Oct. 25, 1932. M. RICHTER 1,884,244

AUTOMATIC ROD OPERATING MECHANISM

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Fig. 1.

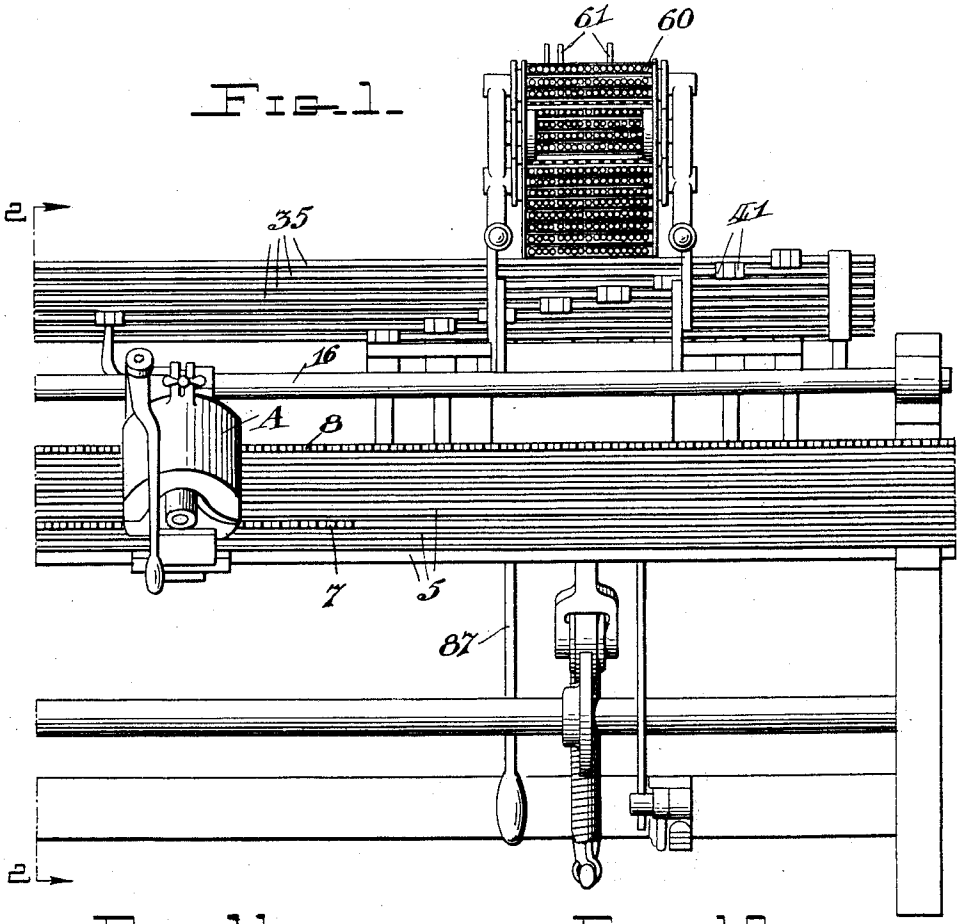


Fig. 11.

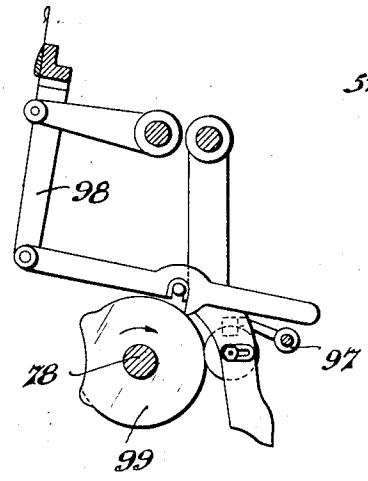
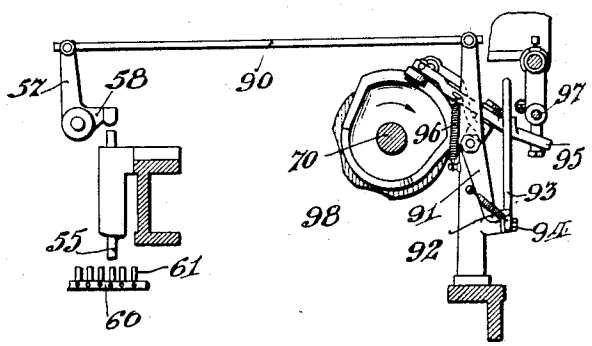


Fig. 10.



