

[54]	LOAD BALANCER AND HOIST CONTROL	3,421,737	1/1969	Ulbing	254/186
[75]	Inventor: Otmar M. Ulbing , Webster, N.Y.	3,552,720	1/1971	McKendrick	254/168
[73]	Assignee: Columbus McKinnon Corporation , Tonawanda, N.Y.	3,773,296	11/1973	McKendrick	254/168
		3,858,845	1/1975	Grote et al.	254/168

[22] Filed: **July 22, 1974**

[21] Appl. No.: **490,233**

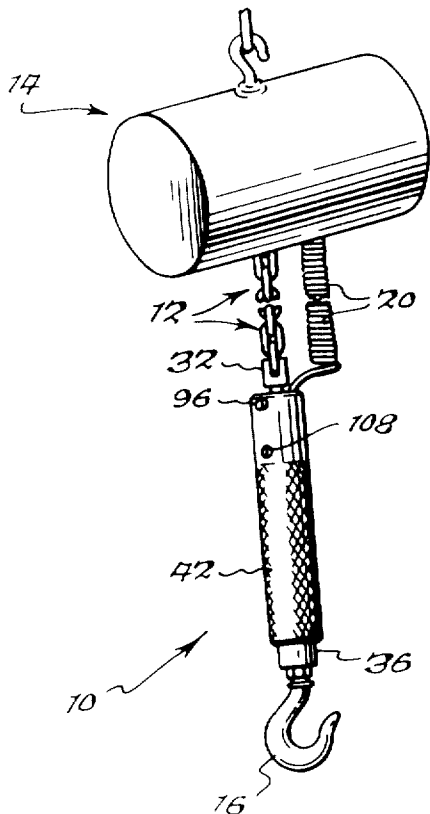
Primary Examiner—Robert J. Spar
Assistant Examiner—Kenneth Noland
Attorney, Agent, or Firm—Bean & Bean

[52] U.S. Cl. **254/168; 318/257**
 [51] Int. Cl.² **B66D 1/48**
 [58] Field of Search 254/168, 167, 172, 174,
 254/173 R, 186 R, 187 R, 150 R, 135 R,
 178; 294/82 AH; 318/257, 310; 91/390;
 175/27.5; 267/125; 60/413

[56] **References Cited**
 UNITED STATES PATENTS
 3,384,350 5/1968 Powell 254/168

[57] **ABSTRACT**
 A load lift cable mounted control for a hoist, which is manually operable to effect raising and lowering of a load lifting device suspended therefrom and which allows a suspended load to be moved vertically by application of relatively light manual pressure directly to such load.

15 Claims, 14 Drawing Figures



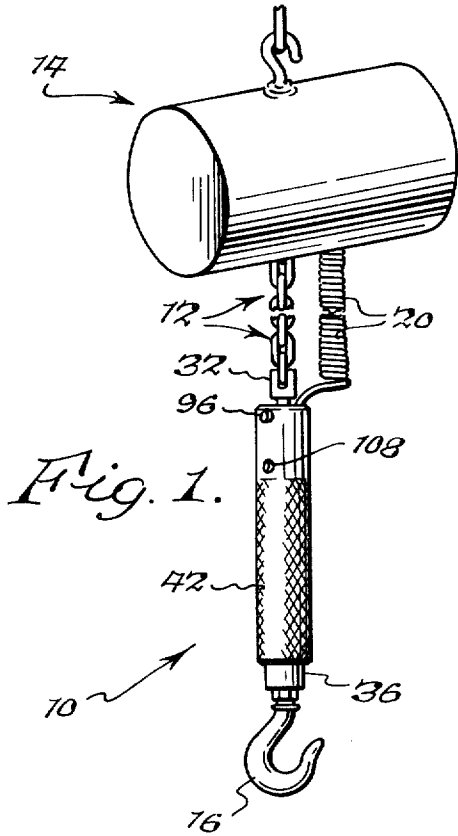


Fig. 1.

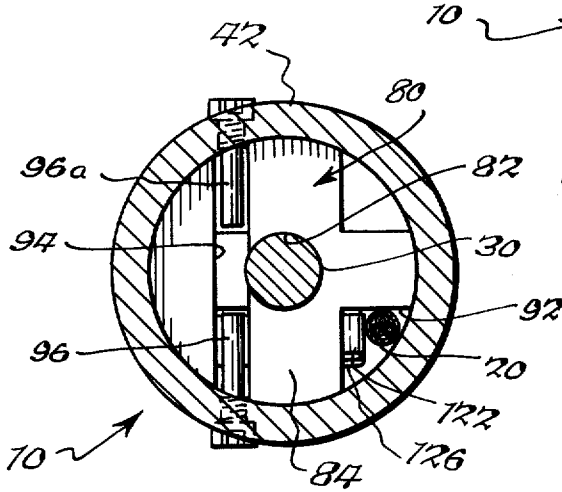


Fig. 2a.

