

Oct. 17, 1967

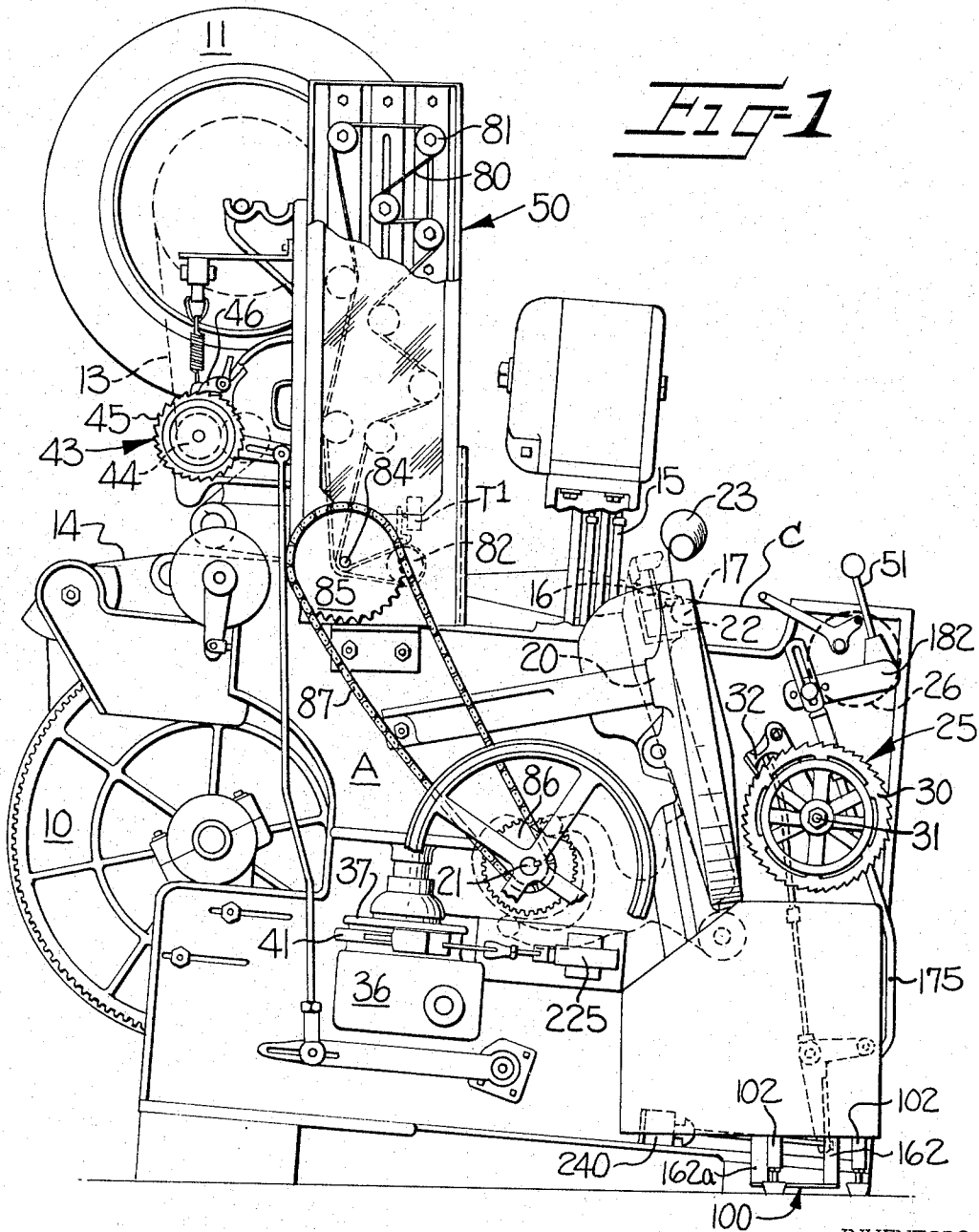
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3,347,280

