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F. M. DELANY
AUTOMATIC DISCONNECTING MECHANISM FOR
FLUID PRESSURE OPERATED LINKAGE
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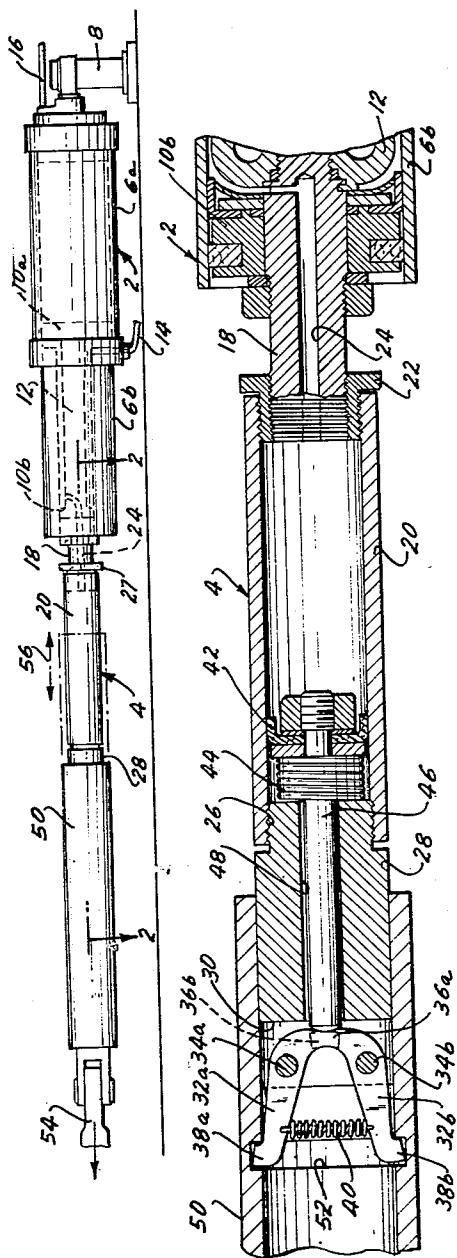


FIG. 1

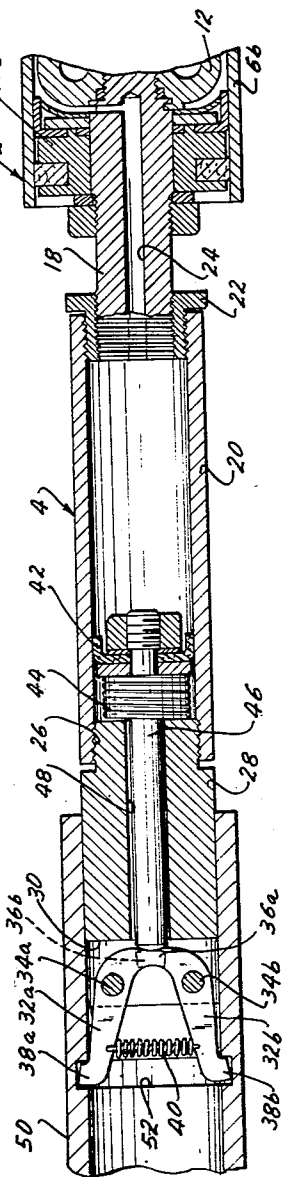


FIG. 2

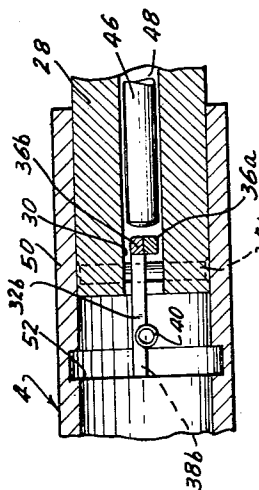


FIG. 3

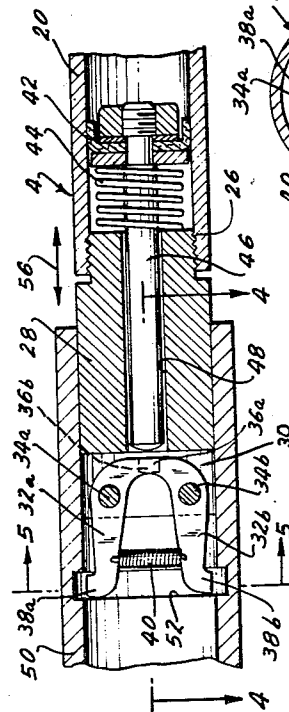
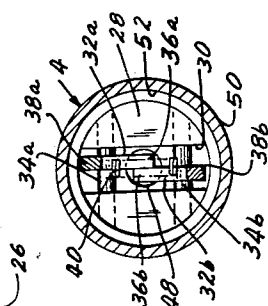


