June 17, 1952 J. W. HUNT 2,601,144

LOAD-CARRYING SAFETY SWITCH

Filed June 22, 1948

FIG. 1

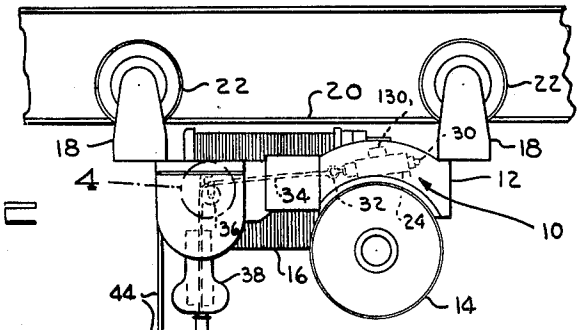


FIG. 2

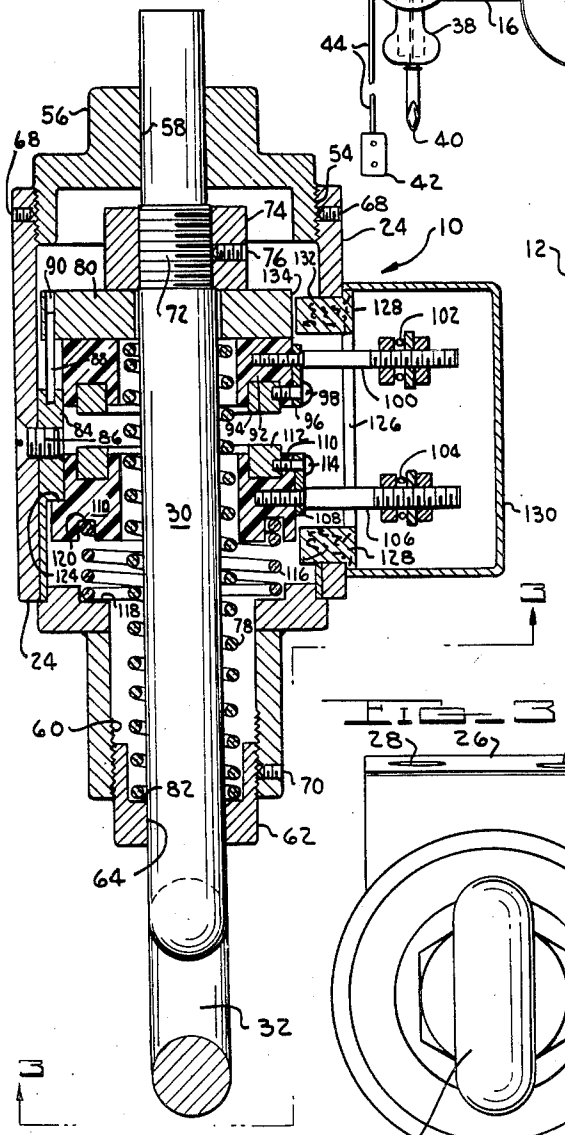


FIG. 4

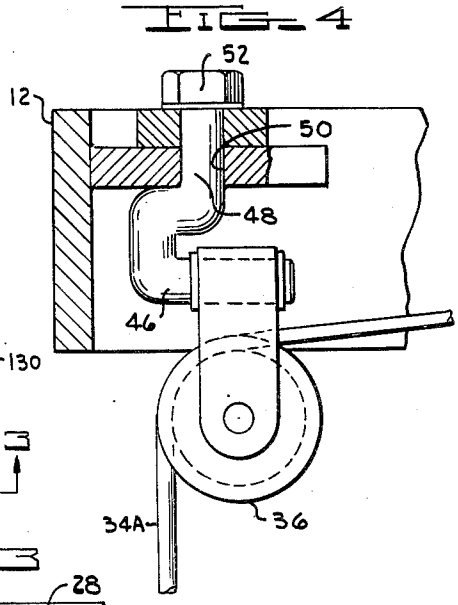
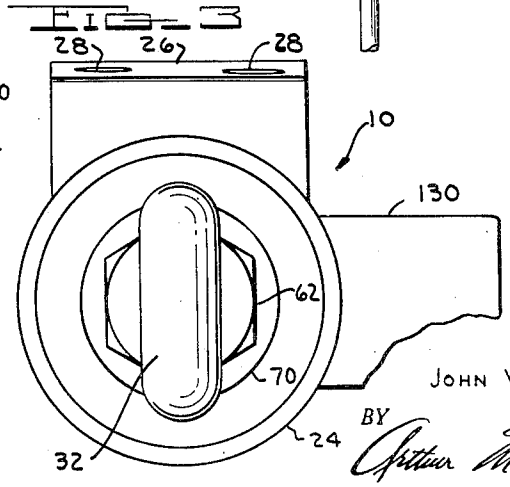