FRINGE MOTION FOR SHUTTLELESS LOOMS

Filed Dec. 22, 1965

6 Sheets-Sheet 1



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6 Sheets-Sheet 2

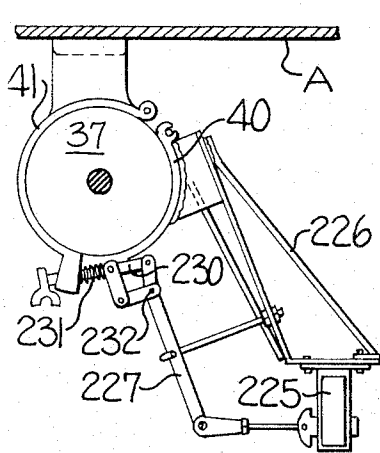


Fig-3

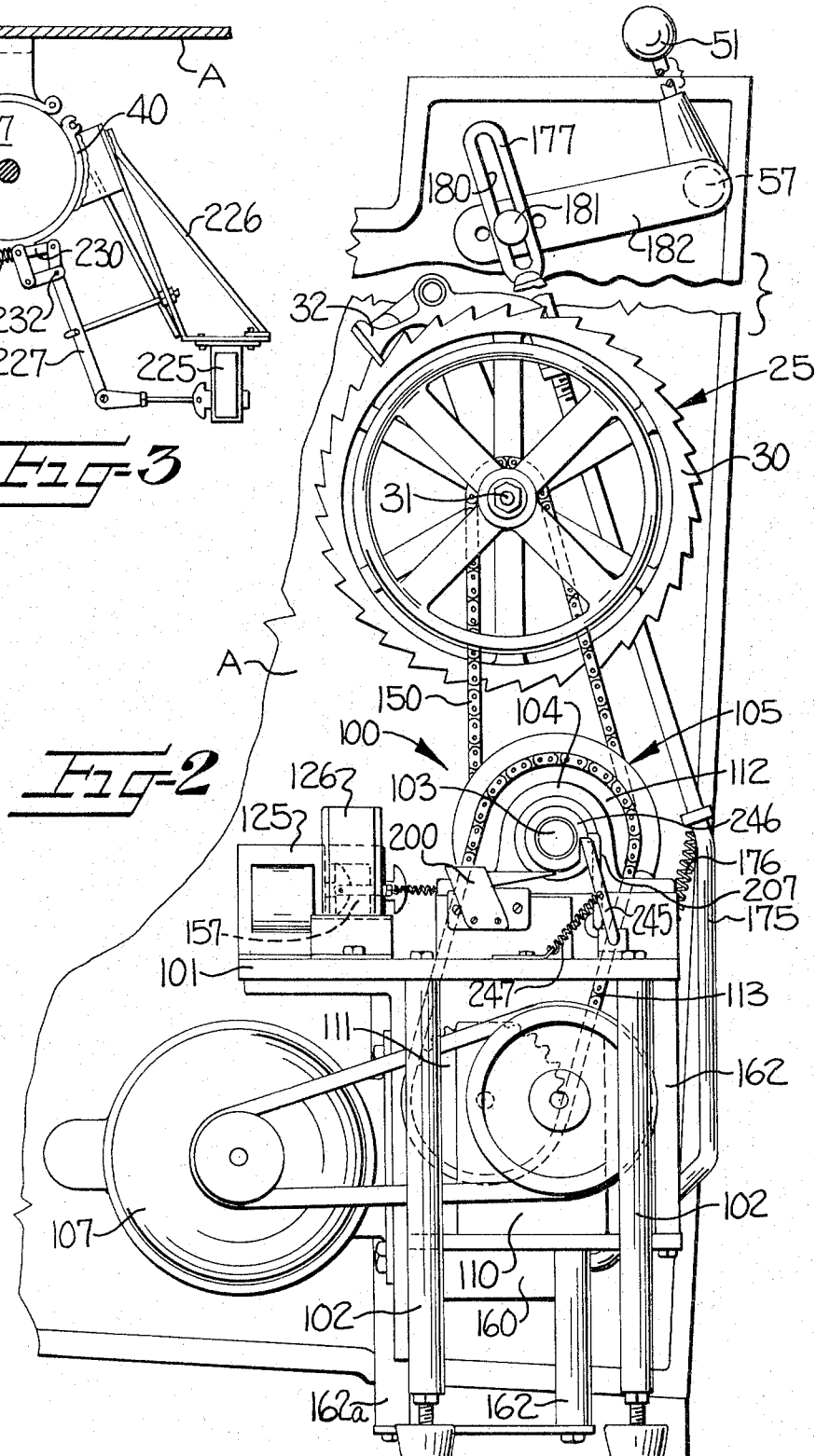


Fig-2

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6 Sheets-Sheet 3

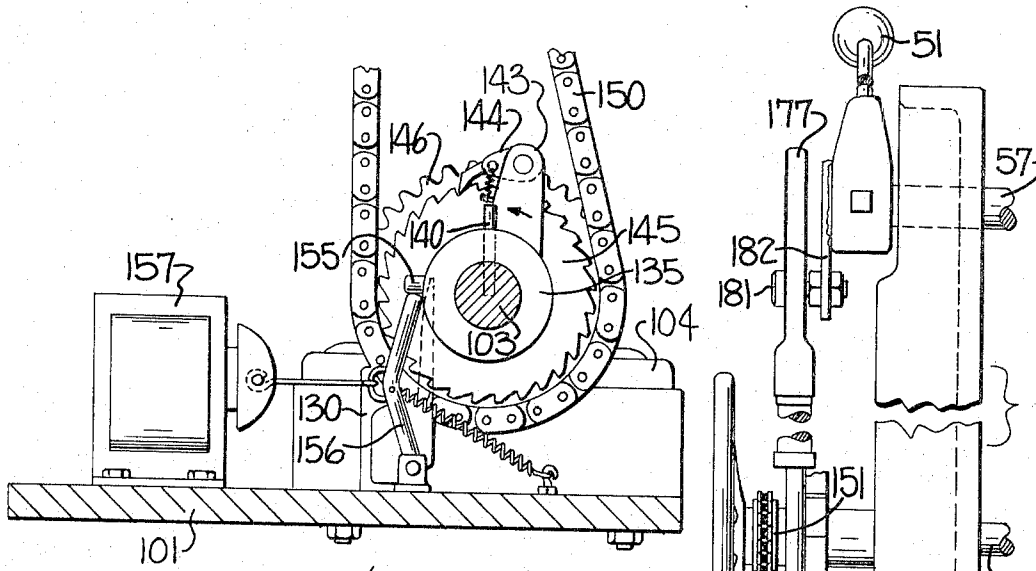


Fig. 5

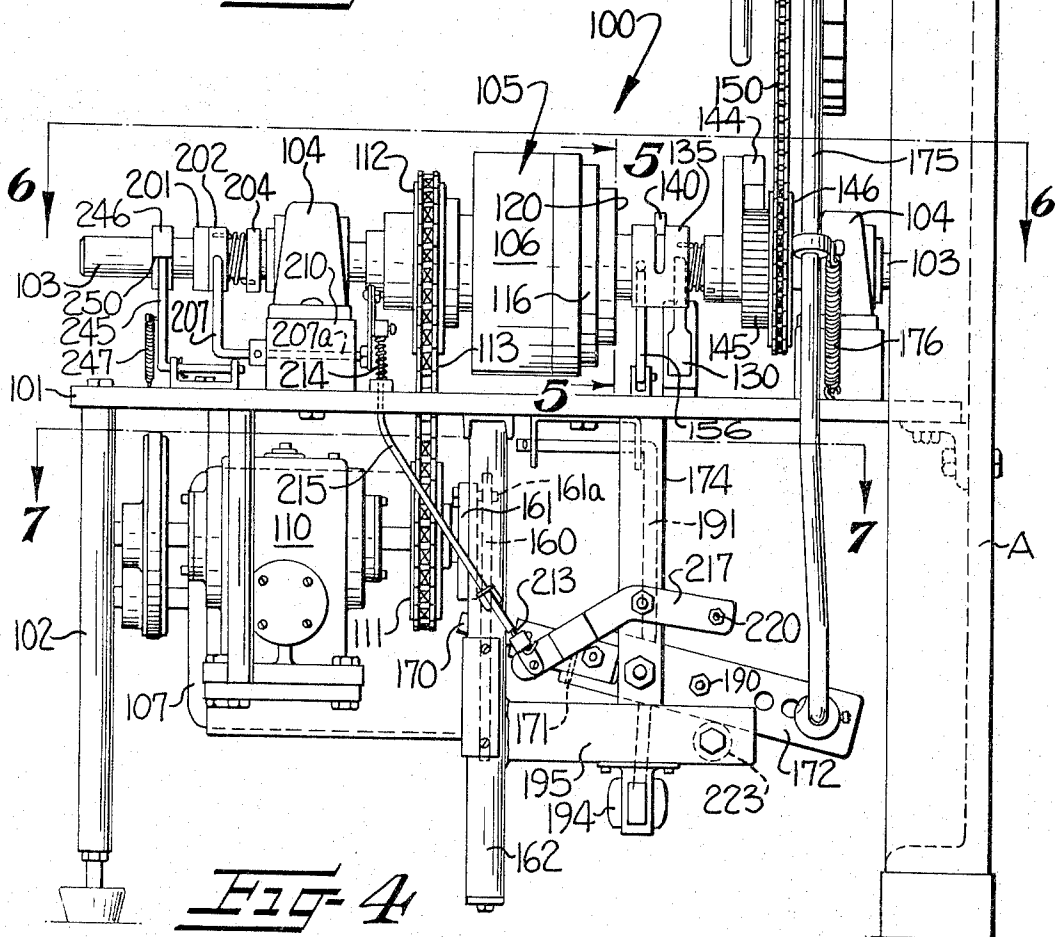


Fig. 4

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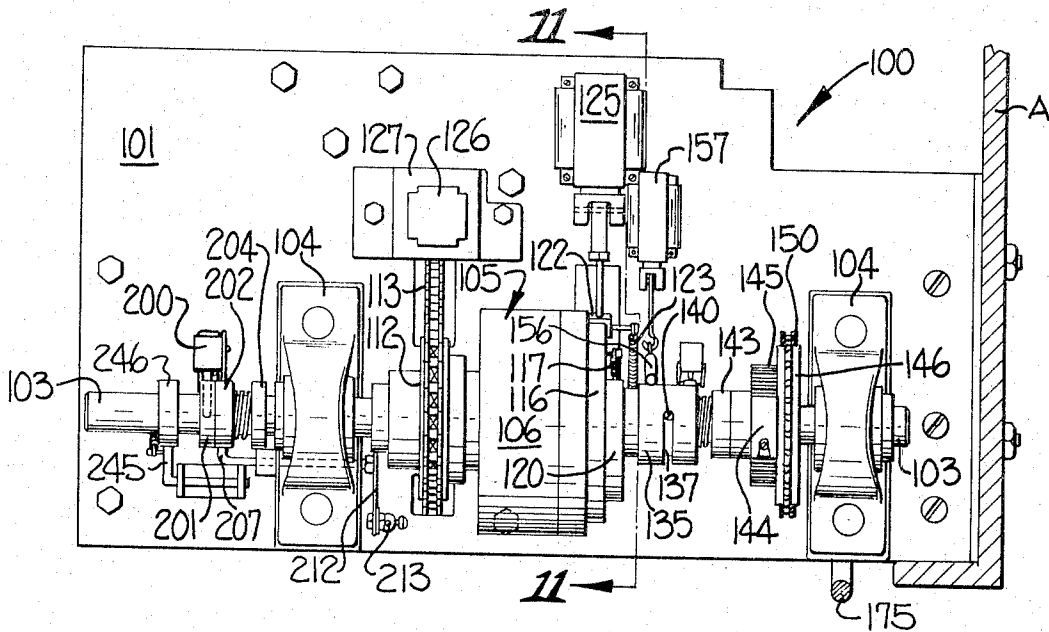