FIG. 4



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AUTOMATIC DISCONNECTING MECHANISM FOR FLUID PRESSURE OPERATED LINKAGE

Frank M. Delany, Summit, N. J., assignor to National
Pneumatic Co., Inc., Boston, Mass., a corporation of
Delaware

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The present invention relates to an arrangement by means of which a linkage powered by a fluid pressure motor and connecting that motor to an operated device is automatically disconnected upon the release of operative pressure in or to that motor, thereafter permitting manual movement of the device entirely independently of the motor.

The invention has general application to all systems in which a device is operated by a fluid pressure motor and in which, upon failure of the motor or for any other reason, manual operation of the device is desired. If the device should remain operatively connected to the motor such manual operation would necessitate movement of the motor piston within its cylinder, thus unduly restricting freedom of movement of the device. In accordance with the present invention the disconnection of the device from the motor permits it to be manually moved freely and readily without in any way affecting the motor.

The invention is here specifically illustrated as part of a linkage by means of which a fluid pressure motor, and more specifically such a motor of the differential piston type, is adapted to move doors between open and closed positions. This type of system is often employed in railroad passenger cars and the like, the trains in which those cars are coupled usually being provided with a central control by means of which the conductor or other appropriate official can control the opening and closing of the train doors. Occasionally cars equipped with door opening systems of this type are coupled with cars not thus equipped, and in such a case it is desired that the doors of all of the cars be manually opened and closed. In other instances the power source to the motors may fail, and then there is no alternative but to have the doors manually openable. In either event it would be a complicated and time consuming matter for a member of the train or maintenance crew to gain access to each individual motor and disconnect it from the door or doors which it is normally designed to operate. Moreover, the possibility of such personnel forgetting to disconnect a particular motor or motors cannot be overlooked.

In accordance with the present invention the linkage between the motors and the doors is so constructed that so long as the motors are operative, so long as pressure is applied to the motors, the motors and doors will be operatively connected. However, upon release of the pressure applied to the motors for any reason, whether because of malfunction of the system or purposefully, the linkage between the motors and their respective doors will automatically be released so that the doors are free to move independently of the motor pistons.

This result is accomplished by means of sturdy and effective mechanism which is substantially foolproof in operation, which is well capable of withstanding the stresses and strains to which it will be subjected while in use, and which will provide for establishment of the operative connection between the motors and the doors no matter what the relative positions of the motors and doors might be at the time that the motors are powered. It is merely necessary, once pressure has been applied to

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the motors, to run the motors through a single operating cycle, at the end of which all of the motor-door operative connections will be established.

To the accomplishment of the above, and to such other objects as may hereinafter appear, the present invention relates to the arrangement of a linkage between a fluid pressure motor and an operated device, as defined in the appended claims and as described in this specification, taken together with the accompanying drawings, in which:

Fig. 1 is a side elevational view of one embodiment of the present invention, the parts being shown in the position which they assume when the door is opened while the operative connection between the door and motor is established;

Fig. 2 is a cross sectional view taken along the line 2—2 of Fig. 1 on an enlarged scale, of a portion of that linkage;

Fig. 3 is a fragmentary cross sectional view of a portion of the linkage shown in Fig. 2 but showing certain parts in the position which they assume when the operative connection between the motor and the operated device is broken;

Fig. 4 is a cross sectional view taken along the line 4—4 of Fig. 3; and

Fig. 5 is a cross sectional view taken along the line 5—5 of Fig. 3.