FIG. 3



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LOAD-CARRYING SAFETY SWITCH

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10 Claims. (Cl. 254—173)

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The present invention relates to an improved load-carrying safety switch adapted for supporting the fixed end of a hoist cable and for automatically stopping the downward movement of the hoist block when the tension in the cable falls below a predetermined minimum.

A major problem which has long confronted the safe and economical use of overhead material handling cable hoists has been the avoidance of slack and injury to the hoist cable resulting from continued unwinding of the cable winding drum after the hoist block has come to rest. In such instances, tangling of the cable or its cross threading or backward winding on the drum kinks or otherwise damages the cable and renders it unfit for further use.

Likewise serious accidental injury to personnel or equipment may result if the damage to the cable is not found in time. For these reasons, daily inspection of such hoist cables is required. It is often necessary to replace expensive cables daily on some operations. The resulting expense and loss of time and production has made an economical, reliable, and efficient device for avoiding such cable damage highly desirable.

Prior to the present invention, reliance has been placed entirely upon the skill and judgment of the hoist operator to stop downward motion of the hoists as required when tension on the cable relaxes. In many instances, it is difficult or impossible for the operator to see all sides of large objects being handled. Thus an edge of the load being handled may catch on fixed equipment out of view of the operator and temporarily restrict downward movement of the hoist block. If the cable winding drum continues to unwind, slack in the cable may result in the aforementioned injuries, or a serious accident may follow if the hook should become disengaged from the load and permit the latter to fall when the temporary obstruction to the load is overcome.

Accordingly, primary objects of the present invention are to provide a small, efficient, durable, and reliable load-carrying electric switch adapted for supporting the fixed end of a hoist cable and for operatively coupling with the hoist motor to stop the downward unwinding movement of the cable winding drum whenever the tension in the cable falls below a predetermined minimum, and thereby to prevent continued unwinding of the cable and kinking or other injury thereto which would otherwise result from its backward or cross winding, for example, on its drum.

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Another object is to provide such a load-carrying switch which relieves a large part of the responsibility for the safe operation of the hoist from the skill and judgment and reliability of the operator, thereby minimizing the cost of maintenance, the replacement of expensive cables, lost production time, and damage to stock and material.

Another object is to provide such a load-carrying switch which is simple and economical in construction, which is readily adjustable to operate with hoist blocks of different weights, which provides a swivel attachment with the fixed end of the cable to avoid twisting of the latter as the cable winds or unwinds from its drum, and which may be readily installed either on new or existing hoist equipment without reducing headroom clearance.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

The above and other objects are accomplished in a preferred embodiment of the present invention comprising a load-carrying housing for a rotatable and axially movable load-supporting shaft adapted at its forward end for attachment with the fixed end of a hoist cable in axial alignment therewith. When the present invention is installed with existing equipment, the housing is preferably adapted for rigid attachment within the mounting for the hoist motor and cable winding drum so as to support the fixed portion of the cable without materially interfering with its previous alignment with respect to the hoist block.

Load-supporting movement limiting means are provided between the housing and the shaft to limit the forward axial movement of the latter in the direction toward its attachment with the fixed end of the cable. When the cable is under load, the load is directed through the shaft to the movement limiting stop. Resilient means are provided between the housing and shaft for urging the latter rearward from its engagement with said movement limiting stop and toward a rest position when the tension on the cable falls below a predetermined minimum.