Fig-6

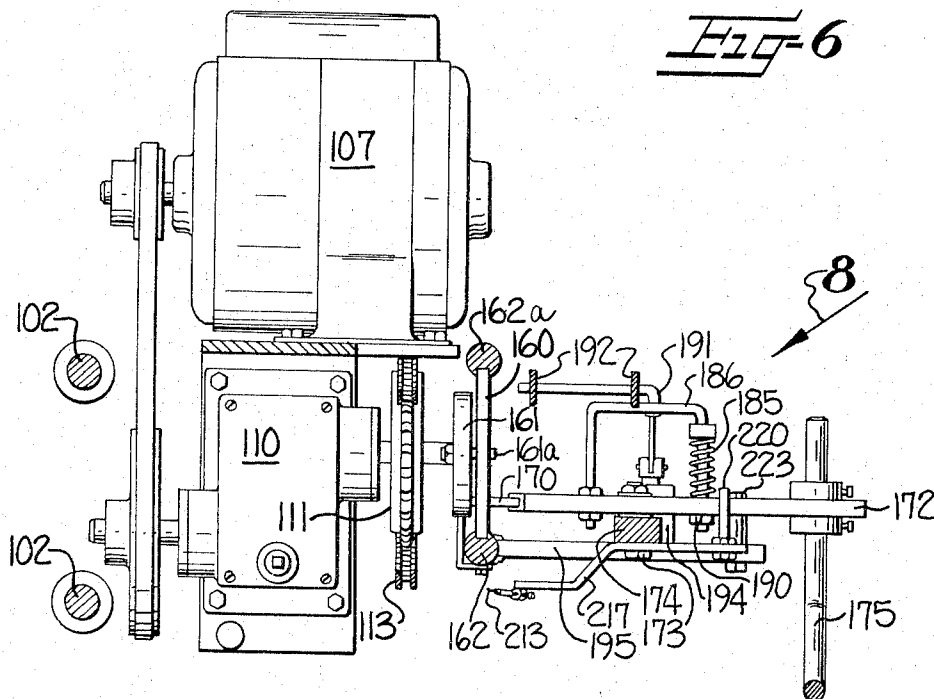


Fig-7

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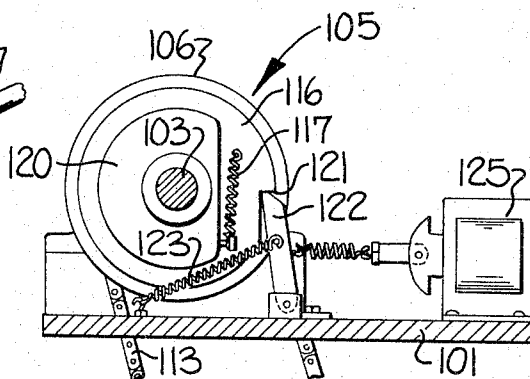
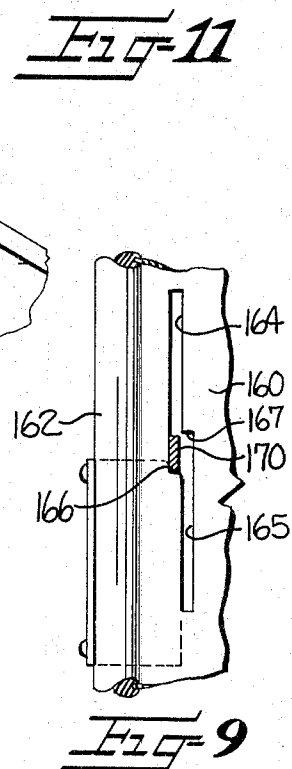
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FRINGE MOTION FOR SHUTTLELESS LOOMS

6 Sheets-Sheet 5



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FRINGE MOTION FOR SHUTTLELESS LOOMS

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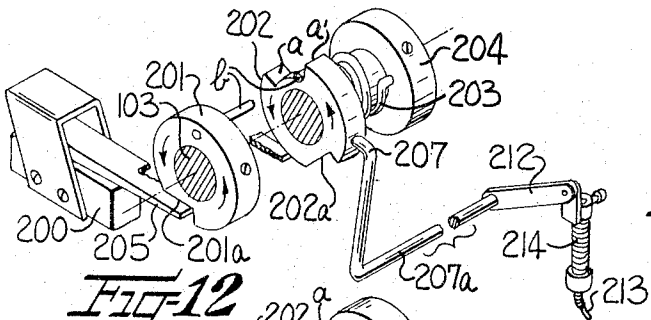