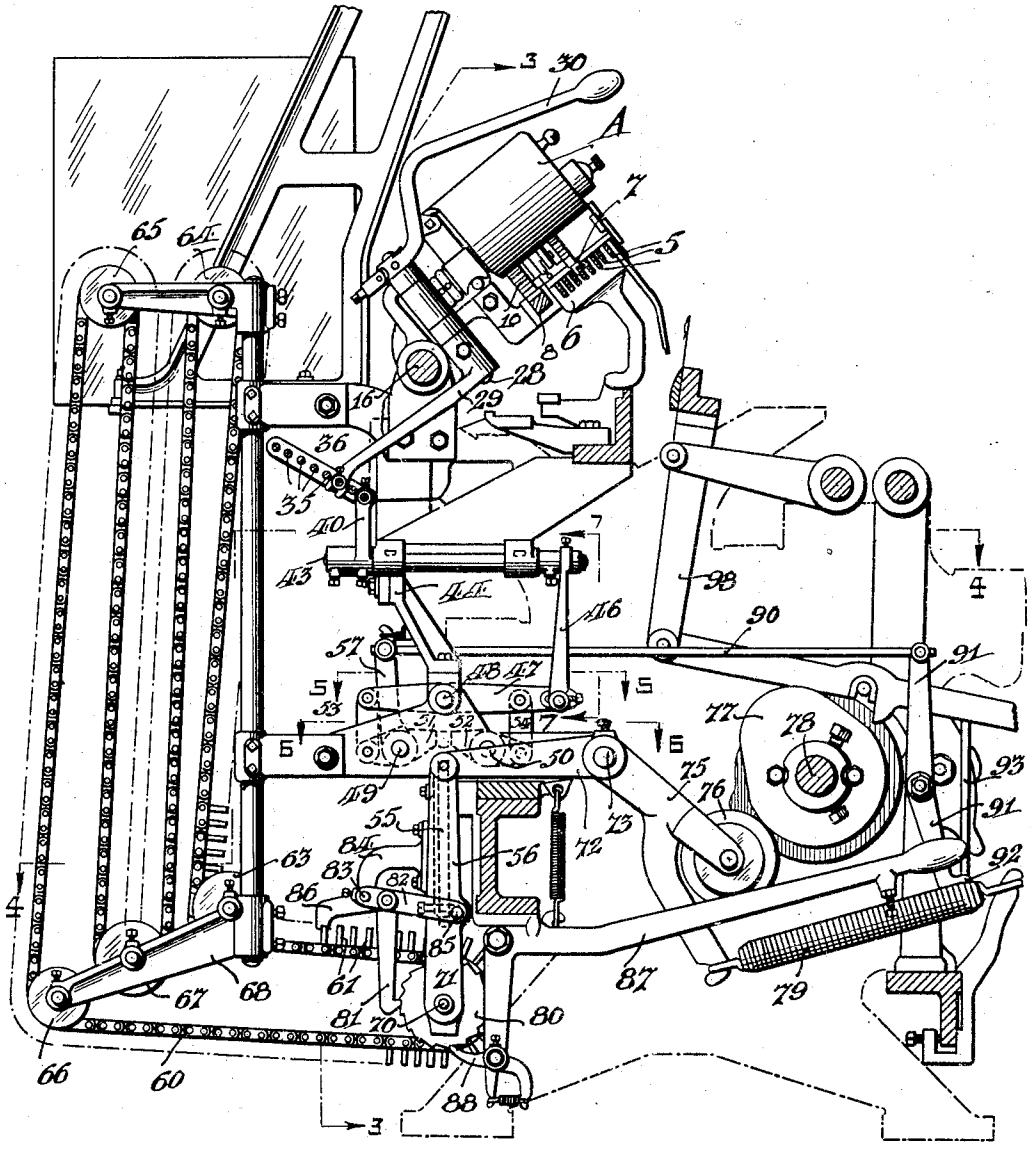
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AUTOMATIC ROD OPERATING MECHANISM

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Fig. 2.



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AUTOMATIC ROD OPERATING MECHANISM

