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[21] Appl. No. **763,827**
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[56]

References Cited

UNITED STATES PATENTS

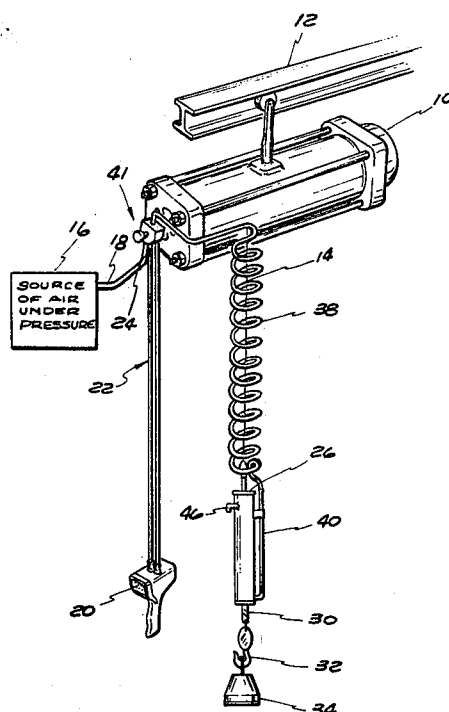
2,500,879	3/1950	Smallpiece	254/189(X)
2,949,894	8/1960	Hewitt	254/168

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[54] **BALANCING APPARATUS FOR HOISTS**
5 Claims, 2 Drawing Figs.

[52] U.S. Cl. 254/135,
254/168
[51] Int. Cl. B66d 1/00
[50] Field of Search 254/168,
135, 172, 186, 178; 60/57, 62

ABSTRACT: A hoist having a lifting cable for raising and lowering a pneumatic balancing attachment and a load with respect to a suspended position is disclosed. The balancing attachment allows the load to be manually, vertically positioned by a fingertip effort between suspended positions without vertically moving the cable.



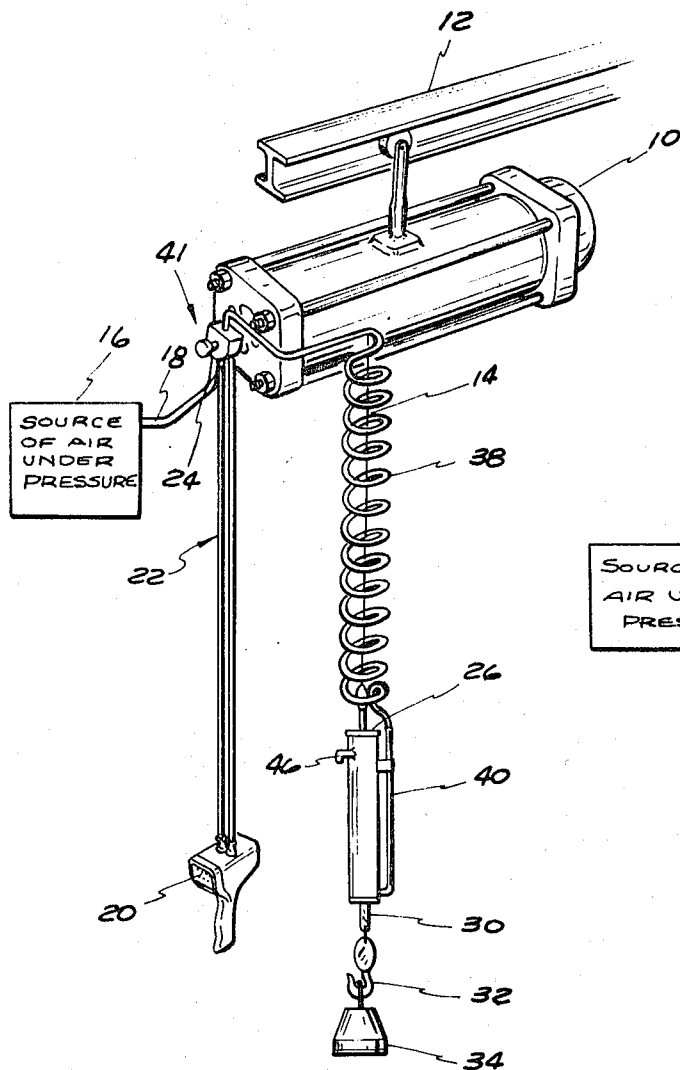


FIG. 1

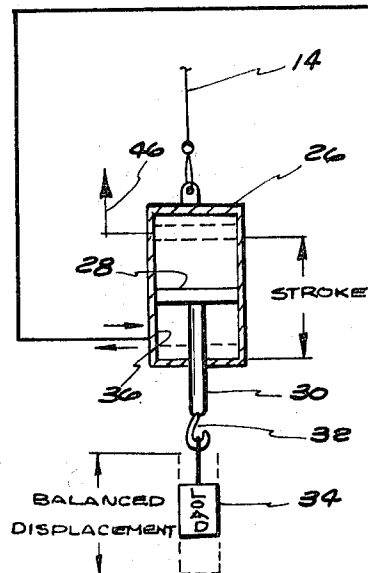
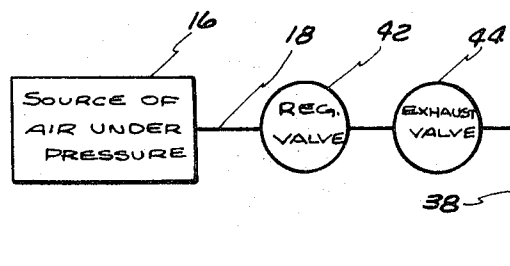