Fig-12

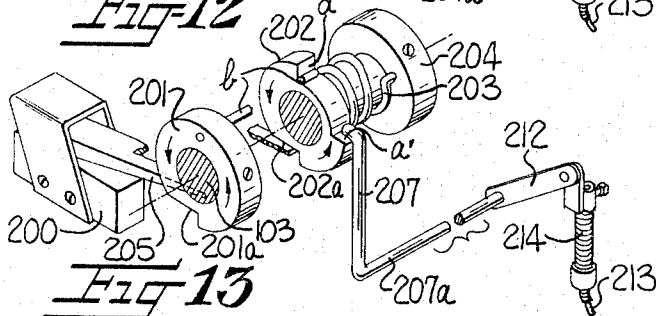


Fig 13

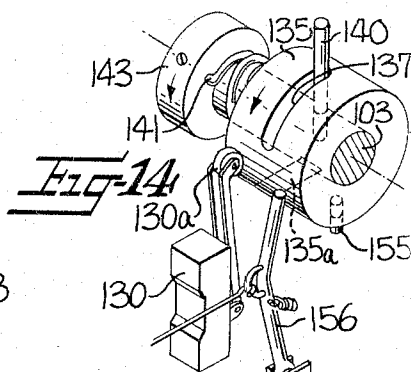


Fig-14

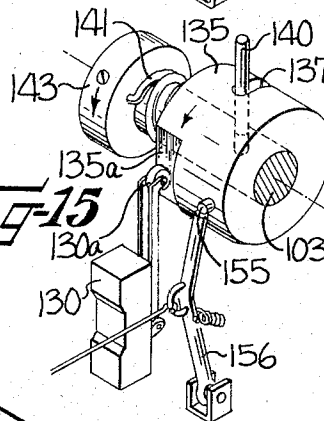
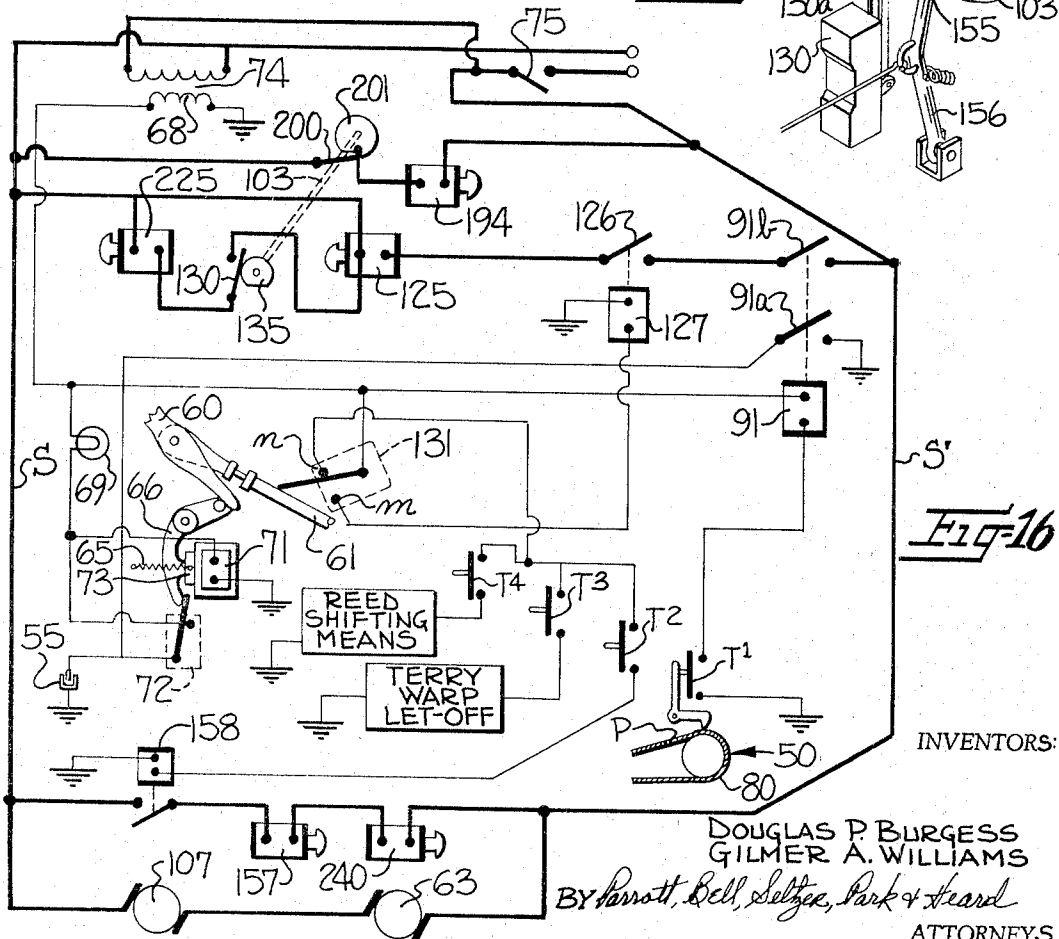


Fig-15



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3,347,280

FRINGE MOTION FOR SHUTTLELESS LOOMS
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Kannapolis, N.C., a corporation of North Carolina
Filed Dec. 22, 1965, Ser. No. 515,569
9 Claims. (Cl. 139—24)

ABSTRACT OF THE DISCLOSURE

A fringe motion in which a pattern device stops the loom and initiates operation of an auxiliary cloth take-up means which drives a cloth take-up roll at faster-than-normal speed and automatically restarts the loom upon a predetermined amount of the cloth having been taken up by the auxiliary cloth take-up means.

This invention relates to shuttleless looms, and more especially, to an improved means for forming spaced fringes devoid of filling in woven fabric and which is particularly adapted for use on a high speed shuttleless loom of the type having tape-mounted filling carriers for drawing filling yarn from a stationary supply and which reciprocate into and out of opposite ends of the warp shed and meet at a medial portion thereof to transfer filling from one carrier to another.

Various types of apparatuses have been used heretofore for increasing the speed of the cloth take-up of a loom at spaced intervals during operation thereof for forming fringes in the cloth, as is desirable in weaving certain terry fabrics. Recent developments in shuttleless looms of the type mentioned above, have made it practical to weave terry cloth thereon. However, the prior art types of fringe motions could not be used on such looms to our knowledge because the shed forming and filling inserting means operate at all times during operation of the loom, and the filling inserting means would be damaged seriously if the warps and cloth were advanced sufficiently to form non-woven fringe areas in the cloth during operation of the filling inserting means.

Therefore, it is an object of this invention to provide a fringe motion which is particularly adapted for use on shuttleless looms of the type described and which comprises means for stopping the weaving operation of the loom and including stopping the operation of the shed forming means, the filling inserting means and the cloth take-up means, auxiliary cloth take-up means for driving the main cloth take-up means while the weaving operation of the loom is stopped, and means for restarting the weaving operation upon a predetermined length of warps and cloth being taken up by operation of said auxiliary take-up means.

In its preferred embodiment, the apparatus of the present invention comprises a normally inactive auxiliary cloth take-up means operatively associated with the conventional main cloth take-up means of the loom, with pattern controlled means for interrupting operation of the shed forming and filling inserting means and other operating elements of the loom and activating the auxiliary cloth take-up means to advance the cloth and warp yarns whenever a section without filling is to be produced, and with means under control of the auxiliary take-up means for deactivating the same and the interrupting means and resuming operation of the shed forming and filling inserting means and said other operating elements upon termination of a predetermined interval of operation of the auxiliary take-up means.

Some of the objects of the invention having been started, other objects will appear as the description pro-

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ceeds, when taken in connection with the accompanying drawings, in which:

FIGURE 1 is a side elevation of a shuttleless loom of the type described as converted for weaving terry cloth, and showing parts of the improved fringe motion in association therewith;

FIGURE 2 is an enlarged fragmentary view of the right-hand portion of FIGURE 1 with the cover removed from the auxiliary cloth take-up means;

FIGURE 3 is a fragmentary plan view of the ground warp let-off mechanism shown in the lower central portion of FIGURE 1;

FIGURE 4 is a front elevation of the auxiliary cloth take-up means adjacent the corresponding side of the loom and looking at the right-hand side of the lower portion of FIGURE 2;

FIGURE 5 is an enlarged elevation, partly in section, taken substantially along line 5—5 in FIGURE 4;

FIGURE 6 is a plan view of the auxiliary take-up means taken substantially along line 6—6 in FIGURE 4;

FIGURE 7 is a plan view, partly in section, taken along line 7—7 in FIGURE 4, particularly illustrating automatic means for starting the loom following each fringe forming operation;

FIGURE 8 is a perspective view of the automatic loom starting means looking in the direction of the arrow 8 in FIGURE 7;

FIGURE 9 is a fragmentary detailed elevation of the vertically reciprocating plate 160 of FIGURE 8;

FIGURE 10 is a fragmentary perspective view of the shipper handle and associated elements at the opposite side of the loom from that shown in FIGURE 2;

FIGURE 11 is a fragmentary elevation of the single revolution clutch of the fringe motion taken substantially along line 11—11 in FIGURE 6;

FIGURES 12 and 13 are perspective views of a control mechanism adjacent the outer end of the auxiliary take-up drive shaft for controlling operation of the automatic loom starting means of FIGURES 7 and 8 and showing corresponding cams in different relative positions;

FIGURES 14 and 15 are perspective views of a control mechanism for preventing unintentional recycling of the single revolution clutch and showing a corresponding cam in two different positions; and

FIGURE 16 is a diagram of an electrical circuit for the fringe motion.

