Jan. 9, 1951 M. L. HICKS 2,537,895

SHUTTLE ACTUATING MECHANISM

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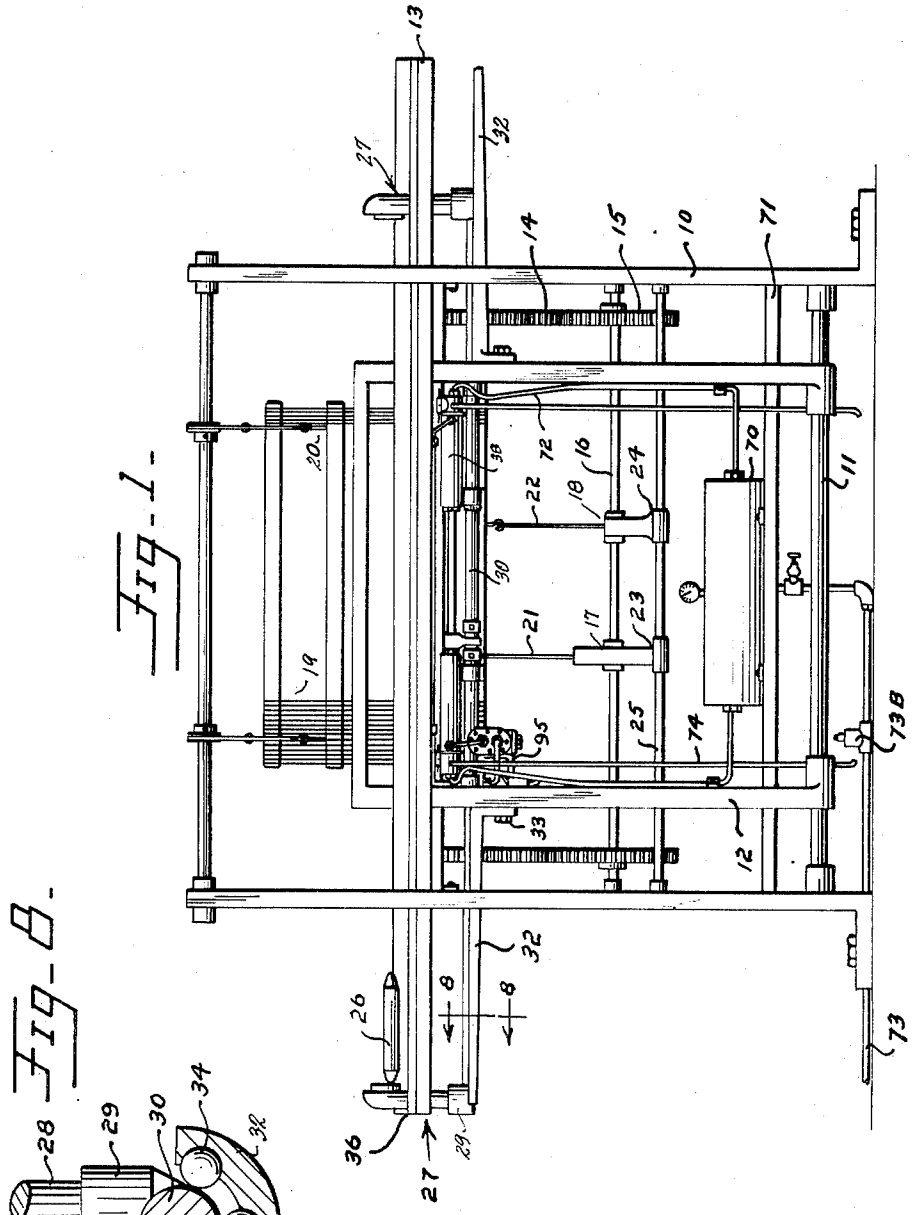


Fig. 1.

Fig. 8.