A pair of axially spaced electrical terminals are provided within the housing for resiliently electrically contacting each other when the load-supporting shaft moves to its forward limit. The terminals are separated to break the electrical

circuit therebetween when the shaft moves rearwardly to its rest position. A motor control circuit completed through the two terminals is operatively coupled with the hoist motor to stop the hoist lowering movement immediately upon breaking the circuit through said two terminals.

Load-carrying control switches of the character described are particularly advantageous where several independently operated cable hoists are used simultaneously, as for example at the corners of heavy machinery or equipment which is to be loaded in a precise position and alignment with respect to other equipment. In this situation, it is frequently impossible for the hoist operator to watch all corners of equipment being handled by the several independently operated hoists. Each hoist is preferably equipped with a load-carrying switch embodying the present invention, with each switch in series with the aforesaid motor control circuit. If the aforesaid circuit is interrupted by operation of any one of the load-carrying switches, that is, if the cable for any one hoist should be relieved of its load, the hoist lowering movement of each hoist motor will immediately stop, thereby serving notice to the hoist operator that the load has been improperly caught somewhere and is tending to cock or tilt. However, the downward movement is prevented before appreciable cocking or tilting of the load can occur.

Details of a preferred embodiment of the present invention as employed by way of example with one type of an overhead tram rail cable hoist are described below in connection with the drawings, wherein:

Fig. 1 is a fragmentary elevation showing an adaptation of the load-carrying switch of the present invention for use with an overhead cable hoist.

Fig. 2 is an enlarged longitudinal vertical midsection through the switch shown in Fig. 1.

Fig. 3 is a fragmentary end elevation taken in the direction of the arrows along the line 3—3 of Fig. 2.

Fig. 4 is a fragmentary view partly in section and showing an enlargement of the portion of the pulley mounting and cable support essentially within the dashed circle 4 of Fig. 1.

Before explaining the present invention in detail, it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

Fig. 1 shows the load-carrying switch indicated generally by the numeral **10** and secured within the mounting **12** which supports the motor **14** and cable winding drum **16** of an overhead tram rail cable hoist. The mounting **12** is carried by the carriage **18** which rides along the rail **20** on the wheels **22**.

The switch **10** is enclosed within a load-supporting housing **24**, Fig. 2, which in turn provides a mounting pad **26**, Fig. 3, and is rigidly secured to a side of the mounting **12**, as for example by bolts passing through the bolt holes **28** of the pad **26**. The switch **10** also provides the rotatable and axially movable load-supporting shaft **30** having the eye loop **32** at its forward end and adapted for attachment with the fixed end of the hoist cable **34**, Fig. 1. The latter passes from its attachment with the eye **32** around the pulley **36**, Fig. 4, is threaded through the pulley of the hoist block **38** in a conventional manner, and is then wound on the cable winding drum **16** which reels the cable **34** in or out in accordance with operation of the motor **14**.

The hoist block **38** carries the depending load-supporting hook **40** to which is secured the load to be handled. A conventional motor control switch **42** on the end of a flexible cable **44** controls the direction of rotation of the motor **14** for selectively raising or lowering the block **38** and hook **40**. As indicated in Fig. 4, the pulley **36** is supported from a hook **46** having an upright screw-threaded shaft **48** which passes through the bolt hole **50** in the mounting **12** and is retained in place by the nut **52**.

In the present instance, the switch **10** is adapted for use with an overhead tram rail hoist which conventionally provides bolt means within the bolt hole **50** for rigidly supporting the fixed end of the cable **34**. By virtue of the present construction, the conventional supporting means for the fixed end of the cable **34** may be removed from the bolt hole **50** and replaced by the hook means **46—48** and pulley **36** without sacrificing the headroom clearance formerly permitted for the hoist block **38**. The hook shaft **48** is then supported within the bolt hole **50**, so as to locate the pulley **36** as required to support the depending portion **34A** of the cable **34**, Fig. 4, in the exact alignment with respect to the pulley block **38** which is conventionally maintained when the fixed end of the cable **34** is supported by bolt means within the bolt hole **50**.