FIG. 2

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BALANCING APPARATUS FOR HOISTS**BACKGROUND OF THE INVENTION**

This invention relates to balancing attachments for hoists and more particularly to a piston and cylinder arrangement that attaches to the cable of a conventional hoist and provides means for counterbalancing the weight of the load suspended by the cable so that it can be moved between a pair of positions that are vertically spaced a distance corresponding to the stroke of the piston without moving the cable.

Lifting apparatus such as hoists and the like, which have a built-in balancing arrangement to permit a suspended load to be raised and lowered by a relatively nominal lifting effort applied on the load are widely employed where it is necessary to manually position the load in order to precisely locate it in a fixture or the like. Such lifting and balancing apparatus are shown in the prior art in U.S. Pat. Nos. 2,613,903; 2,901,219; 3,134,340 and others.

Generally such prior art apparatuses employ a lifting element, such as an arm or a cable, having one end connected to the lifting and balancing means and its other end adapted for attachment to the load. Both the lifting and the balancing means are integrated into a unit which is relatively expensive to purchase because of the complexity of the internal operating components. Thus the utilization of conventional hoists with balancing means has generally been restricted to production lines and the like, where a large number of parts are lifted and positioned.

SUMMARY OF THE INVENTION

The broad purpose of the present invention is to provide a balancing attachment formed of commercially available components that can be connected to any conventional hoist or lifting apparatus. The preferred embodiment of the present invention permits conventional hoisting and lifting devices to be readily converted into a system having both lifting and balancing capability without the expense of commercial units in which the lifting and balancing means are integrated in a single unit.

The preferred embodiment of the invention, which will be described in greater detail, comprises an air cylinder having a piston which is movable in a stroke that corresponds to the vertical distance that it is necessary to adjust the load when it is suspended. The cylinder attaches to the cable and the rod of the piston attaches to the load. Thus the piston and the cylinder provide a connection between the cable and the load such that when the cable is raised, the piston, cylinder and the load are lifted together.

The piston forms a fluid chamber in the cylinder which is connected to a source of compressed air. A pressure regulator and a relief valve control the pressure of the air in the cylinder. The air pressure normally is adjusted so that it counterbalances the weight of the load and allows the piston to be moved with the load its entire stroke with respect to the cylinder.

In use, the load together with the piston and the cylinder are raised by the hoist cable to a suspended position. The introduction of compressed air into the cylinder against the face of the piston balances the load so that the operator can manually raise and lower it a vertical distance that corresponds to the stroke of the piston without having to manipulate the hoist controls to move the cable.

Because the pneumatic force necessary to balance a given load depends on the piston area as well as the air pressure, the operator can quickly adapt the lifting apparatus to handle a load of a different weight by replacing the piston and cylinder with a unit having a larger or a smaller piston area. In addition, he can quickly change the piston and cylinder to a unit having a greater or shorter stroke when it is necessary to vary the length of the load's balanced travel. In addition to the flexibility of the preferred balancing arrangement with respect to different loads and positioning requirements, it has the advantage of being composed of a relatively few components

which are commercially available and is connected to a source of pressurized fluid such as compressed air which is normally available in industrial establishments.

Still further objects and advantages of the present invention will become readily apparent to those skilled in the art to which the invention pertains upon reference to the following description.

DESCRIPTION OF THE DRAWING

The description refers to the accompanying drawing in which like reference characters refer to like parts throughout the several views and in which:

FIG. 1 illustrates a lifting and balancing system illustrating the preferred embodiment of the present invention with a part of the air circuit shown schematically;

FIG. 2 is a schematic diagram illustrating the airflow of the preferred balancing attachment of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, a conventional hoist 10, illustrated in FIG. 1, is attached to a support 12 and is provided with a lifting cable 14 which can be raised and lowered. The hoist 10 is of the air-piston type only for purposes of illustration since other forms of lifting apparatus could be used such as air motors or the like that have a lifting element that is attached to the load. The hoist 10 is connected to a source of air under pressure 16 through a conduit 18. The compressed air provides the motive force for raising and lowering the cable. The operator controls the motion of the cable by means of a control device 20 that is connected by air hose means 22 to a control valve means 24 which allows him to raise, lower or suspend the cable when the load is at a selected height. The hoist 10, the cable 14 and its associated control device are all illustrative of conventional lifting devices employed to raise and lower a load and the particular arrangement of the operating components of the hoist 10 which produces the raising and lowering of the cable does not form an important part of the invention so that a more detailed description of these elements will not be provided.