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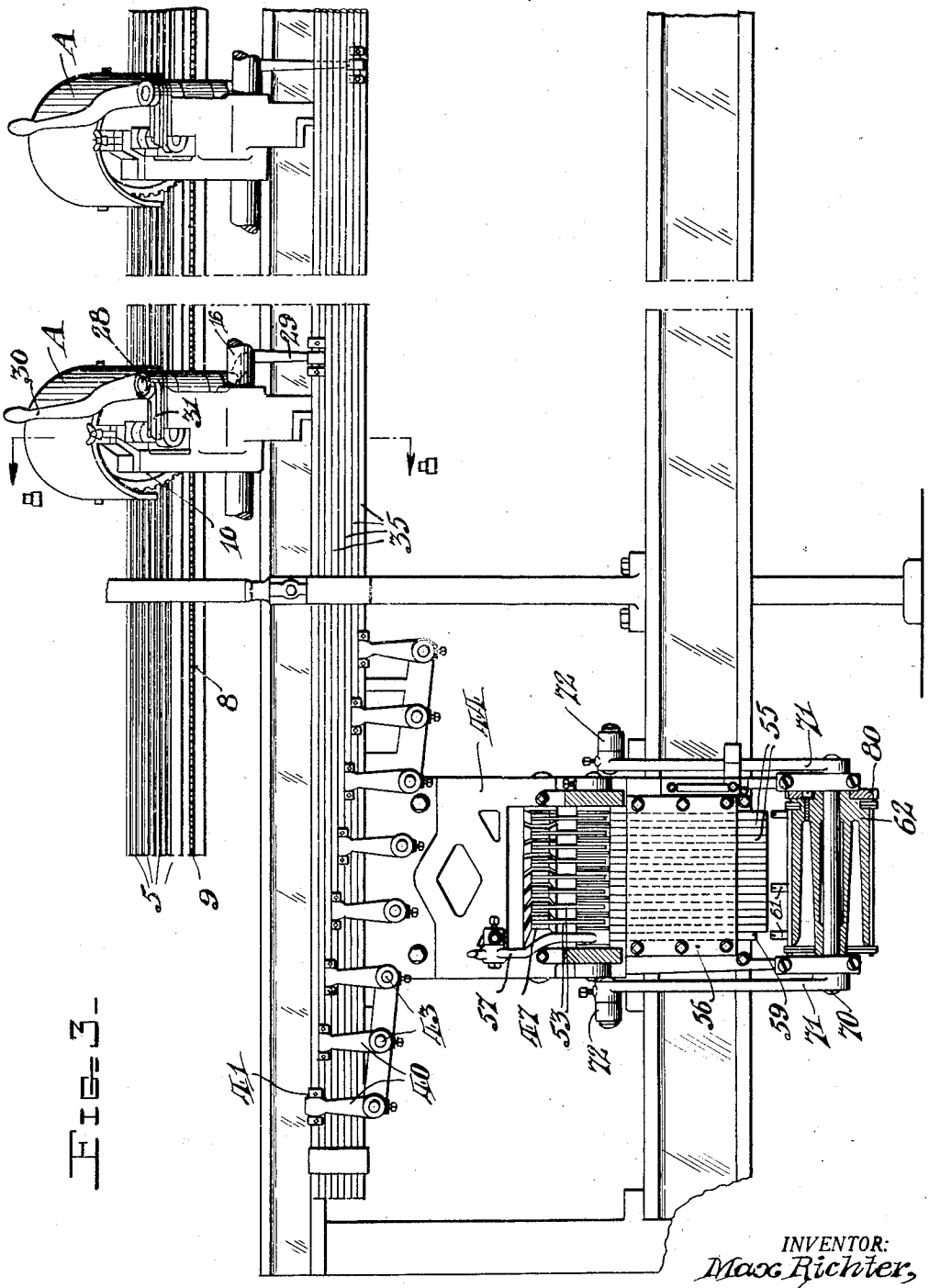


FIG. 3.

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AUTOMATIC ROD OPERATING MECHANISM

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Fig. 4.