The fluid pressure motor, generally designated 2, is operatively connected by means of a linkage generally designated 4 to some suitable operated device such as one or more doors of a railroad car (not shown). The motor 2, in the form here specifically disclosed, is of the conventional differential piston type, and comprises a cylinder having a large section 6a and a small section 6b, the cylinder being mounted at one end on an appropriate supporting post 8. The mounting is here shown as pivotal, but that is by no means essential to the operation of the device. The motor 2 is provided with a large piston 10a slidable in the cylinder section 6a and a small piston 10b slidable in the small cylinder section 6b, the pistons being connected by a large diameter rod 12 which is, however, somewhat smaller than the internal diameter of the cylinder section 6b. Means generally designated 14 are provided for exerting a substantially constant pressure in the space between the pistons 10a and 10b. A second means generally designated 16 is provided for selectively applying or releasing pressure within the cylinder section 6a to the right of the large piston 10a. As is conventional in the operation of motors of this type, pressure exerted within the cylinder section 6a on the right hand side of the piston 10a will overcome the pressure exerted on the left hand side of the piston 10a because of the greater effective area on the right hand side of the piston 10a as compared with the left hand side thereof. Consequently the pistons 10a and 10b and the rod 12 will move to the left to the position shown in broken lines shown in Fig. 1. When pressure is released from the cylinder section 6a the pressure active on the left hand side of the piston 10a will move the pistons 10a and 10b and the rod 12 back to the right.

A piston rod 18 extends out to the left from the piston 10b and a cylinder 20 is secured thereto, as by means of the adapter nut 22 which is externally threadedly received on the threaded exterior of the piston rod 18. The piston rod 18 is provided with a passage 24 one end of which opens onto the interior of the cylinder 20 and the other end of which extends radially to open into the space between the motor pistons 10b and 10a. The passage 24 is of appreciable diameter so that the pressure exerted within the cylinder section 6b via the means 14 will also be exerted inside the cylinder 20.

The left hand end of the cylinder 20 is internally threaded at 26 and a plug 28 is threadedly received therein and projects out therefrom, the external diameter

of the plug 28, as here disclosed, being substantially the same as the external diameter of the cylinder 20. The left hand end of the plug 28 is slotted, at 30, and a pair of connector members 32a, 32b are pivotally mounted within the slot 30 on pins 34a and 34b respectively. These connector members 34a and 34b are provided with fingers 36a and 36b within the slots 30 and which overlap one another substantially in line with the axis of the plug 28. The connector members 32a and 32b, on the other side of the piston pins 34a and 34b respectively, extend out axially beyond the plug 28 and are provided with outwardly extending projecting portions 38a and 38b respectively. A spring 40 is operatively connected between the connector members 32a and 32b to the left of those pivotal axes 34a and 34b respectively, the spring 40 being active to pivot the connector members 32a and 32b counter-clockwise and clockwise respectively to the position shown in Fig. 3, in which the projecting portions 38a and 38b of the connector members 32a and 32b respectively are radially withdrawn.

Slidable within the cylinder 20 is a piston 42. A spring 44 is positioned between the piston 42 and the plug 28, that spring being of the compression type and normally moving the piston 42 to the right as shown in Fig. 3. Upon the application of fluid pressure within the cylinder 20, however, the piston 42 will be moved to the left to the position shown in Fig. 2, compressing the spring 44. A rod 46 is secured to the piston 42 and moves therewith, the plug 28 being provided with a passage 48 through which the rod 46 is slidable, the left hand end of the passage 48 opening onto the slot 30 in line with the overlapped ends 36a and 36b of the connector members 32a and 32b respectively. As may clearly be seen from Fig. 2, when the piston 42 is moved to the left the rod 46 moves therewith so that its tip extends out from the passage 48 into the slot 30 where it engages the overlapping connector member fingers 36a and 36b and, in continuing to move to the left, causes the connector members 32a and 32b to pivot in clockwise and counter-clockwise directions respectively from their positions shown in Fig. 3, thus causing the projecting portions 38a and 38b thereof to extend radially out beyond the periphery of the plug 28.

A tube 50 is slidable over the plug 28 and is provided with an internal groove 52 into which the projecting portions 38a and 38b of the connector members 32a and 32b respectively are adapted to be received. The tube 50 is, at its left hand end, connected in any appropriate manner to an additional linkage member 54 which is in turn connected to the device to be operated, such as a door.