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SHUTTLE ACTUATING MECHANISM

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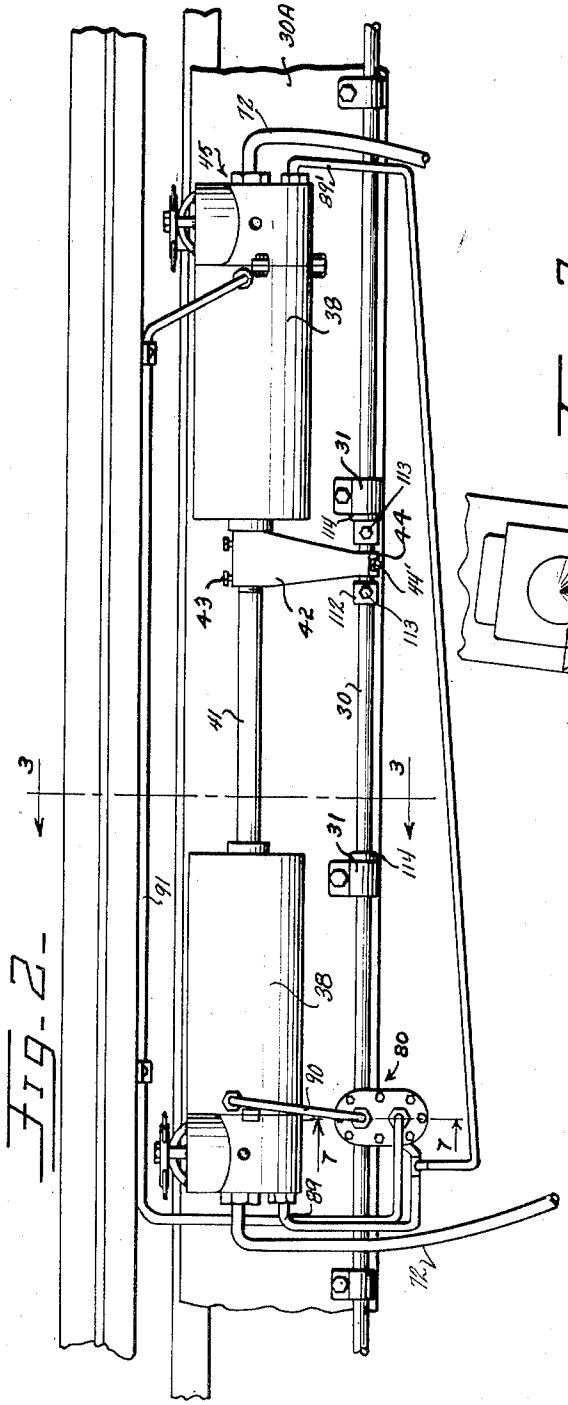


FIG. 2.

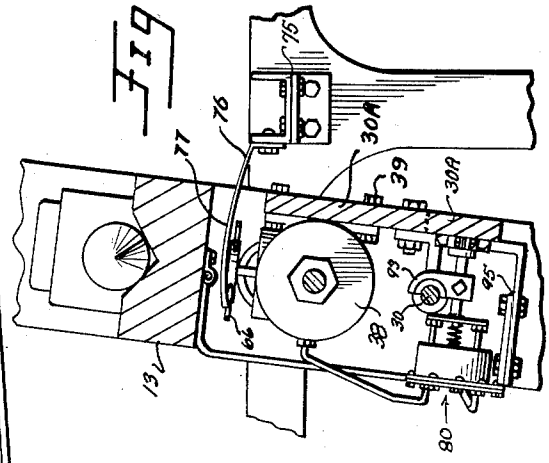


FIG. 3.

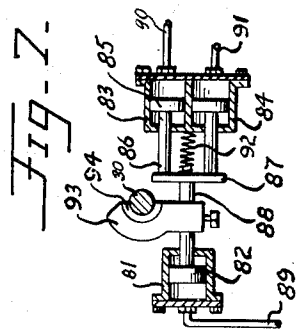


FIG. 7.

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SHUTTLE ACTUATING MECHANISM

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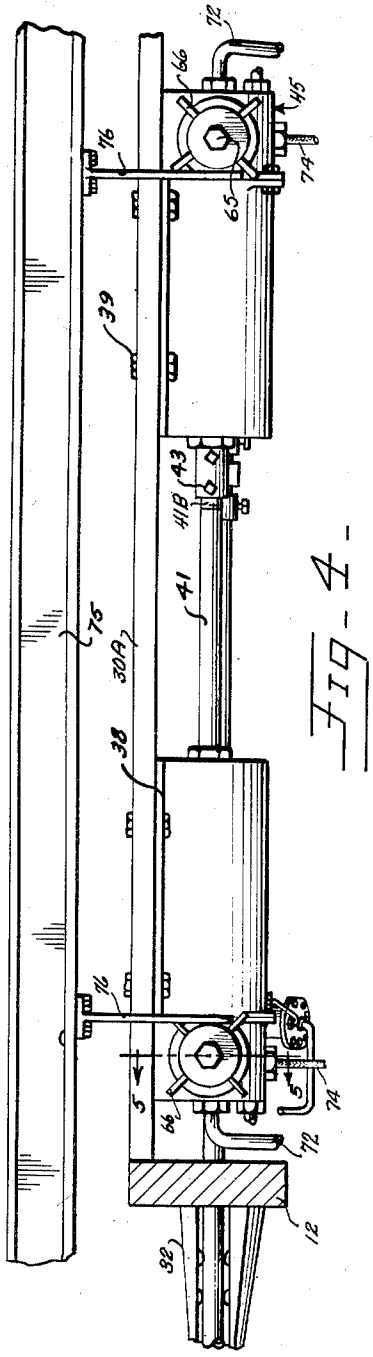


FIG. 4.