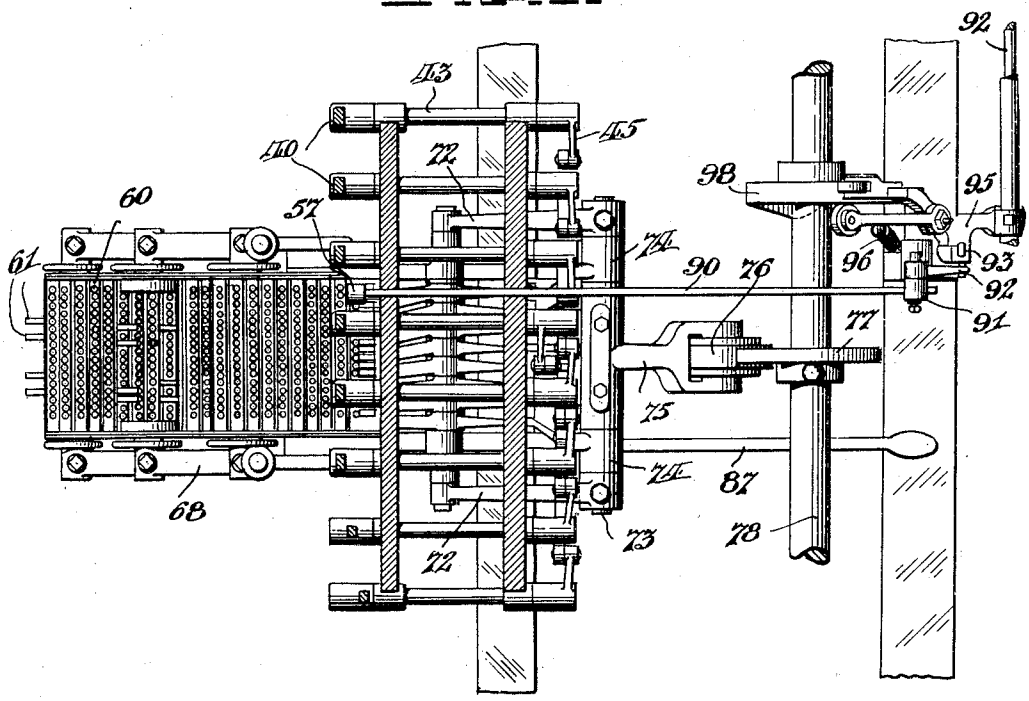


Fig. 5.

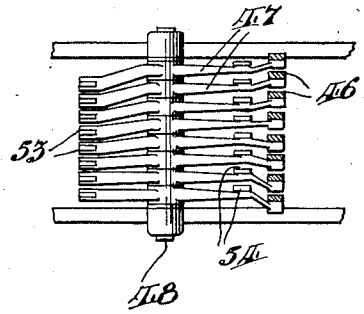
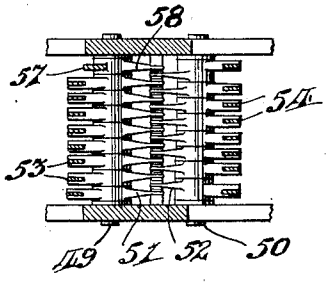


Fig. 6.



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AUTOMATIC ROD OPERATING MECHANISM

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Fig. 7.

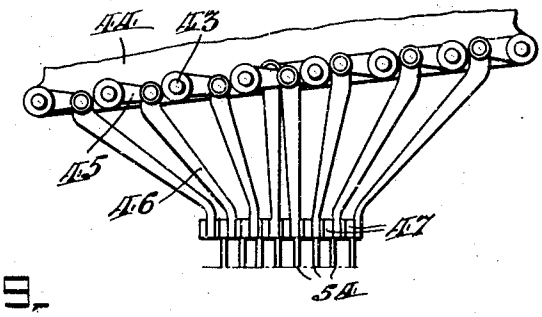


Fig. 9.

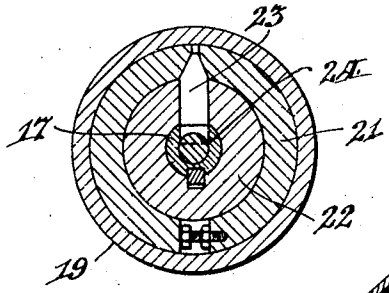
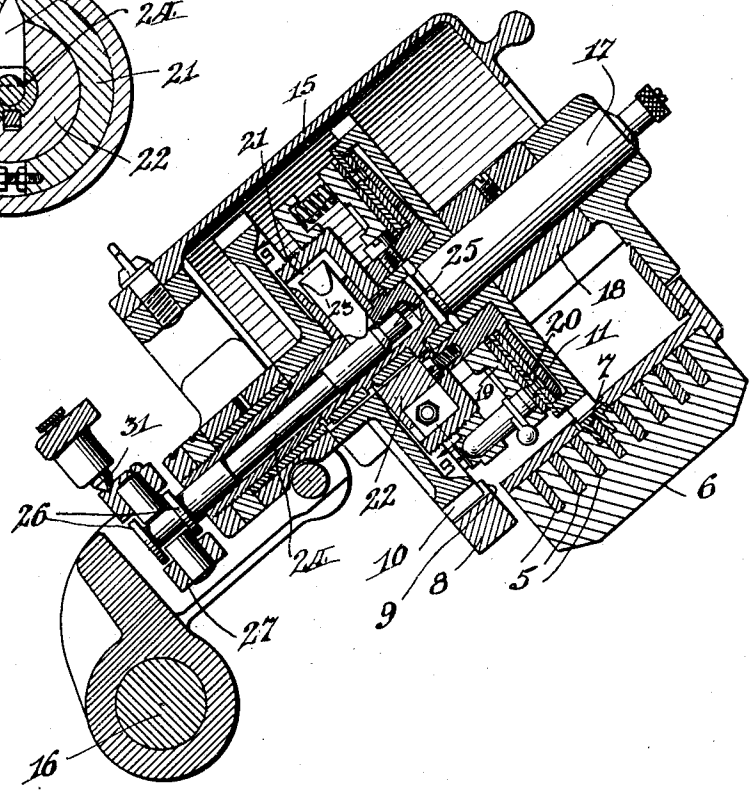


Fig. 8.