Referring more specifically to the drawings, the fringe motion of the present invention is shown in association with a shuttleless loom of the general type disclosed in Budzyna et al. U.S. Patent No. 2,604,123, dated July 22, 1952 and as modified for weaving terry cloth according to Douglas P. Burgess copending U.S. Patent application, Ser. No. 398,238, filed Sept. 22, 1964. In FIGURE 1, the loom comprises ground and terry warp beams 10, 11 from which ground and terry warps 13, 14 pass through shed forming means or harnesses 15 and a beat-up means or oscillatable reed 16 to be woven into cloth C. Reed 16 and a lay 17 are carried by swords 20 which may be oscillated by means such as is disclosed in said patent or said application and driven from a main shaft 21. Looms of this type are characterized in that filling inserting means in the form of tape-mounted filling carriers 22, only one of which is shown, draw filling yarn from a stationary supply package 23 and reciprocate into and out of opposite ends of the warp shed to transfer filling from one carrier to another as they meet at a medial portion of the shed. Lay 17 occupies rearward position during insertion and withdrawal of carriers 22. For forming terry loops, reed 16 may be shifted between partial and full beat-up positions relative to lay 17 for forming respective loose and fast picks by means such as is disclosed in said copending application. The cloth C is taken up during weav-

ing operation of the loom by a main cloth take-up mechanism 25 operatively connected to a take-up roll or sand roll 26 by means well known in the art and which need not be shown or described here. Take-up mechanism 25 may include a ratchet wheel 30 fixed on a shaft 31 geared to roll 26 and engaged by a pawl 32 reciprocated by suitable connections with main shaft 21.

Ground warps 14 are normally tensioned by a conventional tension mechanism or warp let-off motion 36 operatively connected to beam 10 and including a brake drum 37 engaged by pivoted normally tensioned brake bands 40, 41 (FIGURES 1 and 3) which are controlled, by novel means to be later described, to reduce tension on the warps 14 whenever the cloth and warps are to be advanced without inserting filling in the warp shed. A terry warp let-off mechanism 43, including rolls 44, a ratchet wheel 45 and an oscillatable pawl 46, operates in a well known manner to let off terry warp beam 11 and terry warps 13 during each fast pick of the loom, as shown in Parker's U.S. Patent No. 1,901,769, for example. As is usual, the weaving operation of the shed forming means 15, the filling inserting means 22 and beating up means 16, as well as the normal operation of warp let-off mechanisms 36, 43 and main take-up mechanism 25 are effected by rotation of shaft 21. Also, the operation of the terry warp let-off mechanism 43, the position of reed 16 relative to lay 17, and certain operations of pawl 32 of cloth take-up mechanism 25 may be controlled, as disclosed in said copending application, by a pattern device 50 driven by shaft 21. Whenever shaft 21 is stopped, it is apparent that all operating elements of the loom, including the shed forming means 15, filling inserting means 22, beating up means 16, let-off mechanism 36, 43, main take-up mechanism 25 and pattern device 50, cease to operate; i.e., the loom is stopped.

Conventionally, the stopping and starting of the loom is effected by main shipper elements or handles 51, 52 mounted at opposite sides of the front portion of the loom (FIGURES 1, 2, 4 and 10) and which an operator may move rearwardly to "off" position to stop the loom, or forwardly to "on" position to start the loom. Rearward, loom-stopping, movement of shipper handles 51, 52 also may be effected by various conventional stop motions, such as the electrical warp stop motion 55 shown schematically in FIGURE 16. According to the instant invention, rearward loom-stopping, movement of shipper elements 51, 52 also may be effected automatically by pattern device 50 whenever a cloth section without filling is to be produced.

As shown in FIGURES 2 and 10, shipper handles 51, 52 are fixed on a shipper shaft 57 journaled in the loom-sides A, B. A shipper crank 60 (FIGURE 10), fixed on shaft 57, has a control link 61 connecting the same to a conventional clutch means 62 or the like for connecting a drive means, such as electric motor 63 of FIGURE 16, to main shaft 21 when shipper handles 51, 52 occupy "on" position, and for disconnecting the drive means when shipper handles 51, 52 are moved rearwardly in a clockwise direction in FIGURE 10 to "off" position. Shipper crank 60 is normally urged clockwise (toward "off" position) by a tension spring 65 connected to a shipper latch 66 pivoted intermediate its ends on loomside B and engaging one arm of a reset bell crank 67 whose other arm has an abutment 70 thereon engaging the rear surface of the rounded lower end of shipper crank 60. An electromagnet 71 is connected to a low-voltage source of power 68 in series with a resistance or lamp 69 and in parallel with a normally open shipper latch switch 72 and normally attracts an armature 73 on the lower end of latch 66 when shipper handle 52 occupies the "on" position shown in FIGURE 10. Warp stop motion 55 is also in series with shipper latch switch 72. Armature 73 also holds switch 72 closed when armature 73 is against magnet 71. Whenever magnet 71 does not attract armature 73, due to diversion of current away from magnet 71 caused by operation

of the warp stop motion 55, for example, spring 65 moves latch 66 to move bell crank 67 counterclockwise so its abutment 70 moves shipper crank 60, handle 52 and shaft 57 clockwise to "off" position in FIGURE 10, as is conventional. Low voltage power source 68 is shown in the form of the secondary winding of a transformer 74 whose primary winding may be connected to a high voltage power source, not shown, by lead conductors S, S', one of which may have a manually operable master switch 75 therein.

Pattern device 50 (FIGURE 1) may be of the type shown in said copending application, to which reference is made for a more detailed disclosure thereof. Pattern device 50 may comprise a perforate endless pattern element or strip 80 mounted on rollers 81 and a drum 82. Drum 82 may be driven intermittently during the weaving operation of the loom by suitable connection with a shaft 84 connected to main loom shaft 21 by sprocket wheels 85, 86 and a chain 87. The connection between pattern shaft 84 and drum 82 is not shown, but may be substantially as described in said copending application. Whenever a perforation in strip 80 moves to a position above drum 82 it permits actuation of a corresponding pattern switch thereabove. Only one pattern switch is shown at T¹ in FIGURE 1. However, additional pattern switches T², T³, T⁴ are shown in FIGURE 16, all of which are normally held open by pattern strip 80, and each of which closes upon registration of a corresponding perforation P therewith. Pattern switch T¹ is in series circuit with a relay 91 whose switch 91a interrupts the flow of current to magnet 71 (FIGURES 10 and 16) whenever pattern switch T¹ is closed, thus functioning in the same manner as the warp stop motion 55 to stop the weaving operation of the loom. Although a particular pattern device has been described, it is contemplated that other types of pattern devices may be employed for controlling operation of the loom and, as is desirable in this instance, to stop operation of the shed forming and weft inserting means of the loom. With the exception of pattern controlled means for stopping weaving operation of the loom upon a predetermined length of cloth being woven, the parts of the loom heretofore described may be conventional and it is with such or similar parts that the fringe motion of the present invention is adapted to be associated.