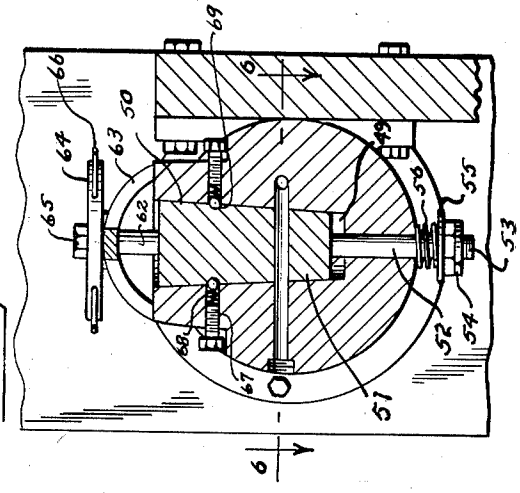


FIG. 5.

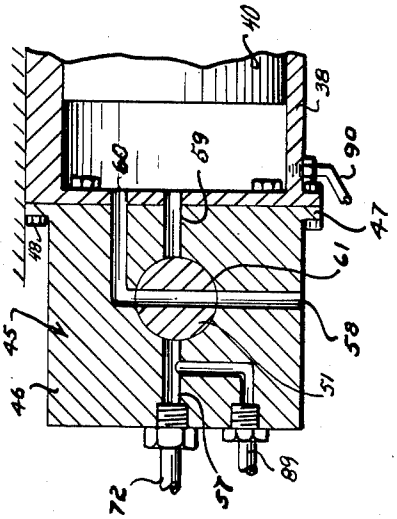


FIG. 6.

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SHUTTLE ACTUATING MECHANISM

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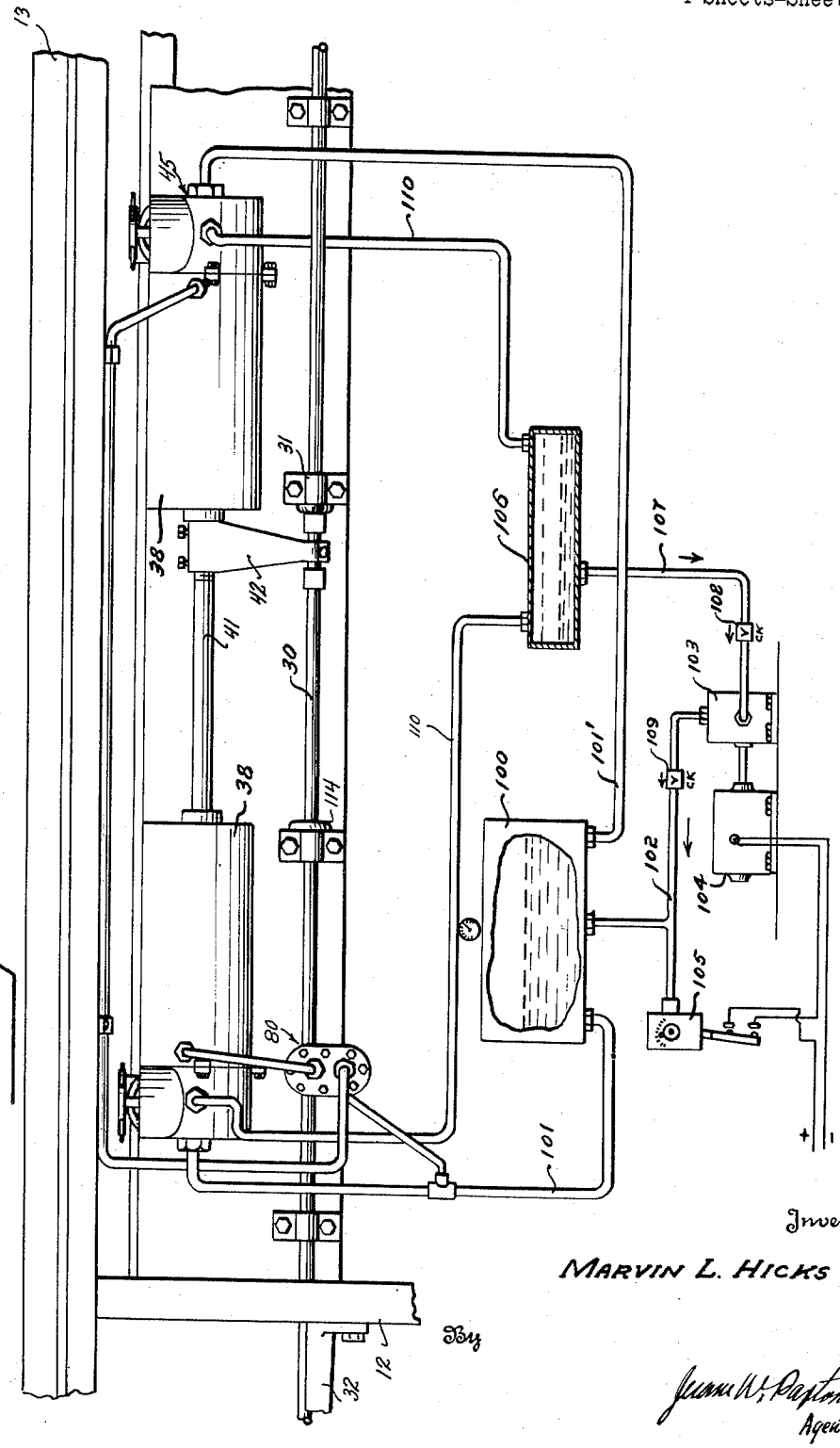


Fig. 9.