An air cylinder 26 having a piston 28 which is movable in a stroke of a predetermined distance that corresponds to the vertical positioning of the balanced load, is connected to the lower end of the cable 14 that is normally attached to the load. A rod 30 extends from the piston through the bottom wall of the cylinder and has its lower end provided with attachment means 32 for connecting a load 34 to the piston 28. Thus it can be seen that when the load 34 is in a suspended position, the piston can be vertically moved with respect to the cylinder thereby vertically moving the load with respect to the cable 14.

The piston 28 forms a movable wall of an expansible fluid chamber 36 in the cylinder which has a volume that is varied as the piston is moved in its stroke. The chamber 36 is connected to the source of pressurized air 16 by conduit means including an air hose 18 and a self-storing air hose 38 which extends from the hoist down and around the lift cable 14 to a metal conduit 40 that is mounted along the side of the cylinder. A combination precision pressure control and relief device 41 is mounted on the hoist 10 and connected in the conduit 18 to control the pressure of the air delivered to the chamber 36. The control and relief device 41 is a conventional, commercially available unit and has an internal regulating valve means 42 and a relief means 44. The regulating valve means 42 is adjusted so that the pressure in the cylinder 36 is sufficient to counterbalance the weight of the suspended load 34. The upper end of the cylinder 26, on the opposite side of the face of the piston 28 with respect to the chamber 36, is provided with a connection 46 to the atmosphere so that when the load is suspended and balanced the operator can raise and lower the load a vertical distance corresponding to the stroke of the piston. To lower the load 34 while it is in a suspended position, the piston 28 is moved downwardly while the

cylinder 26 remains stationary, thereby causing the volume of the chamber 36 to contract. In order that the positioning effort will remain relatively constant, the exhaust valve 44 exhausts a sufficient amount of air from the chamber 36 to maintain the counterbalance pressure. Similarly, as the piston 28 is raised with respect to the cylinder 26, the regulating valve 42 introduces air into the expanding chamber 36 to maintain the counterbalancing pressure.

In practice the operator connects a pneumatic cylinder to the cable 14 having a diameter that accommodates the weight of the load that is to be positioned and a piston with a stroke that accommodates the distance the load is to be manually lowered and raised without using the hand control 20. The load is joined to the attachment means 32 and together with the piston 28 and the cylinder 36 raised by the cable to a suitable suspended height. With the counterbalance pressure in the chamber 36 the operator can then position the load a distance corresponding to the stroke of the piston by a very nominal effort. This positioning can take place at any point of the lifting cable's travel. To vary the amount of manual vertical positioning that is available, he can replace the piston 28 and the cylinder 26 with a piston and cylinder unit having a longer or a shorter stroke. Similarly to accommodate a load having a different weight, he can quickly exchange the piston 28 and cylinder 26 with a piston and cylinder unit having a greater or a smaller diameter. The preferred balancing attachment can be mounted on any conventional hoisting apparatus with the balancing function that is conventionally available in relatively expensive and complicated units.

Although I have described but one embodiment of my invention, it is to be understood that various changes and revisions could be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. An apparatus for converting a hoist into a balancer wherein the hoist includes a fluid pressure system and means selectively actuated by said fluid pressure system for raising and lowering a load, said apparatus being mounted inter-

mediate said fluid pressure actuated means and said load and comprising a cylinder, a piston slidably supported in said cylinder and operable to vary the vertical distance between said fluid pressure actuated means and said load at any given vertical position of said load as produced by said hoist and a fluid pressure system connected with said cylinder to provide pressure to one side of said piston and to exhaust fluid from the other side of said piston in a manner which produces balancing of the load so that the load can be manually positioned throughout the vertical distance provided by the stroke of said piston.

2. The apparatus as defined in claim 1 and in which said hoist includes a cable adapted to be connected with the load and movable up and down to vary the position of the load and said balancer is adapted to be mounted on the end of said cable and includes means for connecting said piston to said load.

3. The apparatus as defined in claim 1 and in which the fluid pressure system for said balancer is adapted to be connected to the fluid pressure system of said hoist.

4. In combination with a hoist which is only capable of raising and lowering a load, a balancing apparatus carried by said hoist and operable to provide balancing of the load over a limited vertical distance, said hoist including a load-supporting member and fluid pressure means for raising and lowering said load-supporting member, said balancing apparatus including a cylinder connected at the end of said load-supporting member, a piston disposed within said cylinder and having means for connecting said piston to the load whereby the load and the piston move together with and also independently of movement of said load-supporting member and fluid pressure means connected with said cylinder to act upon said piston to produce balancing of said load over the range of movement of the load provided by the stroke of said piston.

5. The combination as defined in claim 4 and in which the fluid pressure means of said hoist is connected with the fluid pressure means of said balancing apparatus.

MLJ-101-A

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,552,720 Dated January 5, 1971

Inventor(s) Lorne J. McKendrick

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE SPECIFICATION

Column 3, line 27, after "apparatus"

insert - - and provides the hoisting apparatus - -

Signed and sealed this 20th day of April 1971.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents