Nov. 5, 1946. J. E. LYNAM 2,410,668

COTTON'S PATENT AND OTHER STRAIGHT BAR KNITTING MACHINES

Filed July 14, 1945 5 Sheets-Sheet 1

FIG. 1.

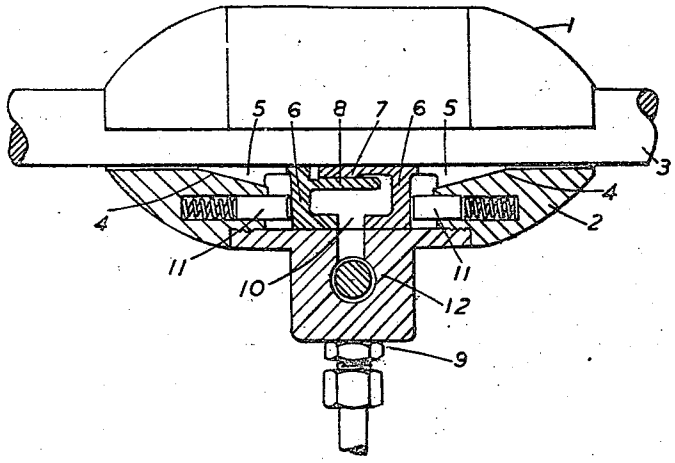


FIG. 2.

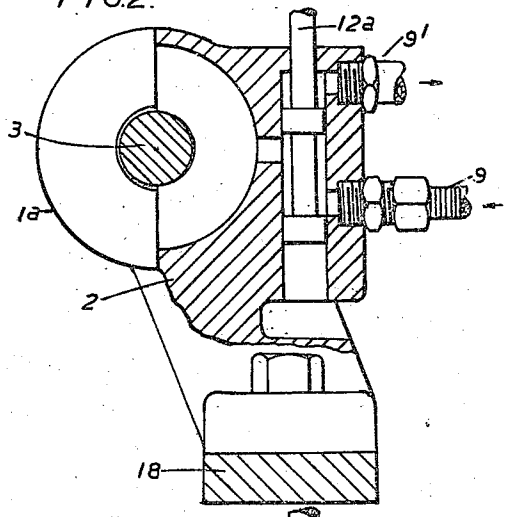
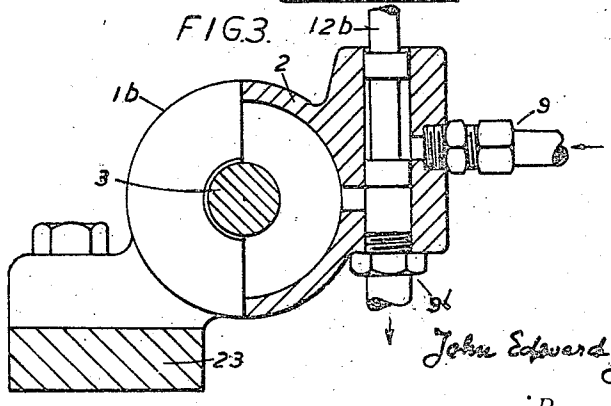


FIG. 3.



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Nov. 5, 1946. J. E. LYNAM 2,410,668

COTTON'S PATENT AND OTHER STRAIGHT BAR KNITTING MACHINES

Filed July 14, 1945 5 Sheets-Sheet 2

FIG.4.