The fringe motion of this invention comprises a normally inactive auxiliary cloth take-up mechanism 100 carried by a frame including a platform 101 attached to the loom frame below main take-up mechanism 25. The outer portion of platform 101 is supported on legs 102. Take-up mechanism 100 comprises a drive shaft 103 journaled in bearings 104 mounted on platform 101 and having a single-revolution clutch 105 mounted thereon. Clutch 105 may be of a type disclosed in U.S. Patent No. 2,140,737, dated Dec. 20, 1938 and includes a driving hub 106 normally loose on shaft 103 and which may be driven continuously by an electric motor 107 suspended from platform 101. As shown in FIGURES 2, 4, 6 and 7, motor 107 drives a gear reduction unit 110 whose output is connected to clutch hub 106 by sprocket wheels 111, 112 and a chain 113. Clutch 105 also includes a cam plate 116 loosely encircling shaft 103 and effective to maintain a fixed connection between hub 106 and drive shaft 103 when it is in operative position to which it is urged by a tension spring 117 (FIGURE 11) connected between cam plate 116 and a fixed hub 120 fast on shaft 103.

When a shoulder 121 on cam plate 116 engages a trip arm 122 pivoted on platform 101 (as shown in FIGURE 11), cam plate 116 is restrained from rotation and spring 117 permits relative movement between cam plate 116 and hub 106 whereby conventional means, not shown in the present application, but clearly shown in Pat. No. 2,140,737, permit hub 106 and sprocket wheel 112 to rotate freely on drive shaft 103 while cam plate 116, fixed hub 120 and shaft 103 remain stationary. A tension spring 123

normally urges trip arm 122 against cam plate 116. Trip arm 122 (FIGURE 11) is moved away from cam plate 116, when a cycle in the operation of the fringe motion is to be initiated, by means of a solenoid 125 mounted on platform 101. As shown in FIGURE 16, the coil of solenoid 125 is connected to lead conductors S, S' in series circuit with a normally open switch 126 of a fringe motion control relay 127, a normally open clutch control switch 130 mounted on platform 101, and a normally open switch 91b of relay 91. The coil of relay 127 is connected to one contact m of a double-throw shipper switch 131 mounted on loomside B adjacent shipper handle 52. Switch 131 is engageable by control link 61 when shipper handle 52 occupies "on" position to maintain switch 131 in engagement with a contact n during weaving operation of the loom. However whenever shipper handle 52 occupies "off" position, the armature of switch 131 is biased into engagement with contact m, thus connecting the coil of relay 127 to low voltage power source 68 (FIGURE 16) whenever shipper handles 51, 52 occupy "off" position. When shipper handles 51, 52 occupy "on" position the armature of shipper switch 131 connects corresponding sides of pattern switches T², T³, T⁴ to low voltage power source 68.

Switch 130 is provided for breaking the circuit to clutch solenoid 125 following each actuation thereof to insure that trip arm 122 (FIGURE 11) engages shoulder 121 and restrains cam plate 116 to stop rotation of drive shaft 103 upon completion of a single revolution thereof. Accordingly, during normal weaving operation of the loom, the high peripheral surface of a clutch control cam 135 (FIGURES 4, 6, 14 and 15) loose on shaft 103 is engaging the arm 130a of switch 130 and holding the same in closed position (FIGURE 14), during which the trailing end of a radial slot 137 in cam 135 is held, by a torsion spring 141, against a radial pin 140 fixed to shaft 103. Torsion spring 141 encircles shaft 103 and is connected to cam 135 and a pawl carrier 143 fixed on drive shaft 103. Pawl carrier 143 has a pawl 144 (FIGURES 4 and 5) pivotally mounted thereon which is spring biased against a ratchet wheel 145 loose on shaft 103. Ratchet wheel 145 is fixed to a sprocket wheel 146 loose on shaft 103. An endless claim 150 (FIGURES 2, 4, 5 and 6) engages sprocket wheel 146 and a sprocket wheel 151 fixed on main take-up shaft 31.

When shaft 103 is rotated by actuation of clutch 105 (during which the main cloth take-up shaft 31 is driven by elements 143-146, 150 and 151), radial pin 140 permits counterclockwise rotation of cam 135 from the position of FIGURE 14 to that of FIGURE 15, whereupon an abutment 155 on cam 135 engages and is restrained from further rotation by a trip bar 156 as a low or flat portion 135a on cam 135 registers with and permits switch arm 130a to move to open position, thus breaking the circuit to clutch solenoid 125 (FIGURES 11 and 16) before a revolution of shaft 103 is completed. Pin 140 then moves along slot 137 relative to cam 135 until shaft 103 stops at the end of its corresponding revolution, thus increasing tension in spring 141. After weaving operation of the loom is restarted in a manner to be later described, pattern device 50 momentarily actuates pattern switch T² to energize a cam resetting solenoid 157 through a relay 158 (FIGURE 16). Solenoid 157 is mounted on platform 101 (FIGURE 6) and its plunger is connected to and thus pulls trip bar 156 out of engagement with abutment 155, permitting spring 141 to return cam 135 to the position of FIGURE 14, and thus closing switch 130 preparatory to a succeeding cycle in operation of the fringe motion.

Upon completion of each auxiliary take-up movement of the cloth being effected by rotation of shaft 103, the weaving operation of the loom is restarted automatically by novel means comprising a reciprocating shipper actuator cam or plate 160 (FIGURES 4, 7, 8 and 9) guided for

vertical reciprocatory movement between posts 162, 162a depending from platform 101. Plate 160 may be reciprocated continuously, such as by means of a crank member or disc 161 fixed to the output shaft of gear reduction unit 110 and having an outwardly projecting eccentric follower or pin 161a fixed thereon and loosely penetrating a lateral or substantially horizontal slot 163 provided in the upper portion of plate 160 (FIGURE 8). As best shown in FIGURES 8 and 9, plate 160 is provided with a pair of upper and lower offset intercommunicating slots 164, 165 which extend past each other at their proximal ends and define respective vertically spaced, offset shoulders 166, 167.

Slots 164, 165 are adapted to alternatively receive one end of a latch 170 of lesser vertical height than the vertical distance between shoulders 166, 167. Latch 170 extends inwardly toward loomside A and an intermediate portion thereof is pivotally mounted, as at 171 (FIGURES 4 and 8), for movement about a substantially vertical axis, in the bifurcated corresponding outer end of a shipper shifting lever 172 whose medial portion is pivotally mounted, as at 173, for movement about a substantially horizontal axis on a fixed bar 174 suitably secured to and depending from platform 101. The lower end of a connecting rod 175 is pivotally connected to shifting lever 172, adjacent its end remote from latch 170, and is normally urged downwardly by a tension spring 176 (FIGURE 4) extending between and connected to connecting rod 175 and platform 101. The upper end of connecting rod 175 has a slotted member 177 (FIGURES 1, 2 and 4) adjustably secured thereon whose longitudinally extending slot 180 is loosely penetrated by a pin 181 projecting outwardly from an auxiliary shipper arm 182. Shipper arm 182 extends forwardly (FIGURES 1 and 2) and is suitably secured to shipper shaft 57 or the corresponding shipper handle 51.

