

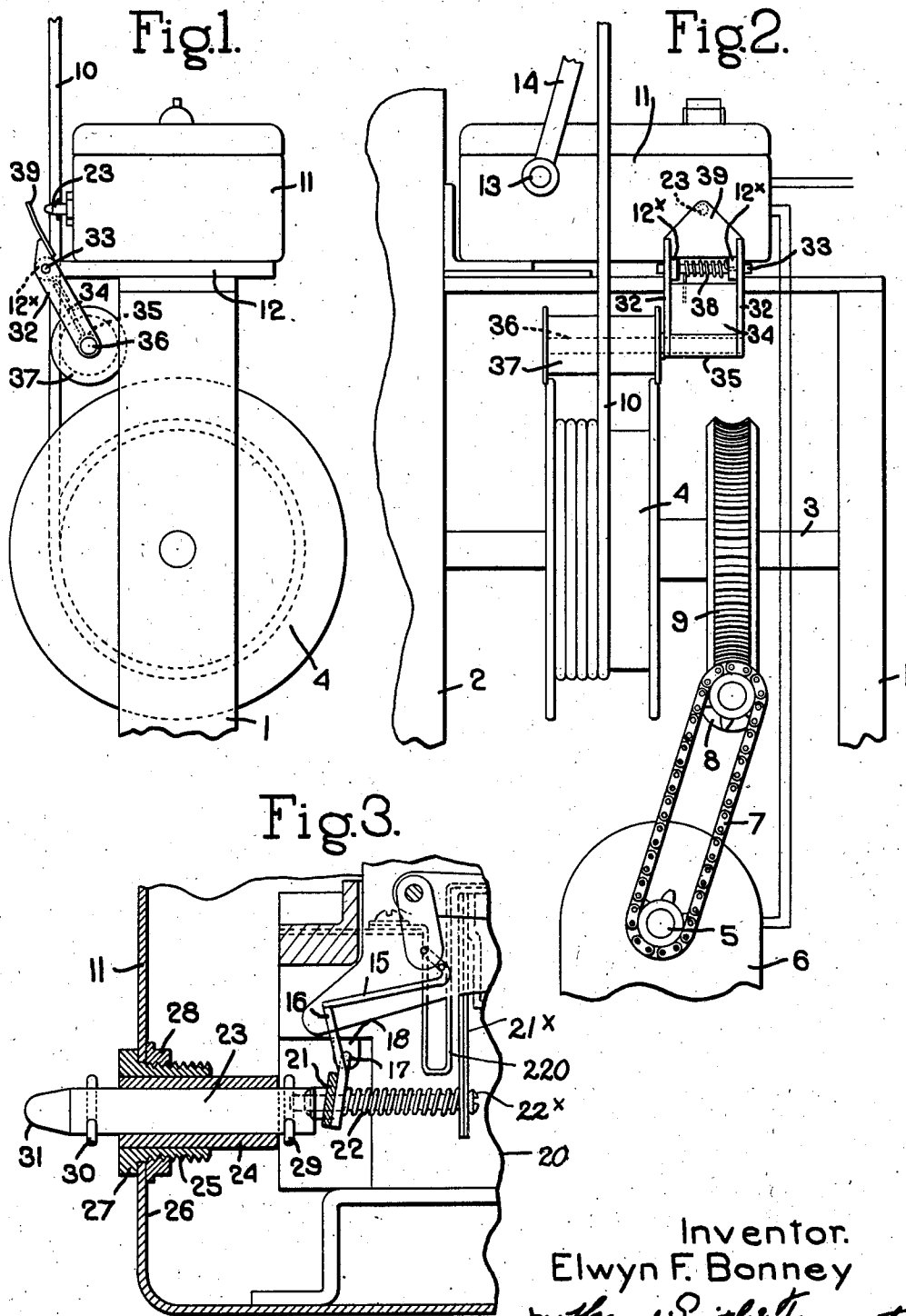
Aug. 11, 1942.