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SHUTTLE ACTUATING MECHANISM

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Application November 23, 1948, Serial No. 61,649

15 Claims. (Cl. 139—144)

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The present invention relates to loom assemblies, and more particularly has reference to a control arrangement for motions of the picker sticks employed with the loom.

Heretofore, the movement of the picker stick to strike the shuttle when it is boxed has been controlled through a camming mechanism generally associated with the cam shaft of the loom. This type of control is very complex structurally and because of the relatively large number of working parts that are required to impart movement to the picker stick, the devices often require adjustment of the parts or replacement or repair of the damaged members. This is not only a time-consuming process but is also quite expensive.

Accordingly, an important object of my invention is to provide a control for a picker stick which includes relatively few working parts, which is positive and efficient in operation and which can be readily installed on all types of looms currently employed in the field, with a few alterations according to make and type model of loom.

Another object of my invention is to provide a control for the picker stick wherein either pneumatic means or liquid means is provided to move the picker stick to drive the shuttle across the loom from box to box.

Yet a further object of my invention is to provide a control for the picker stick wherein the picker stick is carried by a shaft disposed in approximately parallel relation to the lay, the picker stick being fixedly secured to the shaft at approximately right angles to the lay, the shaft being so mounted as to have reciprocating movement, the reciprocating movement being imparted to the shaft by either pneumatic, liquid or fluid means.

And yet another object of my invention is to provide a pneumatic control and fluid control for the picker stick of a loom wherein a novel valve structure is associated with pneumatic and fluid control for operating the control.

An additional object of the invention is to provide a locking assembly for the picker shaft, which assembly will prevent reciprocation of the shaft until a predetermined pressure exists in either fluid or pneumatic control means.

To accomplish the above and other objects, the invention broadly comprises locating a picker stick adjacent each end of a picker shaft which is mounted for reciprocating movement with respect to the lay and oscillating movements of the swords of the loom in approximately parallel relation to the lay at a point below the lay. A pair of cylinders are carried by a frame between swords in spaced parallel relation to the picker shaft, the piston or connection rod being disposed at approximately the mid point of the lay. The piston in each cylinder located off center side is carried by a common piston rod, and an arm secured to the central point of the picker shaft is suitably connected to the piston rods. A control valve is provided for each piston which alternate the pressure to cylinder and each valve communicates with a source of constant pressure which, in turn, is connected to a suitable source of supply and a means of discharge for the used pressure.

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An equalizing unit which includes a cylinder in communication with a source of constant pressure is operatively connected through its piston rod with a pair of cylinders of the same capacity, one of the latter cylinders being coupled to one of the control cylinders, whereas the other cylinder is connected to the opposite control cylinder. A brake device is carried by the piston and normally engages the picker shaft to present reciprocatory movement from being imparted to the shaft, unless there is sufficient pressure in cylinder to drive shuttle across the loom.

Each of the valves associated with the control cylinders is provided with an arm which is adapted to be moved to change the position of the control to admit pressure into the cylinder to move the piston while the other cylinder is exhausted and, as a consequence, the picker shaft is moved in the same direction when the lay is in the back center position.

When the shuttle is boxed and the arm moves the control valve to admit pressure into the control cylinder, that pressure will also be diverted into the cylinder of the equalizing unit associated therewith and until the pressure equals that of the constant pressure cylinder, the brake device will prevent reciprocation of the picker shaft, and when this pressure is attained, the longitudinal movement of the picker shaft will likewise move the picker stick, thereby striking the shuttle and drive it across the loom.

To adapt the above control for use with fluid or liquid, a pressure tank is connected with the inlet port of each control valve, and another line communicates with a pump driven by an electric motor which may be actuated by a pressure responsive switch. A vacuum tank is also in communication with the pump and a conduit extends from the discharge port of each control valve to the tank.

In lieu of a mechanical operator for the control valve, this valve may be actuated by electrical means. A circuit may be completed and the shuttle is boxed and the lay is in back center to actuate a solenoid associated with the valve to rotate the valve plug the desired distance.

Figure 1 is an elevational view of one form of loom equipped with my control arrangement for motions of the picker sticks.

Figure 2 is a view in side elevation, partly broken away, showing the cylinders and their related elements for imparting reciprocatory movement to the picker shaft.

Figure 3 is a sectional view taken along the line 3—3 of Figure 2, looking in the direction of the arrows.

Figure 4 is a plan view, partly broken away and partly in section, of the cylinders, together with the means for actuating the control valve for the cylinders.

Figure 5 is a sectional view taken along the line 5—5 of Figure 4, but being on a somewhat enlarged scale.

