Nov. 21, 1950 A. SHORTLAND 2,530,790

KNITTING MACHINE

Filed May 6, 1948 2 Sheets-Sheet 1

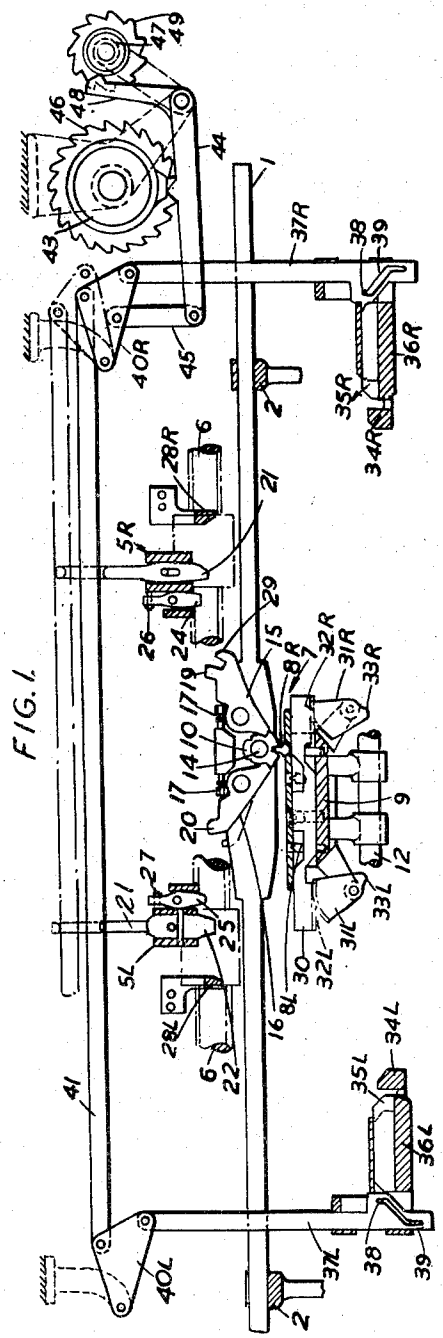


FIG. 1.

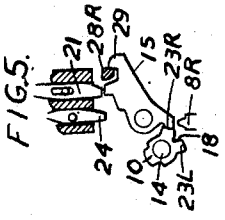


FIG. 5.

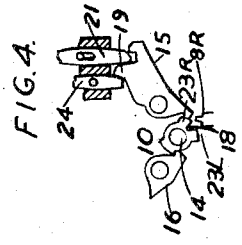


FIG. 4.

Inventor

Arthur Shortland

By

Michael & Shortland

Nov. 21, 1950 A. SHORTLAND 2,530,790

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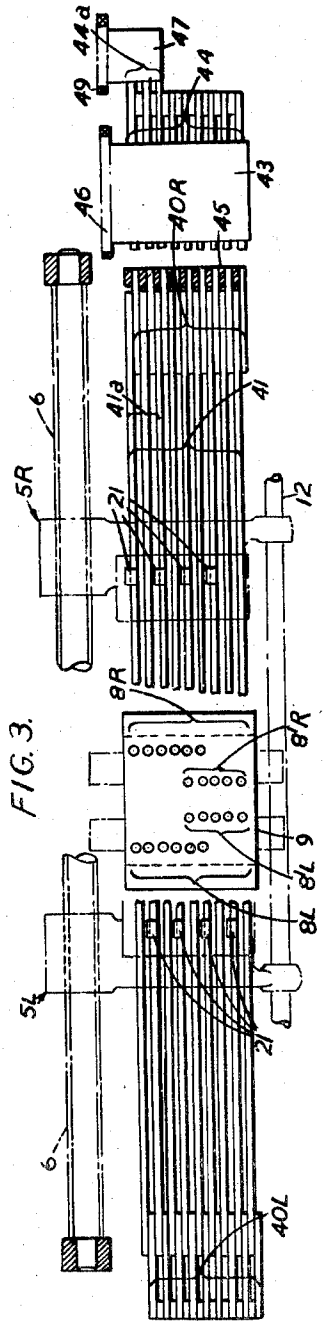


FIG. 3.

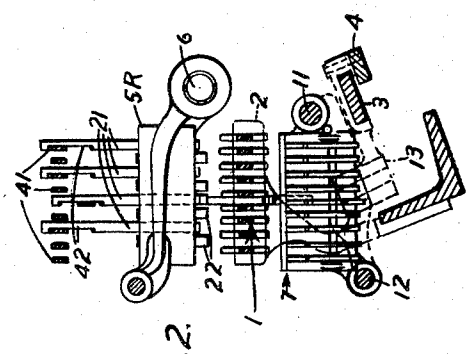


FIG. 2.

