relation to the main thread, as laid to the needles by another of the thread bars across the full width of the blank or across the width of the heel tabs from side to side thereof.

The mechanism above described is equally efficient in the laying of splicing threads during the formation of the foot of a stocking blank in the portions constituting the reinforced foot sole and toe portion of the blank.

In cases where the reinforcing or splicing thread travels across the full width of the blank with the main thread the catch 66 may be thrown out and held out of action, whereby the starting of the movement of the friction box will not be under the control of the cam 80. For this purpose the arresting element 66 is provided with a spring-pressed detent for holding the element in an inoperative position relative to the friction box 35. In the present case the detent takes the form of a forked member comprising the shank 96 which is slidably mounted on a screw 97 threaded into and projecting from the upper end of the element 66, said forked member comprising arms 98, 98 disposed respectively at opposite sides of the element and adapted to engage notches 99 formed on the upper outer edges of the L-shaped brackets 65, between which the arresting element 66 is pivotally mounted. A spring 100, encircling the screw 97 between the upper end of the shank 96 of the detent and the head of the screw 97, tends to force the detent downwardly at all times to maintain contact between the arms 98 thereof and the notches 99 of the bracket 65.

A set screw 101, carried by the element 66 and locked thereto by the lock nut 102 in manner shown in Fig. 5, is held in yielding engagement with surface 114 through the action of the spring 95 thereby controlling the operative positioning of the element 66 laterally relative to the stop plate 70.

The collars 103, 104, freely mounted on 10 between the extremities of the friction box and the bearings 41 and 42 of yoke 37 substantially as shown, preferably include, in their construction, inserts 105, 106 composed of fiber, leather or some other cushioning or shock-absorbing material for the purpose of decreasing the shock and noise ordinarily arising when two metallic objects engage each other in the manner in which the end of the friction box 35 abuts the yoke member 37 to actuate the yarn carriers 5.

The lock member 107, pivotally fastened to the collar 60 by the stud 108 in manner illustrated, is provided for the purpose of extending the function of the invention from that of a plating friction box to one which operates in the usual well known manner. Thus with member 107 laid out of operation, see Figs. 1, 3 and 4, the invention operates in the manner heretofore explained to effect the desired lead of the respective yarn carrier relative to the sinkers. When, however, lever 107 is operatively positioned, as in Figs. 7 and 8, by lowering handle 109 to the position shown; hub 57 abuts the collar 103 which in turn engages the bearing 41, while the stud 110 carried by lever 107 engages the inner shoulder of the bearing 42, thereby combining into a single rigid unit the friction box 35 and the yoke 37. While lever 107 is thus positioned, and the arresting element 66 is in inoperative position, as hereinbefore set forth, every action of the friction box is instantaneously transmitted to the yoke 37 and in turn to the respective carrier in engagement therewith, thereby permitting the use of said unit as an actuator for the non-plating carriers whenever desired. It will be observed that stud 110 is adjustably attached to the lever 107 so as to compensate for wear in manner necessary to maintain the desired rigid unitary implement. The lock nut 112 is included in order to maintain the stud 110 in the desired position

relative to its supporting member. The arcuate extension 113 of the lever 107 cooperates with the opposing side of bearing 58 to confine the axial movement of collar 104 therebetween and thus maintain the latter in an inoperative position during the operation of the friction box unit as a non-plating-carrier actuating means.

Furthermore, in addition to eliminating the usual plating levers by means of the present invention control of which is directly associated therewith, I effect means for eliminating the binding action and resultant wear ordinarily exerted on the splicing rod by the friction box at such times when the carrier and consequently the friction box are maintained inoperative over and against the propelling influence of the splicing rod. The elimination of said binding action being effected by locking the friction box instead of the carriers, during desired intervals and permitting the yoke 37, slide 34 and carriers 5 to remain stationary without any propelling influence being directed thereupon until the friction box is released coincident with the disengagement of detent 66 with the lug portions 71 or 72, as the case may be. Since, in the present invention, locking of the friction box is effected by means directly associated therewith, which engage stationary lug portions closely allied therewith, I eliminate all bending of tongue 34 and consequently the binding action of the friction box relative to the splicing shaft which is ordinarily created when the carriers, instead of the friction boxes, are held inoperative during the operation of the splicing rod.

Of course, the improvements in straight knitting machines specifically shown and described can be changed and modified in various ways without departing from the invention herein disclosed and hereinafter claimed.

I claim:

1. In a straight knitting machine, the combination of a reciprocable thread bar, an actuator, a friction box on and reciprocable by said actuator, a yoke rigidly coupled to the thread bar and provided with relatively spaced bearings slidably mounted on the actuator adjacent opposite ends respectively of the friction box, a brake bar paralleling said thread bar and said actuator, and a brake device carried by the yoke and the brake bar for retaining said thread bar in a fixed position during initial operation of the friction box by the actuator prior to engagement of one end of the friction box with one of the bearings of said yoke.