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UNITED STATES PATENT OFFICE

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AUTOMATIC ROD OPERATING MECHANISM

Application filed June 3, 1930. Serial No. 459,098.

This invention relates to straight or full-fashioned knitting machines, and more particularly to the thread-feeding mechanism thereof, the primary object being to provide an automatically selective pattern-controlled operation of the several thread guide rods commonly employed, permitting thread changes and additions as desired without interruption of the knitting machine operation.

It is recognized that attempts have heretofore been made to selectively operate certain guide rods in successive reciprocations, but such attempts have been limited to special rods and for specific purposes. The present improvements contemplate a freely selectable pattern-controlled operation of any of the several rods providing for desirable single operation or cooperative operation of several as predetermined by the pattern control mechanism therefor.

The invention and its manner of application to and cooperation with a full fashioned knitting machine are fully described in the following specification in connection with the drawings accompanying the same and forming part thereof, and the novel features are clearly set forth in the appended claims.

Referring to the drawings which show only such portions of a well known full-fashioned knitting machine structure as are sufficient to fully disclose the application thereto of one embodiment of this invention and its manner of operation:—

Fig. 1 is a fragmentary plan view of a central portion of a usual knitting machine, unessential portions being broken away or omitted, and showing a preferred embodiment of the pattern control mechanism and one of the selectively operative carrier rod driving connections of this present invention.

Fig. 2 is mainly an enlarged vertical cross sectional view of the machine, taken on the line 2—2 of Fig. 1, and more especially showing the present mechanism for automatically selectively engaging determined thread guide carrier rods.

Fig. 3 is a partial rear sectional elevation taken substantially on the line 3—3 of Fig. 2.

Fig. 4 is a partial sectional plan view taken substantially on the line 4—4 of Fig. 2.

Figs. 5 and 6 are detail sectional plan views taken respectively on the lines 5—5 and 6—6 of Fig. 2.

Fig. 7 is a fragmentary detail elevation looking in the direction of line 7—7 of Fig. 2.

Fig. 8 is an enlarged cross sectional view of one of the thread carrier rod engaging devices, the view being taken substantially on the line 8—8 of Fig. 3.

Fig. 9 is a detail view taken on the line 9—9 of Fig. 8.

Fig. 10 is a fragmentary cross sectional detail view of the idle course operating mechanism.

Fig. 11 is a fragmentary cross sectional view of other parts of the idle course mechanism, the cross section being taken at a different longitudinal portion of the machine.

The knitting machine indicated in the drawings is of the usual multi-section type, and its general construction and operation are well understood and need no particular description other than will appear in connection with that setting forth the present improvements, which latter involve little material change in the known machine functions, but add mechanism particularly directed to the automatic pattern controlled selective operation of the several thread guide rods employed, as will now be fully described.

In full-fashioned knitting machines, as well known, the feeding of the threads is effected by a series of guide rods each carrying a plurality of thread guide fingers, one for each needle section, and motion being imparted to selected rods from a common friction box rod operated by the usual coulier motion mechanism. The selection of a desired rod has commonly been determined by manual connection of such rod to one of the series of friction boxes on said friction box rod, effected prior to operation or while the knitting machine is at rest for this particular purpose. The present improvements are adapted to automatically perform such heretofore manual engagements of the several rods to their reciprocative means.

To provide means for automatically selecting determined carrier rods for operating action, the construction shown in the draw-

ings comprises the substitution for the heretofore commonly employed friction boxes, of a series of friction clutch devices A, one being preferably provided for each of the eight carrier rods 5 indicated, so that any selected rod may be automatically operated when desired.

The carrier rods 5, as heretofore, are longitudinally movably mounted in frame carried brackets 6, and each is shown as preferably provided with a section of rack teeth 7 for reciprocatively traversing the same. The carrier operating rod 8, reciprocatively traversed as heretofore by the usual coulier motion mechanism through connection to slur cock bar 8*a*, is also shown preferably provided with rack teeth 9. And each clutch device A is shown provided with a gear wheel 10 in constant mesh with the rack teeth 9 of rod 8, and a gear wheel 11 in constant mesh with the rack teeth 7 of its respective carrier rod 5. The gear wheels 10 and 11 as indicated are connected by suitable frictional clutch mechanism, and it will be readily seen that by determined operation of such clutch means as hereinafter described, selective operation of any carrier rod 5 is simply provided for.

