

June 9, 1959

E. P. TURNER
LOOM DRIVING MECHANISM

2,889,855

Filed June 23, 1954

6 Sheets-Sheet 1

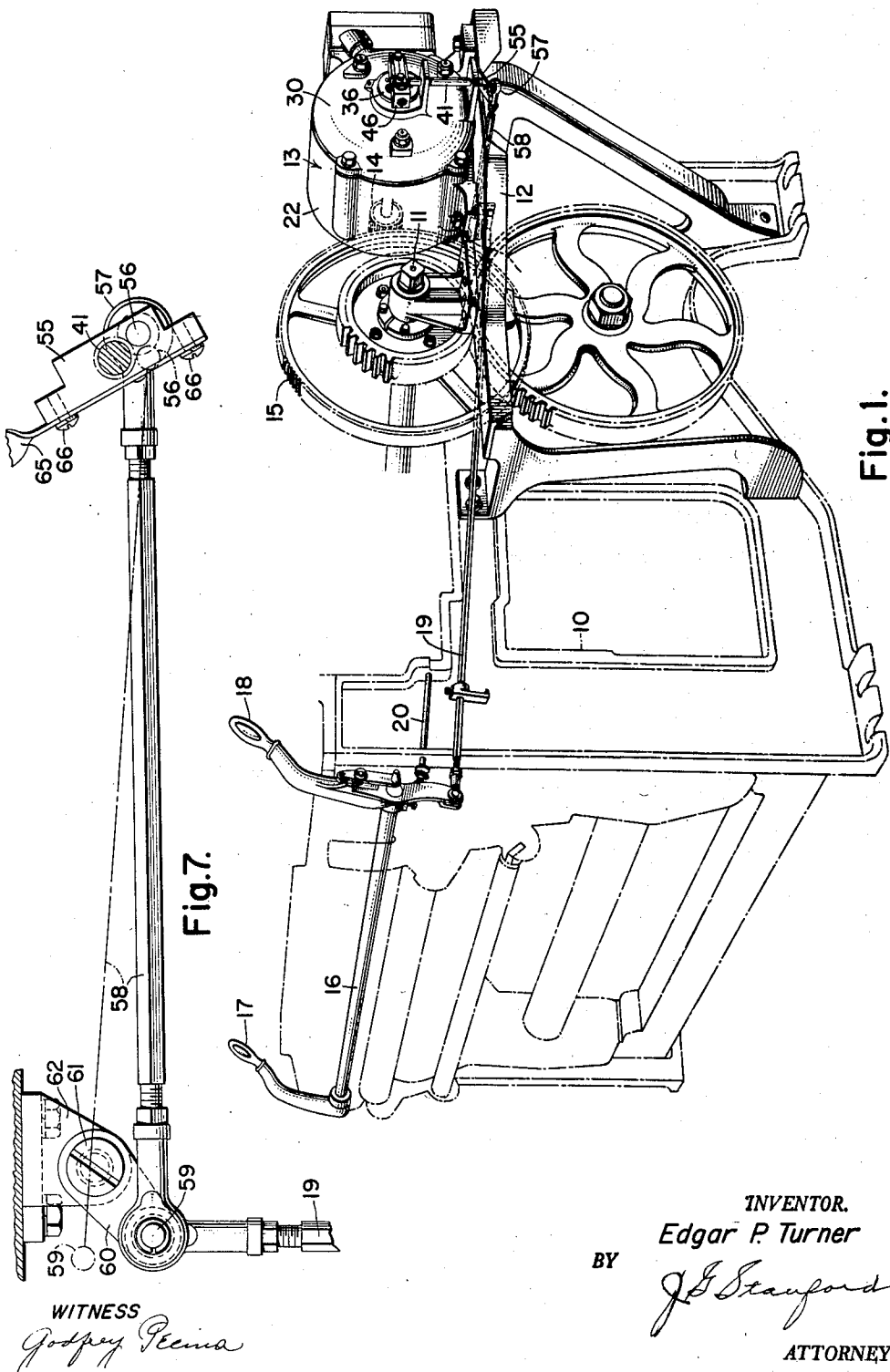


Fig. 1.

Fig. 7.

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WITNESS
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6 Sheets-Sheet 2

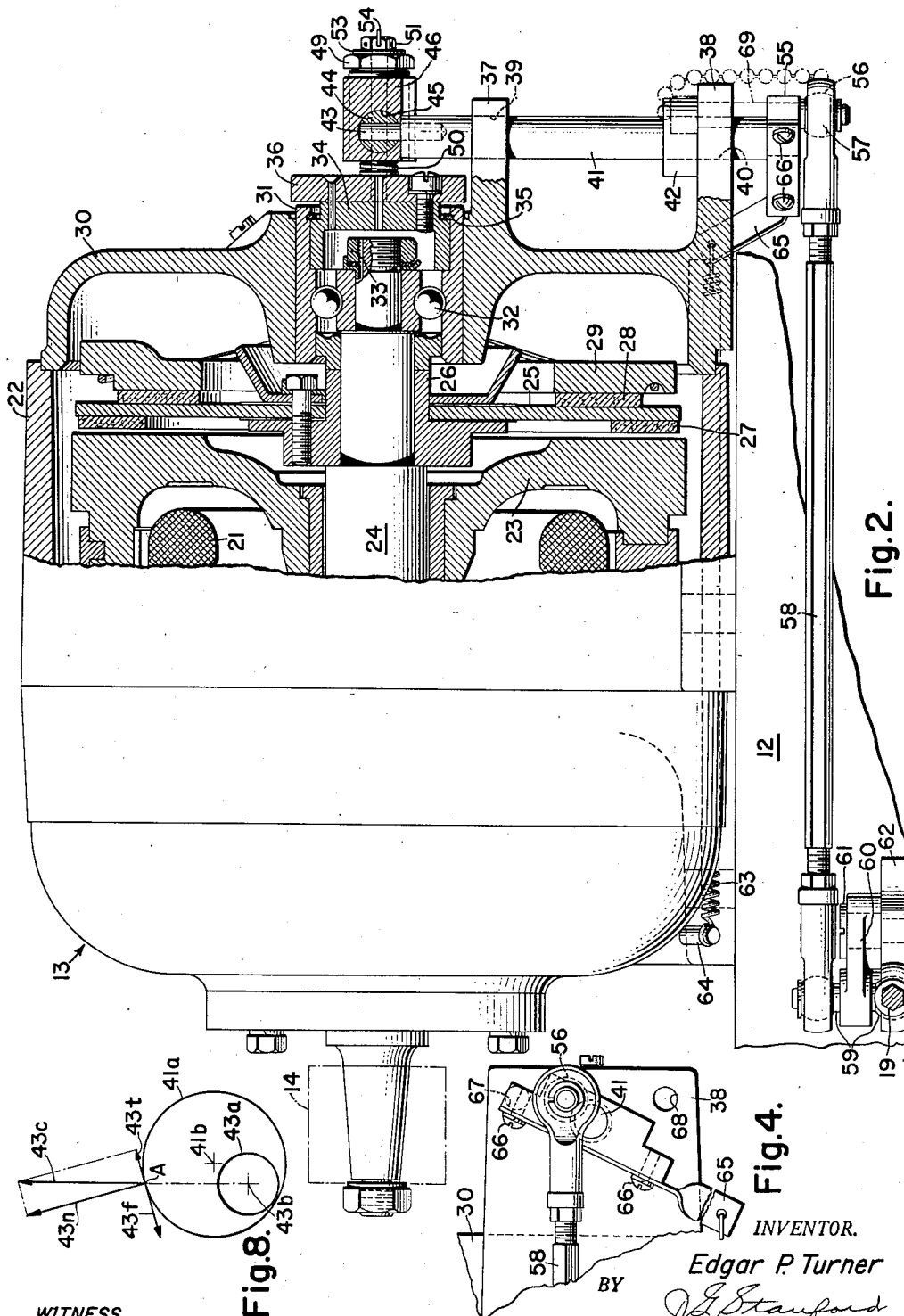


Fig. 2.

Fig. 4.