In order that the shaft **30** will be readily responsive to and axially movable in accordance with the tension in the cable **34**, it is important to maintain the axis of the shaft **30** in coaxial alignment with the fixed end of the hoist cable **34**. Likewise, in order to use the available space within the mounting **12** for the switch **10** with the type of hoist construction shown, the axis of the shaft **30** is maintained at a slight angle with respect to both the horizontal and vertical axial planes of the carriage **18**. The proper alignment of the shaft **30**, as indicated in Fig. 1, is maintained by the proper angular disposition of the mounting pad **26**. Accordingly, the circular bolt holes **28** within the pad **26** appear as thin ellipses in the end view, Fig. 3.

Obviously, in certain installations where there is adequate headroom clearance for the block **38**, the pulley **36** may be eliminated by disposing the switch **10** essentially vertically, as indicated in Fig. 2, with the eye **32** secured directly to the depending cable portion **34A**. In this situation the mounting pad **26** will preferably be replaced by a universal-type mounting to permit a swivel movement of the switch **10** in accordance with changing angles of the cable portion **34A** as the block **38** raises and lowers.

Referring to Fig. 2 for details of the load-supporting switch construction, the rear end of the housing **24** is internally threaded at **54** to receive the externally threaded bushing **56** having the bearing surface **58** for slidably and rotatably supporting the rear extension of the shaft **30**. Similarly, the forward portion of the housing **24** is internally threaded at **60** to receive the externally threaded bushing **62** which provides the bearing surface **64** for rotatably and slidably supporting the forward extension of the shaft **30**. Setscrews **68** and **70** secure the bushings **56** and **62** respectively in their adjusted positions.

Near the rear extension of the shaft **30** is the

threaded portion 72 for the thrust transfer nut 74 which is locked in place by the setscrew 76. Spring pressed against the rearward face of the nut 74 by the rearward end of the coaxial coil spring 78 is the concentric annular load-receiving plate 80 adapted to receive the forward thrust of the shaft 30 from the nut 74. The forward end of the spring 78 rests against the axially adjustable spring receiving shoulder 82 provided therefor by the bushing 62. When the shaft 30 is not subject to the forward thrust of the load on the cable 34, it is resiliently held by the spring 78 at the rest position indicated in Fig. 2.

An essentially annular movement limiting stop 84 is secured concentrically within the housing 24 by a plurality of bolts 86 and sustains the load of the plate 80 when abutted thereby upon forward movement of the shaft 30 against the resiliency of the coil spring 78. Rotation of the plate 80 with the shaft 30 is prevented by the pin 88 projecting rearwardly from the stop 84 and parallel to the axis of the shaft 30. The pin 88 is slidable within the opening 90 provided therefor within the plate 80.

The forward face of the plate 80 carries the coaxial annular ring 92 of electrical insulating material. Projecting forward from the insulating ring 92 and axially movable therewith is the coaxial electrical ring terminal 94 which is secured in place and electrically connected with the connector bar 96 by the electrically conducting screw 98. The bar 96 is in electrical contact with the terminal post 100 which is screw-threaded at its lower end into the insulating ring 92 and is conventionally connected at its upper end to one end of the lead 102 of an electric motor control circuit, not shown.

The other lead 104 of the motor control circuit is conventionally connected with the upper end of the terminal post 106 having its lower end in electrical contact with and screw-threaded through the connector 108 and into the annular electrical insulating ring 110. Similar to and concentric with the terminal 94, an electrical ring terminal 112 projects rearwardly from the face of the insulating ring 110 and is electrically connected with the connector 108 by the electrical conducting screw 114. Upon forward movement of the shaft 30 against the resiliency of the spring 78, the terminals 94 and 112 electrically contact each other to close the aforesaid motor control circuit.