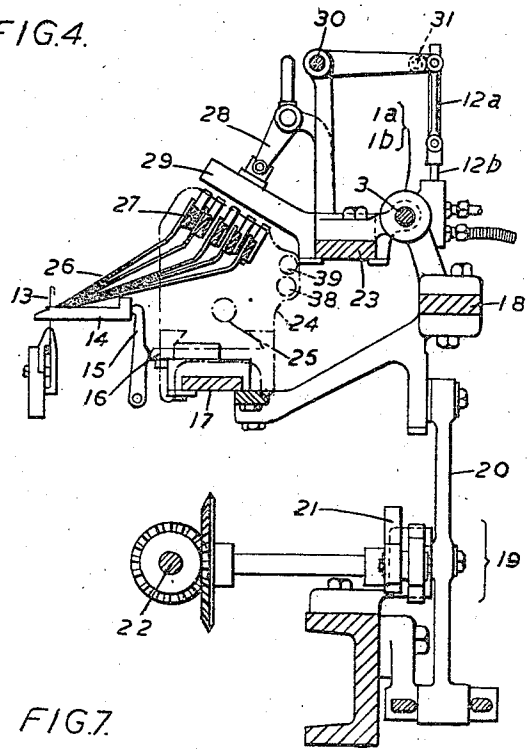
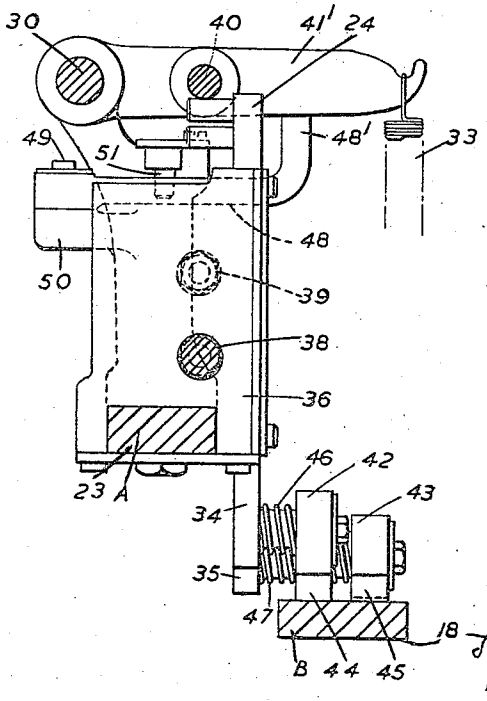


FIG.7.



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Nov. 5, 1946. J. E. LYNAM 2,410,668

COTTON'S PATENT AND OTHER STRAIGHT BAR KNITTING MACHINES

Filed July 14, 1945 5 Sheets-Sheet 3

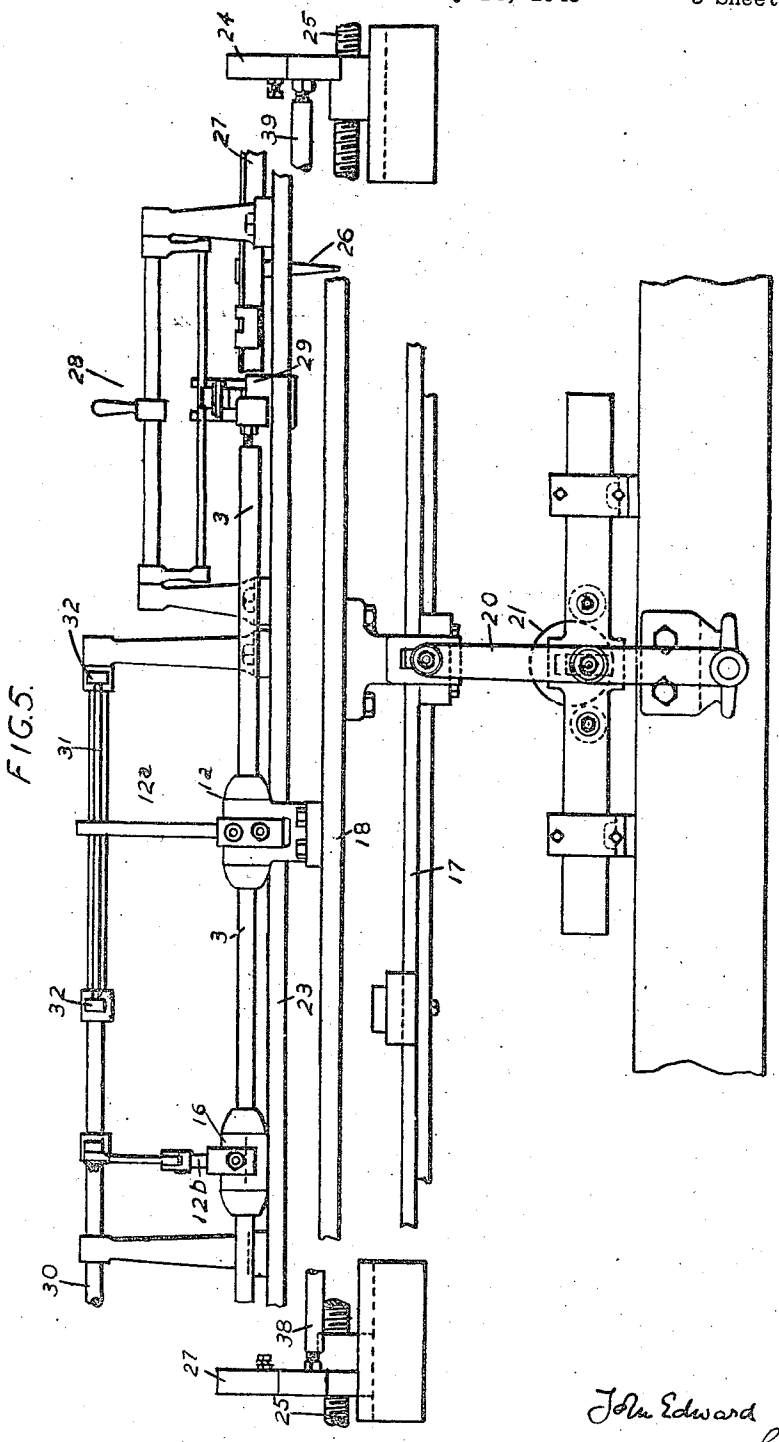


FIG.5.

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Nov. 5, 1946. J. E. LYNAM 2,410,668