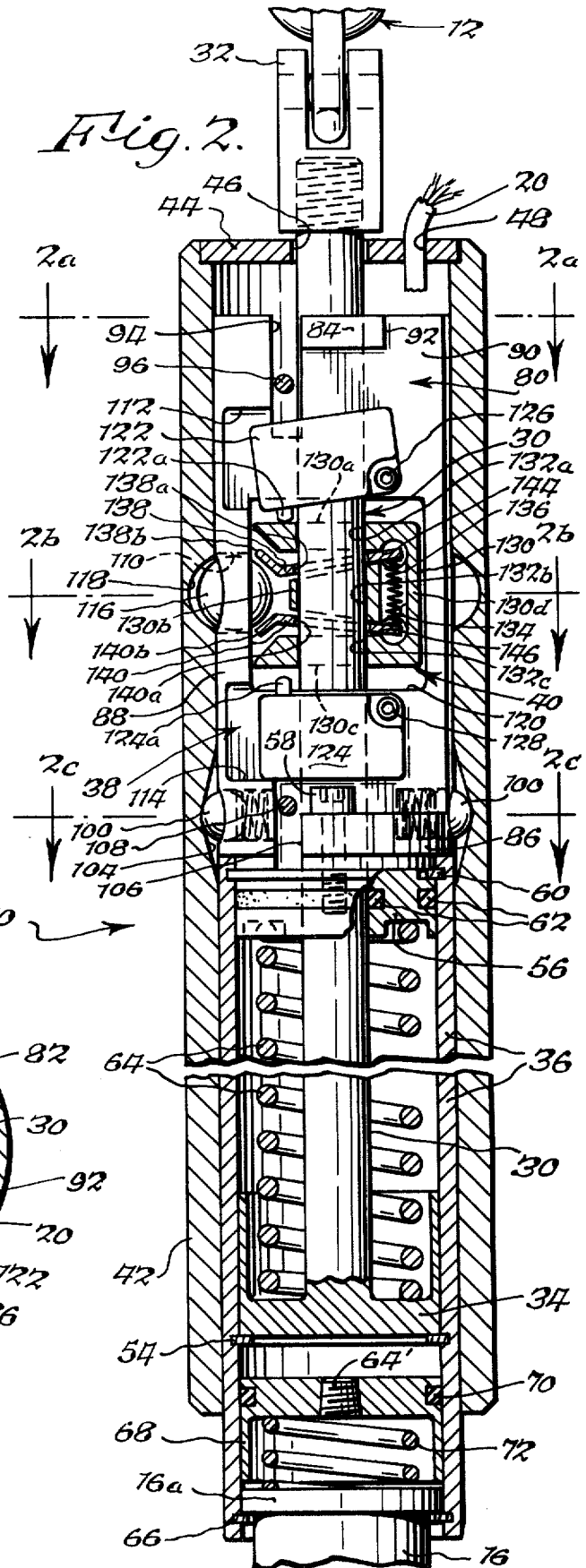


Fig. 2.

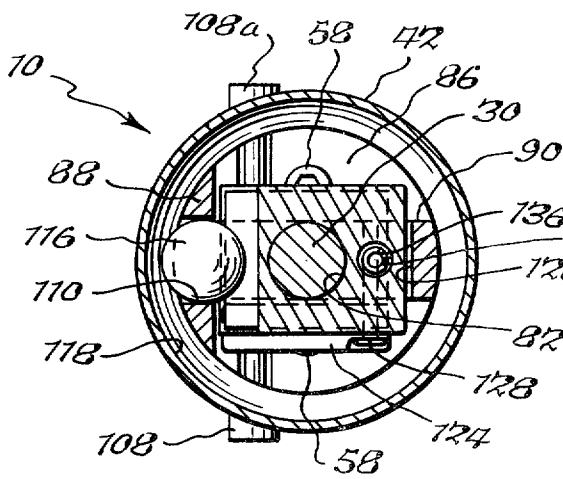


Fig. 2b.

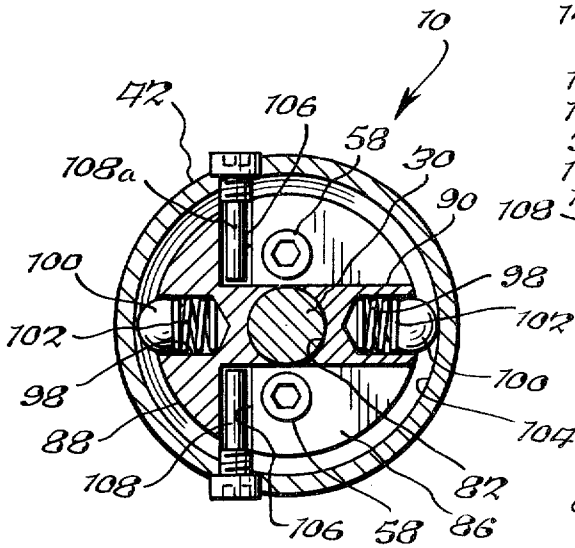


Fig. 2c.