E. F. BONNEY

2,292,738

SAFETY STOP MECHANISM FOR HOISTING MACHINES

Filed July 16, 1940



Inventor.
Elwyn F. Bonney
by *Heard Smith & Tennant.*
Attys.

UNITED STATES PATENT OFFICE

2,292,738

SAFETY STOP MECHANISM FOR HOISTING MACHINES

Elwyn F. Bonney, Newton Lower Falls, Mass., assignor to Lewis-Shepard Company, Watertown, Mass., a corporation of Massachusetts

Application July 16, 1940, Serial No. 345,777

3 Claims. (Cl. 254-174)

This invention relates to improvements in safety stop mechanism for hoisting machines, and the object thereof is to provide improved means for arresting the hoisting mechanism in response to undue slackening of the cable.

Usually electrically operated hoisting machines have a vertically movable load supporting means and a cable and winch for raising and lowering the same, the winch is driven by an electric motor having in its power circuit a reversing switch operable when swung in one direction from neutral position in which the switch is open to cause the motor to rotate the winch in a direction to raise the load supporting means and operable when swung in the opposite direction to reverse the direction of rotation of the motor and winch to control the lowering movement of the load supporting means.

If during its lowering the load supporting means engages an obstruction which arrests its downward movement the continued rotation of the winch will slacken the cable unless and until the power circuit is broken. If, where the cable is thus slackened, the load supporting means is released from the obstruction, the load supporting means and the load upon it will drop and the momentum acquired may be sufficient to break the cable and injure the load supporting means or the load carried thereby.

I am aware that heretofore means have been provided which are operable by the slackening of the cable under such circumstances to break the power circuit to the electric motor. Such devices, however, are more or less complicated and require movements of such extent that considerable slackening of the cable will take place before the circuit to the motor is broken.

One of the objects of the present invention is therefore to provide a safety stop mechanism of sufficient sensitiveness to operate promptly upon the slackening of the cable to break the motor circuit.

Another object of the invention is to provide a simplified safety stop mechanism which may be associated with a commercial type of switch mechanism, preferably of the type in which an overload in the motor circuit will cause the switch to break the motor circuit.

These and other objects and features of the invention will more fully appear from the following description and the accompanying drawing and will be particularly pointed out in the claims.

A preferred embodiment of the invention is illustrated in the accompanying drawing in which a sufficient portion of a usual type of hoisting

machine is illustrated to show the application of the present invention thereto.

In the drawing:

Fig. 1 is a front elevation of a portion of the frame of a hoisting machine having a winch and its cable, a switch box containing a conventional switch mechanism, and means engaging the cable operable upon slackening of the cable to cause the switch to break the motor circuit;

Fig. 2 is a side elevation of the same showing the relative positions of the winch and cable, an electrically operated mechanism for driving the winch and the safety stop mechanism embodying the present invention; and,

Fig. 3 is an enlarged detail sectional view of a portion of the switch box, the trip mechanism for a conventional stop switch in the motor circuit and illustrating partially in section the trigger mechanism and plunger for actuating the same to break the motor circuit.

As illustrated in the accompanying drawing the hoisting mechanism comprises usual frame members 1 and 2 having mounted therein a shaft 3 to which is fixedly secured a winch 4 which is driven from a shaft 5 of an electric motor 6 through a chain 7, a worm 8, and a worm gear 9. The cable 10, which is secured to and wound upon the winch, extends upwardly in the usual manner over a sheave mounted in the upper portion of the frame (not shown) and thence downwardly to the load supporting means. The load supporting means is guided upon suitable uprights in the usual manner.

The switch mechanism for controlling the motor circuit is contained in a switch box 11 which is mounted upon a plate 12 which is carried by a cross girder of the frame and has bosses 12 α projecting from the ends thereof on which a lever having a cable-engaging roller is fulcrumed, as will hereinafter more fully appear.

A suitable controller for reversing the direction of the current supplied to the motor, which is enclosed in the switch box, may be of any usual character having a shaft 13 provided with a manually operable handle 14 for moving the switch from neutral position in which the motor circuit is broken to a position in which the current supplied to the motor will cause the winding of the cable upon the winch to raise the load supporting means and when swung from neutral position in the other direction to reverse the direction of current and thereby cause the winch to lower the load supporting means.

The switch box 11 of the present invention also contains a switch in the motor circuit which may

be operated manually to break the motor circuit and the present invention comprises means operable by the slackening of the cable to cause the safety switch to break the motor circuit.

Any suitable sensitive type of safety switch having trigger mechanism for breaking the motor circuit may be employed. In the illustrative embodiment of the invention shown herein the safety switch is of the commercial type manufactured by The Trumbull Electric Manufacturing Company of Plainville, Connecticut, such as illustrated and described in Patent No. 1,886,477 granted November 8, 1932, to Benjamin E. Getchell and need not therefore be illustrated in detail. The switch illustrated in that patent is an overload switch adapted upon increase in the current supplied to the electric motor in response to an overload upon the motor to throw the switch to open position and thereby break the motor circuit. This switch is of the sensitive type in that the switch is maintained in open position by a latch 15, such as that shown in the patent, which is held in operative position by a trigger 16 which is pivotally mounted at 17 on brackets 18 extending downwardly into a recess 19 of a switch block 20 of insulating material. The trigger 16 has an extension 21 which is normally held by a spring 22 in a position in which the trigger 16 supports the latch 15 and as disclosed in the patent to Getchell aforesaid thermostatic means are provided for tripping the trigger, thus releasing the latch and causing the switch to break the motor circuit.

The thermostatic means for tripping the trigger 16 as illustrated herein is substantially the same as that illustrated and described in the Getchell patent aforesaid and comprises a bimetallic thermoresponsive element 21x carried by a metal bracket which is mounted on the switch block 20 of insulating material and is connected at its lower free end to a threaded rod or bolt 22x which extends axially through the spiral spring 22 and through the trigger extension 21. The rod 22x is provided at its end with a suitable nut which clamps the trigger extension against the end of the spring 22. A suitable heater element 220, in the circuit which supplies the electric current to the motor, is located in proximity to and in parallelism with the thermostatic element 21x and operates when heated by the increase in current when the motor is subject to overload to bend the bimetallic element in a direction which will move the trigger extension 21 in a direction (to the right Fig. 3) and thereby swing the trigger (to the left Fig. 3) out of engagement with the latch 15 thereupon causing the switch mechanism to break the motor circuit in the manner fully disclosed in the Getchell patent.

The present invention comprises a simple and effective means operable upon slackening of the cable to actuate the trigger mechanism of the safety switch. It will be understood that while the Trumbull type of trigger-actuated safety switch is referred to herein that the invention may be applied to other well known commercial types of sensitive trigger-operated switches.

The switch-actuating mechanism which is illustrated herein comprises broadly yieldably actuated means forcibly engaging the cable and means operable by the yielding movement thereof upon slackening of the cable to engage and trip the trigger, thereby to break the motor circuit. In the particular construction illustrated herein a plunger 23 of any suitable material is

slidably mounted in a tubular guide 24 in alignment with the extension 21 of the trigger 16. The tubular guide 24 as shown herein is mounted in a screw threaded sleeve 25 which extends through the front wall 26 of the switch box and has an enlarged head 27 engaging the outer face of the switch box and a clamping nut 28 mounted on the screw threaded portion of the sleeve firmly engaging the inner face of the wall 26. Suitable means, such as cotter pins 29 and 30 are provided to limit the movement of the plunger 23. The plunger 23 desirably is provided with a rounded end portion 31 adapted to be engaged by suitable actuating means operating when the cable is slackened to force the plunger inwardly and thereby trip the trigger.

In the preferred embodiment of the invention which is illustrated herein the actuating means comprises a lever which, as illustrated herein, has parallel arms 32 which are pivotally mounted upon a shaft 33 which is fixedly secured in the ears 12x of the plate 12. The arms 32 of the lever are connected by a plate 34 and also at their ends by a tubular member 35 which is welded to the arms 32 and in which is mounted a shaft 36 of a cable-engaging roller 37 having a length at least equal to the width of the winch drum 4. The lever is so fulcrumed that when the roller engages the cable as illustrated in Fig. 1 it is held forcibly against the cable.

While the weight of the roller, if made of heavy material such as steel, may be sufficient properly to actuate the switch mechanism upon the slackening of the cable, additional means may be provided for more forcibly holding the roller against the cable. In the construction illustrated such means comprises a coiled spring 38 which is mounted upon the shaft 33 and secured at one end to one of the ears 12x of the plate 12, and at its other end engages the plate 34 which connects the lever arms 32. The lever is provided with an upward extension 39 which projects beyond the axis of the plunger 23.

The operation of the safety stop mechanism thus illustrated and described will be obvious. The roller 35 is so suspended by the lever 32 as forcibly to engage the cable at all times and its force of engagement may or may not be augmented by that of the spring 38. If the load supporting means encounters an obstruction during its downward movement the continued rotation of the drum will produce a slackening of the cable which will enable the roller 35 to swing outwardly, thereby causing the extension 39 of the lever 32 to force the plunger 23 inwardly and trip the trigger mechanism, thus releasing the latch 15 and breaking the motor circuit.

It will be understood that the particular embodiments of the invention shown and described herein are of an illustrative character and not restrictive, and that various changes in form, construction and arrangement of parts may be made within the spirit and scope of the following claims.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. Safety stop mechanism, for hoisting machines having a frame, a motor operated winch mounted on said frame having a hoisting cable extending upwardly therefrom, a switch box, mounted on said frame above said winch and in proximity to said cable, having therein a thermostatic overload switch in the motor circuit, means including a trigger for holding the switch closed

when the switch is moved to circuit-completing position but operable by the thermostatic means to trip said trigger and thereby open the switch in response to increase in the current due to overloading of the motor, a plunger slidably mounted in said switch box in alinement with said trigger, a lever fulcrumed on said frame having an upwardly extending arm provided with means to engage and actuate said plunger, and another downwardly extending arm provided with a roller located between the fulcrum of the lever and the winch to engage the cable and when the cable is taut to hold said lever at a substantial angle to the vertical with the plunger-actuating arm out of operative engagement with the plunger and operable upon slackening of the cable to cause the plunger-actuating arm to engage and actuate the plunger to trip the trigger and thereby cause the switch to open the motor circuit.

2. Safety stop mechanism for hoisting machines having a frame, a winch mounted on said frame having a cable extending upwardly therefrom, means including an electric motor for actuating said winch, a switch box mounted on said frame above said winch and in proximity to said cable and having therein a switch for said motor provided with a trigger for holding said switch closed when the switch is moved to circuit-closing position, thermostatically operable means for releasing said trigger in response to overload on said motor circuit thereby to cause the switch to break the motor circuit, and supplementary

means operable in response to slackening of said cable to release said trigger and thereby to cause the switch to break the motor circuit.

3. Safety stop mechanism for hoisting machines having a frame, a winch mounted on said frame having a cable extending upwardly therefrom, means including an electric motor for actuating said winch, a switch box mounted on said frame above said winch and in proximity to said cable and having therein a switch for said motor provided with a trigger for holding said switch closed when the switch is moved to circuit-closing position, thermostatically operable means for releasing said trigger in response to overload on said motor circuit thereby to cause the switch to break the motor circuit, and supplementary trigger-tripping means comprising a plunger slidably mounted in the side of said switch box adjacent to said cable and in alignment with said trigger, and plunger-actuating means having a roller to engage said cable and including means to engage and actuate said plunger, and yieldable means normally holding said roller forceably in engagement with said cable when taut and retaining said plunger-engaging means in inoperative position but operable upon the slackening of the cable to cause the plunger-engaging means to actuate the plunger, thereby to trip the switch and cause the switch to break the motor circuit.

ELWYN F. BONNEY.