COTTON'S PATENT AND OTHER STRAIGHT BAR KNITTING MACHINES

Filed July 14, 1945 5 Sheets-Sheet 4

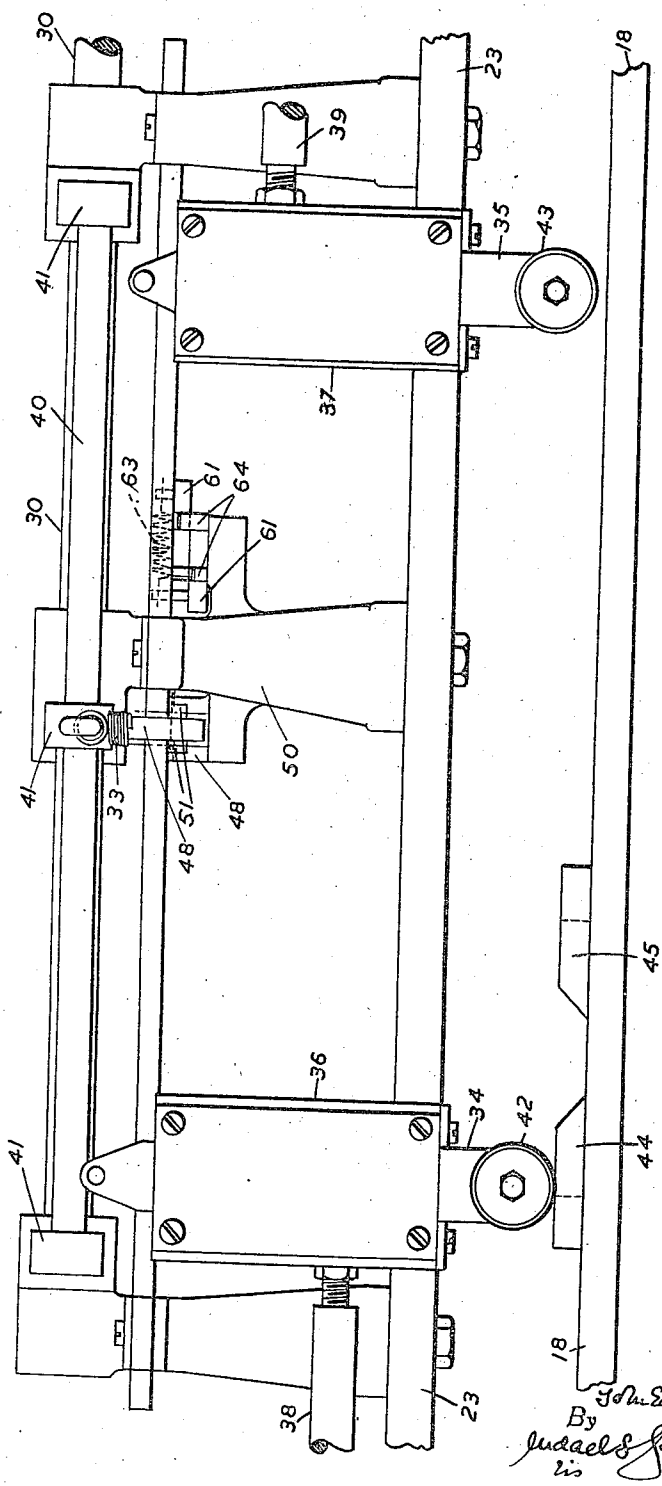


FIG. 6.

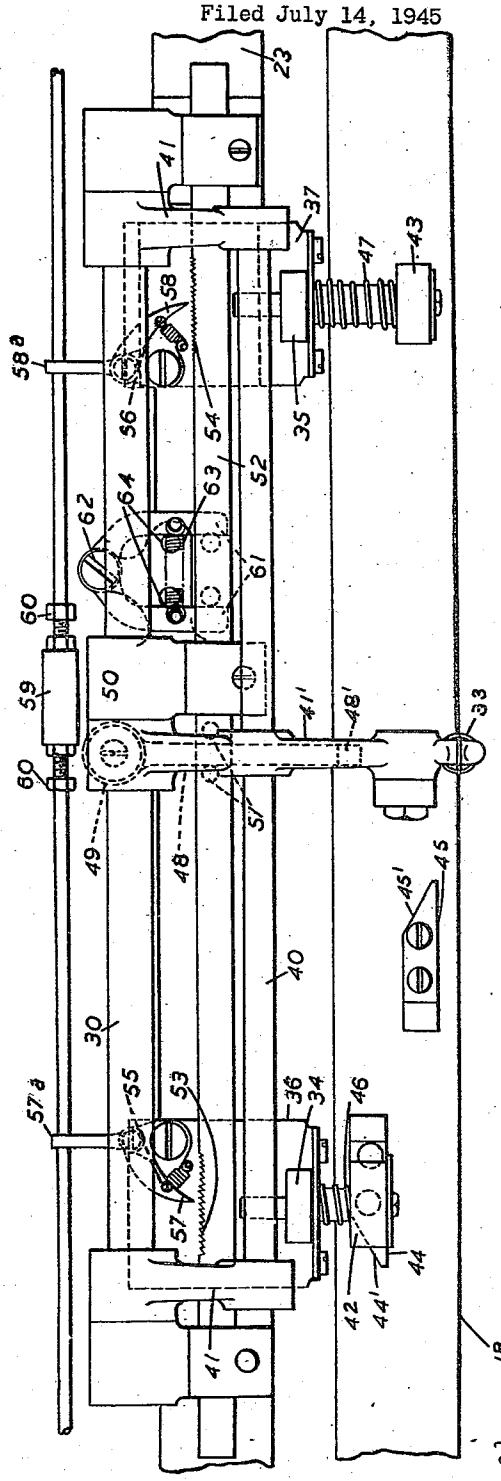
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COTTON'S PATENT AND OTHER STRAIGHT BAR KNITTING MACHINES

Filed July 14, 1945 5 Sheets-Sheet 5

FIG.8.