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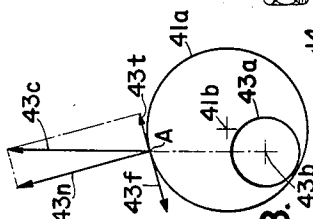
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Fig. 8.



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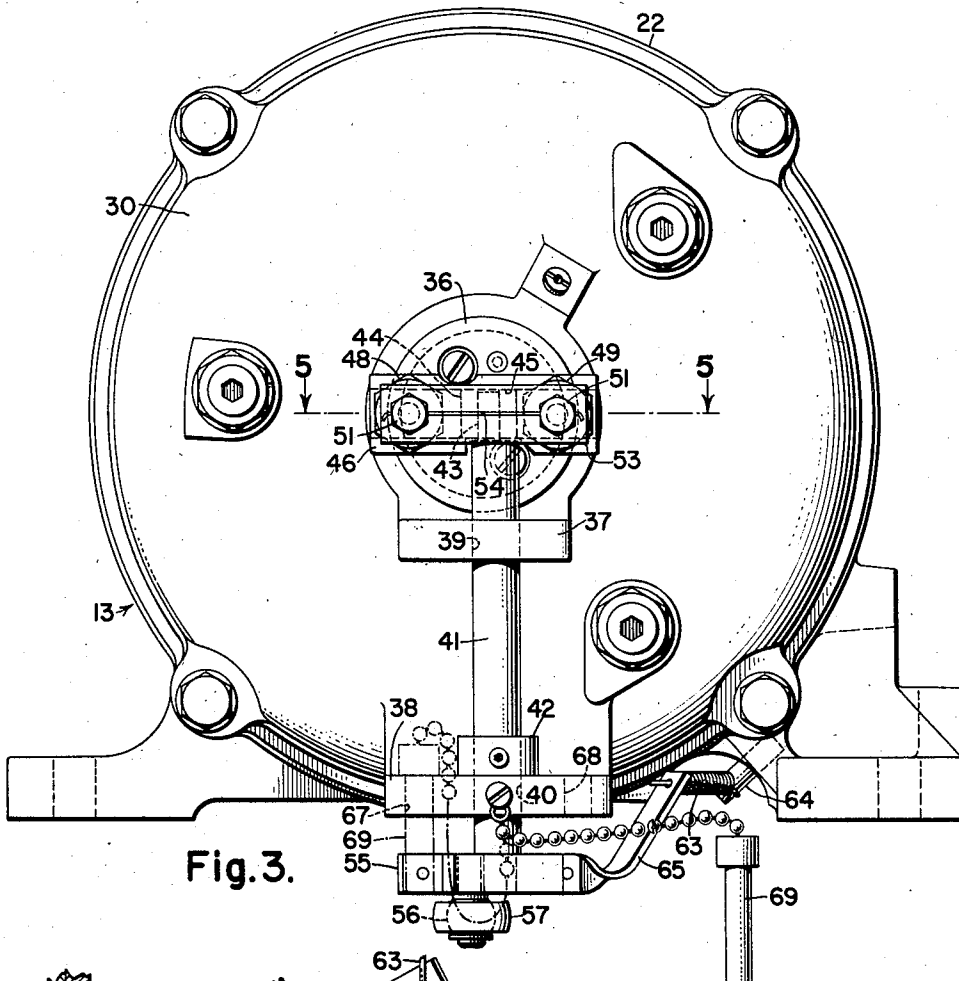


Fig. 3.

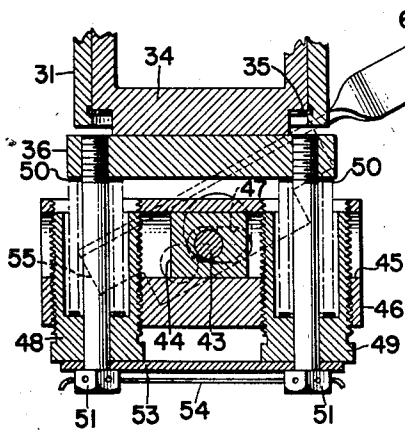


Fig. 6.

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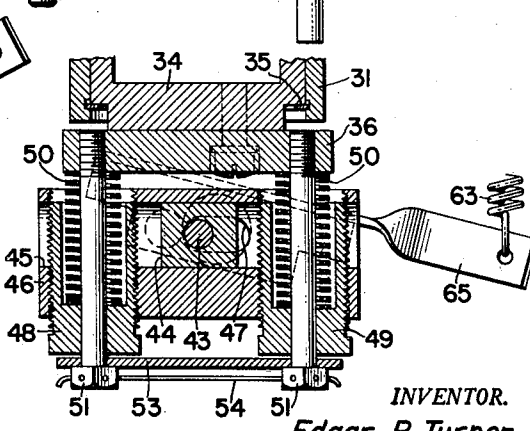


Fig. 5.

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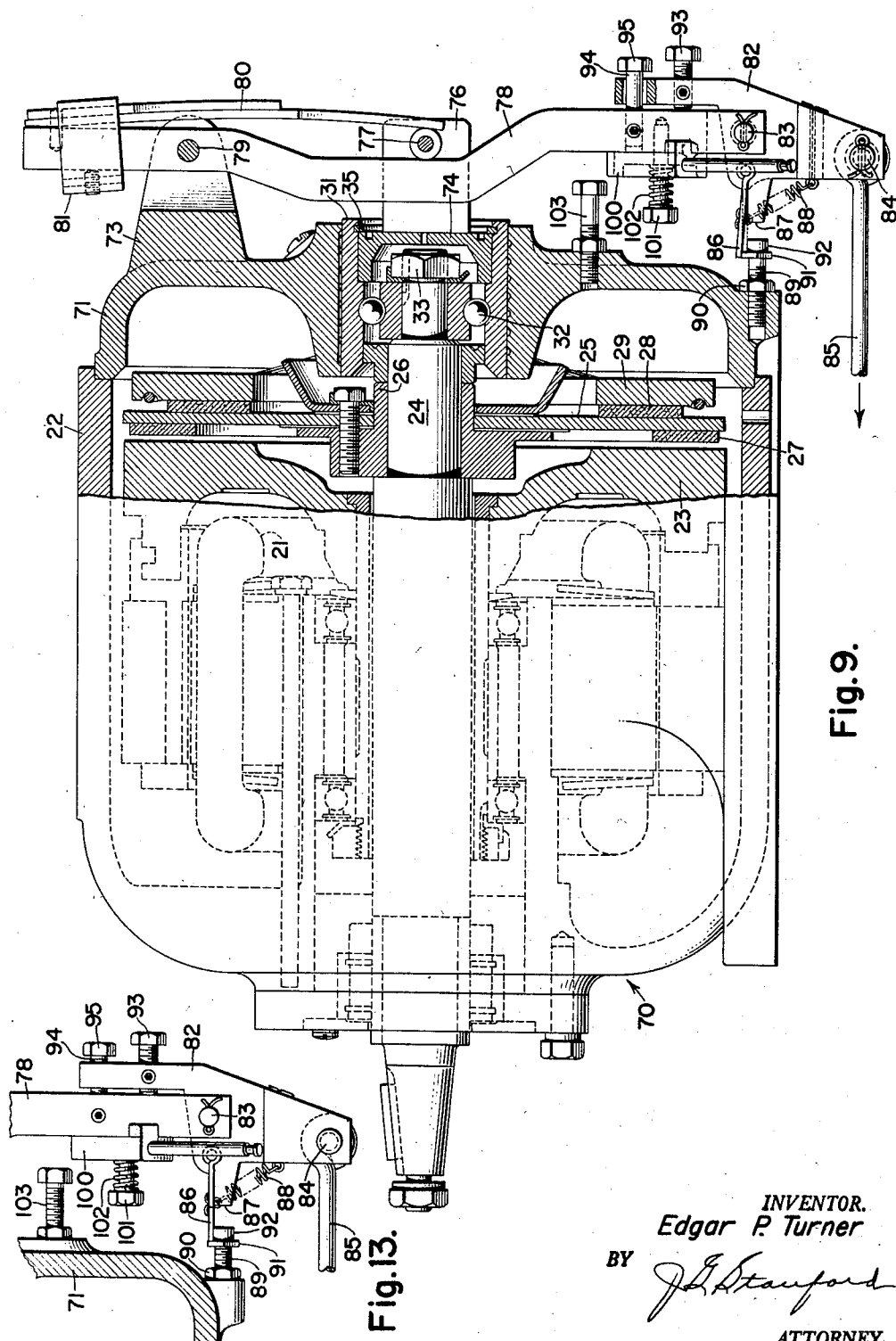


Fig. 9.