Latch 170 (FIGURES 4, 7, 8 and 9) is normally urged forwardly toward vertical slot 164 relative to vertical slot 165 (FIGURE 9) by a compression spring 185 (FIGURES 7 and 8) surrounding one leg of a substantially U-shaped rod member 186, the other leg of which is suitably secured to latch 170 at a point remote from the free end thereof with respect to pivot point 171. Spring 185 extends between and bears against shifting lever 172 and a collar 187 fixed on rod 186. The leg of rod 186 remote from latch 170 loosely penetrates shifting lever 172 and has an abutment 190 fixed on its outer or forward end which is held against the front surface of shifting lever 172 by spring 185. A latch actuator rod 191 is pivotally suspended from platform 101, by means of a bracket 192, and extends downwardly past and closely adjacent the bridging portion of U-shaped rod 186. The lower end of latch actuator rod 191 is connected to the plunger of a solenoid 194 suitably secured to a bar 195 which is, in turn, suitably secured to guide post 162 and bar 174. Solenoid 194 and actuator rod 191 are so arranged that, upon energization of solenoid 194 in a manner to be later described, actuator rod 191 is moved toward lever 172 in engagement with U-shaped rod 186, thus moving the same forwardly in opposition to spring 185 and swinging the free end of latch 170 rearwardly out of alignment with slot 164 and into alignment with slot 165 below shoulder 167, thus tripping latch 170 so that the succeeding downward movement of plate 160 will impart corresponding movement to latch 170 and lever 172. This causes the other end of lever 172 to move upwardly, thus moving connecting rod 175 upwardly so the lower end of the slot 180 in member 177 (FIGURE 2) engages and raises pin 181 to move shipper handle 50 from the "off" position shown in FIGURES 1 and 2 to the "on" position, thus starting the loom. It should be noted that latch 170 and lever 172 remain stationary when latch 170 is aligned with slot 164 during reciprocation of plate 160, because slot 164 simply moves relative to latch 170.

Energization of the loom starting solenoid 194 is effected as a consequence of rotation of auxiliary take-up drive shaft 103 and through an auxiliary normally closed start switch 200 and coacting switch operating cams 201, 202 (FIGURES 4, 6, 12 and 13). Switch 200 and solenoid 194 are connected in series across the main electrical supply conductors S, S' (FIGURE 16). Primary starting cam 201 is fixed on auxiliary take-up drive shaft 103 and secondary starting cam 202 is loosely mounted on shaft 103, but is normally urged in the direction of rotation of shaft 103 by a torsion spring 203 (FIGURES 12 and 13) encircling shaft 103 and having opposite ends connected to secondary cam 202 and a collar 204 adjustably secured on shaft 103. Switch 200 is fixed on platform 101 and has an upwardly biased switch arm 205 thereon which engages the peripheral surfaces of both cams 201, 202.

During weaving operation of the loom (during which auxiliary take-up drive shaft 103 is not rotating) a recess or notch 201a in the periphery of primary cam 201 is aligned with switch arm 205. However, switch arm 205 is then held in the downward or open position by engagement thereof with the high point or periphery of secondary cam 202, as shown in FIGURE 12. Secondary cam 202 also has a recess 202a therein of substantially the same configuration as recess 201a of primary cam 202. In addition, another portion of secondary cam 202 is recessed to define a pair of opposed radially extending shoulders A, A'. Primary cam 201 has an eccentric pin B thereon which is adapted to move in the recess between shoulders A, A' of secondary cam 202. The periphery of cam 202 normally is engaged by a latch finger 207 which extends outwardly and then downwardly and then laterally and is journaled in a block 210 positioned between the outermost bearing block 104 and platform 101.

The substantially horizontal portion 207a of latch finger 207 has a crank arm 212 fixed thereon to which the upper end of a Bowden wire or cable 213 is pivotally connected, the cable being normally urged upwardly by a spring 214 to normally urge latch finger 207 against secondary cam 202. Cable 213 loosely extends through a tubular housing or casing 215 suitably secured to platform 101 and to guide post 162. The lower end of cable 213 is suitably connected to one end of a start switch resetting lever 217 whose medial portion is pivotally mounted on bar 174 and whose portion remote from cable 213 has a rearwardly projecting abutment or pin 220 thereon overlying shifting lever 172 (FIGURE 7). The operation of the auxiliary start switch 200 and cams 201, 202 is as follows:

When rotation of auxiliary take-up drive shaft 103 is initiated in the manner heretofore described, shoulder A' on cam 202 (FIGURES 12 and 13) is bearing against pin B of cam 201 and, as cam 201 starts rotating in fixed relation to shaft 103, spring 203 causes secondary cam 202 to rotate with cam 201 for about three-fourths of a revolution; i.e., until shoulder A' moves into engagement with latch finger 207 and restrains cam 202 from further rotation, although cam 201 continues to rotate. Of course, by the time shoulder A' has moved into engagement with latch finger 207 as shown in FIGURE 13, recess 201a in primary cam 201 will have moved out of registration with switch actuator 205, thus insuring that switch actuator 205 cannot enter the space between shoulders A, A'.

It should be noted that, when shoulder A' is in engagement with latch finger 207, recess 202a of secondary cam 202 is in registration with switch arm or actuator 205, but switch arm 205 cannot move into recess 202a because it is then being engaged by the high surface of primary cam 201. However, primary cam 201 continues rotating relative to secondary cam 202 so that it returns to its initial or starting position at the instant that the corresponding revolution of drive shaft 103 is completed. Thus, both recesses 201a, 202a are then in registration with and permit switch actuator 205 to move upwardly, thus permitting auxiliary start switch 200 to close and effect energization of starting solenoid 194. As heretofore stated, latch 170

(FIGURES 8 and 9) then is moved into alignment with shoulder 167 so that the corresponding downward movement of cam plate 160 imparts downward movement to the corresponding end of shifting lever 172 to restart the loom. At the same time, a portion of lever 172 remote from latch 170 moves upwardly and engages pin 220 to impart upward movement to the corresponding end of reset lever 217 (FIGURES 4 and 8) in opposition to spring 213. In so doing, cable 213 and arm 212 move downwardly in FIGURE 13 while imparting clockwise movement to latch finger 207 and moving the same out of engagement with shoulder A' of secondary cam 202.

Immediately upon latch finger 207 moving out of engagement with shoulder a', spring 203 imparts counterclockwise movement to secondary cam 202 relative to primary cam 201 until shoulder a' moves into engagement with pin b of primary cam 201, thus returning secondary cam 202 to its starting position and moving switch arm 205 downwardly to open switch 200. This insures that solenoid 194 is deenergized before another cycle of the loom restarting mechanism is to be effected and also insures that the loom is not forced to run when a warp end 14 or the filling is broken and actuates the corresponding loom stop motion. Also, spring 185 (FIGURE 8) then may return latch 170 to its inoperative position above shoulder 166 (FIGURE 9) when plate 160 subsequently approaches the end of the corresponding upward stroke thereof and the shoulder 167 releases the latch 170 from engagement therewith. Slot 164 permits plate 160 to reciprocate vertically without imparting movement to latch 170 during weaving operation of the loom. Downward movement of shipper connecting rod 175 and upward movement of latch 170 may be limited by a stop member or abutment 223 carried by and projecting rearwardly from horizontal frame member 195 (FIGURES 4 and 8).

By referring to FIGURE 16, it will be apparent that, whenever fringe motion relay 127 is energized in the manner heretofore described, it causes current to flow to a warp tension reducing solenoid 225 which, as shown in FIGURE 3, is mounted on a bracket 226 suitably secured to brake band member 40. The plunger of solenoid 225 is pivotally connected to a lever 227 which extends inwardly and is pivotally mounted on one end of a brake tension rod 230. Brake tension rod 230 loosely penetrates projecting corresponding ends of brake bands 40, 41 and is surrounded by a compression spring 231. Compression spring 231 extends between and engages the proximal ends of brake bands 40, 41 so that, upon energization of solenoid 225, the pivoting of brake lever 227 about pivot point 232 moves brake tension rod 230 from right to left in FIGURE 3, thus causing brake bands 40, 41 to move apart from each other to reduce the tension on the warp beam 10 and warps 14 during operation of the auxiliary take-up mechanism 100 in the manner heretofore described.