2. In a straight knitting machine, the combination of a reciprocable thread bar, a reciprocating actuator, a friction box on the actuator for operating the thread bar, lost motion means for connecting the thread bar to the friction box, means for retaining the friction box in a fixed position during longitudinal movement of the actuator, a stop disposed in a fixed position within the limits of reciprocation of the friction box by the actuator, a latch carried by the friction box for engagement with the stop to retain the friction box in said fixed position during longitudinal movement of the actuator, and means movable concurrently with the actuator for releasing the latch from the stop at a predetermined point in the longitudinal movement of the actuator.

3. In a straight knitting machine, the combination of a reciprocable thread bar, a reciprocating actuator, a friction box on the actuator for operating the thread bar, lost motion means for connecting the thread bar to the friction box, means for retaining the friction box in a fixed position during longitudinal movement of the actuator including a stop disposed in a fixed position within the limits of reciprocation of the friction box by the actuator, a latch carried by the friction box for engagement with the stop to retain the friction box in said fixed position during longitudinal movement of the actuator, and a cam moving concurrently with said actuator for releasing the latch from the stop at a predetermined point in the course of travel of said actuator.

4. In a straight knitting machine, the combination of a reciprocable thread bar, a reciprocating actuator, a friction box on the actuator for operating the thread bar, lost motion means for connecting the thread bar to the friction box, a pair of relatively spaced stop shoulders in fixed positions within the limits of reciprocation of the friction box, a latch carried by the friction box for engagement with the stops during reverse reciprocatory movements of the actuator respectively, and a cam moving concurrently with the actuator for releasing the latch from one stop shoulder and placing said latch in position for engagement with the other of said shoulders at predetermined points respectively of a reciprocation of the actuator.

5. In a straight knitting machine, the combination of a reciprocable thread bar, a reciprocating actuator, a friction box on the actuator for operating the thread bar, lost motion means for connecting the thread bar to the friction box, a pair of relatively spaced stop shoulders in fixed positions within the limits of reciprocation of the friction box, a latch carried by the friction box for engagement with the stops during reverse reciprocatory movements of the actuator respectively, a cam moving concurrently with the actuator for releasing the latch from one stop shoulder and placing said latch in position for engagement with the other of said shoulders at predetermined points respectively of a reciprocation on the actuator, and means for selectively maintaining said latch in a position to avoid contact with said stops during said reciprocation of the actuator.

6. In a straight knitting machine, the combination of a needle-traversing thread guide, a sinker traversing slur cock, concurrently reciprocating actuators for said guide and slur cock respectively, a friction box slidably mounted on the thread guide actuator, lost motion means between and affording an operative connection for the friction box with the thread guide, means for holding the friction box in a fixed position during initial movement of the slur cock by its actuator, and means carried by the slur cock actuator in predetermined relation to the slur cock for releasing said friction box-holding means at a predetermined point in the concurrent movements of said actuators.

7. In a straight knitting machine, the combination of a needle-traversing thread guide, a sinker-traversing slur cock, concurrently reciprocating actuators for said thread guide and slur cock respectively, a friction box slidably mounted on the thread guide actuator, lost motion means affording an operative connection between the friction box and thread guide, latch and keeper mechanism for holding the friction box in a fixed position during initial movement of the slur cock, and a cam carried by one of said actuators in predetermined relation to the slur cock for

releasing said latch at a predetermined point in said movement of said slur cock.

8. In a straight knitting machine, the combination of a needle-traversing thread guide, a sinker traversing slur cock, concurrently reciprocating actuators for said thread guide and slur cock respectively, a friction box slidably mounted on the thread guide actuator, lost motion means affording an operative connection between the friction box and thread guide, latch and keeper mechanism for holding the friction box in a fixed position during initial movement of the slur cock, and a cam comprising a pair of similarly shaped cam bars arranged in coinciding relation to each other and adjustably secured for relative longitudinal variation on one of said actuators in predetermined relation to the slur cock for releasing said latch at a predetermined point in said movement of the slur cock.

9. In a straight knitting machine, the combination of a needle-traversing thread guide, a sinker-traversing slur cock, concurrently reciprocating actuators for said thread guide and slur cock respectively, a friction box slidably mounted on the thread guide actuator and affording an operative connection between said thread guide and said thread guide actuator, a stop, a latch lever carried by the friction box and engaging the stop to maintain the friction box and thread guide in a fixed position during initial movement of the slur cock, and a cam carried by the slur cock actuator and consisting of a pair of similar coinciding cam bars adjustably secured to said slur cock actuator for relative movement longitudinally thereof for releasing the friction box latch from said stop at a predetermined point in the movement of the slur cock.

10. In a straight knitting machine, the combination of a longitudinally reciprocable thread bar, a longitudinally reciprocating actuating bar parallel thereto, a longitudinally fixed bar parallel to said longitudinally movable bars, a friction box slidably mounted on said actuating bar and operatively connected to said thread bar, stop shoulders on and spaced longitudinally of the fixed bar, a latch carried by the friction box and engaging one of said stop shoulders during movement of the actuating bar in one direction, and a cam concurrently reciprocable with said actuating bar for releasing said latch from said stop shoulder and for placing said latch in position to engage another of said shoulders upon reverse movement of said actuating bar.

11. In a straight knitting machine, the combination of a longitudinally reciprocating bar, a friction box slidably mounted on said bar, a longitudinally fixed stop plate parallel to said bar, a pair of stops on and spaced longitudinally of the stop plate, a latch pivotally mounted on the friction box and engaging one of the stops, and a cam concurrently reciprocable with said bar for releasing said latch from said stop upon movement of the bar in one direction and for placing the latch in position to engage the second of said stops upon reverse movement of said bar.

12. In a straight knitting machine, the combination of a longitudinally reciprocating bar, a friction box slidably mounted on said bar, a longitudinally fixed stop plate parallel to said bar, a pair of stops on and spaced longitudinally of the stop plate, a latch pivotally mounted on the friction box and engaging one of the stops, a cam concurrently reciprocable with said bar for releasing said latch from said stop upon movement of the bar in one direction and for placing the latch in position to engage the second of said stops upon reverse movement of said bar, said cam comprising a pair of similar coinciding cam bars mounted for longitudinal adjustment relative to each other and to said bar.

13. In a straight knitting machine, the combination of a longitudinally reciprocable bar, a friction box slidably mounted on said bar, a latch lever pivoted to said friction box, a stop engaged by said lever, a cam concurrently reciprocable with said bar for releasing the latch from the stop, and means for securing the latch in said released position relative to the stop during reciprocation of the friction box by said bar.

14. In a straight knitting machine, the combination of a reciprocable thread bar, a reciprocating actuator, a device frictionally coupled to said actuator for reciprocating said thread bar, a yoke member bridging said friction device longitudinally of said actuator and having a pair of relatively spaced bearings slidably mounted on the actuator adjacent the opposite ends respectively of said friction device and affording predetermined lost motion between the friction device and the yoke member on the actuator upon initial operation of the friction device by the actuator, and a connecting lever on said friction device adapted to prevent movement between the yoke and friction device.

15. In a straight knitting machine, the combination of a reciprocable thread bar, a reciprocating actuator, a friction box on the actuator for operating the thread bar, lost motion means for connecting the thread bar to the friction box, a pair of relatively spaced stop shoulders in fixed positions within the limits of reciprocation of the friction box, a latch carried by the friction box for engagement with the stops during reverse reciprocatory movements of the actuator, a cam moving in unison with the actuator and adapted to release the latch from one stop shoulder thereby placing said latch in position for engagement with the other of said shoulders at predetermined points respectively of a reciproaction of the actuator, and adjustable means for determining the operative position of said latch member.

16. In a straight knitting machine, the combination of a reciprocable thread bar, an actuator, a friction box reciprocable by said actuator, means operating between the thread bar and the friction box to first provide lost motion between the thread bar and the friction box and then cause the box to directly drive the bar, and mechanism for holding the friction box and releasing it after a predetermined movement of the actuator to take up said lost motion and actuate the thread bar through said means.

17. In a straight knitting machine, the combination of a reciprocable thread bar, an actuator, a friction box reciprocable by said actuator, means operating between the thread bar and the friction box to first provide lost motion between the thread bar and the friction box and then cause the box to directly drive the bar, and adjustable mechanism for holding the friction box and releasing it after a variable predetermined movement of the actuator to take up said lost motion and actuate the thread bar through said means.

18. In a straight knitting machine, the combination of a reciprocable thread bar, an actuator, a friction box reciprocable by said actuator, means operating between the thread bar and the friction box to first provide lost motion between the thread bar and the friction box and then

cause the box to directly drive the bar, mechanism for holding the friction box and releasing it after a predetermined movement of the actuator to take up said lost motion and actuate the thread bar through said means, and adjusting means to prevent said lost motion and cause the thread bar and the friction box to reciprocate in unison.

19. In a straight knitting machine, the combination of a reciprocable thread bar, an actuator, a friction box reciprocable by said actuator, means including a movable member operating between the thread bar and the friction box to first provide lost motion between the thread bar and the friction box and then cause the box to directly drive the bar, mechanism for holding the friction box and releasing it after a predetermined movement of the actuator to take up said lost motion and actuate the thread bar through said means, and means for holding said movable member until said lost motion is taken up.

20. In a straight knitting machine, the combination of a reciprocable thread bar, an actuator, a friction-box member reciprocable by said actuator, means including a movable member operating between the thread bar and the friction box to first provide lost motion between the thread bar and the friction box and then cause the box to directly drive the bar, and mechanism for holding one of said members and releasing it after a predetermined movement of the actuator to take up said lost motion and actuate the thread bar through said means.

21. In a straight knitting machine, the combination with a knitting mechanism including sinkers, a longitudinally reciprocable thread-bar, a longitudinally reciprocable friction rod, and means for actuating the sinkers and the rod, of a friction box mounted on the rod for movement slidably therealong, a carriage also mounted on the rod for movement slidably therealong by the box only after predetermined movement of the box by the rod at the beginning of its strokes, means for connecting the carriage to the thread bar, detents spaced along the rod, an element mounted on the box for cooperation with one of the detents to arrest movement of the box in one direction and with another of the detents to arrest movement of the box in the opposite direction along the rod, and means for releasing the arresting element and the detents from each other in predetermined leading relation to the initially moving active sinkers.

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