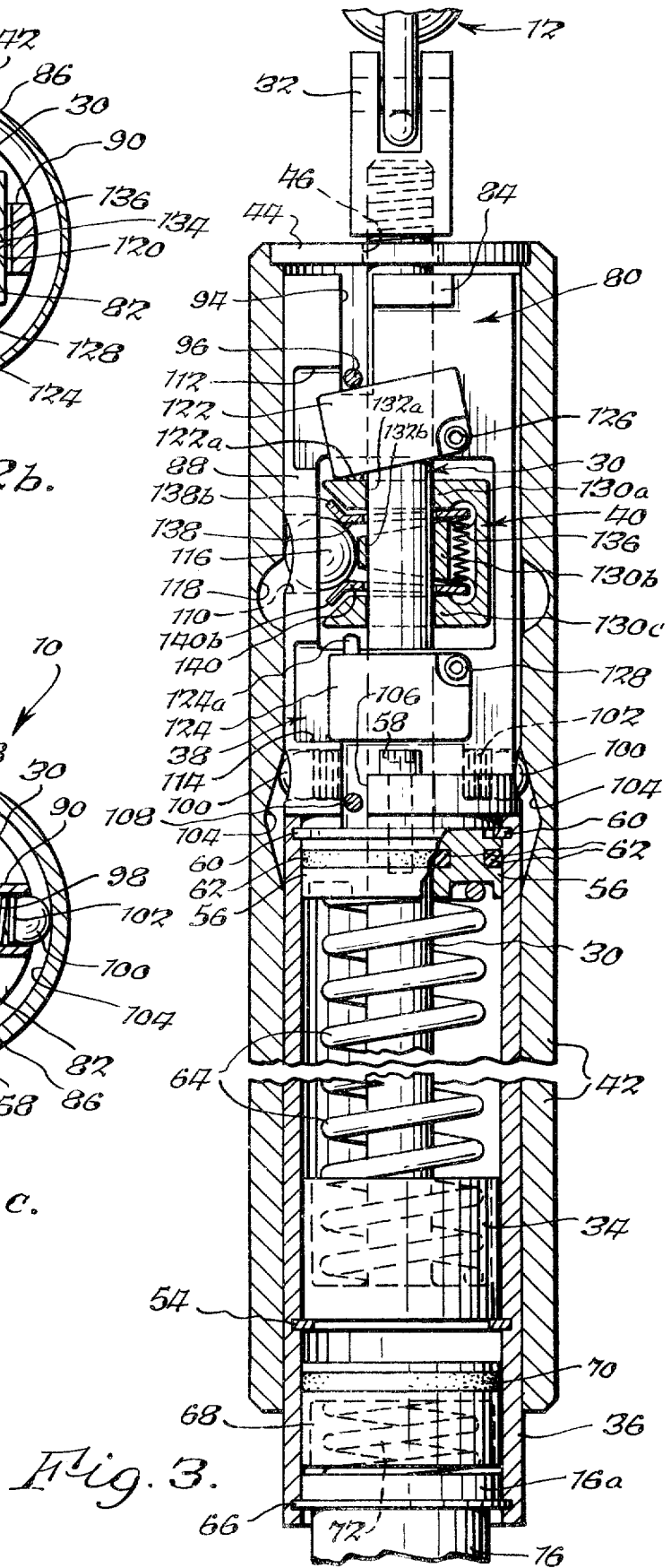
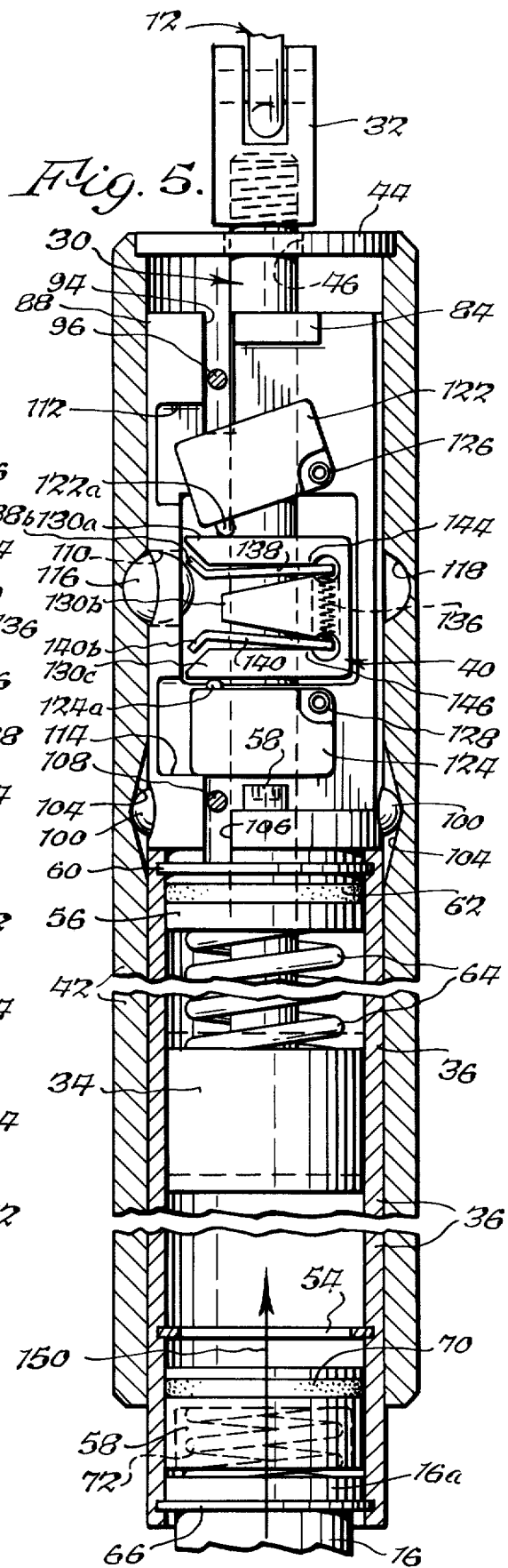
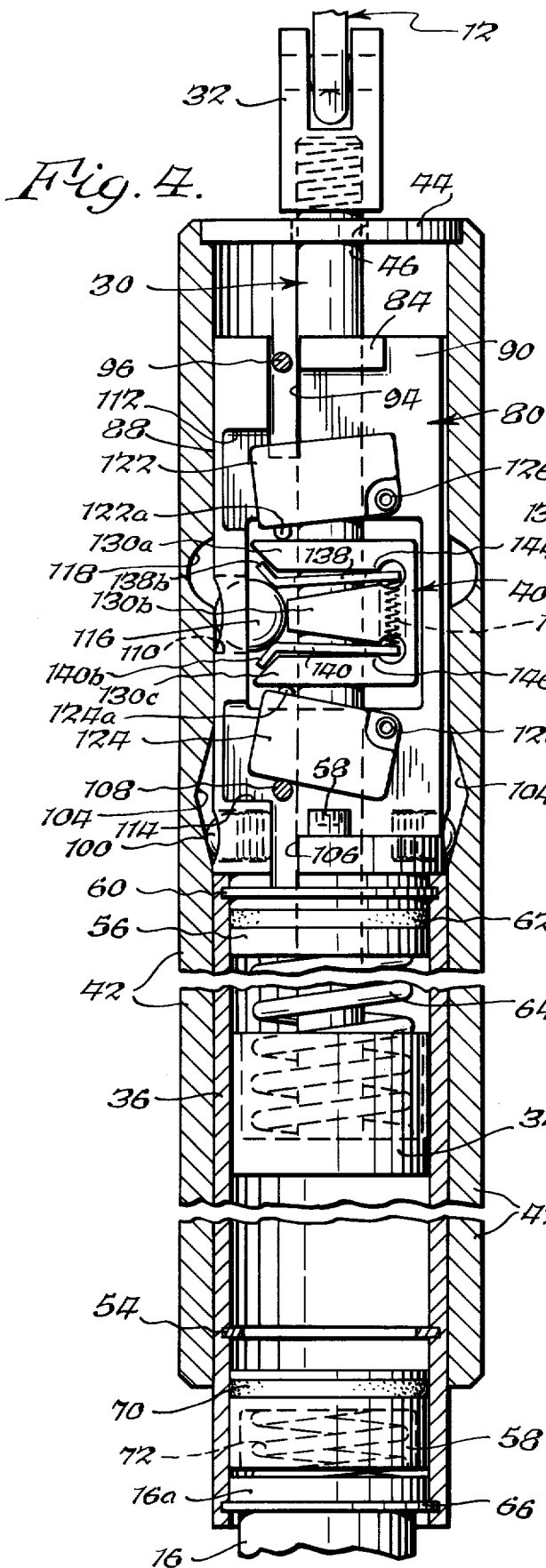


Fig. 3.



LOAD BALANCER AND HOIST CONTROL

BACKGROUND OF THE INVENTION

Heretofore, various types of load lift chain or cable mounted, manual controls have been employed to control normal load lifting and lowering operations of both electric and fluid powered hoists, as for instance those disclosed in U.S. Pat. Nos. 3,554,091 and 3,755,725.