Figure 6 is a sectional view taken along the line 6—6 of Figure 5, looking in the direction of the arrows.

Figure 7 is a sectional view taken along the line 7—7 of Figure 2, looking in the direction of the arrows.

Figure 8 is a view taken along the line 8—8 of Figure 1, looking in the direction of the arrows, but being on a somewhat enlarged scale.

Figure 9 is a diagrammatic representation of a modification wherein a fluid is employed to control motions of the picker sticks.

In Figure 1, I have shown a loom including frame 10, a rocker shaft 11 journaled in the frame, and to which swords 12 for oscillating lay 13 are attached. A power shaft (not shown) is operatively connected to both of the swords through suitable linkage to rock the swords about the shaft 11, and as this structure is well known in the art, it is not thought necessary that it be illustrated.

A gear 14 provided on the power shaft meshes with a gear 15 on shaft 16 rotatably mounted in the frame, and a pair of spaced cams 17 and 18 are provided on the shaft. The cams 17 and 18 are connected to healds 19 and 20 by flexible members 21 and 22 whereby the healds are moved upwardly and downwardly by treadles 23 and 24 carried by shaft 25, each end of which is journaled in the frame 10. As, of course, is well recognized, the healds intermittently draw up one set of warp threads and alternately pull down adjacent ones so that movement of shuttle 26 across the loom will insert the filling thread at each change of position of the warp threads, and the reed will pack together the inserted filling threads.

From Figure 1 it will be seen that the shuttle 26 is boxed at the left hand side of the loom adjacent picker stick designated generally 27. The picker stick 27 includes a standard 28, preferably of wood, which is secured in a socket 29 formed at the outer end of a picker shaft 30 mounted in reciprocating bearings 31 secured to a support or panel 30A between the swords 12 so as to extend out and under the lay. The picker shaft 30 is mounted below and in the center of and in substantially parallel relationship to the lay 13, as illustrated clearly in Figure 2. A support or bracket 32 is bolted to each sword, as shown at 33, and is of arcuate configuration, as shown in Figure 8. The support is formed with a plurality of longitudinally extending grooves 34 in which are mounted a plurality of ball bearings 35 upon which the outer periphery of the shaft 30 is seated. The sides of the support 32 extend above the center of the shaft, thereby preventing appreciable lateral movement of the shaft, which has always been a troublesome problem in looms, and, in addition, the support will prevent bending of the shaft downwardly during operation.

The standard 28 of the picker shaft projects through slot 36 in the lay and it can be seen that with the present invention, it is possible to employ a picker stick of considerably less height than those currently employed wherein the movement of the stick is usually imparted by mechanical means associated with the cam shaft of the loom.

In order to impart the necessary longitudinal movement to the picker shaft, it will be noted that I provide a pair of opposed cylinders 38, each of which is attached rigidly to the panel at a point above the picker shaft 30, as indicated at 39. A piston 40 is movable in each cylinder and each piston is carried by a piston rod 41, the piston rod being disposed at approximately the mid point of the lay 13. The inner or free end of each rod is reduced and threaded, as at 41B for engaging complemental threads in an arm 42. When the rods have been threaded into the arm, screws 43 are tightened to secure the parts together. The lower end of the arm carries a split sleeve 44 which is attached to the picker shaft 30 at the central point of the picker shaft and locked thereto by screw 44'. Manifestly, if pressure is admitted into the left hand cylinder 38 (Figures 2 and 4), the piston therein will force the arm 42 and consequently the picker shaft 30 toward the right, whereby the picker stick 27 will strike the shuttle to drive it across the loom.

To control the flow of pressure in the cylinders, I provide a valve assembly 45 associated with the head of each cylinder. As indicated in Figures 4 and 6, the valve 45 comprises a body 46 which is flanged, as shown at 47, and the cylinder is attached to the flange by bolts or the like 48. The valve body 46 is provided with a substantially centrally located recess or bore 49 having inclined walls 50 in which is located a plug 51, the walls of which have a taper corresponding to that of the walls 50. A pin 52 is suitably attached to the bottom wall of the plug 51 and extends downwardly therefrom through an opening in the valve body 45, and the outer end of the pin is threaded, as shown at 53, to receive lock nuts 54. A washer 55 is located adjacent the inner lock nut and a spring 56 surrounds the pin between the washer and the base or bottom wall of the body 46. By drawing up the nuts 54, it is clear that the pin 52 will be moved downwardly, thereby moving the plug 51 downwardly to a position which will prevent any leakage in the valve assembly.

The valve body is provided with an inlet port 57, a discharge port 58, and ports 59 and 60, which latter ports are in communication with the interior of the cylinder 38. The plug 51 has a port or channel 61 extending therethrough and the ports 57, 58, 59 and 60 are located 90 degrees apart with respect to the bore 49, as is perhaps best shown in Figure 6. The location of these ports is very important, in that it permits the successful operation of the control assembly.