When the motor 2 is energized by the exertion of pressure within the cylinder part 6b, as will be the case whenever the motor 2 is to be operated, that same pressure will be applied within the cylinder 20, the piston 42 will be moved to the left, and the projecting portions 38a and 38b of the connector members 32a and 32b respectively will be received within the groove 52 in the tube 50. Hence there will be a direct and positive mechanical connection between the motor pistons 10a and 10b and the device to be operated. The application or release of pressure within the cylinder part 6a will cause the motor pistons 10a and 10b to move to the left or right respectively, thus giving rise to corresponding movement of the operated device, for example, causing the doors to open and close respectively.

If pressure should fail within the cylinder section 6b, either because of malfunction of the pressure system or purposefully, as when a railroad car is connected in a train with other cars not having power operated doors, the pressure applied within cylinder 20 will also fail. The spring 44 will then move the piston 42 to the right to the position shown in Fig. 3, the spring 40 will cause the projecting connector member portions 38a and 38b to withdraw from the recess 52 inside the tube 50, and

thus the mechanical connection between the tube 50 and the motor pistons 10a and 10b will be broken. The tube 50 will then be freely slidable over the plug 28 and the cylinder 20 in the direction of the arrows 56 of Figs. 1 and 3, Fig. 1 showing in broken lines the position which the tube 50 may assume when, for example, the doors to which it is connected are manually opened while the pistons 10a and 10b and the cylinder 20 remain in their position shown in Fig. 1. As a result the operated device, such as the door, may be manually opened and closed without having to move the motor pistons 10a and 10b.

It may be noted that even if the spring 44 should fail the action of the spring 40 will be sufficient to withdraw the projecting portions 38a and 38b of the connector members 32a and 32b respectively from the groove 52, and in so doing will move the rod 46 to the right, since there will no longer be any appreciable pressure within the cylinder 20 resisting that movement.

Upon the renewed exertion of pressure within the cylinder part 6b the piston 42 will again be urged to the left to its position shown in Fig. 2. If the tube 50 is not then in such a position as to permit the connector member projecting parts 38a and 38b to enter the groove 52, those parts will be urged against the inner surface of the tube 50. If the motor 2 is once cycled the movement of its pistons 10a and 10b will cause a corresponding movement of the cylinder 20 and the plug 28, the latter carrying with it the connector members 32a and 32b. The projecting connector member portions 38a and 38b will ride along the inner surface of the tube 50 until they come into registration with the internal groove 52, and they will then snap into that groove, thus re-establishing the direct operative connection between the motor 2 and the operated device.

While in the construction here specifically disclosed pressure communicating between the cylinder 20 and the motor cylinder section 6b is accomplished by means of the passage 24 through the piston rod 18, such pressure communication can be established in any other appropriate way, as through the use of an external connection, flexible or otherwise, between the cylinders 6b and 20, between the cylinder 20 and the pressure means 14 which communicates with the motor cylinder section 6b, or even directly between the cylinder 20 and the source of pressure for the motor cylinder section 6b. However, certain definite and obvious advantages as to reliability and positiveness of operation inhere in the direct connection of the cylinder 20 to the piston rod 18 and the provision of the communicating passage 24 in the piston rod 18.

It will be seen from the above that the specific construction here disclosed is simple and sturdy, may readily be assembled, and adds but little to the overall expense of the linkage. However, it will be apparent that many variations may be made therein, all within the spirit of the invention as defined in the following claims.

I claim:

1. In the combination of a fluid pressure motor having a cylinder within which pressure is exerted and a piston therein, an operated device, and a linkage operatively connecting said piston and said device; the improvement which comprises said linkage comprising a cylinder within which a second piston is movable, biasing means for urging said second piston in one direction therein, the application of fluid pressure within said cylinder moving said second piston in the other direction against the action of said biasing means, a pressure connection between said motor cylinder and said linkage cylinder through which fluid pressure may pass, thereby applying pressure within said linkage cylinder when pressure is exerted in said motor cylinder, a detachable connection between said linkage cylinder and the remainder of said linkage actuable between detaching and attaching conditions, and an operative connection between said detachable connection and said second piston effective when said second piston

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is in one of its biased and fluid pressure moved positions to actuate said connection to its detached condition, thus operatively separating said device from said motor, and effective when said second piston is in the other of its biased and fluid pressure moved positions to actuate said connection to its attaching condition, thus operatively connecting said device to said motor.