Moreover, fluid operated hoists have for some time been provided with a hoist cable associated load balancing device, which permits an operator to vertically position a heavy load by the exertion of a relatively small manual force thereto, and as by way of example reference is made to U.S. Pat. Nos. 3,384,350 and 3,552,720. In prior constructions of this type, non-balancing lowering and raising operations of the hoist may be controlled by a separate, manually operative control.

SUMMARY OF THE INVENTION

The present invention is directed towards a load lift chain or cable mounted control attachment adapted to both control normal lifting and lowering operations of and provide load balancing capabilities for an otherwise conventional hoist of the type having actuating means for effecting raising and lowering of a load lift hook attachable to the hoist via a load lift chain or cable.

The control attachment of the present invention includes a first part, which is attachable to the load lift chain; a second part, which is attachable to the load lift hook; a preloaded spring device for supporting the second part on the first part while permitting relative movement therebetween in response to the application to the hook of the load to be lifted by the hoist and the application of a vertically directed manually applied force to the load; a pair of electrical switches operable for controlling operation of the hoist actuating means; and a manual control member supported by one of the parts for manually induced movements relative thereto from an inoperative position alternately into vertically spaced raising control and lowering control positions. The control member operates one or the other of the switches when moved from its inoperative position into either of its control positions, whereby to provide control for normal hoist raising and lowering operations. The switches may also be operated to effect desired vertical displacements of a balanced load by applying a small vertically directed manual force to the load when the control member is in its inoperative position. Thus, by means of the present invention, an operator can control vertical movements of a load either by manually operating the control member or by the application of relatively light vertically directed forces directly to the load.

The present invention will be described with particular reference to its use with electric hoists in that it provides therefor a degree of versatility not heretofore possible. However, the present control attachment may be used to control fluid operated hoists by employing the output signal from its electrical switches to control operation of the fluid flow control valves typically incorporated within such hoists, or by merely replacing such electrical switches with fluid switches in the form of air or hydraulic control valves or the like.

DRAWINGS

The nature and mode of operation of the present invention will now be more fully described in the following detailed description taken with the accompanying drawings wherein:

FIG. 1 is a perspective view of a preferred form of the control of the present invention associated with a hoist;

FIG. 2 is a vertical sectional view taken through the control showing the control in a neutral or non-operative condition;

FIG. 2a is a sectional view taken generally along line 2a—2a in FIG. 2;

FIG. 2b is a sectional view taken generally along the line 2b—2b in FIG. 2;

FIG. 2c is a sectional view taken generally along the line 2c—2c in FIG. 2;

FIG. 3 is a view similar to FIG. 2, but showing the control in unloaded-manually operated lower condition;

FIG. 4 is a view similar to FIG. 2, but showing the control in a loaded-manually operated raising condition;

FIG. 5 is a view similar to FIG. 2, but showing the control in a loaded-load manipulated raising condition;

FIG. 6 is a partial vertical sectional view similar to FIG. 2, but showing a modified construction;

FIG. 6a is a partial vertical sectional view taken generally along the line 6—6 in FIG. 6;

FIG. 7 is a partial vertical sectional view similar to FIG. 2, but showing another modified construction;

FIG. 7a is a partial sectional view taken generally along the line 7—7 in FIG. 7;

FIG. 8 is a partial vertical sectional view similar to FIG. 2, but showing a further modified construction; and

FIG. 8a is a partial sectional view taken generally along line 8—8 in FIG. 8.

DETAILED DESCRIPTION

Reference is now made particularly to FIG. 1, wherein the hoist control attachment of the present invention is generally designated as 10 and shown for purposes of illustration as being connected to the load lift chain 12 of an electric hoist 14 and a load attachment or suspension hook 16; an electric cable 20 serving to connect control 10 to the hoist motor directional control circuit, not shown. Cable 20 may be "plugged" into either control 10 or hoist 14 or both in order to facilitate attachment and removal of the control.

Reference is now made to FIG. 2 wherein control 10 is shown as generally including a suspension rod 30, which has its upper end removably attached, as by fitting 32, to lift chain 12 and has its lower end terminating in a damper piston head 34; an inner sleeve or fluid damping cylinder 36, which is dimensioned to slideably receive piston head 34 and has its lower end removably connected or attached to hook 16; a control switch tower assembly 38, which has its lower end attached to inner sleeve 36; a switch operator 40 carried by suspension rod 30; and an outer sleeve or manual control member 42, which is dimensioned to slideably receive inner sleeve 36 and switch tower assembly 38. Further, the upper end of outer sleeve 42 is provided with a closure disc 44 in order to protect assembly 38 from dirt or other foreign objects; such disc being formed with an aperture 46 for slideably receiving suspension rod 30 and an aperture 48 for receiving electrical cable 20.

3

Piston head 34 is located within inner sleeve 36 by an intermediate stop ring 54 and by a rod packing or annular gland 56; the latter being affixed to switch tower assembly 38 by bolts 58 and being in turn located relative to the upper end of the inner sleeve by an upper snap ring 60. Gland 56 may be fluid sealed relative to both suspension rod 30 and inner sleeve 36 by any suitable means, such as O-rings 62. Resilient means, such as a coil type compression spring 64, may be arranged intermediate gland 56 and piston head 34 and preloaded in order to normally bias the latter into engagement with intermediate snap ring 54. Thus, spring 64 serves to support inner sleeve 36 and tower assembly 38 on piston head 34, while permitting relative movement therebetween in the manner to be described.

Suitable means, such as lower snap ring 66, is employed to releasably retain the enlarged head portion 16a of hook 16 within the lower end of inner sleeve 36. A cup-shaped volume compensating piston 68 is slideably received within the lower end of inner sleeve 36 above head portion 16a and suitably fluid sealed relative to the inner sleeve, as by an O-ring 70. Resilient means, such as a coil type compression spring 72 may be arranged intermediate hook head portion 16a and piston 68 and preloaded in order to bias the latter upwardly towards piston head 34. This serves to slightly pressurize damping liquid filling a cavity or chamber bounded by gland 56, piston head 68 and inner sleeve 36 in order to prevent entry of air thereinto. To facilitate assembly, piston 68 may be formed with a damping liquid fill opening having a threaded closure or plug 74. The fit between piston 34 and inner sleeve 36 permits controlled leakage of damping liquid across piston head 34 for the purpose of damping momentary accelerations and decelerations of piston head 34 and its associated rod 30, due to starting and stopping of hoist 14. If desired, other damping mechanisms may be employed, eg. the provision of valve controlled flow passages through the piston head.