A shaft 62 is attached to the top of the plug

51 and is supported by arms 63 attached to the valve body 45. An annular member 64 is detachably connected to the upper end of the shaft 62, as shown at 65, and supports outwardly extending arms 66, there being four such arms, each arm being diametrically opposed, or, in other words, the arms being carried by the annular member at intervals of 90 degrees.

To insure that the port 61 will be in proper alinement with the ports in the valve body, it will be noted that the body is provided with a channel 67, at the outer end of which is seated a spring-pressed ball 68. The plug 51 is formed with a hemispherical depression 69 so that when the plug has been turned to the point where the desired ports are in alinement, the ball 68 will be forced into the depression, thereby locking the plug with respect to the valve body. The inlet port 57 is connected to a source of constant pressure 70 mounted on a beam 71 carried by the frame 10 at a point adjacent the lower end of the frame, by means of a conduit 72. The source of pressure, namely a tank or the like, may be connected to a central supply tank (not shown) by a conduit 73, and a pressure regulator valve 73B is interposed in the conduit to keep the pressure at a constant desired level for operation. The adjustment of the valve enables the tank to be kept at a predetermined poundage pressure necessary for the power to drive the shuttle across the loom. The discharge outlet 58 may be provided with a hose or other conduit 74 which terminates near the floor for eliminating water, oil, etc.

To actuate or turn the valve plug 51, the frame 10 supports a beam 75 upon which is mounted a finger 76, there being one finger for each valve. The finger 76 is downwardly curved, as at 77, as shown in Fig. 3 and each finger 76 is adapted, when the lay is in the back center position, to engage one of the arms 66 and thereby move the plugs 51 a quarter turn. To explain more clearly the operation, it is assumed that the shuttle 26 is at the left hand side of the loom, and as the lay moves to the back center position, the finger 76 will engage one of the arms 66, thereby turning the plug 51 until the port 61 therein communicates with the port 57, and in this position (Figure 6), the port 61 will also communicate with the port 58 whereby the cylinder will be in communication with the pressure from the tank 70. Simultaneously, the valve associated with the opposite cylinder will be moved so that that cylinder will be in communication with the discharge conduit through the ports 60, 61 and the discharge port 58. Manifestly, the piston 40 will be moved toward the right, thereby imparting a similar movement to the picker shaft 30 so that the picker stick will drive the shuttle 26 across the loom. With repeated movement of the valve control, the cycle of operation will be continued during the operation of the loom.

To insure that there is sufficient pressure in the cylinder to drive the shuttle across the loom, I provide an equalizing device designated generally 80. The equalizing device 80 comprises a cylinder 81 having a piston 82 movable therein. Spaced from the cylinder 81 are a pair of cylinders 83 and 84, and piston 85 of each cylinder has a rod 86 attached to a cross-piece 87 which, in turn, is connected to piston rod 88 of the piston 82. Each of the cylinders 81, 83 and 84 is of equal capacity, and the cylinder 81 is tapped into the pressure port 57 of the right of the left hand valve assembly 45 by a conduit 89 and into the equivalent port of the right hand valve assembly 45 by means of the conduit 89'. The cylinder 83 is connected with the head of the left cylinder 38 by a conduit 90 (Figure 6), whereas the cylinder 84 communicates with the head of the other cylinder 38 through line 91. A spring 92 is interposed between the cross-piece 87 and the casing of the cylinders 83 and 84, and the purpose thereof will be later more fully described.

An arcuate member 93 is detachably connected to the shaft 88 and supports a brake shoe 94 which is adapted to engage the picker shaft 30 and in the engaged position serves to prevent longitudinal movement of the shaft. Consequently, it can be seen that since the piston 81 is in communication with the source of constant pressure at the pressure ports of the control valve, the brake shoe will be held in engagement with the shaft until the pressure admitted into the cylinder 38 is equal to the pressure in the valve port 57. When this pressure is attained, for example, in the left cylinder 38, the pressure in the cylinder 83 will equal that in the cylinder 81, whereupon the spring 92 will force the piston rod 88 toward the left (Figure 7). In other words, when equal pressure is on both cylinders, the common connecting rod is free and the spring urges the rod and piston into the single cylinder by this movement, thus moving the brake shoe 94 away from the shaft 30 to enable the shaft to reciprocate so that the picker stick may drive the shuttle across the loom.

The equalizer assembly 80 is mounted to the panel 30A by a stand or bracket 95, and while for illustration purposes it is shown adjacent one of the swords, I have ascertained that an excellent location is to the left of the loom center near one of the members supporting a bearing. While the cylinders 81, 83 and 84 are shown disposed horizontally, it is apparent that these units may be located vertically with respect to the picker shaft, and this change can be easily accomplished by one skilled in the field.

In Figure 9, I have illustrated another form of control wherein a fluid or liquid is utilized to actuate the motion of the picker sticks. Since the cylinders and their related elements are similar to those shown in Figure 1, the same reference characters will be applied to these parts.

