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Workman et al.

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[54] **MANUAL AND FLUID PRESSURE BRAKE RELEASE FOR HOISTS**

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[52] **U.S. Cl.** ..... **192/3 R**, 188/105

[51] **Int. Cl.** **F16d 23/00**

[58] **Field of Search** ..... 192/3 R

[56] **References Cited**

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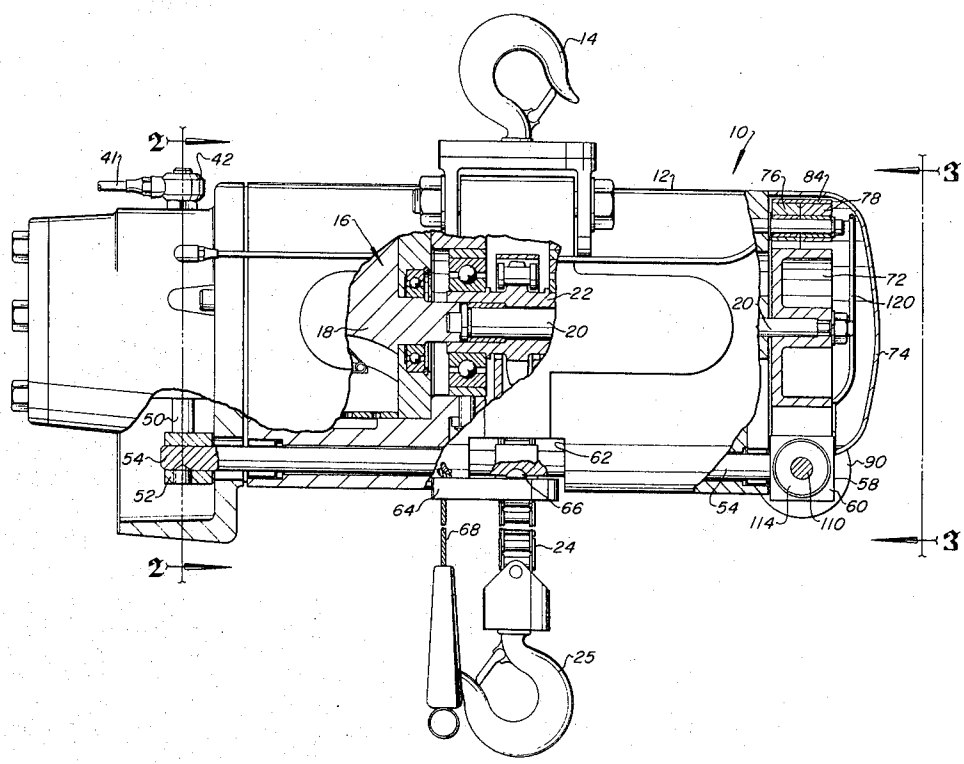
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[57] **ABSTRACT**

The release mechanism of a manually actuated brake for a pneumatic hoist includes piston and cylinder type pneumatic actuators interposed in the actuating mechanism for the brake shoes. Actuation of the brake release mechanism when the air supply to the hoise is insufficient to raise or hold a load will result in movement of the actuator piston rods with respect to the cylinders to prevent movement of the brake shoes.