Switch tower assembly 38 is best shown in FIGS. 2-2c as including a cylindrical metal mounting block 80, which is formed with an axially extending bore opening 82 for slideably receiving rod 30 and which is cut away to define top and bottom guide portions 84 and 86, respectively, and an intermediate "T" shaped portion having vertically extending side and transverse ribs or webs 88 and 90, respectively.

Top guide portion 84 is shown in FIGS. 2 and 2a as being cut away, as at 92, so as to freely receive cable 20. Also, in FIGS. 2 and 2a, top guide portion 84 and transverse rib 90 are shown as being cut away, as at 94, so as to define vertically extending slots for receiving locating-operating pin 96 and locating pin 96a, which are carried by outer sleeve 42.

Bottom portion 86 is best shown in FIGS. 2 and 2c as having radial bores 98, which are dimensioned to receive centering balls 100 and coil spring devices 102. As will be apparent from the drawings, spring devices 102 normally serve to bias their associated centering balls 100 radially outwardly for receipt within an annular, V-shaped, centering groove 104 formed on the inner surface of outer sleeve 42; balls 100 and the inclined side walls of groove 104 serving to normally retain outer sleeve 42 in its centered or inoperative position illustrated in FIG. 2. Springs 102 accommodate for depressions of centering balls 100 occasioned by manually induced displacements of outer sleeve 42 into its lower or hook lowering and upper or hook raising posi-

4

tions illustrated in FIGS. 3 and 4, respectively; such springs serving to automatically return the outer sleeve to its inoperative position when the operator's hand is released from the outer sleeve. Bottom guide portion 86 is also cut away as at 106 so as to define vertically extending guide slots for receiving locating-operating pin 108 and locating pin 108a, which are carried by outer sleeve 42.

Side rib 88 is formed with a radially extending through bore opening 110 and a pair of vertically spaced stop surfaces 112 and 114. Bore opening 110 is dimensioned to guidingly receive an unlocking ball 116 and is adapted to be disposed in radial alignment with an annular groove 118 or recess formed on the inner surface of outer sleeve 42 whenever the outer sleeve is disposed in its inoperative position.

Transverse rib 90, which is cut away to define an opening 120 dimensioned to freely receive switch operator 40, serves to mount an upper or load hook lowering switch 122 and a lower or load hook lifting switch 124, which are mounted by pins 126 and 128, respectively, for independent pivotal movements about vertically spaced parallel pivot axes. While switches 122 and 124 may be of any conventional construction, they are illustrated as being in the form of "microswitches" having depressable plunger operators 122a and 124a, which are normally biased into their extended or inoperative positions illustrated in FIG. 2 by internal spring mechanisms, not shown. It will be understood that although the spring force of the internal spring mechanisms of switches 122 and 124 is normally quite small, it is nonetheless sufficient to permit plunger operator 122a to support the weight of switch 122 without being depressed into its switch operating condition. Also, it will be appreciated that switches 122 and 124 may be chosen to provide a variable speed output signal, rather than a simple "on-off" signal. Switches 122 and 124 would of course be connected with the motor control circuit of hoist 14 by cable 20.

Switch operator 40 is best shown in FIGS. 2 and 2b as being in the form of an "E" shaped member 130 having horizontally disposed upper, intermediate and lower leg portions 130a, 130b and 130c, respectively, and a vertically disposed connecting portion 130d. Leg portions 130a, 130b and 130c are formed with vertically aligned through openings 132a, 132b and 132c, which are dimensioned to slideably receive suspension rod 30; intermediate leg portion 130b also being formed with a vertically extending opening 134 dimensioned to receive a compression type coil spring 136. Coil spring 136 is arranged to bear adjacent its upper and lower ends on upper and lower locking plates 138 and 140, which are arranged above and below intermediate leg portion 130b. Locking plates 138 and 140 are formed with through openings 138a and 140a dimensioned to loosely receive suspension rod 30 are deformed to define relatively diverging, lock releasing cam edge portions 138b and 140b. It will be understood that locking plates 138 and 140 are maintained in bearing engagement with pivot edge surfaces 144 and 146 defined by leg portions 130a and 130c, respectively, by coil spring 136 such that the locking plates are normally biased towards one another for locking engagement with suspension rod 30, as shown in FIG. 2. However, when outer sleeve 42 is displaced in the manner illustrated in FIGS. 3 and 4, unlocking ball 116 is forced thereby to move inwardly through bore opening 110 into camming engagement with edge portions 138b and 140b,

5

thereby to pivot locking plates 138 and 140 away from one another and out of locking engagement with suspension rod 30 against the return bias of coil spring 136. It will be understood that the above described construction is such that when unlocking ball 116 is forced into engagement with edge portions 138b and 140b for the purpose of freeing switch operator 40 for sliding movements relative to suspension rod 30, the switch operator is nonetheless essentially constrained from vertical movements relative to control switch tower assembly 38.

The mode of operation of control 10 will now be described by first making reference to FIG. 2, wherein the control is shown as being in an inoperative condition and with no load being applied to hook 16. Preferably, spring 64 is sufficiently pre-loaded to permit it to support the weight of remaining elements of control 10, as well as unloaded hook 16, on damper piston head 34 without being deformed from its maximum extended position shown in FIG. 2, wherein piston head 34 is bottomed out on or engaged by intermediate snap ring 54. Also in this inoperative condition, balls 100 are vertically "centered" within slot 104 by spring devices 102, thereby to retain outer sleeve 42 in its centered or inoperative position wherein annular slot 118 is disposed in radial alignment with bore opening 110. When thus aligned, slot 118 may freely receive unlocking ball 116, which is pushed radially outwardly through bore opening 110 by edge portions 138b and 140b as a result of coil spring 136 tending to bias locking plates 138 and 140 into friction locking or latching engagement with suspension rod 30. Also in this inoperative condition, pin 108 is spaced vertically below stop surface 114 thereby to permit switch 124 to rest on the latter, and pin 96 is spaced vertically above switch 122 with the latter being supported by engagement of its plunger 122a with upper leg member 130a.

Reference is now made to FIG. 3, which shows control 10 in its manually operated hook unloaded lowering condition, which is produced when an operator grips and pulls down on outer sleeve 42 for the purpose of lowering hook 16 to a position where it may be conveniently attached to a load to be lifted. At the initiation of downward movement of sleeve 42, groove 118 is moved downwardly from alignment with bore opening 110 with the result that the unlocking ball 116 is forced to move inwardly through bore opening 110 into camming engagement with edge portions 138b and 140b, such that the locking plates are pivoted apart from locking engagement with suspension rod 30 against the bias of spring 136. Although switch operator 40 is thus released from latching engagement with suspension rod 30, no relative movement occurs therebetween since hook 16 remains in an unloaded condition and unlocking ball 116 serves to retain the switch operator essentially centered within opening 120. Thereafter, locating-operating pin 96 is brought into engagement with switch 122 causing it to pivot downwardly about pin 126 to effect depression of plunger 122a into its switch operating condition. Upon operation of switch 122, the hoist motor control circuit is energized to effect lowering of chain 12. When the operator releases his grip on outer sleeve 42, the latter is automatically returned to its inoperative position with the result that the circuit through switch 122 is opened and switch operator 40 is again locked to suspension rod 30.

6

After attaching hook 16 to the load to be lifted, the operator would grip and pull upwardly on outer sleeve 42 for the purpose of raising the load to a desired height. Referring to FIG. 4, it will be understood that at the initiation of this upward movement of sleeve 42, groove 118 is moved upwardly from alignment with bore opening 110 with the result that the unlocking ball 116 is again forced to move into camming engagement with edge portions 138b and 140b to release switch operator 40 from locking engagement with suspension rod 30, while at the same time serving to retain the switch operator centrally located within opening 120. Thereafter, locating-operating pin 108 is brought into engagement with switch 124 causing it to pivot upwardly about pivot pin 128 to effect engagement of its plunger operator 124a with lower leg member 130c and subsequent depression of the plunger operator into its switch operating condition. Upon operation of switch 124, the hoist motor control circuit is energized to effect raising of chain 12; the now loaded hook remaining stationary until spring 64 has been compressed to an extent sufficient to balance the load applied thereto, as indicated in FIG. 4. When the operator releases his grip on outer sleeve 42, the latter is automatically returned to its inoperative position with the result that the circuit through switch 124 is opened and switch operator 40 is again locked to suspension rod 30. It will be noted that relative movement occurs between suspension rod 30 and switch operator 40 at the initiation of the above described loaded hook or load lifting operation, such that when the switch operator is again locked to the suspension rod it has been displaced lengthwise thereof from the position illustrated in FIG. 2.

If desired, the operator may continue to raise or lower the load by manual manipulations of outer sleeve 42. However, the present construction also permits the operator to raise or lower the load by the application of a relatively light or small lifting or lowering force or pressure directly thereto. This alternative mode of operation of control 10 will be more clearly understood by referring to FIG. 5, wherein arrow 150 represents an operator applied lifting force, which is applied directly to the load, and serves to partially reduce the value of the load initially balanced by spring 64. As a result, spring 64 is permitted to expand until it again balances the load minus the lifting force. During expansion of spring 64, inner sleeve 36 moves vertically relative to the stationary suspension rod 30 with the result that lower stop surface 114 drives plunger operator 124a upwardly into depressing engagement with lower leg portion 130c of switch operator 40, whereupon the hoist is operated to raise the load. Upward movement of the load will continue until the lifting force is removed, whereupon spring 64 will again be compressed and plunger 124a automatically moved downwardly from engagement with switch operator 40. The phantom and full line positions of piston head 34 illustrated in FIG. 5 merely represent the compressed and expanded conditions of spring 64 discussed above.

In a like manner, the load may be lowered by the application of a downwardly directed force to the load; this serving to slightly increase the value of the load initially balanced by spring 64 with the result that the spring is further compressed. As this occurs, stop surface 112 serves to drive switch 122 downwardly while plunger operator 122a is maintained stationary due to its initial engagement with switch operator upper leg portion 130a, whereby to effect depression of the

plunger operator. Then the operator applied load is removed, spring 64 is permitted to expand and stop surface 112 automatically moves upwardly to permit plunger 122a to extend into its normal projecting or non-operating condition.

While stop surfaces 112 and 114 are preferably employed to limit opposing rotations of switches 122 and 124 during balancing operations of the type disclosed above with reference to FIG. 5, it will be understood that pins 96 and 108 may be employed to perform this additional function.

The amount of load applied force required to activate the hoist will depend on the characteristics of spring 64 and the extent of motion required to actuate switches 122 and 124. The control would preferably be designed such that operating force will not exceed 5% of the load carried by hook 16. It is therefore difficult to build a control unit with a range of more than about 300 pounds. However, it is feasible to build units having different ranges, eg. 20-300 or 300-600 or 600-900 pounds capacity. This limitation as to capacity is not a great disadvantage, since a given unit will often be selected on the basis that it is to be employed in manipulating a given tool or other article of a constant known weight. Moreover, units of varying capacity ranges can be quickly interchanged to suit operating requirements.

Exemplary modifications of the preferred form of the present invention will now be described with reference to FIGS. 6-8a, wherein identical parts are identified by like numbers and modified parts are identified by like primed numbers.

A first modified form of the invention designated as 10a in FIGS. 6 and 6a structurally departs from the preferred form principally in the non-pivotal mounting of switches 122 and 124 directly on switch operator 40', as by fasteners 160; the upper and lower operator leg portions 130a' and 130c' being substantially enlarged for this purpose. Moreover, operator pins 96' and 108' for switches 122 and 124, respectively, may constitute single pins, which are end supported on sleeve 42'; the guiding function of such pins being dispensed with by mounting a guide pin 162 on assembly 38' and providing a guide pin receiving slot 164 in sleeve 42'. This construction simplifies assembly 38' from the standpoint that it now includes only bottom guide portion 86' and side rib 88'.

The manner of operation of control attachment 10a is identical to that of attachment 10 from the standpoint that manually induced vertical movements of sleeve 42' from its illustrated inoperatively position alternately into raising and lowering control positions, not shown, as well as the application of manual upwardly and downwardly directed force to a suspended load, serves to alternately operate switches 124 and 122, respectively.

Another modification of the present invention designated as 10b in FIGS. 7 and 7a structurally departs from the preferred form principally in the non-pivotal mounting of switches 122 and 124 directly on sleeve 42'', as by a mounting-spacer bar 170 and fasteners 172. Moreover in this construction, operating plungers 122a and 124a are arranged for engagement with the upper and lower operator leg portions 130a and 130c in order to avoid the use of operator pins. Otherwise, this construction employs the simplified construction of assembly 38' and guide arrangement described in connection with FIGS. 6 and 6a.