Inventor

A. Kenneth Shortland

By

Mueller & Aigner

Atty

Patented Nov. 21, 1950 2,530,790

UNITED STATES PATENT OFFICE

2,530,790

KNITTING MACHINE

Arthur Shortland, Leicester, England, assignor to Mellor Bromley & Co. Limited, Leicester, England

Application May 6, 1948, Serial No. 25,502
In Great Britain May 13, 1947

18 Claims. (Cl. 66—127)

1

This invention concerns knitting machines and particularly Cotton's patent and other straight bar knitting machines. An object of the invention is the provision of improved apparatus for positively driving one member to and fro from another member of a knitting machine and a specific object is the provision in a straight bar knitting machine, of positive apparatus for driving a carrier to and fro with a variable traverse. A further object of the invention is the provision, in a straight bar knitting machine, of positive carrier-driving apparatus which eliminates the usual friction box drive.

The invention provides, in a knitting machine, apparatus for driving a driven member to and fro between limit stops, comprising a driver movable to and fro, releasable coupling mechanism for establishing a positive driving connection between the driver and the driven member, and coupling release means carried by the driven member and operable by approach to either limit stop to render the coupling mechanism temporarily ineffective to transmit the drive in the approach direction (i. e. that direction in which the driven member or the coupling release means is approaching the limit stop under consideration) but capable of re-engagement upon reversal of travel of the driver to transmit the drive in the reverse direction until again operated by approach to the other limit stop. It will be appreciated that in the application of the invention to a straight bar knitting machine the driver may be a part of the Coulier or draw mechanism (such for example as the slurcock tie bar or some member which is reciprocated therewith) and the driven member may be a carrier or carrier rod, the limit stops being the usual carrier stops or their equivalent. In a construction wherein the spacing between these limit stops is adjustable the invention permits a driver having constant amplitude of traverse to drive positively a driven member with a variable amplitude of traverse and it will therefore be appreciated that the apparatus is well adapted to replace the usual friction box drive for the carriers of a straight bar knitting machine.

In general, however, it is desirable in a straight bar knitting machine to provide a plurality of carriers which may be driven selectively, being brought into and out of use as required. Therefore according to an important subsidiary feature of the invention the apparatus comprises a plurality of driven members to be driven selectively by the driver, a coupling mechanism for each driven member, and means for selecting said coupling mechanisms for operation.

2

According to a further important subsidiary feature of the invention the coupling mechanism comprises a latching means driven to and fro by the driver, a keeper on the driven member for engagement by the latching means and movable between driving and release attitudes, and locking means on the driven member for locking the keeper in the driving attitude which locking means is releasable by the release means. In order to provide for the selective driving of any one of a plurality of carriers, carrier rods, or other driven members there is a plurality of said latching means one for each driven member, and mechanism for moving them selectively between operative and inoperative attitudes.

A further important subsidiary feature of the invention the latching means comprises a pair of alternative latches, spaced apart in the direction of travel, for engagement with the associated keeper and means for rendering one latch operative in travel in one direction and the other in travel in the other direction. This permits the driven member under consideration to have a lead or lag in relation to some other part of the machine such for example as another driven member. It will therefore be appreciated that apparatus of the construction just defined is applicable to the plating carrier of a Cotton's patent or other straight bar knitting machine.

According to a further important subsidiary feature at least two latching means are simultaneously operable to drive the associated driven member, and the spacing between the latches of one latching means differs from that between the latches of the other latching means, whereby the associated driven members may be given different leads.

The foregoing and other features of the invention set out in the appended claims are incorporated in the construction which will now be described, as an example of the application of the invention to the carrier driving apparatus of a Cotton's patent or other straight bar knitting machine, with reference to the accompanying drawings which are to some extent diagrammatic and in which:

Figure 1 is an elevation, partly in section, of the apparatus;

Figure 2 is a sectional view showing the various carrier rods and their coupling mechanisms;

Figure 3 is a plan showing certain details;

Figure 4 is a detail view showing the manner in which a carrier rod is locked to a carrier stop;

Figure 5 is a view, similar to Fig. 4, showing the rod locked in the "home" position.

The general construction of the knitting ma-

chine follows conventional lines and requires no description or illustration, it being only necessary to direct attention to the fact that the machine is provided, as is usual, with a plurality of carrier rods having the general reference number 1 mounted in suitable guides 2 for endwise reciprocation and a slur bar 3 and slurcock tie bar 4 which is reciprocated with constant amplitude by Coulier or draw mechanism of any convenient construction; the rods 1 include at least one and preferably a plurality of splicing carrier rods hereinafter referred to.

The apparatus provides for any selected one or more of the carrier rods 1 to be driven with a varying amplitude from the slurcock tie bar 4, the amplitude of traverse of the rods being determined by carrier stops 5R, 5L which are adjustable in known manner (for example by a screw or screws 6 in conformity with the movement of fashioning points).

For each rod 1, there is a releasable coupling mechanism for driving it from the tie bar. The mechanisms are indicated generally at 7. They each consist of driving latches 8R, 8L on a block 9 and a keeper 10 on the appropriate rod 1; the block 9 is driven along guide bars 11, 12 by a connection 13 from the tie bar. The keeper 10 is pivoted to its carrier rod 1 at 14 and is provided with a recess 18 in which latch 8R is engaged during movement to the right and latch 8L during movement to the left. The spacing between these latches is such as to give the appropriate lead of the carrier over the slurcock; for this reason the spacing between the latches 8'R and 8'L provided for splicing or plating carrier rods differs from that between the latches for main carrier rods as is clearly apparent from Fig. 3. This figure also shows that some of the carrier rods have both kinds of latches, so that their carriers may be employed either as main carriers or as plating carriers. As the operative latch travels with the block 9 and the tie bar 4 it tends to swing the keeper 10 about its pivot 14 and to disengage from the keeper, but locking mechanism is provided on the carrier rod which, until released prevents pivotal movement of the keeper so that the carrier rod is itself reciprocated. The locking mechanism consists of two pivoted detents 15, 16 on the rod 1, one preventing the keeper 10 from swinging in one direction and the other preventing it from swinging in the other direction which detents are urged to operative position by spring means 17. Release mechanism is provided which, as the carrier rod approaches either of the stops 5R, 5L, operates to release the appropriate detent so that the driving force exerted by the operative latch 8R or 8L swings the keeper 10 and causes the latch to disengage therefrom at the time when the carrier is brought to a standstill by this stop; the latches thereupon travel on to the end of their traverse but on the return traverse the other latch engages the recess 18 in the keeper 10 and swings the latter in the opposite direction until its movement is terminated by the other detent whereupon the said other latch drives the carrier rod 1 in the opposite direction until, on approach to the other stop, the last mentioned detent is released in the manner previously described.

The release mechanism for the detents comprises noses 19, 20 on the respective detents 15, 16, and stop members 21, 22 for each pair of detents, so placed on the carrier stops as to be capable of being engaged by the noses. For example when in travel to the right, nose 19 strikes stop member 21 the detent 15 is swung to free keeper 10 so that latch 8R may rotate the latter and free itself (Fig. 4). Rotation of the keeper 10 brings a wing 23R on it to a position in which it holds detent 15 in the attitude shown in Figs. 4 and 5 and brings an opposite wing 23L to a position in which it is placed to be struck by the other latch 8L in travel to the left (assuming that latch 8L has by then been raised to operative position).

Not only does the engagement of nose 19 or 20 with the respective stop member 21 or 22 bring the associated carrier rod 1 to a standstill (while the slurcock and the block 9 run on to the end of their traverse) but also produces the engagement of an anti-rebound catch. It will be observed that a second member 24 or 25 is associated with each member 21 or 22, the width of the gap between each pair of members being adjustable by screw means 26 or 27, and upon nose 19 or 20 striking member 21 or 22 it swings up into the gap (see Fig. 4) and locks the rod 1 to the carrier stop 5R or 5L as the case may be.

It is customary in Cotton's patent knitting machines to keep inoperative carriers in a "home" position beyond the end of that division of needles with which they are associated. The carriers are only brought in from this home position when they are required for use. While in use the carriers travel between limits determined by the stops and when any carrier is no longer required it is permitted to pass, beyond the limit set by one of these stops, out to the home position. It is further customary so to arrange matters that the home position for the carriers of alternate carrier rods is at one end of the division of needles and the home position of the carriers of the intermediate rods is at the other end of the division. The present invention provides for carrier rods to be brought into and out of a homing position. For this purpose the stop member 21 for each rod 1 is capable of being raised to an inoperative position which permits the nose 19 to travel outward past it, but the other stop member 22 of that rod is incapable of being raised to an inoperative position. Furthermore one of the adjustable stops 5R has a movable stop member 21 for each alternate rod and a fixed stop member 22 for each intervening rod, while the other stop 5L has a movable stop member 21 for each said intervening rod and a fixed stop member 22 for each said alternate rod. This permits alternate rods to be homed to the right and the intervening rods to be homed to the left, the appropriate stop member 21 being raised as required. When it is desired to "home" a carrier rod the stop member 21 for that rod is raised and the nose 19 on that rod travels past member 21 until it strikes against a fixed home stop 28R or 28L as the case may be. Upon the nose 19 striking this home stop the detent 15 is swung to the release position as shown in Fig. 5. Moreover a hook part 29 on this detent 15 hooks round the home stop so that the carrier rod is held in the home position. Since each rod homes in one direction it is unnecessary to provide the hook part on both the detents 15 and 16, and for this reason the alternate rods 1 which home to the right are provided with a detent 15 at the right hand side of the locking mechanism and the intervening rods which home to the left are provided with a detent 15 at the left hand side.

The mechanism described and illustrated involves the operative latch 8R or 8L being brought

to a neutral position at the end of the traverse of the slur-cock tie bar 4. At the end of that traverse the fresh selection is made from among the latches so that the carrier rod that has just finished its travel, or another carrier rod, is traversed in the reverse direction by one of the alternative latches. Each pair of alternative latches 8R, 8L is shifted by a cam bar 30 mounted for horizontal movement within the block 9. Each of these cam bars is shaped as shown in Fig. 1 so that when it is shifted to the right within the block 9 latch 8L is lifted and when it is shifted to the left latch 8R is elevated. These movements are imparted to the cam bar by quadrants 31R and 31L pivoted on the block 9 and engaging racks 32R and 32L on the cam bar. The quadrants are provided with tail members 33R and 33L respectively and towards the end of each traverse of the slurcock tie bar 4 all the tail members 33R or 33L engage neutralising cams 34R or 34L respectively so that all the cam bars 30 not already in neutral position are shifted to a position in which the associated latches 8R and 8L are in their neutral position. Thereafter continued travel of the block 9 brings the tail members 33R or 33L into position for engagement with selectors 35R or 35L there being a pair of selectors, 35R, 35L for each pair of quadrants. The selectors are movably mounted in beds 36R, 36L and when any selector is selectively projected towards the centre of the machine it is thereby positioned to be struck by the associated quadrant tail 33R or 33L with the result that the appropriate quadrant is swung in a direction such that the cam bar 30 is moved beyond the neutral position and the appropriate latch 8R or 8L is elevated. The latch that is thus selected and elevated drives the associated carrier rod 1 in the next traverse (in the reverse direction).

In order to cause a carrier rod to travel in from the home position a selector 35R or 35L appropriate to that rod is moved inwards to its operative position. This movement causes it to engage the tail of the associated quadrant 31R or 31L and to elevate the required latch 8R or 8L so that as the block 9 moves in its next traverse the raised latch engages the detent 10 of the required carrier bar, swings that detent to permit the catch 15 to disengage from the home stop 28R or 28L and thereupon drives the carrier rod along the line of needles.

The selectors 35R, 35L are operated by vertically movable bars 37R, 37L connected with the selectors by pins 38 and slots 39, the said bars 37R and 37L being connected in pairs by levers 40R, 40L and tie rods 41. These tie rods 41 serve to raise and lower the stop members 21 for they extend through slots 42 cut across the faces of these stop members as shown in Fig. 2. It will be appreciated that alternate rods 41 operate those stop members 21 that are provided on the right hand stop 5R and the intervening rods 41 operate these stop members 21 that are provided on the left hand stop 5L. This is readily apparent from Fig. 3.

It will be observed that the slots 42 are substantially wider than the tie rods 41 and these tie rods have two degrees of movement. Considering the lower position shown in full lines in Fig. 1 the first portion of the upward movement of a rod 41 does not influence a stop member 21 but it causes the associated selectors 35R and 35L to be retracted to an inoperative position. The next stage of movement raises the stop member 21 without further effect on the selectors because as will be observed the lower part of each slot 39 extends vertically. Conversely the first stage of downward movement of a rod 41 permits the stop member 21 to descend to operative position but does not affect the selectors. The next stage of downward movement causes the selectors to move inwards.

These movements of the bars 41 are produced by a patterning drum 43 of conventional form acting on feelers 44 connected by links 45 one to each lever 40R. The drum 43 is provided with conventional racking mechanism indicated generally at 46 and with a ring of studs for each feeler 44. These studs comprise low studs which produce the first stage of downward movement of rods 41 and high studs which produce the second stage.

It is desirable that the knitting machine shall be so constructed and arranged that each of three carriers can be employed in alternation, each for one draw, in the production of "ringless" hose and the like by the three carrier system. While knitting on the three carrier system it is not desirable that when each carrier has made its draw it shall pass out to the home position until next required. Thus at the end of each draw it is merely necessary to make a fresh selection from among the selectors 35R, 35L and this selection is under the control of an auxiliary patterning drum 47 (with conventional racking mechanism 49) which acts on extensions 48 of those three feelers 44 which in Fig. 3 are grouped by the bracket 44*a*, these feelers being connected to the rising and falling bars 41*a* associated with the three carrier rods that are employed in the three carrier system. At the start of "ringless" work, low studs on the main drum 43 lower stops 21 and the auxiliary drum 47 thereafter makes the appropriate selections from among the three sets of selectors 36R, 36L without shifting the stops.

In conclusion, it is pointed out that the apparatus described herein not only provides for the carriers to be driven positively, with a variable amplitude, but also provides that irrespective of the amplitude of traverse the lead of the carrier over the slur cock, and the lead of the main carrier over the plating carrier, is constant.

I claim:

1. In a knitting machine, apparatus for driving a driven member to and fro between limit stops, comprising a driver movable to and fro, releasable coupling mechanism for establishing a positive driving connection between the driver and the driven member, and coupling release means carried by the driven member and operable by approach to either limit stop to render the coupling mechanism temporarily ineffective to transmit the drive in the approach direction but capable of re-engagement upon reversal of travel of the driver to transmit the drive in the reverse direction until again operated by approach to the other limit stop.

2. For a straight bar knitting machine of the type having a carrier, carried stops for determining its traverse, and Coulier or draw mechanism for driving the carrier; the combination of a driver movable to and fro with a part of the draw mechanism, releasable coupling mechanism for establishing a positive driving connection between the driver and the carrier, and coupling releasable means travelling with the carrier and operable by approach to either carrier stop to render the coupling mechanism temporarily ineffective to transmit the drive in the approach

direction, but capable of re-engagement upon reversal of travel of the driver to transmit the drive in the reverse direction until again operated by approach to the other carrier stop.

3. For straight bar knitting machines of the type having a yarn carried movable to and fro with a variable amplitude of traverse, adjustable carrier stops for varying this traverse, Coulier or draw mechanism for driving the carrier to and fro and comprising a part having a constant amplitude of traverse; the combination of releasable coupling mechanism for establishing a positive driving connection between the driver and the carrier, and coupling release means travelling with the carrier and operable by approach to either carrier stop to disengage the coupling mechanism and to render the latter automatically re-engageable upon reversal of travel of the driver to drive the carrier in the reverse direction until again operated by approach to the other carrier stop.

4. Apparatus according to claim 1, comprising a plurality of driven members to be driven selectively by the driver, coupling mechanism for each driven member, and means for selecting said coupling mechanisms for operation.

5. For a knitting machine, apparatus for driving a driven member to and fro with a variable traverse between limit stops, comprising in combination a driver movable to and fro with constant amplitude; releasable coupling mechanism for establishing a positive driving connection between the driver and the driven member and comprising latching means driven to and fro by the driver, a keeper on the driven member for engagement by the latching means and movable between driving and release attitudes, and locking means on the driven member for locking the keeper in the driving attitude which locking means is releasable by the release means, and coupling release means carried by the driven member and operable by approach to either limit stop to render the coupling mechanism temporarily ineffective to transmit the drive in the approach direction but capable of re-engagement upon reversal of travel of the driver to transmit the drive in the reverse direction until again operated by approach to the other limit stop.

6. Apparatus according to claim 5 comprising a plurality of driven members to be driven selectively by the driver, a plurality of the said latching means one for each driven member, and mechanism for moving the latching means selectively between operative and inoperative attitudes and for thereby selecting the required driven member.

7. Apparatus according to claim 5 wherein the latching means comprises a pair of alternative latches, spaced apart in the direction of travel for engagement with the associated keeper, and means for rendering one latch operative in travel in one direction and the other in travel in the other direction.

8. Apparatus according to claim 5, wherein the latching means comprises a pair of alternative latches spaced apart in the direction of travel for engagement with the associated keeper, and means for rendering the leading latch operative in each traverse of the driving member.

9. Apparatus according to claim 5, comprising a plurality of the driven members; latching means, a keeper, and locking means, for each driven member, each of which latching means comprises a pair of alternative latches spaced apart in the direction of travel for engagement with the associated keeper; means for rendering the leading latch operative in travel in each direction; and means for rendering at least two of the latching means simultaneously operative to drive the two driving members associated therewith wherein the spacing between the latches of these two latching means differs whereby the associated driven members have different leads.

10. Apparatus according to claim 5, having the keeper movable in the act of release to an attitude in which it is placed for engagement by the latching means in the next traverse, which keeper is then movable by the latching means to the driving attitude.

11. Apparatus according to claim 5, wherein locking means comprises two detents one operable in traverse in one direction and the other in traverse in the opposite direction, and parts associated with the detents for engagement with the stops to shift the detents to release the keeper.

12. Apparatus according to claim 5, wherein the locking means comprises two detents, one operable in traverse in one direction and the other in traverse in the opposite direction, parts associated with the detents for engagement with the stops to shift the detents to release the keeper, and a part on each detent for locking engagement with the stop against which it engages.

13. For a knitting machine having a driven member movable to and fro with a variable amplitude of traverse, adjustable limit stops for varying this amplitude, and a driver movable to and fro with constant amplitude of traverse; the combination of releasable coupling mechanism for establishing a positive driving connection between the driver and the driven member which coupling mechanism comprises a pair of alternative latches spaced apart in the direction of travel for engagement with the keeper hereinafter specified, a cam member carried by the driver and movable to and fro in relation to it between alternative positions to render the latches alternatively operative, one operative in travel in one direction and the other in travel in the other direction, a keeper on the driving member for engagement by the operative latch and movable between the driving and release attitudes, locking means on the driven member for locking the keeper in the driving attitude, coupling release means carried by the driven member and operable by approach to either limit stop to release the keeper for movement by the operative latch to a coupling release attitude in which said keeper is positioned for automatic engagement by the other latch upon reversal of the driver to transmit the drive in the reverse direction, and means for shifting the cam member at the ends of the traverse of the driver.

14. Apparatus according to claim 13, wherein the means last mentioned comprises selecting mechanism for moving any selected cam member.

15. Apparatus according to claim 1, having means for rendering one limit stop inoperative thereby to permit the driven member to travel out to a home position, and a home stop for bringing the driven member to rest in that position.

16. Apparatus according to claim 5, having means for rendering one limit stop inoperative thereby to permit the driven member to travel out to a home position, and a home stop for bringing it to rest in the home position; and wherein the locking means comprises two detents

whereof one is operable in traverse in one direction and the other in traverse in the other direction, parts associated with the detents for engagement with the limit stops to shift the detents to release the keeper, means on each detent for locking with the limit stop upon engagement with the latter and, on one detent, for locking with the home stop upon the driven member reaching the home position.

17. For a straight bar knitting machine having a plurality of carrier rods, positive carrier-driving mechanism for driving any selected carrier rods with a variable amplitude of traverse, comprising a common driver movable to and fro with a constant amplitude of traverse and having for each rod a pair of alternative driving latches spaced apart in the direction of traverse and an operating member movable between two alternative positions to render the latches alternatively operative and to a neutral position to render them both inoperative; means for shifting the operating members to neutral position at each end of the driver traverse; selectors for then selectively shifting an operating member to render operative the leading latch in the next traverse; a pair of adjustable limit stops for adjustably determining the carrier rod traverse and comprising, for each rod, a stop element on each limit stop for stopping that rod upon being struck by a detent hereinafter mentioned, one of which elements of each pair is movable to an inoperative position; mechanism on each carrier rod comprising a keeper having a central driving position for driving engagement by the operative latch and movable by the latter to a release position at one or other side of the driving position according to the direction of traverse of the latch, and two releasable detents one for preventing movement of the keeper to one release position and disposed to travel into engagement with and to be released by one stop element and the other for preventing movement of the keeper to the other release position and disposed to travel into engagement and to be released by the other stop element of the pair of stop elements associated with that rod; a home stop for each rod, located outwards of the movable stop element of that rod, for engaging and operating one of the detents to arrest the rod in a home position consequent upon the movable element being rendered inoperative; and selective means for selectively moving the movable stop elements into and out of operative position.

18. Apparatus according to claim 17, having at least three rods and mechanism for selecting three rods for use in turn each for one course.

ARTHUR SHORTLAND.

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