The motor control circuit completed through the terminals 94 and 112 is operatively connected with the hoist motor circuit so as to prevent downward movement of the block 38 when the terminals 94 and 112 are separated, and to permit downward movement of the hoist block 38, as selectively determined by the control switch 42, when the terminals 94 and 112 are in contact with each other. Actuation of the hoist motor 14 for upward movement of the block 38 is in no way effected, regardless whether the terminals 94 and 112 are in contact or not. The electrical details of many types of circuits which will prevent downward actuation of the hoist motor 14 upon separation of the terminals 94 and 112, without interfering with its upward actuation, are well known to those skilled in this particular art and are accordingly not described herein.

In order to prevent the load on the fixed end of the cable 34 from being transmitted through the shaft 30 to the terminals 94 and 112, the latter terminal is resiliently held in position by a light coil spring 116 concentrically around the shaft 30 and under compression between the spring seat 118, provided for its forward end by the housing 24, and the spring retaining seat 120 provided for its rearward end within the insulating ring 110. When the shaft 30 is moved forward to the limit permitted by the stop 84, a resilient contact between the terminals 94 and 112 is effected.

Rearward movement of the terminal 112 toward the terminal 94 is limited by contact between the essentially annular shoulder 122 of the forward face of the stop 84 and the mating annular shoulder 124 of the insulating ring 110. In this connection, it is important to the efficient operation of the present invention that the abutting shoulder stops 122—124 be disposed to effect a sharp and quick separation between the ring terminals 94—112 immediately upon release of the load on the cable 34 below the minimum required to compress the spring 78. Thus a quick break between the terminals 94—112 is effected with a minimum rearward movement of the shaft 30.

The terminal posts 100 and 106 project through the elongated slot 126 of the insulating collar 128 which is press fitted into the wall of the housing 24 around the aforesaid terminal posts 100 and 106. Movement of the terminal posts 100 and 106 as required by axial movement of the shaft 30 is permitted by the slot 126. The projecting extremities of the posts 100 and 106 are enclosed within the terminal box 130, which is secured to the housing 24 and through which passes the electrical cable, not shown, having the terminals 102 and 104. The collar 128 provides the depending insulating skirt 132 which encloses the posts 100—106 and effectively insulates them from other portions of the switch mechanism, even if the posts 100—106 should become accidentally bent from their positions shown in Fig. 2. The lower rearward portion of the skirt 132 rides within the groove 134 provided therefor within the upper rearward portion of the plate 80.

In operation of the switch 10, tension in the spring 78 is adjusted in accordance with the weight of the pulley block 38 and hook 40 by screw-threaded adjustment of the axial position of the bushing 62 and spring seat 82 provided thereby. It is to be observed that the external portion of the bushing 62 may comprise a nut head, so that adjustment of the tension of the spring 78 for pulley blocks of different weights is readily accomplished. The tension in the spring 78 is preferably adjusted so that the full weight of the block 38 and hook 40 alone will pull the shaft to the limit of movement permitted by the stop 84, and thereby maintain the circuit through the terminals 94—112 closed.

In this situation, downward movement of the hoist block 38 may be controlled at the discretion of the hoist operator by means of the control switch 42. Whenever the load on the cable 34 falls below the predetermined minimum required to compress the spring 78, the shaft 30 will be resiliently moved rearward, and the terminals 94 and 112 will be separated as indicated in Fig. 2. Accordingly, when the load on the hook 40 reaches the floor, or catches on adjacent equipment so that its downward movement is momentarily stopped, the downward hoisting movement of the hoist motor 14 automatically stops. Slack in the cable 34 and consequent injuries result-

ing from kinking or cross winding or backward winding and the like are automatically avoided. Likewise, the immediate cessation of downward movement of the hook **40** avoids the possibility of accidentally disengaging the latter from the load sling.