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UNITED STATES PATENT OFFICE

2,410,668

COTTON'S PATENT AND OTHER STRAIGHT BAR KNITTING MACHINE

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Application July 14, 1945, Serial No. 605,115
In Great Britain February 5, 1945

16 Claims. (Cl. 66—126)

1

In straight bar knitting machines it is customary to drive the yarn carrier or each of them through the medium of a permanent friction coupling, known as a friction box or friction, which provides sufficient frictional grip to drive the carrier to and fro but slips when the traverse of the carrier in either direction is terminated by a stop. Thus in a common construction of Cotton's Patent machine there is a friction rod which is reciprocated with a constant amplitude by a draw cam and extends through at least one friction box which contains a frictional surface permanently pressed against the rod to grip it and which is connected to a carrier rod (or any selected one of several carrier rods). The known arrangement readily permits the traverse of the carrier to be varied (by adjusting the stops) as required but since the friction is applied throughout the whole time that a given carrier is operative it has various recognized disadvantages among which may be mentioned the heavy impact when the carrier rod strikes a stop, the power absorbed in forcing the friction rod through the box after said impact, and the heavily-fluctuating load thus thrown upon the driving motor of the machine. A specific object of the present invention is a construction which avoids or minimises these disadvantages. Another object is a fluid-operated friction coupling (i. e. a hydraulic or pneumatic clutch or brake) for a reciprocatable member of a Cotton's Patent or other straight bar knitting machine.

The invention provides in a knitting machine, particularly a straight bar knitting machine; the combination with a member movable to and fro, of a coupling comprising two relatively-movable parts one of which is connectable to said member, a friction member for connecting them frictionally, and fluid-operated means for operating said friction member. The coupling may serve to drive a reciprocatable member, or to hold it stationary, or there may be a coupling for each purpose. Specifically, the said member may be a yarn carrier or carrier rod and as viewed from an important aspect the invention provides in a Cotton's Patent or other straight bar knitting machine having at least one carrier movable to and fro with a variable amplitude and a reciprocatable driver for driving it, a driving coupling comprising two relatively-reciprocatable parts whereof one is connectable to the carrier and the other to the driver, a friction member for connecting them, and fluid-operated means for operating said friction member in accordance with the desired amplitude of travel.

2

The coupling preferably comprises a housing, a rod extending through it, a split taper collet encircling the rod within the housing and co-operating with a taper surface, and a piston in the housing for operating the collet. It is further preferred that there shall be two opposed pistons each operating a collet.

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 alternate driving and locking of a carrier driving bar which is connected to a carrier or capable of being mounted to any selected one of a plurality of carriers, with reference to the accompanying drawings in which—

Figure 1 is a part-section through a coupling.

Figure 2 is a cross section illustrating the use of such a coupling for driving a reciprocatable rod and

Figure 3 is a like view illustrating its use for holding the rod stationary;

Figure 4 is a cross section showing the relevant parts of a Cotton's Patent or other straight bar knitting machine and illustrating the application of the coupling thereto;

Figure 5 is a rear elevation of this machine; and

Figure 6 is an elevation, Figure 7 a cross section, and Figure 8 a plan (all on a larger scale) of certain details of this machine.

The coupling employed in this example is indicated generally at 1 in Fig. 1 and consists of a hollow housing 2 through which the carrier driving bar 3, of circular cross section, extends slidably. The housing interior terminates in two, oppositely directed, slow tapers 4 each of which accommodates a split taper collet or gripper 5 encircling the bar 3 so that if these collets are forced outwards they will wedge into the tapers and so will grip the bar and couple it frictionally to the housing. They are operated by fluid-pressure means and for this purpose each collet 5 is attached to or integral with a piston 6 encircling the bar 3, these two pistons 6 are slidable on the bar and in the housing and one of them has a boss 7 slidably received in a sleeve 8 projecting from the inner face of the other. To force the pistons 6 apart as in a cylinder and to cause the coupling to lock, air, oil, or other fluid under pressure is admitted through a union 9 in the housing 2 to the annular cavity 10, between them, surrounding the sleeve 8. They are moved towards each other, to withdraw the collets 5 and to free the coupling, conveniently by

spring-pressed plungers 11 located in the walls of the housing, or they may be positively actuated by other convenient means. The fluid pressure is controlled by valve apparatus indicated generally at 12 in Fig. 1 (details of which are shown in Figs. 2 and 3).