The mode of operation of control attachment 10b is identical to that of controls 10 and 10a.

A further form of the present invention designated as 10c in FIGS. 8 and 8a is essentially an inverted form of control attachment 10, wherein parts are reversed. Specifically, tower assembly 38'' and its associated inner sleeve, not shown, are fixed to the lift chain and suspension rod 30 has its lower end fixed to the load lift hook and its upper end fixed to a damping piston head arranged with the inner sleeve above a supporting spring. This construction differs in that the transverse or switch mounting rib 90' of assembly 38'' is offset from the centerline of the attachment and stop surface 112' is defined by a plate 178 fixed to the lower end of side rib 88'. This construction also differs in that operator plates or fingers 180 and 182 are constrained for pivotal movements with switches 122 and 124 by pins 126 and 128 and fasteners 184 and 186, respectively, and cooperate with operator pins 96' and 108' to force the plunger operators of their associated switches into depressing engagement with inverted operator leg portions 130a and 130c, when sleeve 42' is displaced from its inoperative position. Stop surfaces 112' and 114 (or if properly arranged pins 96' and 108') cooperate with operator leg portions 130a and 130c to effect operation of switches 122 and 124, when downwardly and upwardly directed manual forces are applied to a suspended load. Control 10c may have a pin-slot guide similar to that shown in FIGS. 6 and 7.

Moreover, while not specifically illustrated, it is anticipated that the present control may be provided with an additional pair of control switches, wherein one pair is disposed to be actuated upon movements of the control member or outer sleeve and the other pair is disposed to be actuated upon relative movements between parts occasioned by manually applied forces to the load, thereby providing a two speed hoist operating capability.

It will be noted that in all disclosed forms of the control attachment, the manual control member cooperates with the switch operator to effect operation of switches 122 and 124 when the former is moved into either of its control positions, regardless of whether such switches are mounted on the tower assembly, the control member or the switch operator. In a like manner, the switch operator always cooperates with either the tower assembly or the control member to effect operation of the switches when a vertically directed manual force is applied to a suspended load when the control member is in its inoperative position.

It will be understood that, although control 10 has been described with specific reference to its use in controlling operation of a conventional electric hoist, it may also be employed with any other conventional lifting device used to raise and lower a load, such as a fluid drive hoist. In the latter case, fluid switches, including control valves, may be used in place of microswitches 122 and 124. Further, it will be understood that the term "lift chain" is used generically to include lift cables, and the term "hook" is used generically to include any device which may be conveniently employed to attach a "lift chain" to a load.

I claim:

1. A control attachment for remotely controlling and providing balancing capabilities for a hoist of the type having actuating means for effecting raising and lowering of a load lift hook attachable to said hoist via a load lift chain, said control attachment comprising in combi-

nation:

a first part attachable to said load lift chain;
a second part attachable to said load lift hook;

means for supporting said second part on said first part while permitting movement of said second part relative to said first part in response to the application to said hook of a load to be lifted by said hoist and the application of a vertically directed manually applied force to said load;

operating means releasably locked to one of said first and second parts for movement therewith relative to the other of said first and second parts;

switch means for controlling said hoist actuating means;

unlocking means carried by said other of said parts and being operable to release said operating means for movement relative to said one of said parts while constraining said operating means from movement relative to said other of said parts; and

a manual control member supported by said other of said parts for manually induced movements relative thereto from an inoperative position alternately into raising control and lowering control positions, said switch means being carried on one of said other of said parts, said operating means and said control member, said control member operating said unlocking means when moved from said inoperative position into either of said control positions, said control member cooperating with said operating means to effect operation of said switch means when said control member is moved into either of said control positions, and said operating means cooperating with one of said other of said parts and said control member to effect operation of said switch means when a vertically directed manual force is applied to said load while said control member is in said inoperative position.

2. A control attachment according to claim 1, wherein said means for supporting said second part includes means for damping movements between said parts.

3. A control attachment according to claim 1, wherein said one of said parts includes a vertically extending suspension rod having one end thereof attachable to one of said load lift chain and said load lift hook and having an opposite end thereof connected to a piston head; said other of said parts includes means defining a damping fluid filled chamber receiving said piston head for relative vertical sliding movements intermediate vertically spaced ends of said chamber, relative movements of said piston head within said chamber being dampened by flow of damping fluid across said piston head; and said means for supporting said second part on said first part includes a spring device arranged within said chamber intermediate said piston head and one of said vertically spaced ends of said chamber.

4. A control attachment according to claim 1, wherein said switch means is carried by said second part.

5. A control attachment according to claim 1, wherein said switch means is carried by said control member.

6. A control attachment to claim 1, wherein said switch means is carried by said operating means.

7. A control attachment according to claim 1, wherein said first part includes a suspension rod having its upper end attachable to said load lift chain and having its lower end connected to a piston head; said sec-

ond part includes a damping fluid filled chamber receiving said piston head for relative vertical sliding movements, relative movements of said piston head within said chamber being dampened by flow of damping fluid across said piston head; said means for supporting said second part on said first part includes a spring device arranged within said chamber intermediate said piston head and an upper end of said chamber; said second part additionally includes a tower assembly surrounding said suspension rod above said chamber; said operating means is supported by said suspension rod for sliding movements lengthwise thereof and includes resiliently deformable means for releasably locking said operating means to said suspension rod; said unlocking means is an unlocking ball carried within an opening defined by said tower assembly for essentially radial movement relative to said suspension rod into and out of releasing engagement with said operating means; and said control member is a sleeve slideably supported by said second part concentrically of said suspension rod, said control member and said tower assembly having means cooperating to normally bias said control member into said inoperative position vertically intermediate said control positions thereof, said control member having an inwardly opening recess arranged in alignment and adapted to partially receive said unlocking ball only when said control member is in said inoperative position, said control member when moved into either of said control positions forcing said unlocking ball radially inwardly towards said suspension rod into releasing engagement with said operating means.