As heretofore stated, when the weaving operation of the loom is restarted, the armature of shipper switch 131 is moved to break the circuit to fringe motion relay 127 and provide current for pattern switches T², T³, T⁴ (FIGURE 16). In so doing, relay 127 and, thus warp tension reducing relay 225 are deenergized, as is necessary for normal loom operation. Thereafter, pattern strip 80 is advanced to move the corresponding perforation P therein out of registration with switch T¹ to deenergize relay 91 and stop diversion or interruption of current from magnet 71 (FIGURES 10 and 16) so normal loom operation is resumed. It should be noted that the loom restarting mechanism of FIGURE 8, and including connecting rod 175, holds shipper handles 51, 52 in the "on" position for a sufficient period of time to permit pattern strip 80 to move and thus render magnet 71 operable in the manner last described to then take over the holding of shipper handles 51, 52 in the "on"

position independently of connecting rod 175. Thereupon, the bottom of slotted member 177 (FIGURES 1 and 2) moves away from pin 181.

If desired, pattern switches T², T³, T⁴ may be used for controlling the conventional cloth take-up mechanism 25, the terry warp let-off mechanism 43, and the position of reed 16 relative to lay 17, in the manner disclosed in said copending application, for weaving terry cloth between successive fringe portions formed according to the instant invention. As disclosed in said copending application, it is desirable to stop the normal operation of the cloth take-up mechanism at certain times during weaving, especially during transition from the weaving of a non-terry border to terry weaving. Accordingly, a take-up release solenoid 240 is shown in FIGURE 16 which may serve the purpose of lifting pawl 32 (FIGURES 1 and 2) out of engagement with ratchet wheel 30, if desired, in the manner disclosed in said copending application. Conveniently, the cam resetting solenoid 157 (FIGURES 5 and 16) adjacent auxiliary take-up drive shaft 103 may be connected to current supply conductors S, S' in series with take-up release solenoid 240 so that, when pattern strip 80 calls for temporary inactivation of the main take-up mechanism 25, the consequent closing of pattern switch T² also effects energization of resetting solenoid 157 so cam 135 returns from the position of FIGURE 15 to that of FIGURE 14 before another fringe motion cycle is to be initiated.

Since clutch 105 does not connect motor 107 (FIGURES 2 and 7) to auxiliary take-up drive shaft 103 during weaving operation of the loom, and pawl 144 (FIGURES 4, 5 and 6) then would permit undesirable reverse rotation of shaft 103 (clockwise in FIGURES 2 and 5), a hold-back latch 245 (FIGURES 2, 4 and 6) is pivotally supported on platform 101 and is biased, by a spring 247, against a restraining collar 246 fixed on shaft 103. Collar 246 is so positioned on shaft 103 that a shoulder 250 on collar 246 may engage latch 245 at the end of each revolution of shaft 103 to prevent reverse rotation thereof and insure that cams 135, 201, 202 occupy proper relative positions when shaft 103 is not being driven and preparatory to each succeeding revolution of shaft 103.

It is thus seen that we have provided an improved fringe motion particularly adapted for use in conjunction with a shuttleless loom and wherein pattern controlled means stops the loom and thus initiates operation of the single revolution clutch 105 to advance the cloth a predetermined amount while the loom is not operating. Upon advancement of the cloth being completed, it can be seen that means are provided for restarting the loom automatically and conditioning the fringe motion for a succeeding cycle when called for by the pattern device.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

We claim:

1. In a shuttleless loom having warp shed forming means, filling inserting means for drawing filling yarn from a stationary supply and inserting the yarn in the shed, an oscillatable reed, and main cloth take-up means advancing the cloth and warps during weaving operation of the loom; the improvement comprising means for stopping the weaving operation of the loom and including stopping the operation of the shed forming means, the filling inserting means, the reed and the cloth take-up means, auxiliary cloth take-up means for driving the main cloth take-up means while the weaving operation of the loom is stopped, and means for restarting the weaving operation upon a predetermined length of warps

and cloth being taken up by operation of said auxiliary take-up means.

2. Apparatus according to claim 1, in which said loom includes a warp beam and a tension mechanism for resisting rotation of the warp beam during weaving operation of the loom; means for reducing tension on the warp beam during operation of said auxiliary take-up means.

3. In a shuttleless loom having shed forming means for forming a shed of warp yarns, an oscillatable reed and filling inserting means for drawing filling yarn from a stationary supply and for inserting the filling yarn in the shed during weaving operation of the loom; the improvement comprising means for interrupting the operation of the reed, the shed forming means and the filling inserting means upon a predetermined length of cloth being woven, means responsive to operation of said interrupting means for taking up the cloth and the warp yarns a predetermined amount during such interruption, and means responsive to said taking-up means operatively associated with said auxiliary cloth take-up means taking up said predetermined amount of cloth and warp yarns for deactivating said interrupting means and resuming the operation of said reed, said shed forming means and said filling inserting means.

4. Apparatus according to claim 3, in which said loom includes a warp beam for said warp yarns and a tension mechanism for resisting rotation of the warp beam during weaving operation of the loom, and said means responsive to operation of said interrupting means being operable to reduce the tension on said warp beam during such interruption.

5. Apparatus according to claim 3, in which said loom includes a main take-up means for taking up the cloth during weaving operation of the loom, and wherein said means responsive to operation of said interrupting means comprises a normally inactive auxiliary take-up means operatively connected to said main take-up means, and means for activating said auxiliary take-up means upon operation of said interrupting means.

6. Apparatus according to claim 5, in which said interrupting means comprises a shipper element movable between "on" and "off" positions and occupying "on" position during weaving operation, a pattern device, and means under control of said pattern device for effecting movement of said shipper element from "on" position to "off" position.

7. Apparatus according to claim 6, in which said auxiliary take-up means includes a rotary member and said activating means comprises means for driving said rotary member, said means for deactivating said interrupting means comprising a normally inactive shipper operating means connected to said shipper element, and means responsive to predetermined rotation of said rotary member for activating said shipper operating means to move said shipper element from "off" to "on" position.

8. Apparatus according to claim 6, in which said pattern device includes a movable pattern element, means driving said pattern element during weaving operation of the loom and means responsive to movement of said shipper element to "off" position for stopping said means driving said pattern element, and said means responsive to said taking up means taking up said predetermined amount of cloth and warp yarns including means to move said shipper element from "off" to "on" position to thereby restart said means for driving said pattern element, and said means to move said shipper element to "on" position being operable to maintain said shipper element in the "on" position until after said pattern element has been driven a predetermined amount.

9. In a loom having means for weaving cloth during operation of the loom and including an oscillatable reed, warp shed forming means, filling inserting means, warp let-off means and cloth take-up means, and a pattern means driven by the loom during operation thereof; the

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combination therewith of means responsive to said pattern means for stopping the operation of the loom and including stopping the reed, the shed forming means, the filling inserting means, the warp let-off means, the cloth take-up means and the pattern means, means also responsive to said pattern means for driving said cloth take-up means a predetermined amount while the loom operation is stopped, and means for restarting the loom operation in response to said cloth take-up means being driven said predetermined amount.

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