2. The combination of claim 1, in which said detachable connection comprises a first member connected to said linkage cylinder, a second member movable relative to said first member, a locking member carried by said first member and movable between operative and inoperative positions in which it respectively lockingly engages and disengages from said second member, and an operative connection between said locking member and said second piston effective to move said locking member to its operative and inoperative positions respectively when said second piston is in one and the other of its fluid pressure moved and biased positions respectively.

3. The combination of claim 2, in which said operative connection between said locking member and said second piston comprises a rod operatively connected to said second piston, said first member having a passage therethrough through which said rod slides and beyond which said rod is movable, said locking member being carried by said first member beyond said passage, said rod engaging said locking member and moving it to operative position when said rod is slid out from said passage.

4. The combination of claim 2, in which said operative connection between said locking member and said second piston comprises a rod operatively connected to said second piston, said first member having a passage therethrough through which said rod slides and beyond which said rod is movable, said locking member being carried by said first member beyond said passage, said rod engaging said locking member and moving it to operative position when said rod is slid out from said passage, and biasing means urging said locking member to its inoperative position.

5. The combination of claim 1, in which said detachable connection comprises a first member connected to said linkage cylinder, a second member slidable over said first member and having a recess on its inner surface, a locking member articulately mounted on said first member and movable between an operative position in which it is received within said recess in said second member, thereby connecting said first and second members for simultaneous movement, and an inoperative position withdrawn from said recess in said second member, thereby releasing said second member for movement independently of said first member, and an operative connection between said locking member and said second piston effective to move said locking member to its operative and inoperative positions respectively when said second piston is in one and the other of its fluid pressure moved and biased positions respectively.

6. The combination of claim 5, in which said operative connection between said locking member and said second piston comprises a rod operatively connected to said second piston, said first member having a passage therethrough through which said rod slides and beyond which said rod is movable, said locking member being carried by said first member beyond said passage, said rod engaging said locking member and moving it to operative position when said rod is slid out from said passage.

7. The combination of claim 5, in which said operative connection between said locking member and said second piston comprises a rod operatively connected to said second piston, said first member having a passage therethrough through which said rod slides and beyond which said rod is movable, said locking member being carried by said first member beyond said passage, said rod engaging said locking member and moving it to operative position when said rod is slid out from said passage, and

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biasing means urging said locking member to its inoperative position.

8. In the combination of a fluid pressure motor having a cylinder within which pressure is exerted and a piston and piston rod therein, an operated device, and a linkage operatively connecting said piston rod and said device; the improvement which comprises a cylinder connected to said piston rod within which a second piston is movable, biasing means for urging said second piston in one direction therein toward said piston rod, the application of fluid pressure within said cylinder moving said second piston in the other direction against the action of said biasing means, a pressure connection between said motor cylinder and said linkage cylinder through which fluid pressure may pass, thereby applying pressure within said linkage cylinder when pressure is exerted in said motor cylinder, said piston rod having a passage communicating between said motor cylinder and said linkage cylinder, said passage comprising said pressure connection, a detachable connection between said linkage cylinder and the remainder of said linkage actuatable between detaching and attaching conditions, and an operative connection between said detachable connection and said second piston effective when said second piston is in one of its biased and fluid pressure moved positions to actuate said connection to its detached condition, thus operatively separating said device from said motor, and effective when said second piston is in the other of its biased and fluid pressure moved positions to actuate said connection to its attaching condition, thus operatively connecting said device to said motor.

9. The combination of claim 8, in which said detachable connection comprises a first member connected to said linkage cylinder, a second member movable relative to said first member, a locking member carried by said first member and movable between operative and inoperative positions in which it respectively lockingly engages and disengages from said second member, and an operative connection between said locking member and said second piston effective to move said locking member to its operative and inoperative positions respectively when said second piston is on one and the other of its fluid pressure moved and biased positions respectively.

10. The combination of claim 9, in which said operative connection between said locking member and said second piston comprises a rod operatively connected to said second piston, said first member having a passage therethrough through which said rod slides and beyond which said rod is movable, said locking member being carried by said first member beyond said passage, said rod engaging said locking member and moving it to operative position when said rod is slid out from said passage.