The application of such a coupling to a Cotton's Patent or other straight bar knitting machine is illustrated in Figs. 4 and 5 which show needles 13, sinkers 14, jacks 15, slur cock 16, slur bar 17 and a sliding bar 18 reciprocated by the draw mechanism 19 having a draw lever 20 and draw cam 21, main cam shaft 22, a stationary longitudinal frame member 23, and stops 24 adjustable by stop screws 25 in the customary manner, carriers 26, and carrier rods 27 capable of being selectively coupled by known means 28 to a driving block 29 which is slidable along the frame member 23 and is connected to the driving bar 3. Two of the couplings 1 are employed, a driving coupling 1a for driving the carrier driving bar 3 and a locking coupling 1b for locking it in a stationary position.

The housing 2 of the driving coupling 1a is mounted on a bar (such for example as the sliding bar) 18 which is reciprocated with a constant amplitude by the draw cam 21 of the machine; the housing of the locking coupling 1b is mounted on the frame member 23, and changeover control valve apparatus is provided for admitting fluid pressure to either coupling while simultaneously opening the other to exhaust. Thus at the same time that pressure is applied to the driving coupling 1a to cause it to connect the carrier driving bar 3 to the reciprocating bar 18, the locking coupling 1b is opened to exhaust and releases the driving bar 3, and at the same time that the driving coupling 1a is connected to exhaust and ceases to drive the driving bar 3 pressure is applied to the locking coupling 1b which therefore holds the driving bar 3 stationary by locking it to frame member 23.

For each coupling, the valve apparatus 12 consists of a single plunger having a plurality of collars whereby the coupling may be connected to a pressure supply 9 or exhaust 9'. If the pressure fluid is air, the exhausts can emit direct to atmosphere, but if it is a liquid such as oil they are desirably connected by piping to a sump. The respective valve plungers are indicated at 12a and 12b in Figs. 2 and 3 and it will be seen that when they are both raised the driving coupling 1a is connected to the pressure supply and the locking coupling 1b to exhaust and when they are both lowered the driving coupling is connected to exhaust and the locking coupling to the pressure supply. This valve apparatus is operated by valve-operating apparatus in accordance with the desired length of travel of the selected carrier 26, and conveniently the adjustment of the usual carrier stops 24 is employed to adjust the valve timing so that the changeover from driving to locking is effected as the selected carrier rod 27 strikes a stop 24.

For this purpose the following construction is adopted. The valve plungers 12a, 12b are connected to a horizontal rock shaft 30 so as to be raised or lowered simultaneously, the plunger 12a of the driving coupling 1a being free to slide, as said coupling travels to and fro, along a horizontal rod 31 supported from said rock shaft by levers 32. The rock shaft 30 is biassed by spring 33 to a position in which the driving coupling 1a is released and the locking coupling 1b is operative and is arranged to be rocked, to move the valve plunger 12a to a driving position, by either of two operating plungers 34, 35 slidable in blocks 36, 37 (which are slidable along frame member 23 and are connected to the end stops 24 by rods 38, 39 so that their spacing is adjusted as the stops are adjusted). These plungers are arranged to engage and lift a horizontal rod 40 connected to the rock shaft 30 by arms 41 and at their lower ends respectively carry trucks 42, 43 for engagement by cams 44, 45 on the tie bar or like part 18 that reciprocates with a constant amplitude. These cams and trucks are offset, so that either truck is located in the track of one cam only as will readily be appreciated from Figs. 7 and 8, and each truck is capable of being shifted axially against the pressure of a spring 46 or 47 by an incline 44' or 45' at the outer end of its cam. This arrangement is such that in movement of the tie bar or the like 18 from left to right the left hand cam 44 rises the left hand plunger 34 and towards the end of this movement the right hand cam 45 displaces the truck 43 of the right hand plunger 35 without lifting the latter; in movement from right to left the right hand cam 45 lifts the right hand plunger 35 and towards the end of this movement the left hand cam 44 displaces the truck 42 of the left hand plunger 34 without lifting the latter.