5 Claims, 3 Drawing Figures



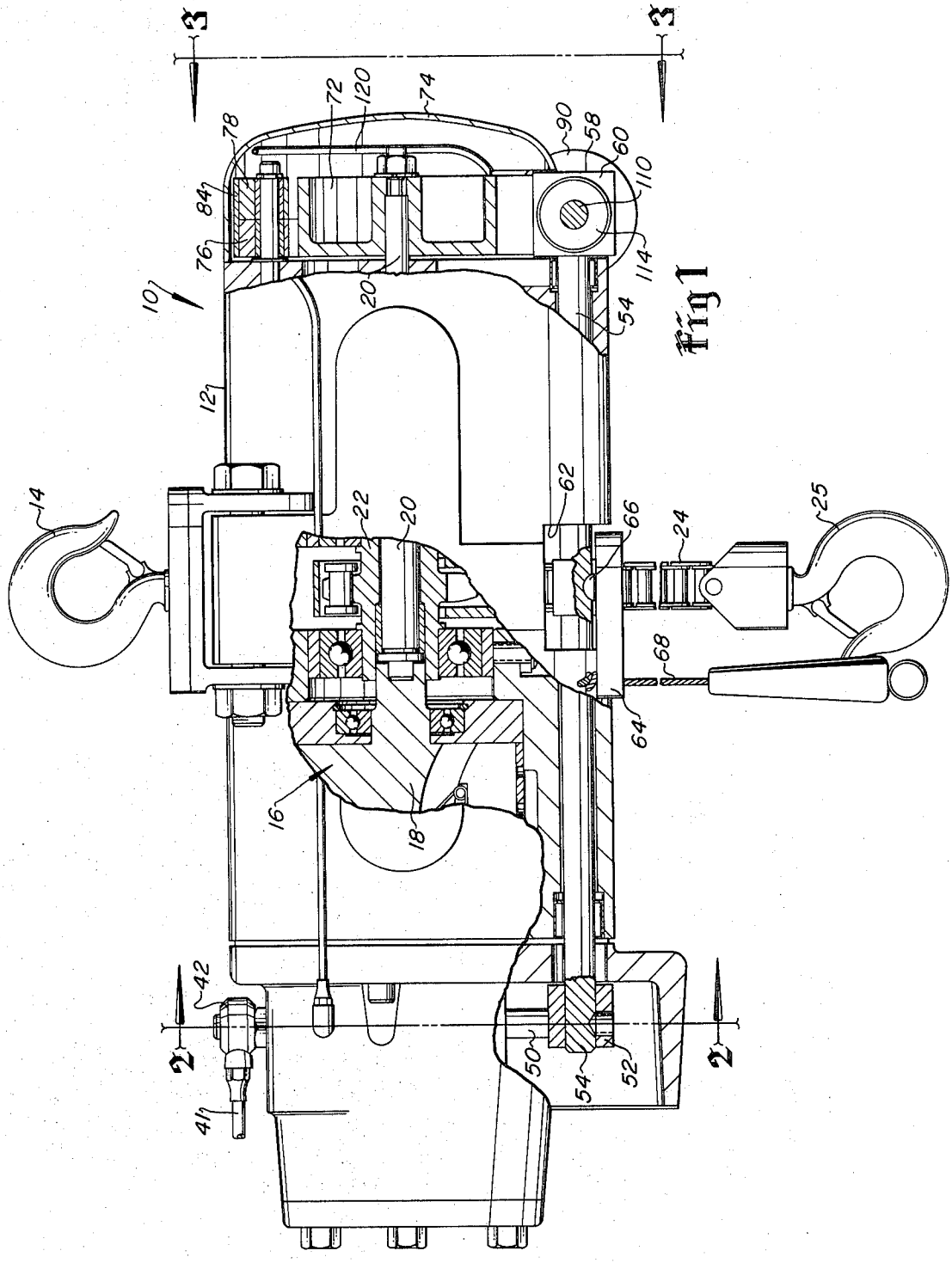

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Fig 1

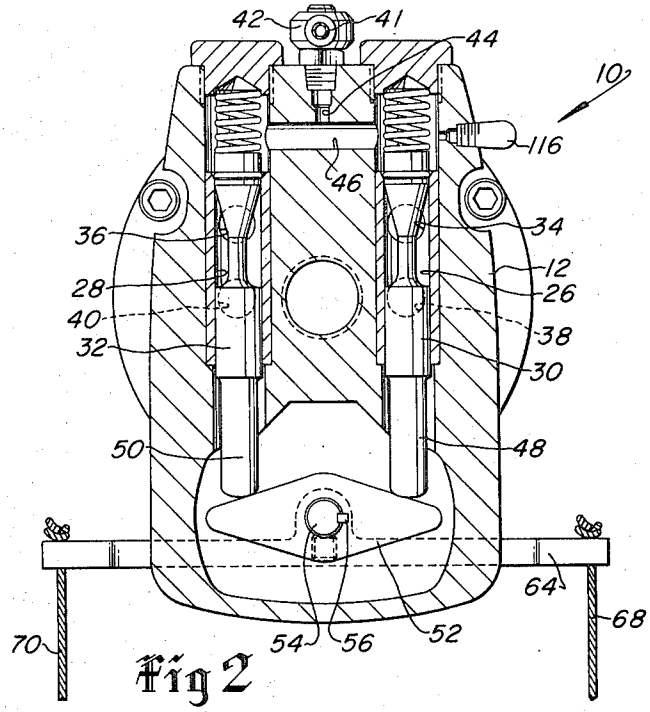

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Fig 2

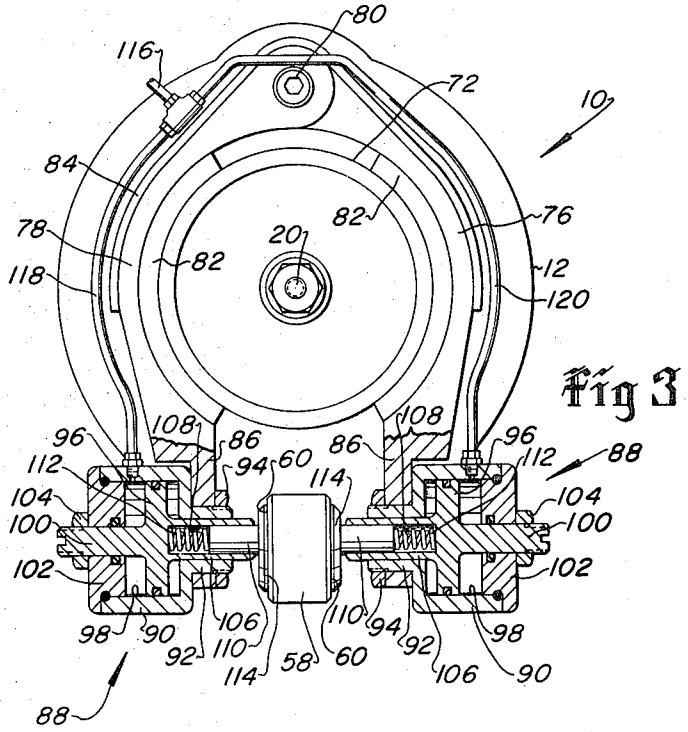

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Fig 3

MANUAL AND FLUID PRESSURE BRAKE RELEASE FOR HOISTS

BACKGROUND OF THE INVENTION

Hoists with pressure fluid operated motors include a type in which a control lever or linkage actuates a throttle valve for supplying pressure fluid to the hoist motor and simultaneously actuates a mechanism to release the hoist brake. A longstanding problem associated with the control of hoists of the general type described above concerns the unwanted release of the brake and lowering of the hoist load when the pressure fluid supply to the hoist motor is insufficient to operate the hoist to raise a load or at least prevent rapid lowering of the load. A hoist operator is usually unaware of a fluid supply failure or insufficiency until the hoist control lever is actuated. Accordingly, with simultaneous operation of a throttle valve and brake release mechanism rapid and unexpected lowering of the hoist load is experienced if the fluid supply pressure is insufficient to operate the motor to raise or hold a load.

SUMMARY OF THE INVENTION

The present invention provides a control device for a hoist having a fluid operated motor which is responsive to an insufficiency or failure of the supply of motive fluid to the motor to prevent actuation of the brake release mechanism to release the hoist brake. The brake release control of the present invention also provides for automatic application of the brake on a fluid operated hoist should a failure of the pressure fluid supply occur while the brake is released and the hoist motor is being operated to raise or lower a load.

The present invention provides a pressure fluid actuator interposed in the linkage which interconnects a hoist operating lever and the brake shoes of a fluid operated hoist, which actuator is responsive to a failure of the pressure fluid supply to the hoist to prevent releasing movement of the brake or conversely to provide for automatic engagement of a released brake. With the brake release control of the present invention manually actuated controls for simultaneous operation of a hoist throttle valve and brake release are rendered inoperable to effect release of a hoist brake in the event of a failure of the pressure fluid supply.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal view partially sectioned of a pressure fluid operated hoist including the brake release control of the present invention;

FIG. 2 is a section view taken along the line 2—2 of FIG. 1; and,

FIG. 3 is an end view taken substantially from the line 3—3 of FIG. 1 with the cover member removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawings and in particular FIGS. 1 and 2 a pneumatic hoist is shown and generally designated by the numeral 10. The hoist 10 includes a housing 12 including a hoist suspension hook 14 for suspending the hoist from a suitable support. The hoist 10 also includes a pressure fluid operated motor 16 disposed within the housing 12. The motor 16 is of the well known rotary vane type and has a rotor member 18 responsive to the introduction of pressure fluid such as compressed air to the motor to rotatably drive shaft means 20 to which suitable mechanism is connected including a sprocket 22 to raise and lower a chain 24. The chain 24 may include a suitable hook 25 on its free end for attachment to a load.