Fig. 13.

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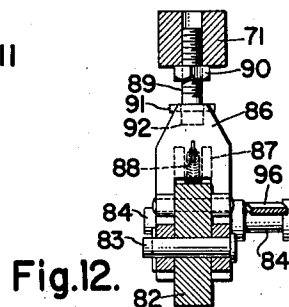
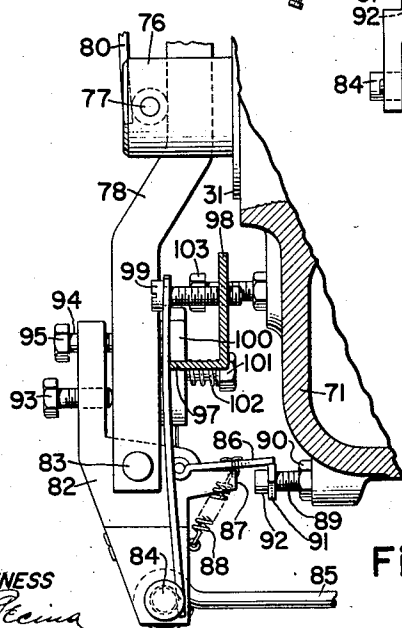
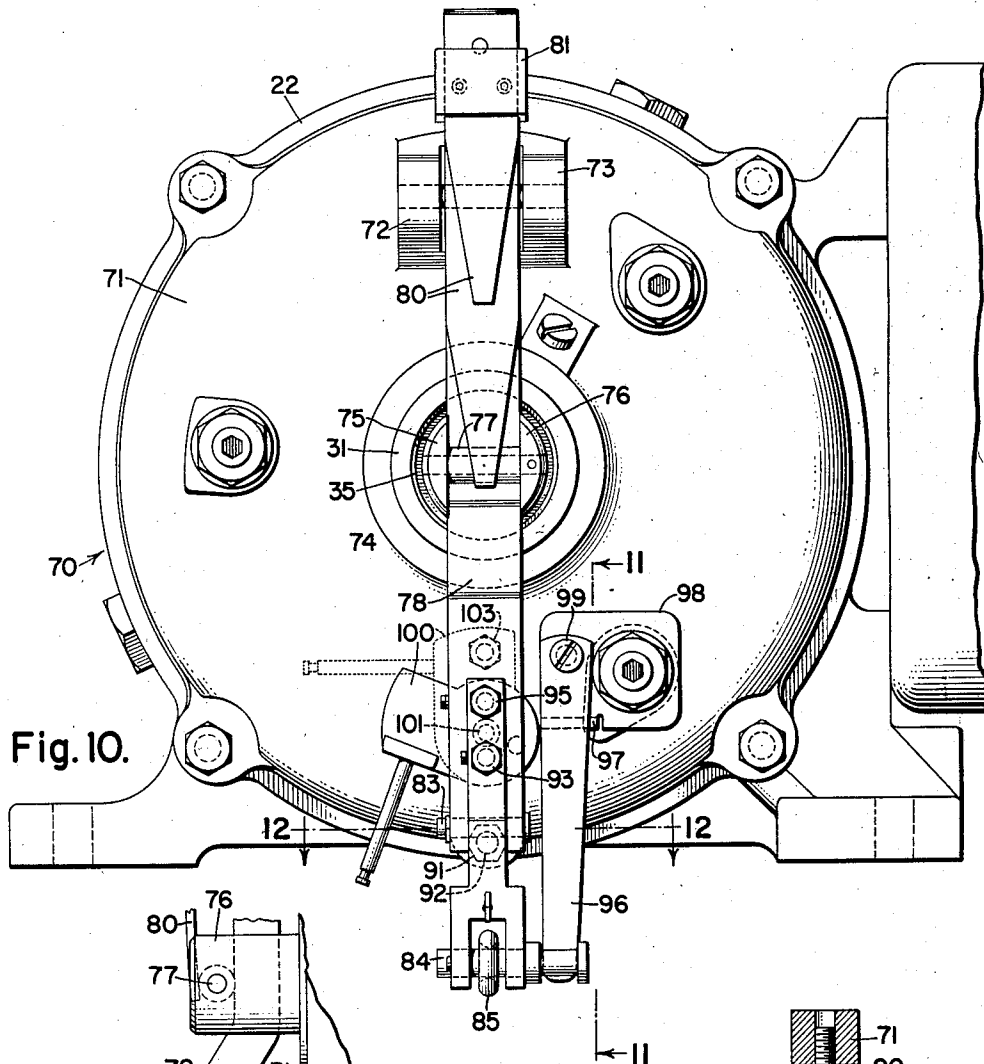
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LOOM DRIVING MECHANISM

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LOOM DRIVING MECHANISM

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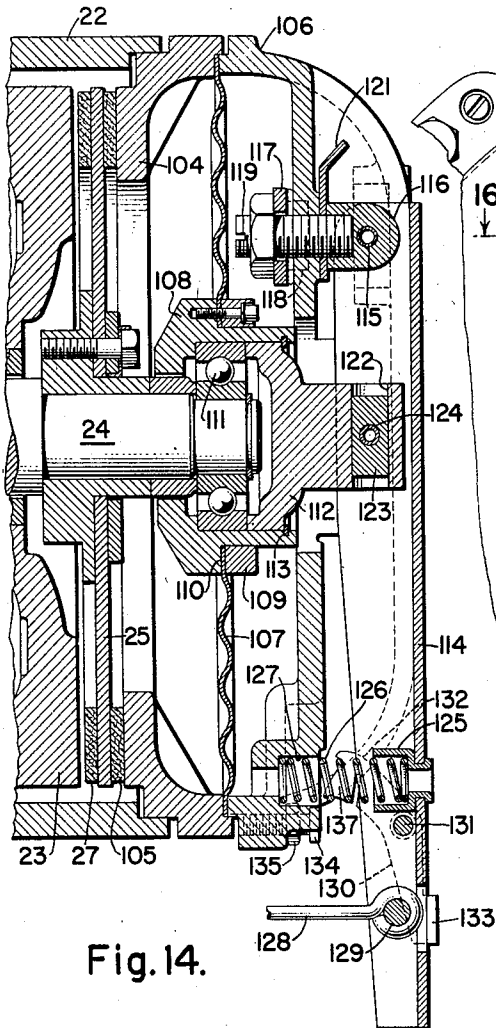


Fig. 14.

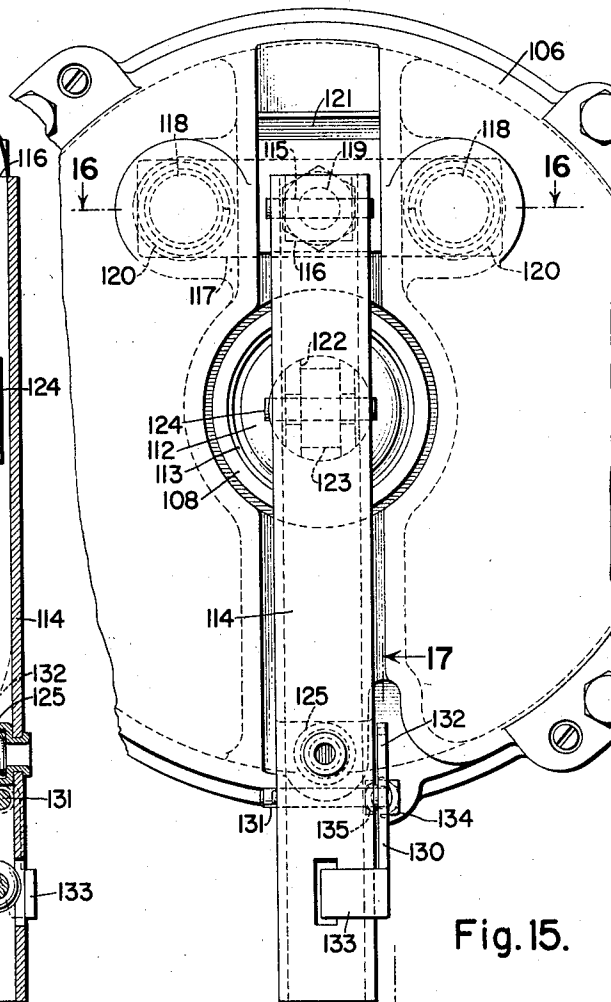


Fig. 15.