8. A control attachment according to claim 7, wherein said tower assembly defines upper and lower stop surfaces; said switch means includes raising and lowering control electrical switches carried by said tower assembly for vertical pivotal movements about vertically spaced pivot axes disposed relatively below and above said operating means, respectively, each of said switches having a normally extended operating plunger depressable to effect actuation of its associated switch; and said control member carries upper and lower operating pins, said upper and lower operating pins cooperating with said operating means to effect depression of the plunger operator associated with said raising and lowering control switches upon movement of said control member from said intermediate position into said raising and lowering control positions, respectively, and said upper and lower stop surfaces cooperating with said operating means to effect depression of the plunger operator associated with said lowering and raising control switches upon the application of downwardly and upwardly directed manual force to said load, respectively, while said control member is in said inoperative position.

9. A control attachment according to claim 7, wherein said switch means includes raising and lowering control switches carried by said operating means, each of said switches having an operator engageable by said control member to effect operation thereof when said control member is moved into either of said control positions.

10. A control attachment according to claim 7, wherein said switch means includes raising and lowering control switches carried by said control member, each of said switches having an operator engageable by said operating means to effect operation thereof when said control member is moved into either of said con-

11

trol positions.

11. A control attachment according to claim 1, wherein said second part includes a suspension rod having its lower end attachable to said load lift hook and having its upper end connected to a piston head; said first part includes a damping fluid filled chamber receiving said piston head for relative vertical sliding movements, relative movements of said piston head within said chamber being dampened by flow of damping fluid across said piston head; said means for supporting said second part on said first part includes a spring device arranged within said chamber in engagement with said piston head; said first part additionally includes a tower assembly; said operating means is supported by said suspension rod for sliding movements lengthwise thereof and includes resiliently deformable means for releasably locking said operating means to said suspension rod; said unlocking means is an unlocking ball carried within an opening defined by said tower assembly for essentially radial movement relative to said suspension rod into and out of releasing engagement with said operating means; and said control member is a sleeve slidably supported by said first part concentrically of said suspension rod, said control member and said tower assembly having means cooperating to normally bias said control member into said inoperative position vertically intermediate said control positions thereof, said control member having an inwardly opening recess arranged in alignment and adapted to partially receive said unlocking ball only when said control member is in said inoperative position, said control member when moved into either of said control positions forcing said unlocking ball radially inwardly towards said suspension rod into releasing engagement with said operating means.

12. A control attachment for remotely controlling and providing balancing capabilities for a hoist of the type having actuating means for effecting raising and lowering of a load lift hook attachable to said hoist via a load lift chain, such control attachment comprising in combination:

- a first part attachable to said load lift chain;
- a second part attachable to said load lift hook;
- means for supporting said second part on said first part while permitting movement of said second part relative to said first part in response to the application to said hook of a load to be lifted by said hoist and the application of a vertically directed manually applied force to said load;
- hook raising and lowering control switches connectible to said hoist actuating means for controlling hook raising and lowering operations thereof;
- switch operating means releasably locked to one of said first and second parts for movement therewith relative to the other of said first and second parts;
- unlocking means carried by said other of said parts and being operable to selectively release said switch operating means from locking association with said one of said parts whereby to permit relative movement between said switch operating means and said one of said parts while constraining said switch operating means from movement relative to said other of said parts; and
- a manual control member supported on said other of said parts for manually induced movements from an inoperative position alternately into vertically spaced raising control and lowering control positions, said control member operating said unlock-

12

ing means when displaced from said inoperative position into either of said control positions, said control member cooperating with said switch operating means to effect operation of said raising and lowering control switches when moved into said raising and lowering control positions, respectively, and said switch operating means cooperating with one of said other of said parts and said control member to effect operation of said raising and lowering control switches when upwardly and downwardly directed manual forces, respectively are applied to said load while said control member is in said inoperative position thereof.

13. A control attachment according to claim 12, wherein said means for supporting said second part on said first part includes spring means, said spring means being preloaded to prevent relative movement between said parts in the absence of application of said load to said hook, and means are provided for damping said relative movement between said parts.

14. A control attachment for remotely controlling and providing balancing capabilities for a hoist of the type having actuating means for effecting raising and lowering of a load lift hook via a load lift chain, said control attachment comprising in combination:

- a first part attachable to said load lift chain;
- a second part attachable to said load lift hook;
- means for supporting said second part on said first part while permitting movement of said second part relative to said first part in response to the application to said hook of a load to be lifted by said hoist and the application of a vertically directed manually applied force to said load;
- switch means operable for effecting load lift hook raising and lowering operations of said hoist actuating means; and
- a manual control member supported by one of first part and said second part for manually induced movements relative thereto from an inoperative position alternately into raising control and lowering control positions for operating said switch means for effecting load lift hook raising and lowering operations of said hoist actuating means, and raising and lowering movements of said second part relative to said first part resulting from the application of vertically directed manual forces to said load while said control member is in said inoperative position operating said switch means for effecting load lift hook raising and lowering operations of said hoist actuating means, respectively.

15. A control attachment for remotely controlling and providing balancing capabilities for a hoist of the type having actuating means for effecting raising and lowering of a load lift hook attachable to said hoist via a load lift chain, said control attachment comprising in combination:

- a first part attachable to said load lift chain;
- a second part attachable to said load lift hook;
- means for supporting said second part on said first part while permitting vertical movement of said second part relative to said first part in response to the application to said hook of a load to be lifted by said hoist and the application of a vertically directed manually applied force to said load;
- operating means supported by one of said first and second parts for vertically directed sliding movements lengthwise thereof and including normally operable means for releasably locking said operat-

13

ing means against vertical sliding movement relative to said one of said parts;
 an unlocking means carried by the other of said first and second parts for movements between unlocking and locking positions relative to said operating means wherein said operating means is released for vertical sliding movement and locked against vertical sliding movement relative to said one of said parts, respectively, said unlocking means when in said unlocking position constraining said operating means from vertical movement relative to said other of said parts, said normally operable means tending to move said unlocking means into said locking position thereof;
 a manual control member supported by said other of said parts for manually induced vertical movements relative thereto between an inoperative position alternately into vertically spaced raising con-

5
10
15
20
25
30
35
40
45
50
55
60
65

14

trol and lowering control positions, said control member upon movement into either of said control positions forcing said unlocking means into said unlocking position thereof and releasing said unlocking means for movement into said locking position thereof when in said inoperative position; and switch means for controlling load lift hook raising and lowering operations of said hoist actuating means, said control member cooperating with said operating means to effect operation of said switch means when said control member is moved into either of said control positions, and said operating means cooperating with one of said other of said parts and said control member to effect operation of said switch means when a vertically directed manual force is applied to said load while said control member is in said inoperative position.

* * * * *