A pressure tank 100 adapted to contain three-fourths fluid and one-fourth air pressure is suitably suported by a beam or the like extending between the loom frame ends. A pair of lines or conduits 101 and 101' extend from the bottom of the tank 100 to the inlet port 57 of the valve assemblies 45 at the left hand and right hand. The tank 100 is also connected by means of a conduit 102 to a pump 103 which is driven by electric motor 104 controlled through a pressure operated switch 105 interposed in the line 102.

A vacuum tank 106 of lesser capacity than the tank 100 is also supported by a member carried by the loom frame ends and the capacity of this tank is three-fourths air space and one-fourth fluid. A line 107 extends from the tank 106 to the pump 103, and a one-way valve 108 is interposed between the tank and the pump. A similar valve 109 is also provided in the line 102 between the tank 100 and the pump 103.

A pair of conduits 110 extend from the tank 106 to the outlet or discharge port 58 of each of the valves 45.

It is clear that the pressure in the tank 100 will force the fluid through the conduits 101 into the

valve port 57 of the body 45, thereby moving the piston in the cylinder to reciprocate the picker shaft and simultaneously, of course, fluid will be exhausted from the opposite cylinder through the line 110 to the vacuum tank 106. In other words, the tank 100 is in the nature of a hydraulic ram in that the air pressure in the tank will force the fluid through the conduits 101 and 101', it being understood that there will always be fluid in the tank 100 and in the vacuum tank 106 from which the fluid is removed through suction action.

The pressure operated switch 105 for operating the motor will keep the pressure constant and the switch may be adjusted to increase or diminish the pressure. Hence, it can be seen that it is a very simple operation to convert the control as illustrated in Figure 1 to a fluid assembly by the inclusion of the vacuum tank, the pump, the motor and the pressure switch.

It is also advantageous to provide a means for lubricating the pistols in the cylinders 38 and this may be done by locating a lubricant supply tank above the cylinders and carried by the lay. An oil line may lead from each end of the tank into the cylinders.

To enable the picker shaft 30 to be easily assembled or disassembled, this shaft may be made in three sections, the individual sections being connected together by means of sleeves or the like. Additionally, the shaft 30 is provided with a pair of collars 112 having set screws 113 so that the length of reciprocating movement of the shaft may be adjusted. These collars further function as stops against resilient pads or bumpers 114 carried by the bearings 31 disposed below the base of the cylinders. In other words, this assembly will aid in absorbing the shock at the end of the throwing motion of the picker shaft and eliminate the sound of metal hitting metal. The same results may be accomplished by providing a resilient bumper on the connecting rod 41 adjacent each cylinder 38.

It is, of course, to be understood that each picker stick 27 is provided with a check strap and the check strap arm may be attached at its ends to the lay and support 32, respectively. By being connected to the support, the check strap arm acts as a stabilizer for the support as it moves with the motion of the lay. In certain types of looms, the frame is too high to accommodate the check strap above the support 32 and in this situation the picker shaft may be located above the cylinders 38 adjacent the bottom of the lay. This would necessitate the longitudinal slotting of the support 32 to permit the picker stick to extend below the support to enable the check strap to be associated therewith.

Since the finger 76 is fixed to the beam carried by the frame, the lay movement functions as a supply of force to move the arms 66, and if movement of the lay is arrested, the picker motion does not operate. Each arm 66 may be pivotally mounted to the annular member 64 and spring means associated therewith will hold the arm extended and yet enable the arm to move inwardly relative to the member 64.

I claim:

1. In a control assembly for imparting movement to the picker sticks of a loom having a frame, a lay and swords for oscillating the lay mounted for rocking movement on the frame, a picker shaft disposed below the lay and mounted for reciprocating movement relative to the lay, a picker stick supported at each end of the picker shaft and extending through a slot in the lay, pressure operated means supported by the swords, a connection between the pressure operated means and the picker shaft, means carried by the frame adapted to actuate the pressure operated means when the lay is in back center position to move the picker shaft so that the picker stick will drive the shuttle across the loom and a bracket secured to each sword and extending outwardly therefrom to support the outer end of the picker shaft throughout its full stroke of movement.

2. A control assembly as claimed in claim 1 wherein the pressure operated means is supported by a member extending between the swords.

3. A control assembly as claimed in claim 1 wherein the pressure operated means is supported above and parallel to the picker shaft.

4. A control assembly as claimed in claim 1 wherein the picker shaft is mounted below and equidistant from the front and rear edges of the lay.

5. In a control assembly for imparting movement to the picker sticks of a loom having a frame, a lay and swords for oscillating the lay mounted for rocking movement on the frame, a picker shaft disposed below the lay and mounted for reciprocating movement relative to the lay, a picker stick supported at each end of the picker shaft and extending through a slot in the lay, a support attached to the swords, a pair of opposed cylinders supported by the support, a piston in each cylinder, a rod connecting said pistons, an arm secured at one end to the connecting rod and at the other end to the picker shaft, a valve means associated with each cylinder, a source of constant pressure, a connection between the pressure source and each valve means, actuating means for the valve means, and a pair of fingers on the frame adapted to move the actuating means when the lay is in the back center position so that when one valve is moved to admit pressure to its cylinder, the other valve moves to place its cylinder in communication with the atmosphere whereby the piston in the cylinder under pressure will reciprocate the picker shaft thus enabling the picker stick to drive the shuttle across the loom.