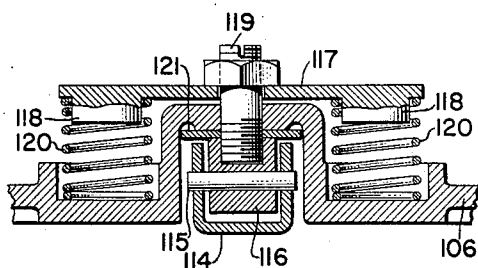


Fig. 16.

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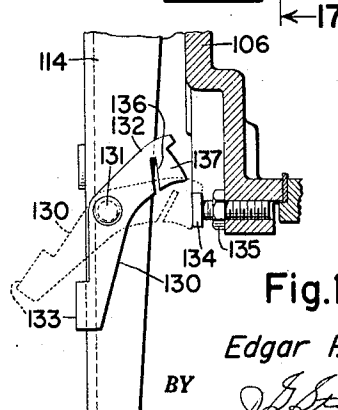


Fig. 17.

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2,889,855

LOOM DRIVING MECHANISM

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Application June 23, 1954, Serial No. 438,799

8 Claims. (Cl. 139—336)

This invention relates to a driving mechanism for weaving looms and, more particularly, relates to a mechanism which will stop a loom quickly without undue shock to the loom mechanism or the driving device.

It has long been a problem in the weaving industry to obtain a dependable loom driving mechanism which can be readily serviced without prolonged down-time for the entire loom and which would provide both rapid stopping of the loom and rapid acceleration of the loom when starting. In prior looms, the loom structure has included a main clutch used for connecting the loom to a conventional electric driving motor and a spring-engaged brake for stopping the loom. The clutch and brake are normally of the friction type. In most looms, the clutch and brake mechanism requires rather frequent repair and adjustment and where the clutch and brake form part of the loom structure, the result is that the entire loom must be shut down until the necessary repairs and adjustments are made. It is also true that the heavy parts of a loom, when moving at weaving speeds, contain a large amount of kinetic energy which must be absorbed by the brake in stopping. When a spring-engaged brake is used, the brake spring must be extremely heavy to effect stopping within a reasonable time. However, even with a very heavy spring, if the loom must be stopped very abruptly within a limited time, as when a shut down due to thread breakage occurs it has been found that the brake tends to bounce and chatter resulting in slow and erratic stopping of the loom. This condition is particularly troublesome in looms of the center fork detection type where very rapid braking is essential. Having these problems in view, it is the purpose of this invention to devise a loom drive and control mechanism which is not subject to the above objections as will appear from the following objects and description of the invention.

An object of this invention is to provide a driving and stopping mechanism for a loom which is compact and efficient.

Another object of the invention is to provide a unitary clutch-brake motor structure for a loom which can be removed and serviced as a unit.

A further object of the invention is to provide a control device for the loom mechanism and the loom driving mechanism which will assure positive and effective control of the loom.

A still further object of the invention is to provide means for stopping the loom abruptly in the event of an emergency shut-down.

Other objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings.

In the drawings,

Fig. 1 is a perspective view of a portion of a loom embodying the invention.

Fig. 2 is a side elevational view, partly in section, of a first embodiment of a clutch-brake motor and control mechanism for use in the loom mechanism shown in Fig. 1.

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Fig. 3 is a right end view in elevation of the clutch-brake motor shown in Fig. 2.

Fig. 4 is a bottom view of the clutch and brake control mechanism shown in Fig. 2.

Fig. 5 is a sectional view of the clutch-brake trunnion mechanism taken on line 5—5 of Fig. 3 showing the mechanism in the clutch engaged position.

Fig. 6 is a view similar to Fig. 5 showing the mechanism in its brake constrained position.

Fig. 7 is a top plan view of the loom control linkage for the clutch-brake motor.

Fig. 8 is a force diagram of the trunnion mechanism of the transmitter embodiment shown in Figs. 2—6 inclusive.

Fig. 9 is a side elevational view, partly in section, of a second embodiment of a clutch-brake motor and control mechanism for use in the loom mechanism shown in Fig. 1.

Fig. 10 is a right end view in elevation of the motor embodiment shown in Fig. 9.

Fig. 11 is a view of the control latch mechanism taken on line 4—4 of Fig. 10.

Fig. 12 is a sectional view taken on line 12—12 of Fig. 10.

Fig. 13 is a left side view in elevation of the latch mechanism of Fig. 9 shown in its latch engaged position.

Fig. 14 is a vertical sectional view of a clutch-brake motor similar to the motor of Fig. 2 but provided with a different clutch-brake device and control mechanism.

Fig. 15 is a partial right end view of the motor shown in Fig. 14.

Fig. 16 is a sectional view taken on line 16—16 of Fig. 15.

Fig. 17 is a view of the inertia latch device taken on line 17—17 of Fig. 15.

Referring more particularly to the drawings, a portion of a loom frame 10 of conventional design is shown in broken outline in Fig. 1. The frame 10 carries a conventional main power shaft or crank shaft, one end of which is shown at 11. A motor support frame 12 is rigidly secured to the loom frame and carries a unitary clutch-brake motor or power transmitter 13 for driving the loom. A motor drive pinion 14 meshed with a large gear 15 secured to the power shaft 11 transmits power from the transmitter 13 to the shaft 11 at a substantially reduced speed. Journally supported on the front of the loom frame 10 is a shipper shaft 16 which carries shipper handles 17 and 18 for controlling the loom mechanism. A shipper arm connecting rod 19 is pivotally secured to the shipper handle 18 to control actuation of the motor clutch and brake in a manner to be more fully described below. A shut-down rod 20 is also carried by the frame 10 and is adapted to be actuated by a conventional emergency shut-down mechanism. The rod 20 is arranged to strike the shipper lever 18 and move it to its stopping position. Since this invention relates only to a driving and control mechanism for a loom which can be applied to any conventional loom, a more detailed description of the particular loom weaving structure is not believed to be necessary.

One embodiment of the unitary transmitter or clutch-brake motor 13 is shown in Fig. 2 along with the associated loom control mechanism. The motor portion of the transmitter is substantially the same as the motor portion of the transmitter disclosed in the Wendel U.S. Patent No. 2,650,995, dated Sept. 1, 1953, and includes a stator 21 carried by a motor casing or frame 22. A flywheel and rotor 23 are rotatably supported on bearings carried by the frame 22. A driven shaft 24 extends through the rotor 23 and is journaled at one end in a bearing (not shown) carried by the frame 22. A flexible friction disc 25 is secured to a hub 26 pressed onto a reduced diameter portion of the driven shaft 24 and carries a friction