Since, when the plunger 34, 35 and the valve plungers 12a, 12b are raised the valve apparatus admits fluid pressure to the driving coupling 1a and connects the locking coupling 1b to exhaust, this ensures that irrespective of the adjustment of the stops 24 and of the length of draw, the carrier 26 moves with a definite lead over the slurcock 16 which lead is governed by the positioning of the two cams 44, 45 (and these may be adjustable on the tie bar). Each cam is comparatively short, and only holds up its plunger for a short while. Therefore a latch is provided for retaining the aforesaid rod 40 in the raised position, together with means for tripping the latch to release the rod when the carrier rod 27 strikes a stop 24 so that the valve plungers 12a, 12b then move to the locking position. The latch consists of an arm 48 pivoted at 49 on a fixed part 50; it is connected by pins 51 to a horizontally slidable trip bar 52 which is spring biassed to a central position in which the end 48' of latch arm 48 fits under one (41') of the levers supporting the horizontal rod 40 so that as soon as one of the plungers 34, 35 raises said rod 40 the latch arm 48 moves into position and holds it up. At each end, near the adjustable blocks 36, 37 carrying the operating plungers 34, 35 the trip bar 52 has a rack of ratchet teeth 53, 54 the two racks being oppositely directed, and on each block 36, 37 there is a short lever 55 or 56 carrying a pawl 57 or 58 for engaging the associated rack and constituting a release device. Each pawl has a projecting finger 57a or 58a which, when struck, first carries the pawl into engagement with its rack and then displaces the pawl-carrying lever so that the pawl makes a stroke which shogs the trip bar 52 and removes or trips the latch 48 from beneath the lever 41' of horizontal bar 40. The fingers 57a, 58a are struck, one at each end of the traverse of the carrier rod 27, by a striker 59 which travels between them and is mounted on the carrier rod or a rod coupled to it, the striking faces of the striker being preferably provided by adjustment screws 60. Thus irrespective of the length of traverse as determined by the setting of the adjustable end stops 24, each time a carrier rod 27 strikes a stop the

latch 48 is released and the rod 40 descends under the influence of spring 33 to lower the valve plungers 12*a*, 12*b* and thereby to release the driving coupling 1*a* and to apply the locking coupling 1*b*.

This means for biassing the rack bar 52 and the latch 48 to the central position may consist of a pair of scissor fingers 61, pivoted at 62 on the fixed part 50 of the machine, which are drawn together by spring 63 to grip a pair of pins 64 on the bar 52.

The fluid under pressure is supplied by a suitable source of supply (e. g. a pump or compressor) needing no illustration; air is preferred because such leakage thereof as may occur will cause less trouble than oil in a knitting machine.

I claim:

1. In a knitting machine, the combination with a member movable to and fro, of a coupling comprising two relatively-movable parts one of which is connectable to said member, a friction member for connecting said parts frictionally, and fluid-operated means for operating the friction member.

2. In a knitting machine having two relatively-movable members, a fluid-pressure operated coupling for releasably connecting them comprising two relatively-movable parts respectively connected to said members, a gripper for gripping the two parts together, and fluid-operated means for actuating the gripper.

3. In a straight bar knitting machine, a reciprocatable member, a driver therefor, and a releasable driving coupling for connecting the reciprocatable member to the driver comprising two relatively-movable parts connectable respectively to said member and driver, a friction member for connecting said parts frictionally together, and fluid-pressure means for operating the friction member.

4. In a straight bar knitting machine, a reciprocatable member, a stationary member, and a releasable locking coupling for holding the reciprocatable member stationary by locking it to the stationary member, comprising two relatively-movable parts connectable respectively to said member and driver, a friction member for connecting said parts frictionally together, and fluid-pressure means for operating the friction member.