When the downward movement of the hoist block **38** stops for any reason by operation of the switch **10**, the hoist operator will immediately know that the load is being supported by other means than the hook **40** and that accessory equipment is subject to possible injury. Inasmuch as the contacts **94** and **112** have no effect upon the upward movement of the hoist motor **14**, the hoist operator may accordingly raise the block **38** until the load is resumed by the cable **34** and contact between the terminals **94** and **112** is re-established. After ascertaining and remedying the difficulty which had previously prevented the load's downward movement, the hoist operator may then resume the downward movement.

It is to be observed that efficient operation of the switch **10** requires that the load on the cable **34** be applied directly to the coil spring **78** with a minimum of frictional resistance. Accordingly, the shaft **30** is slidably supported near each end within the bushings **56** and **62**, which hold the shaft **30** securely in the aforesaid coaxial alignment with the fixed end portion of the cable **34**. Thus tension in the latter is applied directly along the axis of the shaft **30** for axial movement thereof with a minimum of frictional resistance. In addition, the construction described permits a rotational movement of the shaft **30**, within the bushings **56—62**, as required by the cable **34** as it winds or unwinds from the drum **16**.

By the foregoing, I have disclosed a simple, efficient and reliable load-carrying safety switch adapted to sustain the load of the fixed end of a hoist cable and to hold the terminals of a motor control circuit in electrical contact with each as long as the load on the hoist cable remains above a predetermined minimum, and which effects a sharp separation of the terminals to prevent downward movement of the hoist upon release of the load on the hoist cable below said predetermined minimum.

Having thus described my invention, I claim:

1. In a load-supporting hoist control switch adapted for supporting attachment with the fixed end of a hoist cable and for stopping the downward hoisting action of the hoist motor when tension in said cable falls below a predetermined minimum, the combination of a load-supporting housing, a load-supporting shaft operatively supported within said housing for limited axial movement and having a cable attachment end adapted for attachment with the fixed end of said cable in coaxial alignment therewith, resilient means for urging said shaft in the axial direction away from said cable attachment end to a rest position, a pair of axially spaced electrical terminals in an electrical circuit adapted to stop the downward hoisting action of said hoist motor upon separation of said two terminals, one of said terminals being yieldably mounted on said housing, the second of said terminals being carried by said shaft for axial movement therewith and for electrically contacting said first terminal upon axial movement of said shaft a predetermined distance from said rest position in the direction toward said cable attachment end.

2. In a load-supporting hoist control switch adapted for supporting attachment with the fixed end of a hoist cable and for stopping the downward hoisting action of the hoist motor when tension in said cable falls below a predetermined minimum, the combination of a load-supporting housing, a load-supporting shaft operatively supported within said housing for rotational and limited axial movement and having a cable attachment end adapted for attachment with the fixed end of said cable in coaxial alignment therewith, resilient means for urging said shaft in the axial direction away from said cable attachment end to a rest position, an electrical terminal operatively coupled with said shaft for axial movement therewith, a second electrical terminal resiliently urged axially of said shaft toward said first terminal to a position spaced therefrom when said shaft is at said rest position, said first terminal being adapted for electrically contacting said second terminal upon a predetermined axial movement of said shaft against the force of the resilient means urging said shaft to its rest position, and said two terminals being in an operative electrical circuit adapted to be coupled with said hoist motor for stopping the downward movement of said hoist upon separation of said terminals.

3. In a load-supporting control switch for a hoist motor and adapted for supporting attachment with the fixed end of a hoist cable for stopping the downward movement of the hoist when tension in said cable falls below a predetermined minimum, the combination of a load-supporting housing, a load-supporting shaft slidably and rotatably mounted in said housing and having its forward end attached to the fixed end of said cable in coaxial alignment therewith, load-supporting movement limiting means provided between said housing and shaft for limiting the forward movement of said shaft when said cable is under load, a pair of electric terminals in an operative circuit with said hoist motor to stop the downward movement of said hoist upon separation of said terminals, one of said terminals being yieldably mounted in said housing, the second of said terminals being movable with said shaft for contacting said first terminal when said shaft is at the limit of its forward movement, and means to separate said two terminals when the tension on said cable falls below a predetermined minimum and including resilient means operatively disposed for resiliently urging said shaft rearward.