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clutch facing 27 on one side and a friction brake facing 28 on the other side. A brake ring 29 engageable by the friction facing 28 is carried by an end cover 30 which forms a part of the casing 22. The end cover slidably supports a bearing sleeve 31 which forms the outer race of a control bearing 32. The inner race of the bearing 32 abuts against a shoulder on the shaft 24 and is securely fastened to the end of the driven shaft 24 by a nut 33 threaded onto the end of the shaft. A control member 34 is secured in a counterbore in the member 31 by a snap ring 35 and carries a control plate 36 securely fastened to the control member 34 by screws. Two bearing bosses 37 and 38 are formed integral with the end cover 30 and are provided with bearing holes 39 and 40, respectively. The bearing bosses 37 and 38 journal support a vertically disposed actuating shaft 41 which is located relative to the bearing boss 38 by a collar 42 securely fastened to the actuating shaft and bearing against the upper surface of the boss 38. The upper end of the shaft 41 carries an axially extending eccentric pin 43 which is located eccentrically relative to the center of the shaft 41 to provide a maximum throw which is less than the radius of the bearing hole 39 or 40. A trunnion block 44 is provided with a bearing hole which receives the eccentric pin 43. The trunnion block 44 is mounted in a horizontal slideway 45 formed in a slide block 46 provided with an elongated opening 47 through which the eccentric pin 43 passes to enter the trunnion block 44, as best shown in Figs. 5 and 6. Two hollow clutch adjusting cylinders 48 and 49 are threaded into the slide block 46, one on either side of the trunnion block 44. The outer ends of the cylinders 48 and 49 are closed except for a small diameter hole centrally located in each. A coil compression spring 50 is located in each of the cylinders 48 and 49 and each spring 50 is adapted to bear against the closed end of its cylinder at one end and the control plate 36 at the other end. A cap screw 51 passes through the small diameter hole in each of the cylinders 48 and 49 and is threaded into the control plate 36. A feeler plate 53 is positioned between the closed ends of the cylinders 48 and 49 and the heads of the cap screws 51 to assure proper clutch operation as will be described below. The cap screws 51 are locked together by a lock-wire 54 after adjustment.

The lower end of the shaft 41 carries an actuating block 55 securely fastened thereto which carries a ball stud 56 forming part of a ball joint 57 which connects the actuating block 55 to one end of a connecting rod 58 located beneath the transmitter. The other end of the connecting rod 58 is pivotally connected to the shipper arm connecting rod 19 by means of a double ball pivot connection 59 carried by an overcenter link 60. The link 60 is pivoted on a stud 61 carried by a support pad 62 on the motor support frame 12. A coil tension spring 63 extends between and is fastened to a stud 64 carried by the motor frame 22 and a return lever 65 secured to the actuating block 55 by two screws 66. As best shown in Figs. 3 and 4, the lower bearing boss 38 is provided with two holes 67 and 68 either of which can receive a stop pin 69.

From the foregoing description, it is believed that the operation of the device will be readily understood. The structure shown in Figs. 1, 2, 3, 4 and 7 illustrates the relative positions of the various parts when the loom is stopped under normal conditions of shut-down. For normal shut-down, the shipper handles 17 and 18 are moved manually clockwise about the axis of the shipper shaft 16 to the position shown in Fig. 1. This movement of the handle 18 pulls the shipper arm connecting rod 19 forward, moving the over-center link 60, connecting rod 58 and actuating block 55 to the positions shown in Figs. 1 and 7 and turning the actuating shaft 41 counterclockwise as viewed in Fig. 7. As the shaft 41 turns, it moves the eccentric pin 43 and thus the trunnion block 44 and slide block 46 to the right as viewed in Fig. 1,

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until the ends of the cylinders 48 and 49 firmly clamp the feeler 53 against the heads of the cap screws 51 moving the control plate 36, driven shaft 24 and friction disc 25 to the right until the brake facing 28 firmly engages the brake ring 29. The coil spring 63 holds the mechanism yieldingly in this normal brake-engaged position and no other brake is required. It is not necessary to disconnect the motor power supply (not shown). The motor rotor 23 can continue to rotate without affecting the loom. Braking the driven shaft 24 of the transmitter 13 brakes the loom through the reduction gears 14 and 15.

Assuming that the motor is energized and the rotor 23 is rotating, it is only necessary to move the shipper handle 17 or 18 counterclockwise about the axis of the shipper shaft 16 as viewed in Fig. 1, to engage the clutch facing 27 with the face of the rotating rotor and flywheel 23. As the shipper handle moves, the shipper arm connecting rod 19 moves to the right along the loom frame 10, as viewed in Fig. 1, turning the link 60 clockwise, as viewed in Fig. 7, and drawing the connecting rod 58 to the left. This movement turns the actuating shaft clockwise, as viewed in Fig. 7, thus moving the trunnion block 44 and the slide block 46 to the left, as viewed in Fig. 2. As the slide block 46 moves to the left, the ends of the cylinders 48 and 49 bear against the springs 50 urging the control plate 36 and member 34 to the left, thus moving the shaft 41 until the clutch facing 27 engages the rotor 23. As the shipper handle is moved to its final clutch-engaged position, the ball joint 59 carried by the link 60 moves to a position shown diagrammatically in broken lines in Fig. 7, drawing the connecting rod over the center of the pivot stud 61. This over-center action causes the springs 50 to be compressed slightly and the spring action then places the connecting rod 58 under tension to hold the link 60 in the over-center position until the shipper mechanism is moved to release it. As shown in Fig. 5, when the parts are properly assembled and the clutch is firmly engaged, the springs 50 are compressed only enough that the feeler plate 53 is loose between the ends of the cylinders 48 and 49 and the heads of the cap screws 51. If the feeler plate 53 indicates that the parts are not correctly adjusted, the cylinders 48 and 49 may be turned to compress or release the springs 50 until the feeler plate 53 indicates that the adjustment is correct. This construction assures proper clutch-engaging pressure whenever the clutch is firmly engaged and the over-center device holds the clutch securely in engagement.

Occasionally, during the course of weaving operations, the shuttle will fail to box properly. Under such circumstances, it is imperative that the loom be stopped instantly. In the event of filler thread breakage, it must be stopped before the lay beats up the filler thread. This is accomplished by means of an emergency shut-down device which functions to stop the loom automatically and part of my invention is in the stopping mechanism described above which can be actuated by the emergency shut-down device. In the loom shown in Fig. 1, when the emergency shut-down mechanism (not shown), which can be of a conventional type, operates to stop the loom, it strikes the shut-down rod 20 a sharp blow of considerable force, driving the rod 20 to the left against the shipper handle 18. The sudden, sharp movement of the rod 20 drives the handle 18 clockwise about the shaft 16 causing the rod 19 to pull the link 60 from its over-center position and move the parts from the clutch-engaged position to their brake-engaged position. However, since the shut-down rod 20 strikes the shipper handle 18 with considerable force, energy is imparted to the control mechanism which causes the control mechanism to move beyond its normal brake-engaged position and firmly engage the brake facing with the brake ring 29 under far greater force than that imparted by the spring 63. The force is sufficient to cause the fric-

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tion disc 25 to flex, thus permitting the actuating shaft 41 to rotate further than it does for the normal brake-engaged position. This increased braking force will cause the loom to stop very quickly provided the brake is held firmly in engagement. After the emergency shut-down device operates, its force is dissipated and the brake tends to bounce back out of engagement but there is incorporated in the present device a means for holding the brake constrained in a position such that the loom is substantially instantaneously stopped.

Referring particularly to the diagram of Fig. 8 and the views of Figs. 5 and 6, it is apparent that if unrestricted the shaft 41 and the eccentric pin 43 could rotate about the center of the shaft 41. However, when properly adjusted, the total maximum motion of the disc 25 is about $\frac{1}{16}$ " which restricts the motion of the shaft to a limited number of degrees. In the particular embodiment shown, the slide block 46 is arranged with respect to the friction disc 25 in such a manner that when the clutch is engaged and properly adjusted with the plate 53 free, the center of the eccentric pin 43 will lie slightly below the center of the shaft 41, as viewed in Fig. 5. In Fig. 8, circle 41a represents the actuating shaft 41 journaled in the bearings 37 or 38 and 43a represents the eccentric pin in the position where maximum braking is obtained. The centers of the shaft 41 and the pin 43 are represented by 41b and 43b, respectively. Assuming that Fig. 8 is the equivalent of a top plan view of the shaft 41, the flexed disc 25 of the engaged brake exerts a force on the pin 43 through its center as represented by the vector 43c. This force draws the shaft 41 against the bearing wall at A with a normal force represented by the vector 43n. Completing the resolution of forces, a small tangential force represented by the vector 43t tends to turn the shaft 41 clockwise to release the brake. However, the tangential force 43t is resisted by the force of the spring 63 and the friction in the bearings 37 and 38 which is represented by the vector 43f and which is far larger than the force 43a. Since the force exerted by the flexed disc 25 is the only force tending to move the shaft 41 and its tangential component is less than the force of spring 63 and the resisting friction, the shaft 41 will oscillate about its axis 41b between the flexed and normal brake positions of the disc 25 until the energy of the recoiling force 43c is dissipated. Whereupon, the disc 25 is held in a normal brake engaged position by the force exerted by the spring 63 and the resisting friction. In the event that the pin center 43b is moved clockwise in Fig. 8, the vector 43t will increase until it equals and then becomes larger than the spring force and vector 43f whereupon the brake disc 25 will not be constrained to oscillate between the flexed and normal brake positions but will be intermittently engaged and disengaged until the recoil force is sufficiently dissipated such that the vector 43t is less than the vector 43f at which point the brake disc 25 will react as described above in connection with the initial setting of the pin center 43b. Obviously, this intermittent engagement and disengagement of the brake disc 25 is undesirable since it prolongs the stopping time of the loom. It is apparent that the mechanism will hold the brake engaged at any position of the pin 43 where the tangential force of the flexed disc 25 does not exceed the total of friction in the bearings 37 and 38 and the force of the spring 63. For practical reasons, it is desirable that the center 43b of the pin 43 does not pass beyond a vertical line through the shaft center 41b. To release the brake from its engaged position, it is only necessary for an operator to apply enough force to the shipper handle to overcome the bearing friction force. It is apparent that with proper adjustment the mechanism can be used to hold the clutch in engagement in a similar manner.

The stop pin 69 and the holes 67 and 68 in the bearing block 38 serve multiple purposes. When the pin 69

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is placed in the hole 67, as indicated by broken lines in Fig. 3, the pin interferes with the movement of the actuating block 55 and will not permit the spring 63 to draw the block 55 far enough to engage the brake.

The block 55 strikes the pin 69 after the clutch is disengaged and before the brake engages, thus holding the disc 25 in a neutral position where the loom can be manually operated. If the pin 69 is removed from the hole 67 and placed in the hole 68, the pin 69 again limits the movement of the block 55 but now engagement of the clutch is prevented. When the shipper handle 18 is moved toward operating position, the actuating block 55 strikes the pin 69 before the clutch engages. This prevents accidental starting of the loom and the possible resultant damage to the loom or injury to an operator working on the loom.

From the foregoing description, it is apparent that the device described effectively uses the driving force of the loom emergency shut-down mechanism as well as the inertia of the parts set in motion by the shut-down mechanism to drive the brake mechanism of a unitary clutch-brake motor into firm engagement beyond its normal spring-braked position to a quick or rapid stopping position and then immediately holds the brake constrained between these positions. The mechanism permits the use of a relatively light brake spring which prevents bouncing of the brake and permits the operator to retain complete control over the loom by manipulation of the shipper handle.

A second type of clutch-brake motor 70 shown in Figs. 9-13 inclusive may be used in place of the clutch-brake motor 13 shown in Fig. 1. The major portions of the structure of the motor 70 shown in Fig. 9 are identical with the structure of motor 13 of Fig. 2 and the same numbers have been used to identify identical parts. An end cover 71 closes the motor frame or casing 22 and carries a pair of lever pivot bosses 72 and 73 protruding from the outer surface. A control cap 74 is held in place in the sleeve 31 by the snap ring 35 and carries two spaced ears 75 and 76 carrying a roll-pin 77 which extends between them. An actuating lever 78 is pivotally supported near one end by a pivot pin 79 carried by the bosses 72 and 73 and extends downwardly between the ears 75 and 76 and behind the roll-pin 77. A leaf-type spring 80 is secured to the end of the lever 78 above the pivot pin 79 by a clamp 81 and extends downwardly to clamp the roll-pin 77 between its free end and the actuating lever 78. The lower end of the lever 78 is bifurcated and carries a latch lever 82 supported on a pivot pin 83. The lower end of the latch lever 82 is pivotally attached by means of a pin 84 to a connecting rod 85 which corresponds to the connecting rod 58 shown in Figs. 2 and 7 and can be fastened to the double ball-stud 59 on the link 60 in a similar fashion. The loom control mechanism remains the same as described in connection with Figs. 1-8 inclusive and no further description is believed to be required. The latch lever 82 carries a pivoted latch plate 86 which is yieldingly drawn toward a stop 87 formed integral with the latch-lever 82 by a small tension spring 88 which is secured to the latch plate 86 at one end and to the latch lever 82 at the other end. An adjustable latch stop 89 is threaded into the end cover 71 and is held in place by a lock nut 90. A stop flange 91 formed on the latch stop 89 adjacent to the head 92 functions as an abutment for the latch plate 86. Two adjustable stop screws 93 and 94 coact with the upper end of the latch lever 82 to limit its movement relative to the actuating lever 78. The screw 93 is threaded into the lever 82 and can abut against the actuating lever 78 while the screw 94 passes through a hole in the latch lever 82 and is threaded into the actuating lever 78. The screw head 95 provides a stop for the latch lever 82. The pin 84 extends to one side of the actuating lever 78 and is engaged by a leaf type brake spring 96 which passes over a fulcrum flange 97 on a

mounting plate 98 and is anchored under the head of an adjusting screw 99 threaded into the plate 98. The plate 98 is securely fastened to the end cover 71. The lower end of the actuating lever 78 also carries a safety stop 100 which is pivotally fastened to the actuating lever 78 by a cap screw 101 and compression spring 102. When the safety stop 100 is in the position shown in dotted lines in Fig. 10, the safety stop 100 is engageable with a stop screw 103 threaded into the end cover 71 for preventing engagement of the clutch.

It is believed that the operation of the second embodiment of the loom and clutch-brake motor will now be readily understood. The entire mechanism is controlled by the shipper handles 17 and 18 as described above in connection with Figs. 1-8 inclusive and under normal shut-down conditions the positions of the parts are substantially as shown in Figs. 1 and 9-12 of the drawings. The brake spring 96 urges the latch lever 82 counterclockwise about the pin 83, as viewed in Fig. 9 until the stop screw 93 abuts against the actuating lever 78. The force of the spring then urges the actuating lever 78 counterclockwise about the pivot pin 79, urging the roll-pin 77 and hence the driven shaft 24 and friction disc 25 to the right, as viewed in Fig. 9, until the brake facing 28 engages the brake ring 29. It should be noted that the latch plate 86 rests on the top of the flange 91 but does not drop down on the head 92. The loom is placed in operation by moving the shipper handle 18 counterclockwise as described above, which movement draws the bottom of the actuating lever 78 to the left, as viewed in Fig. 9, by means of the connecting rods 85 and 19 and the link 60. The latch lever 82 pivots clockwise about the pin 83, as viewed in Fig. 9, until the latch lever 82 strikes the head 92 of the stop screw 89. The actuating lever 78 is then moved clockwise about its pivot pin 79 causing the leaf spring 80 to urge the roll-pin 77 and hence the driven shaft 24 and friction disc 25 to the left until the clutch facing 25 engages the rotor 23. As the link 60 is forced to its over-center position, the spring 80 flexes to hold the clutch in engagement under spring pressure.

When the loom is stopped by an emergency shut-down, such as thread breakage, the emergency shut-down mechanism functions as previously described to drive the shut-down rod 20 and the associated actuating mechanism toward the brake-engaged position of the parts. The energy imparted to the mechanism by the shut-down rod 20 causes the actuating lever 78 to move further counterclockwise about its pivot pin 79 than for normal shut-down, causing the brake facing 28 to be drawn tightly against the brake ring 29 and the disc 25 to flex. As the disc 25 flexes, the end of the actuating lever 78 moves beyond its normal braked position for the latch plate 86 to drop behind the flange and rest on the head 92 as shown in Fig. 13. After the energy in the parts is absorbed and the disc 25 tends to relax, the latch plate 86 prevents the actuating lever 78 from returning to its normal brake-engaged position and holds the brake in a locked or a positive stop position under the brake-engaging force of the flexed disc 25 which is a much greater force than that exerted by the spring 96. Thus, the latch plate 86 and associated parts function to hold the brake in a locked position preventing bouncing of the brake but permitting the use of a relatively light brake spring 96.

The loom can be started from the brake-locked condition by merely moving the shipper hand 17 or 18 counterclockwise in a normal manner. As the connecting rod 85 moves to the left in Fig. 9 under the control of the shipper handle 17 or 18, the initial movement of the connecting rod 85 to the left in Fig. 9 causes the latch lever 82 to pivot clockwise around the pivot pin 83. As the latch lever 82 pivots, the stop 87 lifts the latch plate 86 clear of the flange 91 to permit the actuating lever

78 to be drawn into its clutch-engaged position in a normal manner.

Under some circumstances it may be desirable to stop the loom with the brake disc 25 in a normal brake-engaged position under emergency conditions, rather than in the locked braked position. In the embodiment shown in Figs. 9-13 this is accomplished by selectively positioning the latch plate 86 and the cooperating stop 89 relatively to each other in a manner such that the latch plate 86 serves as a stop or limiting device for preventing the brake disc 25 from recoiling beyond the normal brake engaged position.

As explained above in connection with the locking function of the latch plate 86, when the energy of the shut down device is imparted to the clutch-brake motor the brake disc 25 is flexed and the end of the actuating lever 78 moves beyond its normal braked position and the latch plate 86 drops behind the flange 91. It is readily apparent that in the event that it is not desired to hold the brake locked with the brake disc 25 flexed, it is merely necessary to thread the stop member 89 inwardly to increase the clearance between the flange 91 and the free end of the latch plate 86 such that the actuating lever 78 may have limited clockwise movement and thereby permit the disc 25 to recoil away from the brake ring 29. This adjustment causes the brake disc 25 to oscillate between the fully flexed and the above described latch operative position with a gradually diminishing amplitude until the initial impact energy imparted to the brake is dissipated whereupon the brake is held in a normal brake engaged position by the spring 63 as shown in Fig. 9. In order to achieve the substantially instantaneous stopping of the loom under emergency conditions it is evident, of course, that the clearance between the flange 91 and latch plate 86 be such as to prevent the brake disc 25 from recoiling beyond its normal brake engaged position.

A third transmitter embodiment adapted to be used in place of the transmitter 13 shown in Fig. 1 is shown in Figs. 14-17 inclusive. The major portion of the motor structure is identical with than shown in Fig. 2 and it is not believed to be necessary to show the entire motor. The same numerals have been used to identify identical parts. The right end of the motor frame or casing 22 carries a brake ring 104 which can be engaged by the friction brake facing 105 on the flexible disc 25. An end cover 106 is secured to the frame 22 and brake ring 104 and the outer edge of a corrugated flexible diaphragm 107 is firmly clamped between the brake ring 104 and the end cover 106. The diaphragm 107 is provided with a central opening which receives a portion of a control bearing cup 108. A clamping ring 109 securely clamps the inner edge of the diaphragm 107 against a shoulder 110 formed on the control cup 108 to which the clamping ring 109 is fastened by screws. A control bearing 111 is positioned in the bearing cup 108 and held in place by a control plate 112 secured by a snap ring 113. One end of the driven shaft 24 is journally supported in the bearing 111 which is fixed against axial movement relative to the shaft 24. The flexible diaphragm support structure is fully disclosed in my copending application Serial No. 325,583, filed on Dec. 12, 1952, and does not form a part of the present invention.

The end cover 106 is provided with a vertically disposed channel adapted to receive an actuating lever 114. A fulcrum pin 115 is secured to the upper end of the actuating lever 114 and extends through a journal hole in a fulcrum block 116. A fulcrum plate 117 inside the end cover 106 carries two spring centering bosses 118 located on either side of the fulcrum block. A stud 119 passes through the plate 117 and the end cover 106 and is threaded into the fulcrum block 116. A nut threaded on the stud holds the parts assembled. A compression spring 120 surrounds each boss 118 and abuts against

the plate 117 at one end and the end cover 106 at the other end. The springs 120 normally draw the block 116 firmly against a feeler plate 121 inserted between the block 116 and the end cover 106. A slideway 122 is provided in the control plate in which is positioned a trunnion block 123 pivotally fastened to the lever 114 by a pin 124. The lower end of the lever 114 carries a spring cup 125 in which is positioned one end of a brake spring 126. The other end of the brake spring 126 is positioned in a socket 127 formed in the end cover 106. The lower end of the lever 114 is fastened to one end of a connecting rod 128 by a pivot pin 129. The other end of the connecting rod 128 can be fastened to the double ball-stud 59 carried by the link 60, as described in connection with the two previous embodiments of the clutch-brake motor.

An inertia latch 130 is pivotally fastened to the lower end of the lever 114 by a pivot pin 131. The latch 130 comprises a latch finger 132 extending substantially parallel to one side of the lever 114 and a weighted tail piece 133 which is bent around the lever 114. A latch stop screw 134 is threaded into the end cover 106 where it can be engaged by the latch finger 132. A lock nut 135 holds the stop screw in its adjusted position. A slot 136 in the latch finger 132 provides a resilient tongue 137 which absorbs the latching shock.

The operation of a loom equipped with this type of transmitter is also controlled by the shipper handle 18 in a manner similar to that described in connection with the first embodiments of the device. Under normal shut-down conditions, the shipper handle 18 is moved clockwise to force the bottom of the lever 114 to the right, as viewed in Fig. 14, in the same manner as described in connection with the embodiment shown in Figs. 1-8 inclusive. The actuating lever 114 moves about the pivot pin 115 under the force of the brake spring 126 and the connecting rod 128 causing the control cup 108, bearing 111, driven shaft 24 and friction disc 25 to move to the right, as viewed in Fig. 14, and at the same time flexing the diaphragm 107 until the brake facing 105 engages the brake ring 104. The loom is placed in operation also in a manner similar to that described in connection with the embodiment shown in Figs. 1-8. As the shipper handle 18 of Fig. 1 is moved counterclockwise, the bottom end of the actuating lever 114 is drawn to the left, as viewed in Fig. 14, against the force of the spring 126 causing the control cup 108, driven shaft 24 and disc 25 to move to the left until the clutch facing 27 engages the rotor 23. Further movement of the lever 114 as the link 60 is moved to its over-center position causes the lever 114 to pivot about the pin 124 thus compressing the springs 120 in order to hold the clutch in engagement under the force of the springs 120. When the cap screw 119 is properly adjusted and the link 60 is in its over-center position, the feeler plate 121 should be free between the block 116 and the end cover 106.

In the event of an emergency shut-down, the knock-off rod 20 strikes the shipper handle 18 a sharp blow, as previously described, driving the actuating lever 114 to the right, as viewed in Fig. 14, to engage the brake facing 105 firmly with the brake ring 104. The force of the blow applied by the knock-off rod 20 and the inertia of the parts causes the lever 114 to move further than usual, thus flexing the disc 25. When the disc 25 has flexed sufficiently to absorb the energy of the parts, the lever 114 stops abruptly at a position of maximum travel. When the lever 114 stops, the energy in the weighted tail 133 of the latch 130 tends to keep the latch moving and causes the latch 130 to pivot counterclockwise about the pivot pin 131 until the latch finger 132 is in positive engagement with the stop screw 134. When the stop screw 134 is properly adjusted to provide the correct amount of clearance, the latch finger 132 barely clears the stop screw 134 as it drops into engagement and, before the latch finger can drop out of engagement, the

lever tends to rebound toward the clutch engaged position thus forcing the latch 130 firmly against the stop screw 134 where it is held in a brake-locked position. As in the other embodiments, this provides a high braking force without using heavy brake springs and also prevents the brake from bouncing. The brake can be released from the locked position by moving the shipper handle 18 further toward the brake-engaging position so that the disc 107 is flexed a little more than in the brake locked position and the latch finger 132 is released from the stop screw 134. The weighted tail 133 then drops down and rotates the latch finger 132 clear of the stop screw 134 permitting the lever 114 and associated parts to return to the normal brake-engaged position or to be moved into the clutch engaged position.

As in the previously described embodiments the embodiment illustrated in Figs. 14-17 inclusive is also capable of stopping the loom within the requisite time limitations with the brake held in a final normal brake engaged position. This is accomplished by adjusting the stop screw 134 such that the latch serves as an inertia actuated stop device for limiting the recoil movement of the brake disc 25. To this end the screw 134 is adjustably threaded into the casing to provide a sufficient clearance between the stop screw 134 and the latch finger 132 such that when the disc 25 is flexed its maximum under the emergency shut down impact and the latch finger 132 is pivoted counterclockwise the latter merely strikes the stop screw 13 and does not remain in engagement therewith as previously described. When the latch finger 132 strikes the stop screw 134 some of the recoiling force imparted to the disc 25 by the flexing thereof under the initial impact will not be entirely dissipated thereby causing the brake disc 25 to rebound against the brake facing 105 under a force less than that of the initial impact. The brake disc 25 will continue to oscillate or rebound between its normal brake engaged and flexed brake positions until the kinetic energy imparted to the brake by the initial impact is dissipated whereupon the brake will be held in the normal brake engaged position by the brake spring 126 as shown in Fig. 14. The above described brake action is effective to stop the loom within the fraction of a second required by the emergency conditions of the loom. To start the loom it is merely necessary to move the shipper handle toward the clutch engaging position.

From the foregoing description it is believed that the many advantages of this invention are readily apparent. The invention provides a unitary power device for a loom which can be readily removed and replaced without causing prolonged down-time for the entire loom. The power device also provides a neat and compact unit which includes an effective clutch and brake device as part of the unit. The control mechanism permits the loom to be easily and effectively controlled and permits the use of a relatively weak brake spring without sacrificing braking power and efficiency. Finally, the biggest single advantage is the extremely rapid and accurate stopping of the loom obtained in emergency shut-downs through use of the brake constraining feature.

Having thus described the nature of the invention, what I claim herein is:

1. A loom having a frame; a main drive shaft carried by said frame; a shipper mechanism carried by said frame and including a shipper handle; a unitary electric clutch-brake motor carried by said frame comprising a housing, a motor rotor carried by said housing, a driven shaft carried by said housing and adapted to be rotated by said rotor, means including a clutch for operatively connecting said driven shaft to said rotor, brake means for stopping said driven shaft, said brake means having a normally engaged position and a position for rapid stopping; power transmission means operatively connecting said driven shaft to said main drive shaft; actuating means for said clutch and brake means operatively connected to

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said shipper handle; an emergency shut-down device carried by said frame and adapted to coact with said shipper mechanism to actuate said brake to its rapid stopping position for substantially instantaneous stopping of the loom; and automatic means coacting with said actuating means to hold said brake constrained between said normally engaged and rapid stopping positions upon actuation of said shut-down device.

2. A loom having a frame; a main drive shaft carried by said frame; a shipper mechanism carried by said frame and including a shipper handle; a unitary electric clutch-brake motor carried by said frame comprising a housing, a motor rotor carried by said housing, a driven shaft carried by said housing and adapted to be rotated by said rotor, means including a clutch for operatively connecting said driven shaft to said rotor, said clutch having an engaged position and a disengaged position, brake means for stopping said driven shaft, said brake means having a normally engaged position and a position for rapid stopping; power transmission means operatively connecting said driven shaft to said main drive shaft; actuating means for said clutch and brake means operatively connected to said shipper handle; an emergency shut-down device carried by said frame and adapted to coact with said shipper mechanism to actuate said brake to its rapid stopping position for substantially instantaneous stopping of the loom; automatic means coacting with said actuating means to hold said brake constrained between said normally engaged and rapid stopping positions upon actuation of said shut-down device; and means for releasing said constraining means when said shipper handle is moved to operate said clutch means to its engaged position.

3. A loom having a frame; a main drive shaft carried by said frame; a shipper mechanism carried by said frame and including a shipper handle; a unitary electric clutch-brake motor carried by said frame comprising a housing, a motor rotor carried by said housing, a driven shaft carried by said housing and adapted to be rotated by said rotor, means including a clutch for operatively connecting said driven shaft to said rotor, said clutch having an engaged position and a disengaged position, brake means for stopping said driven shaft, said brake means having a first position for normal stopping and a second position for rapid stopping; power transmission means operatively connecting said driven shaft to said main drive shaft; actuating means for said clutch and brake means operatively connected to said shipper handle, spring means for holding said clutch means in its first position for normal stopping; an emergency shut-down device carried by said frame and adapted to actuate said brake to its second position for quick stopping of the loom; automatic means coacting with said actuating means to hold said brake constrained between said first and second positions upon actuation of said shut-down device, and means for releasing said last named means when said shipper handle is moved to operate said clutch means to its engaged position.

4. An electric power transmitter for driving a loom comprising a frame, a motor rotor carried by said frame, a driven shaft carried by said frame and adapted to be rotated by said motor, clutch means for operatively connecting said driven shaft to said rotor, said clutch means having engaged and disengaged positions, brake means for restraining rotation of said driven shaft, said brake means having a normal engaged position and a quick stopping engaged position, actuating means for said clutch and brake means, a spring means coacting with said actuating means for holding said clutch means in said normal engaged position and a latch automatically effective and acting in concert with said spring for holding said brake means constrained between said normal and quick stopping position.

5. An electric power transmitter for driving a loom comprising a frame, a motor rotor carried by said frame,

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a driven shaft carried by said frame and adapted to be rotated by said rotor, clutch means for operatively connecting said driven shaft to said rotor, brake means for restraining rotation of said driven shaft, actuating shaft bearings carried by said motor frame, an actuating shaft rotatably journaled in said bearings, an eccentric carried by said actuating shaft and having a throw radius less than the radius of said bearings, a trunnion block journaled on said eccentric, a control block provided with a slideway for receiving said trunnion block, an actuating member carried by said frame, an adjustable yielding connection between said actuating member and said control block, a feeler device coacting with said yielding connection for adjusting the amount of yielding in said yielding connection, and means operatively connecting said actuating member to said clutch and brake means for actuating said clutch and brake means.

6. An electric power transmitter for driving and stopping a loom comprising a transmitter frame, a motor rotor carried by said frame for rotation, a driven shaft carried by said frame and adapted to be rotated by said rotor, a brake for restraining rotation of said driven shaft, said brake having a normally engaged position and a position for rapid stopping, clutch means for operatively connecting said driven shaft to said motor rotor, actuating means for said brake and said clutch means, said actuating means being operative to move said brake to said locked position, and means coacting with said actuating means to hold said brake between said normal braked and rapid stopping positions.

7. A clutch-brake motor for a machine having a shut down device effective to apply a momentary stop impact to the clutch-brake motor, said clutch-brake motor comprising a frame, a motor rotor carried by said frame, a driven shaft journaled in said frame for rotation by said rotor, clutch means for operatively connecting said driven shaft to said rotor, brake means for restraining rotation of said driven shaft, said brake means having a normally braked position and a quick stopping brake position, resilient means exerting a force for holding said brake in a normal braked position, said brake means being movable to said quick stopping braked position under application of the momentary stop impact of the machine shut down device, said brake means in said quick stopping brake position imparting a recoiling force exceeding said force of said resilient means normally tending to cause said brake means to be intermittently engaged and disengaged, and means operatively associated with said brake means responsive to the momentary stop impact of the shut down device for constraining the movement of said brake means between said normal and quick stopping brake positions for substantially instantaneously stopping the machine.

8. A clutch-brake motor for driving a machine having a shut down device effective to apply a momentary stop impact to the clutch-brake motor, said clutch-brake motor comprising a frame, a motor rotor carried by said frame, a driven shaft journaled in said frame for rotation by said rotor, clutch means for operatively connecting said driven shaft to said rotor, brake means for restraining rotation of said driven shaft, said brake means having a normal brake position and a quick stopping brake position, a spring for holding said brake in a normal brake position, a lever for actuating said clutch and brake means, said lever being adapted upon application of the momentary stop impact of said machine shut down device to abruptly position said brake means in said quick stopping position, said brake means in said quick stopping position imparting a recoiling force exceeding the force of said spring and thereby tending to cause said brake means to be intermittently engaged and disengaged, and means operatively associated with said lever responsive to the momentary stop impact of the shut down device for constraining the movement of said brake means between

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said normal and quick stopping brake positions for substantially instantaneously stopping said machine.

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