5. In a straight bar knitting machine, the combination with a driver, a reciprocatable member, and a stationary member, of a fluid-pressure operated driving coupling for driving the reciprocatable member from the driver and a fluid-pressure operated locking coupling for holding the reciprocatable member stationary by locking it to the stationary member, and control valve means for rendering said couplings operative alternatively.

6. A machine according to claim 5, wherein the reciprocatable member is a yarn carrier.

7. In a straight bar knitting machine having at least one carrier movable to and fro with a variable amplitude and a reciprocatable driver for driving it, a driving coupling comprising two relatively-reciprocatable parts whereof one is connectable to the carrier and the other to the driver, a friction member for connecting them, and fluid-operated means for operating said friction member in accordance with the desired amplitude of travel.

8. In a knitting machine, a releasable fluid-pressure operated coupling for connecting two members together, comprising a housing, a rod extending slidably through it, a taper surface in the housing, a split taper collet encircling the rod within the housing and co-operating with said surface, and a piston in the housing for operating the collet.

9. Apparatus according to claim 8, having two opposed taper surfaces in the housing, a collet for each surface, and two opposed pistons for displacing the collets.

10. In a straight bar knitting machine, a yarn carrier, adjustable stops for determining the length of its traverse, a reciprocatable driver for the carrier, a fluid-pressure operated coupling for driving the carrier from the driver, and valve means for rendering the coupling operative at a predetermined stage in each traverse of the driver and for rendering it inoperative when the carrier traverse is determined by a stop.

11. In a straight bar knitting machine of the kind having a line of needles, a slur cock travelling therealong with a constant amplitude of reciprocation, a carrier movable along the line with a variable amplitude of traverse, and adjustable stops for determining the carrier traverse, the combination of a driver for the carrier movable to and fro with a constant amplitude, a releasable fluid-pressure operated coupling for driving the carrier from the driver, and valve means for rendering the coupling operative to drive the carrier with a predetermined lead over the slurcock and for rendering it inoperative when the carrier traverse is terminated by a stop.

12. A machine according to claim 11, including two valve-operating devices adjustable for spacing with the stops, cam means travelling with the slur cock for operating through one or other of said devices during travel in either direction to render the coupling operative, release devices, for rendering the coupling inoperative, adjustable for spacing with the stops, and a striker travelling with the carrier for operating a release device at each end of the carrier travel.

13. In a knitting machine, the combination of a member movable to and fro, a driver therefor also movable to and fro, a stationary member, a fluid-pressure operated driving coupling for driving the first member from the driver, a fluid-pressure operated locking coupling for locking the first member to the stationary member, valve means controlling said couplings, two spaced valve-operating devices for operating the valve means to render one coupling operative and the other inoperative, cam means travelling with the driver for operating the devices alternately one at the commencement of each traverse of the driver, two spaced release devices for rendering the one coupling inoperative and the other operative, means travelling to and fro with the movable member for operating said release devices alternately, and means for varying the length of travel of the movable member by adjusting the spacing between the two-valve operating devices and between the two release devices.

14. A machine according to claim 13, wherein the said movable member is a carrier, having adjustable carrier stops and means for adjusting said operating devices and release devices with said stops.

15. A machine according to claim 13, having the valve means movable between two alternative positions in one of which the driving coupling is operative and the locking coupling is inoperative and in the other of which the driving coupling is inoperative and the locking cou-

pling is operative, a latch for locking said means in one of these positions upon operation of either of the valve-operating devices, and means in the release devices for tripping the latch.

16. In a straight bar knitting machine, the combination of a yarn carrier, a reciprocatable driver therefor, a fluid-pressure operated friction driving coupling for connecting the carrier to the driver, a stationary member, a fluid-pressure operated locking coupling for locking the carrier to the stationary member, and valve mechanism for rendering the driving coupling operative during a portion of each traverse of the driver and for rendering the locking coupling operative during the remainder whereby the carrier is held stationary during the initial and terminal portion of each driver traverse.

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