11. The combination of claim 9, in which said operative connection between said locking member and said second piston comprises a rod operatively connected to said second piston, said first member having a passage therethrough through which said rod slides and beyond which said rod is movable, said locking member being carried by said first member beyond said passage, said rod engaging said locking member and moving it to operative position when said rod is slid out from said passage, and biasing means urging said locking member to its inoperative position.

12. The combination of claim 8, in which said detachable connection comprises a first member connected to said linkage cylinder, a second member slidable over said first member and having a recess on its inner surface, a locking member articulately mounted on said first member and movable between an operative position in which it is received within said recess in said second member, thereby connecting said first and second members for simultaneous movement, and an inoperative position withdrawn from said recess in said second member, thereby releasing said second member for movement independently of said first member, and an operative connection

between said locking member and said second piston effective to move said locking member to its operative and inoperative positions respectively when said second piston is in one and the other of its fluid pressure moved and biased positions respectively.

13. The combination of claim 12, in which said operative connection between said locking member and said second piston comprises a rod operatively connected to said second piston, said first member having a passage therethrough through which said rod slides and beyond which said rod is movable, said locking member being carried by said first member beyond said passage, said rod engaging said locking member and moving it to operative position when said rod is slid out from said passage.

14. The combination of claim 12, in which said operative connection between said locking member and said second piston comprises a rod operatively connected to said second piston, said first member having a passage therethrough through which said rod slides and beyond which said rod is movable, said locking member being carried by said first member beyond said passage, said rod engaging said locking member and moving it to operative position when said rod is slid out from said passage, and biasing means urging said locking member to its inoperative position.

15. In combination, a fluid pressure motor having a cylinder within which pressure is exerted, and a piston rod extending out therefrom, a second cylinder operatively connected to said piston rod to move therewith, a piston movable within said second cylinder, said motor piston rod having a passage communicating between said motor cylinder and said second cylinder, through which passage fluid pressure is transmitted, means active on said piston in said second cylinder to urge it in one direction, the application of fluid pressure in said second cylinder via said passage moving said piston in the opposite direction, a connector member articulately mounted on said second cylinder and movable between first and second positions thereon, and an operative connection between said connector member and said piston, whereby the former is moved to its first and second positions respectively in accordance with the position of said piston within said second cylinder.

16. In combination, a fluid pressure motor having a cylinder within which pressure is exerted and a piston rod extending out therefrom, a second cylinder operatively connected to said piston rod and movable therewith, a piston movable in said second cylinder toward and from said piston rod, said piston rod having a passage com-

municating between said motor cylinder and said second cylinder at the piston rod end of the latter, through which passage fluid pressure is transmitted, spring means active on said piston rod, the application of fluid pressure in said second cylinder at the piston rod end thereof moving said piston in the opposite direction, the end of said second cylinder remote from said piston rod carrying a connector member pivotally mounted thereon, said latter cylinder end having a passage therethrough, said piston having an element connected thereto and movable through said passage, said connector member having a part displaced from its pivotal axis and in line with said passage and operatively connected to said element, whereby movement of said piston results in movement of said connector member.

17. The combination of claim 15, in which said fluid pressure motor is of the differential piston type, the cylinder thereof being divided into two sections in the first of which pressure is constantly applied and in the second of which pressure is intermittently applied to cause movement of said motor piston rod, said piston rod passage communicating between said second cylinder and said first section of said motor cylinder.

18. The combination of claim 16, in which said fluid pressure motor is of the differential piston type, the cylinder thereof being divided into two sections in the first of which pressure is constantly applied and in the second of which pressure is intermittently applied to cause movement of said motor piston rod, said piston rod passage communicating between said second cylinder and said first section of said motor cylinder.

19. The combination of claim 1, in which said fluid pressure motor is of the differential piston type, the cylinder thereof being divided into two sections in the first of which pressure is constantly applied and in the second of which pressure is intermittently applied to cause movement of the said motor piston rod, said pressure connection being between said linkage cylinder and said first section of said motor cylinder.

20. The combination of claim 8, in which said fluid pressure motor is of the differential piston type, the cylinder thereof being divided into two sections in the first of which pressure is constantly applied and in the second of which pressure is intermittently applied to cause movement of the said motor piston rod, said piston rod passage communicating between said linkage cylinder and said first section of said motor cylinder.

No references cited.