4. The combination as claimed in claim 3 and being further characterized in that a bushing having an externally threaded portion is adjustably screw-threaded axially into said housing for rotatably and slidably supporting said shaft, a spring retaining seat is carried by said bushing for axial movement therewith, a second spring retaining seat is carried by said shaft for axial movement therewith, said resilient means comprise a coil spring around said shaft and disposed between said two spring retaining seats for resiliently resisting forward movement of said shaft, the tension in said resilient means being adjustable by screw-threaded axial adjusting movement of said bushing.

5. In a load-supporting control switch for a hoist motor and adapted for supporting attachment with the fixed end of a hoist cable for stopping the downward movement of the hoist when tension in said cable falls below a predetermined minimum, the combination of a load-supporting housing, a load-supporting shaft slidably and rotatably mounted in said housing

and having its forward end attached to the fixed end of said cable in coaxial alignment therewith, load-supporting movement limiting means provided between said housing and shaft for limiting the forward movement of said shaft when said cable is under load, a pair of electric terminals in an operative circuit with said hoist motor to said terminals, one of said terminals being mounted in said housing, the second of said terminals being movable with said shaft for contacting said first terminal when said shaft is at the limit of its forward movement, means to separate said two terminals when the tension on said cable falls below a predetermined minimum and including resilient means operatively disposed for resiliently urging said shaft rearward, a bushing having an externally threaded portion adjustably screw-threaded axially into said housing for rotatably and slidably supporting said shaft, a spring retaining seat carried by said bushing for axial movement therewith, a second spring retaining seat carried by said shaft for axial movement therewith, said resilient means comprising a coil spring around said shaft and disposed between said two spring retaining seats for resiliently resisting forward movement of said shaft, the tension in said resilient means being adjustable by screw-threaded axial adjusting movement of said bushing, means to assure resilient electrical contact between said terminals when said shaft is at the limit of its forward movement and including a second resilient means for urging said first-named terminal rearward, and means to assure a quick electrical separation between said terminals upon a minimum of rearward movement of said shaft and including movement limiting means operatively disposed between said housing and said first-named terminal for limiting the rearward movement thereof essentially to the minimum required for adequate electrical contact between said terminals when said shaft is at the forward limit of its movement.

6. In a load-supporting hoist control switch adapted for supporting attachment with the fixed end of a hoist cable and for stopping the downward hoisting action of the hoist motor when tension in said cable falls below a predetermined minimum, the combination of a load-supporting housing, a load-supporting shaft operatively supported within said housing for limited axial movement and having a cable attachment end adapted for attachment with the fixed end of said cable in coaxial alignment therewith, resilient means for urging said shaft in the axial direction away from said cable attachment end to a rest position, a pair of axially spaced electrical terminals in an electrical circuit adapted to stop the downward hoisting action of said hoist motor upon separation of said two terminals, one of said terminals being mounted in said housing for axial movement relative thereto, the second of said terminals being carried by said shaft for axial movement therewith and for electrically contacting said first terminal upon axial movement of said shaft a predetermined distance from said rest position in the direction toward said cable attachment end, and a resilient means for urging said first-named terminal axially toward said second terminal to a position spaced from said second terminal when said shaft is at its rest position.

7. In a load-supporting hoist control switch adapted for supporting attachment with the fixed end of a hoist cable and for stopping the downward hoisting action of the hoist motor when tension in said cable falls below a predetermined minimum, the combination of a load-supporting housing, a load-supporting shaft operatively supported within said housing for rotational and limited axial movement and having a cable attachment end adapted for attachment with the fixed end of said cable in coaxial alignment therewith, resilient means for urging said shaft in the axial direction away from said cable attachment end to a rest position, a pair of axially spaced electrical terminals in an electrical circuit adapted to stop the downward hoisting action of said hoist motor upon separation of said two terminals, one of said terminals being yieldably mounted on said housing, the second of said terminals being carried by said shaft for axial movement therewith and for electrically contacting said first terminal upon axial movement of said shaft a predetermined distance from said rest position in the direction toward said cable attachment end.