As more clearly shown in Fig. 8, each clutch device A comprises a housing 15, which, contrary to the heretofore employed friction boxes, does not shift its position, and is fixedly supported on a rigid frame rod 16 so as to overhang the series of carrier rods 5 and rest on a bracket 6 as indicated and each housing 15, as shown, is formed with suitable bearings for a shaft 17 for its respective gears 10 and 11, gear 10 being preferably keyed to said shaft and gear 11 freely rotatable thereon in the path of its particular guide rod 5, and properly spacedly retained in such position by a collar 18 fixed to shaft 17. The particular frictional clutch mechanism indicated in the drawings as connecting gears 10 and 11, comprises a flanged brake drum 19 carrying adjustably tensioned spring-backed clutch-plates 20 in frictional engagement with gear 11, said drum and clutch-plates being freely rotatable on shaft 17 except as engaged by an expanding brake ring 21, and said brake ring, as shown, lies within drum 19 and is carried by a collar 22 keyed to shaft 17 adjacent gear 10, a projectable wedge block 23 mounted in said collar being adapted to enter a split in brake ring 21 to expand the latter and lock said drum 19 to collar 22 and thus jointly rotate them, and consequently jointly rotate gears 10 and 11, except when rod 5 contacts with a fixed stop to limit its traverse movement, when gear 11 will be held against rotation and the clutch plates 20 will idly slip.

To determinedly project wedge block 23, shaft 17 is shown as having a central aperture in one end thereof to receive an axially shiftable pin 24, the inner end thereof having a bevel-connected reduction 25, and said shaft 17 having a recess through which wedge block 23 extends, the latter being projected when riding on the larger diameter portion of pin 24 and being withdrawn from projection to free brake ring 22 when riding on pin reduction 25. Pin 24 is shown as projecting beyond the end of shaft 17, and formed with spaced collars 26, 26 between which the forked ends of a lever 27 engage to axially shift said pin. Lever 27 is fixed to a shaft 28 to which shaft is secured a pattern-actuated arm 29, and a hand lever 30 for manual engagement and disengagement of any particular rod 5 when desired. A spring catch 31 may be provided to hold pin 24 in desired position.

Each clutch device A as indicated is provided with its own particular lever 29, and each of said levers is operated by its particular one of a series of rods 35 extending in spaced parallel relation to carrier rods 5 and mounted in suitable carrying brackets 36, and said rods 35 are selectively moved by suitable pattern controlled mechanism hereinafter fully described, whereby automatic selection of any carrier rod is determinedly provided for.

The particular pattern control mechanism for determinedly moving selected ones of rods 35 in either direction to connect or disconnect its respective clutch mechanism as above set forth, comprises a series of levers 40, each having its forked end engaging between collars 41, 41 secured to its respective rod; said levers each being fixed to a particular one of a series of shafts 43, mounted in a suitable bearing bracket 44, as clearly seen in Fig. 3. The opposite end of each shaft 43, as seen in Fig. 7, is provided with a crank arm 45, to which is pivoted one end of an arm 46, the other ends of the series of said arms being bent to converge and each respectively pivotally connected to one of a series of cross levers 47, all intermediately pivotally carried on a common axle 48 suitably mounted in bearing bracket 44. Located below said axle 48, and lying in parallel spaced relation on opposite sides therefrom are two axles 49 and 50, each intermediately pivotally carrying a series of levers 51 and 52, respectively, with the inner ends of said levers overlapping in a medial line below axle 48, the drawings showing eight levers 51 and eight levers 52. The oppositely extending end of each lever 51 is shown connected by its separate link 53 to an end of its respective one of the series of levers 47, and the other ends of levers 52 are respectively separately connected by similar links 54 to said levers 47 on the side of the latter adjacent arms 46. By appropriate action exerted on any one of the overlapping inner ends of levers 51 and 52 motion may be imparted to a deter-

mined lever 47, lever 51 swinging it to move its arms 46 downward, and lever 52 to move its arm 46 upward. Such upward and downward movement of arms 46 it will be seen reversely move the respective shaft 43 to which said arm is connected so as to turn the latter and consequently swing its opposite end lever 40 in one or other direction, such action moving its determined rod 35 in one or other direction, which movement as above set forth engages or disengages the clutches of the respective devices A.

To selectively operate any one or more of said overlying inner ends of levers 51 and 52, the drawings show a row of push bars 55 slidably mounted in a frame 56 so as to lie in a vertical plane directly beneath said inner ends, the drawings indicating seventeen of said bars 55, sixteen acting individually on the sixteen inner ends of levers 51 and 52, and the seventeenth controlling a movement hereinafter set forth through a special bell crank 57 (Figs. 2 and 6) mounted on axle 49, and having one end 58 thereof, similar in shape to the inner ends of levers 51, extending beneath said seventeenth push bar 59.