Referring to FIG. 2, the housing 12 includes two parallel bores 26 and 28 in which are reciprocably disposed, respectively, control valve members 30 and 32. Opening into the bores 26 and 28 are motor inlet ports 34 and 36 and exhaust ports 38 and 40. An air supply conduit 41 is connected to the housing 12 by a connector 42 and suitable passages 44 and 46 are formed in the housing for conducting pressure air into the upper portions of the bores 26 and 28. The lower end portions 48 and 50 of the respective valve members 30 and 32 are engaged with mechanism including a cam member 52 which is retained on one end of a manually actuable control shaft 54 by a key 56. In response to rotation of the control shaft 54 the valve members 30 and 32 are actuated by the cam 52 to valve pressure fluid to and exhaust fluid from the hoist motor 16 and they are adapted to operate the motor in opposite directions of rotation. The basic operation of the valves 30 and 32 to control the flow of pressure air to the motor 16 is disclosed in detail in U.S. Pat. No. 3,213,758 to L.H. Workman. The valve members 30 and 32 are exemplary of a throttle control valve arrangement for reversibly operating the motor 16.

The control shaft 54 is mounted in the housing 12 for limited rotation in opposite directions for operating the valves 30 and 32 to supply pressure fluid to reversibly operate the hoist motor 16. The control shaft 54 extends through the housing 12 to the end of the hoist opposite the end shown in FIG. 2. A blocklike cam member 58 is formed on the end of the control shaft 54 and has opposed parallel cam surfaces 60 as shown in FIG. 3. Substantially midway the length of the hoist housing 12 is a relieved portion 62 which provides space for manual actuating means including a control lever 64 connected to the control shaft by a key 66. The lever 64 may have suitable ropes 68 and 70 or other means provided to enable a hoist operator to manually control the operation of the hoist in a manner well known.

Referring to FIGS. 1 and 3 the hoist 10 includes releasable brake means for preventing the rotation of the shaft 20 and sprocket 22 to thereby hold or prevent unwanted lowering of a hoist load. The hoist brake means includes a cylindrical drum 72 fixed to one end of the shaft 20 for rotation therewith and disposed within a cover member 74 on the housing 12. The drum 72 is substantially surrounded by two brake shoes 76 and 78 which are pivotally mounted on the housing 12 by a pin 80. The brake shoes 76 and 78 are each provided with a liner 82 of a suitable friction material. The brake shoes 76 and 78 are biased to have their liners engage the drum 72 for preventing rotation thereof by a leaf spring 84. The brake shoes each include an integral arm portion 86 extending on opposite sides of the control shaft cam member 58.

On each brake shoe arm portion 86 is mounted pressure fluid actuator means 88 in the form of a cylinder 90 having a reduced diameter portion 92 extending through a bore in the brake shoe arm and secured by a nut 94. Each cylinder 90 has a reciprocable piston 96 disposed in an interior chamber 98. Each piston 96 includes an integral partially threaded stem portion 100 extending through a cover member 102 on each cylinder. A nut 104 threaded over the stem portion 100 may

be adjusted axially to form a stop which limits the movement of the piston **96** toward the cam member **58.** The pistons **96** are further characterized by hollow rod portions **106** opposite the stems **100** and extending toward the cam member **58.** The rod portions **106** each include a bore **108** in which is disposed a cam follower **110** biased into engagement with the cam member **58** by a spring **112** disposed in the bore **108.** The cam followers **110** include flanged portions **114** which are directly engaged with the opposed cam surfaces **60.** Each cylinder **90** is in communication with the fluid supply conduit **41** by way of a conduit **116** suitably connected to the bore **26,** FIG. **2,** and flexible conduits **118** and **120** leading to each cylinder chamber. When pressure air is supplied to the hoist **10** from a suitable source, not shown, by way of conduit **41** the pistons **96** are biased toward the cam member **58** and are limited in their movement in that direction by the engagement of nuts **104** with the cylinder cover members **102.** The position of the nuts **104** on the stem portion **100** may be adjusted to compensate for wear on the brake liners **82** and yet maintain a small gap between the end of the rod portions **106** and the flanged portions **114** of the cam followers **110.**