8. In a load-supporting control switch for a hoist motor and adapted for supporting attachment with the fixed end of a hoist cable for stopping the downward movement of the hoist when tension in said cable falls below a predetermined minimum, the combination of a load-supporting housing, a load-supporting shaft slidably and rotatably mounted in said housing and having its forward end attached to the fixed end of said cable in coaxial alignment therewith, load-supporting movement limiting means provided between said housing and shaft for limiting the forward movement of said shaft when said cable is under load, a pair of electric terminals in an operative circuit with said hoist motor to stop the downward movement of said hoist upon separation of said terminals, one of said terminals being mounted in said housing, the second of said terminals being movable with said shaft for contacting said first terminal when said shaft is at the limit of its forward movement, means to separate said two terminals when the tension on said cable falls below a predetermined minimum and including resilient means operatively disposed for resiliently urging said shaft rearward, a bushing having an externally threaded portion adjustably screw-threaded axially into said housing for rotatably and slidably supporting said shaft, a spring retaining seat carried by said bushing for axial movement therewith, a second spring retaining seat carried by said shaft for axial movement therewith, said resilient means comprising a coil spring around said shaft and disposed between said two spring retaining seats for resiliently resisting forward movement of said shaft, the tension in said resilient means being adjustable by screw-threaded axial adjusting movement of said bushing, and means to assure resilient electrical contact between said terminals when said shaft is at the limit of its forward movement and including a second resilient means for urging said first named terminal rearward to a position spaced from said second named terminal when the shaft is at its rest position.

9. In a load-supporting control switch for a hoist motor and adapted for supporting attachment with the fixed end of a hoist cable so as to stop the downward movement of said hoist when tension in said cable falls below a predetermined minimum, the combination of a load-supporting housing, a bushing having an externally screw-threaded portion adjustably screw-threaded into said housing for axial adjusting movement, a load-supporting shaft rotatably and slidably

mounted in said bushing and projecting externally of said housing through said bushing, attachment means provided by said external projection for attaching to the fixed end of said hoist cable in coaxial alignment therewith, a spring retaining shoulder carried by said shaft and axially movable therewith, a second spring retaining shoulder carried by said bushing and axially movable therewith, a coil spring around said shaft and disposed between said spring retaining shoulders for urging said shaft in the direction away from said attachment means to a rest position, movement limiting means provided by said housing to limit the axial movement of said shaft, and a pair of axially spaced electrical terminals in an operative circuit adapted to be coupled with said hoist motor to stop the downward movement of said hoist upon separation of said two terminals, one of said terminals being resiliently mounted in said housing for resilient axial movement upon contact with the second of said terminals, the second of said terminals being carried by said axially movable shaft for electrically contacting said first terminal upon a predetermined axial movement of said shaft from said rest position against the force of said resilient means, the force of said resilient means being adjustable for hoist blocks of different weights by adjusting the axial position of said bushing and the spring retaining shoulder thereof.

10. In a load-supporting hoist control switch adapted for supporting attachment with the fixed end of a hoist cable and for stopping the downward hoisting action of the hoist motor when tension in said cable falls below a predetermined minimum, the combination of a load

supporting housing, a load-supporting shaft operatively supported within said housing for limited axial movement and having a cable attachment end adapted for attachment with the fixed end of said cable in coaxial alignment therewith, load-supporting movement limiting means provided between said housing and shaft for limiting the forward movement of said shaft when said cable is under load, adjustable limiting means for limiting the rearward movement of said shaft when the load on said cable has been removed, a pair of electric terminals in an operative circuit with said hoist motor to stop the downward movement of said hoist upon separation of said terminals, one of said terminals being yieldably mounted in said housing, the second of said terminals being movable with said shaft for contacting said first terminal when said shaft is at the limit of its forward movement, and means to separate said two terminals when the tension on said cable falls below a predetermined minimum and including resilient means operatively disposed for resiliently urging said shaft rearward.

JOHN W. HUNT.

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