To automatically selectively actuate any of the push bars 55 and 59, the drawings show a pattern chain 60 made up of pivotally connected sections of a width sufficient to embrace the row of seventeen bars 55, the selective movement of the latter being effected by properly placed pins 61 spacedly fixed to determined chain sections. This chain is carried by a drum 62 and its necessarily extended length is carried over idler drums or rollers 63, 64, 65, 66 and 67 adjustably mounted in suitable supporting arms of a chain carrier bracket 68 fixed to the knitting machine frame.

Drum 62 is shown carried by a shaft 70 mounted in the depending ends of a pair of links 71, 71, the other ends of which are pivotally connected to the ends of a pair of levers 72, 72 fixed to a shaft 73 mounted in frame carried bearings 74, 74. Shaft 73 is indicated as determinedly rocked by a lever 75 fixed thereto and having its free end provided with an anti-friction roller 76 riding on a suitably shaped cam 77 provided on the knitting machine main cam shaft 78, a spring 79 holding said roller 76 against said cam 77. Cam 77 acts to rock shaft 73 and thus raise and lower drum 62, carrying the pins 61 of chain 62 into contact with determined ones of push bars 55 to move the latter into action against their respective lever ends 51 or 52, which latter, as above set forth reversely shift rods 35 and these in turn selectively control the engagement and disengagement of the clutches of the respective devices A to operate a selected rod 5.

To determinedly rotate pattern chain 60 step by step, a ratchet gear 80 is shown secured to drum 62 and a pawl 81 is pivotally hung intermediately from a link 82, which link has one end pivotally connected at 83 to a fixed arm 84 and its other end pivotally connected at 85 to one of said links 71. The raising and lowering movement of link 71 will act at each reciprocation to rack gear 80 and thus bring a new chain section into operation against push bars 55 at each upward movement of drum 62. Pawl 81 is shown provided with an angular arm 86 adapted to engage with a suitably placed chain pin 61, whereby said pawl at a determined time is thrown out of engagement with gear 80 to stop the aforesaid rotation of the pattern chain. A hand lever 87 is also shown, carrying a spring pressed pawl 88 whereby gear 80 may be racked when desired to move pin 61 from beneath arm 86 to release the pawl 81 for resumed action on gear 80; said hand lever carried pawl 88 as shown also acting as a reverse movement locking pawl for ratchet gear 80. Pattern chain pin 61 may be set to act at the end of a cycle of movement of said chain, or several may be employed to interrupt the chain action for long continued repetition of a fixed selected rod operation or such chain halting may be desirably employed for other special purposes of halting the machine operation for certain adjustments or for resetting of certain non-automatic controls.

At times it is desired to make so-called idle courses as heretofore and well understood to return the slur-cock bar 8a to the opposite side of the machine after completion of certain courses, and provision is made for automatically effecting of such idle courses as shown in the drawings by employing a suitably set chain pin 61 to determinedly act on push bar 59 which actuates the end 58 of bell crank 57 to swing the latter. Bell crank 57 as clearly shown in Figs. 2, 4, 10 and 11 is connected by a rod 90 to one end of an intermediately pivoted lever 91 the opposite end of which is formed with a cam foot 92 adapted to engage the angular extension of a spring tensioned catch lever 93 and turn the latter on its pivot 94. Lever 93 has a projection (not shown) acting as a catch to normally lock a lever arm 95 in depressed position against action of its spring 96 normally tending to swing said lever in a reverse direction, said lever 95 having an extension beyond said catch lever engagement adapted to bear against a fixed projection on axially shiftable, rod 97. The opposite end of lever 95, as indicated when released by catch lever 93 moves into the path of action of a compound cam 98 on cam shaft 78, said cam then acting to swing said lever 95 on its pivotal support and also swing it in a plane at right angles thereto to longitudinally shift rod 97. The shifting of rod 97 shifts the cam operating needle-presser lever 98 to the action of a different cam path on its operating cam

99 which different cam path will prevent needle beard-closing movement of presser lever 98. Such movement, as well known, prevents knocking over of the fabric which remains on the needles and furnishes an idle course movement of a carrier rod at certain times necessary and understood in the art.

The mechanism above fully set forth provides for the automatic pattern-controlled selective operation of any desired thread carrier rod 5; and it will be understood that the feeding traverse of the several rods thus reciprocatively traversed will be determined, as heretofore, by usual end and intermediate stops limiting their movements to desired needles only, the gear 11 in the particular clutch device A of such held rod being held against rotation and the clutch plates 20 idly slipping.

From the foregoing description it is believed the nature of the present improvements and their manner of operation will be readily understood, and while one form of embodiment has been shown and set forth in detail, other forms and modifications may be readily devised within the spirit of the invention as defined in the following claims.