When the control shaft **54** is rotated in either direction by movement of the lever **64** the cam member **58** will rotate to move the cam followers **110** with respect to the rod portions **106** until engagement of the flanged portion **114** with the ends of the rod portions occurs. The gaps between the rod portions **106** and the flanged end portions **114** of the cam followers provide for some initial movement of the control shaft **54** and the control valves **30** and **32** to valve pressure fluid to the motor **16** before the brakes are released. Continued rotation of the control shaft will move the piston rods **106** and simultaneously further move the control valves **30** and **32** by way of the cam member **52** on the opposite end of the control shaft. If compressed air at a predetermined pressure is supplied to the hoist motor **16** and the cylinders **90** the pistons **96** will not move relative to the cylinders and instead the cylinders will move with the pistons to pivot the brake shoes **76** and **78** away from the drum **72** to release the braking action on the shaft **20.** The control valves will have also valved air to and from the motor **16** to provide for raising or controlled lowering of the load. However, if the air supply has failed or is of an insufficient pressure to drive the motor **16** to raise a load or prevent rapid lowering of a load the pistons **96** will move relative to the cylinder **90** when the cam member **58** is rotated. Accordingly, the brake shoes **76** and **78** will not move to release the braking action on the drum **72.** The cylinders **90** and pistons **96** may be selected to be of a predetermined size which will provide a biasing force equal to or greater than the effective biasing force of the spring **84** to hold the piston nonmovable relative to the cylinder when the fluid supply pressure is sufficient to raise or prevent rapid lowering of a predetermined maximum hoist load. If the fluid supply pressure is not sufficient to enable the motor to control the predetermined maximum load the pistons will merely move within the cylinders and the brakes will not release. Moreover, should a failure or decrease in the fluid supply pressure occur while the brakes are released the shoes will automatically move to engage the drum **72** in response to relative movement between the pistons and cylinders. Accordingly, the brake means of the present invention will automatically be applied or remain applied under a condition of insufficient fluid supply pressure regardless of the position of the control lever **64** and associated shaft **54.**

The cylinders **90** interposed in the brake actuating mechanism of the hoist **10** also act as shock absorbers to some extent to provide a cushioned or somewhat gradual release and application of the brakes particularly if the control lever and shaft are actuated quite rapidly or violently.

What is claimed is:

1. In a hoist including a fluid operated motor:
means connected to said motor for hoisting a load;
releasable brake means for preventing unwanted movement of said means and characterized by a rotatable brake drum, a pair of opposed brake shoes pivotally mounted on said hoist, and biasing means for biasing said brake shoes into engagement with said drum;
conduit means for conveying pressure fluid to operate said motor;
control valve means interposed in said conduit means;
mechanism including manual actuating means for actuating said control valve and releasing said brake means and characterized by a rotatable control shaft including a cam member; and,
fluid actuator means including pressure fluid piston and cylinder means disposed between said cam member and said brake shoes and being connected to receive pressure fluid from said conduit means, said fluid actuator means being operable to prevent movement of said brake shoes to release said brake drum in response to actuation of said manual actuating means when the fluid pressure in said conduit means is insufficient to operate said motor means to raise or hold a load connected to said hoist.

2. The invention set forth in claim **1** wherein:
said piston and cylinder means comprise a cylinder and piston unit mounted on each of said brake shoes and including a cam follower engageable with said cam member, said cylinder and piston units being disposed for relative movement between said pistons and said cylinders in response to the movement of said cam member when said fluid pressure in said cylinders and said conduit means is insufficient to operate said motor means to raise or hold a load connected to said hoist.

3. The invention set forth in claim **2** wherein:
said piston and cylinder units include adjustable stop means to limit the movement of said pistons relative to said cylinders.

4. The invention set forth in claim **2** wherein:
said cam followers are disposed on said piston and cylinder units for limited relative movement with respect to said brake shoes to provide for limited movement of said control shaft without movement of said brake shoes.

5. In a hoist including a fluid operated motor;
means connected to said motor for hoisting a load;
releasable brake means for preventing unwanted movement of said means;
conduit means for conveying pressure fluid to operate said motor;
control valve means interposed in said conduit means;

mechanism including manual actuating means for actuating said control valve and releasing said brake means and characterized by a movable control shaft and a member connected to said shaft and movable in response to the movement of said shaft to release said brake means; and,

fluid actuator means connected between said member and said brake means so as to transmit brake releasing force from said member to said brake means and being connected to receive pressure fluid from said conduit means, said fluid actuator means being operable to prevent the release of said brake means in response to the movement of said member when the fluid pressure in said conduit means is insufficient to operate said motor means to raise or hold a load connected to said hoist.

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