6. A control assembly as claimed in claim 5 wherein the picker shaft is mounted below and equidistant from the front and rear edges of the lay.

7. A control assembly as claimed in claim 5 and braking means to prevent reciprocation of the picker shaft until the pressure in the cylinder is sufficient to drive the shuttle across the lay.

8. A control assembly as claimed in claim 5 wherein the valve means includes a body having a port in communication with the pressure source, a port in communication with the atmosphere, at least one port in communication with the cylinder, a plug rotatably mounted within the body having a port extending radially therethrough, and diametrically opposed arms carried by the plug so that when the lay is in the back center position the finger on the frame will contact one of the arms to move the plug 90 degrees with respect to the body, thereby alining the bore in the plug with the desired bore in the body.

9. A control assembly as claimed in claim 5 wherein the connecting rod between the pistons is disposed at the longitudinal center of the lay.

10. A control assembly as claimed in claim 5 wherein the arm is attached to the center of the picker shaft.

11. A control assembly as claimed in claim 5 wherein a bracket is secured to each sword and

extends outwardly therefrom for supporting the outer end of the picker shaft.

12. In a control assembly for imparting movement to the picker sticks of a loom having a frame, a lay and swords for oscillating the lay mounted for rocking movement on the frame, a picker shaft located below and supported for reciprocating movement with respect to the lay, a picker stick carried at each end of the picker shaft and extending through a slot in the lay, a beam attached to the swords, a pair of opposed cylinders supported by the beam, a piston in each cylinder, a rod connecting said pistons, an arm secured at one end to said connecting rod and at the opposite end to the picker shaft, a valve means associated with each cylinder, a source of fluid, a connection between the source of fluid and each valve means, a vacuum tank, connections between said vacuum tank and each of said valve means, pumping means, a conduit from said pumping means to said fluid source, a conduit from said vacuum tank to said pumping means, actuating means for said valve means, and a pair of spaced fingers on the frame adapted to move the actuating means when the lay is in the back center position whereby one valve means is moved to admit fluid into its cylinder while the other valve means moves to place its cylinder in communication with the vacuum tank whereby the piston under fluid pressure will move the picker shaft so that the picker stick will drive the shuttle across the loom.

13. In a control assembly for imparting movement to the picker sticks of a loom having a frame, lay and swords for oscillating the lay mounted for rocking movement on the frame, a picker shaft disposed below the lay and mounted for reciprocating movement relative to the lay, a picker stick supported at each end of the picker shaft and extending through a slot in the lay, a support extending between and secured to the swords beneath the lay, pressure operated means supported by the support, a connection between the pressure operated means and the picker shaft, means carried by the frame adapted to actuate the pressure operated means when the lay is in back center position to move the picker shaft so that the picker stick will drive the shuttle across the loom, and means cooperating with the picker shaft to prevent reciprocation of the picker shaft until the pressure in the pressure operated means is sufficient to drive the shuttle across the lay.

14. In a control assembly for imparting movement to the picker sticks of a loom having a frame, a lay and swords for oscillating the lay mounted for rocking movement on the frame,

a picker shaft disposed below the lay and mounted for reciprocating movement relative to the lay, a picker stick supported at each end of the picker shaft and extending through a slot in the lay, a support attached to the swords, a pair of opposed cylinders supported by the support, a piston in each cylinder, a rod connecting said pistons, an arm secured at one end to the connecting rod and at the other end to the picker shaft, a valve means associated with each cylinder, a source of constant pressure, a connection between the pressure source and each valve means, actuating means for the valve means, and means on the frame adapted to move the actuating means when the lay is in the back center position so that when one valve is moved to admit pressure to its cylinder, the other valve moves to place its cylinder in communication with the atmosphere whereby the piston in the cylinder under pressure will reciprocate the picker shaft thus enabling the picker stick to drive the shuttle across the loom.

15. In a control assembly as claimed in claim 14 wherein means is provided to prevent reciprocation of the picker stick until the pressure in one of the opposed cylinders is sufficient to drive the shuttle across the lay, said means including a cylinder in communication with the source of constant pressure, two cylinders supported opposite said first named cylinder, the said cylinders being of equal capacity, a piston in each of said cylinders, a piston rod for the said pistons, means connecting the piston rods, means connecting one of the oppositely disposed cylinders with one of the cylinders on the support secured to the swords, means connecting the other of the said oppositely disposed cylinders with the other of the cylinders on the support between the swords, a braking member carried by the means connecting the piston rods for engaging the picker shaft, and spring means tending to urge the braking member away from the picker shaft.

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