What I claim is:

1. In combination with a straight knitting machine, automatic thread-traversing mechanical control mechanism comprising a plurality of movable thread-carrier rods having a common operative mechanism, separate rotary clutch devices connecting each rod to said common operative mechanism, and pattern mechanism controlling the automatic selective operation of said clutch devices.

2. In combination with a straight knitting machine, automatic thread-traversing mechanical control mechanism comprising a plurality of movable thread-carrier rods having a common operative mechanism, separate fixedly positioned operative mechanisms connecting each rod to said common operative mechanism, and pattern mechanism controlling the automatic selective operations of determined rod operative mechanisms.

3. In combination with a straight knitting machine, automatic thread-traversing mechanical control mechanism comprising a plurality of movable thread-carrier rods having a common operative mechanism, separate fixedly positioned frictional clutch devices connecting each rod to said common operative mechanism, and pattern mechanism controlling the automatic selective operation of determined clutch devices.

4. In combination with a straight knitting machine, automatic thread-traversing mechanical control mechanism comprising a plurality of movable thread-carrier rods, a common operative bar for the latter having a plurality of engaging rod operative driving connections, separate fixedly positioned driving connections associated with each carrier rod, frictional clutch devices connecting each fixedly positioned driving connection to its respective one of said bar engaging rod operative driving connections, and pattern mechanism controlling the automatic selective operation of determined clutch devices.

5. In combination with a straight knitting machine, automatic thread-traversing mechanical control mechanism comprising a plurality of movable thread-carrier rods, a common operative bar for the latter, separate fixed driving connections for the several carrier rods each having a driving connection engaging said common operative bar, frictional clutch devices operatively engaging each fixed driving connection and its respective bar engaging driving connection, a plurality of operative control rods for said frictional clutch devices each controlling its respective clutch, means for operating the several rods closely associated at a fixed position, and a movable pattern chain for selectively actuating the means for operating determined rods.

6. In combination with a straight knitting machine having a plurality of movable thread-carrier rods and a common operative mechanism therefor including a reciprocated bar, frictional clutch devices operatively connecting each rod to said bar, individual control rods for said clutches, and pattern control operative mechanism for said control rods comprising a series of operative rods therefor, crank arms for reversely moving said rods, and a pattern chain for selectively moving said crank arms.

7. In combination with a straight knitting machine having a plurality of movable thread-carrier rods and a common operative mechanism therefor including a reciprocated bar, frictional clutch devices operatively connecting each rod to said bar, individual control rods for said clutches, and pattern control operative mechanism for said control rods comprising a series of operative rods therefor, crank arms for reversely moving said rods, a series of levers for moving said crank arms, and pattern-actuated bell crank for determinedly rocking said levers.

8. In combination with a straight knitting machine having a plurality of movable thread-carrier rods and a common operative mechanism therefor including a reciprocated bar, frictional clutch devices operatively connecting each rod to said bar, individual control rods for said clutches, and pattern control operative mechanism for said control rods comprising a series of operative rods therefor, crank arms for reversely moving said rods, a series of intermediately pivoted levers for moving said crank arms, a pair of bell cranks pivotally engaging said levers, and a pattern chain having pins movable into operative engagement with said bell cranks.

9. In combination with a straight knitting machine, automatic thread-traversing mechanical control mechanism comprising a plurality of movable thread-carrier rods having a common operative mechanism, separate fixedly positioned frictional clutch devices connecting each rod to said common operative mechanisms, pattern mechanisms controlling the automatic selective operation of determined clutch devices, and a hand lever for each frictional clutch device.

10. In combination with a straight knitting machine, automatic thread traversing mechanical control mechanism comprising a plurality of movable thread-carrier rods, means for operating the same in feeding traverse movements, presser operative means for preventing removal of a course of loops from the needles, means for jointly operating said rod and presser operative means to move said rod to the opposite side of the machine in an idle course, and pattern mechanism automatically selectively controlling the operative means of determined carrier rods, and determined operation of said presser operative means conjointly during a selected rod traverse movement.

11. In a flat knitting machine embodying a pattern control mechanism and one or more thread carrier rods; a reciprocative rod actuator, a rod driving gear associated with each rod and in constant engagement therewith, a frictional clutch mechanism for each gear operative to engage and disengage the latter with said rod actuator, and pattern mechanism operative to selectively actuate said frictional clutch mechanisms.

12. In a flat knitting machine embodying a pattern control mechanism and one or more thread carrier rods; a common actuator for said rods having a rack gear and a plurality of gears meshing therewith, a rack gear for each rod having a gear meshing therewith, a separate clutch mechanism for each rod adapted to engage and disengage its rod gear with its respective one of the gears meshing with said common actuator rack gear, and pattern mechanism operative to selectively actuate a determined clutch mechanism.

In testimony whereof I affix my signature.

MAX RICHTER.