July 1, 1958 J. M. EITEL 2,841,659

CONTROL MECHANISM

Filed April 20, 1956 2 Sheets-Sheet 1

FIG_1_

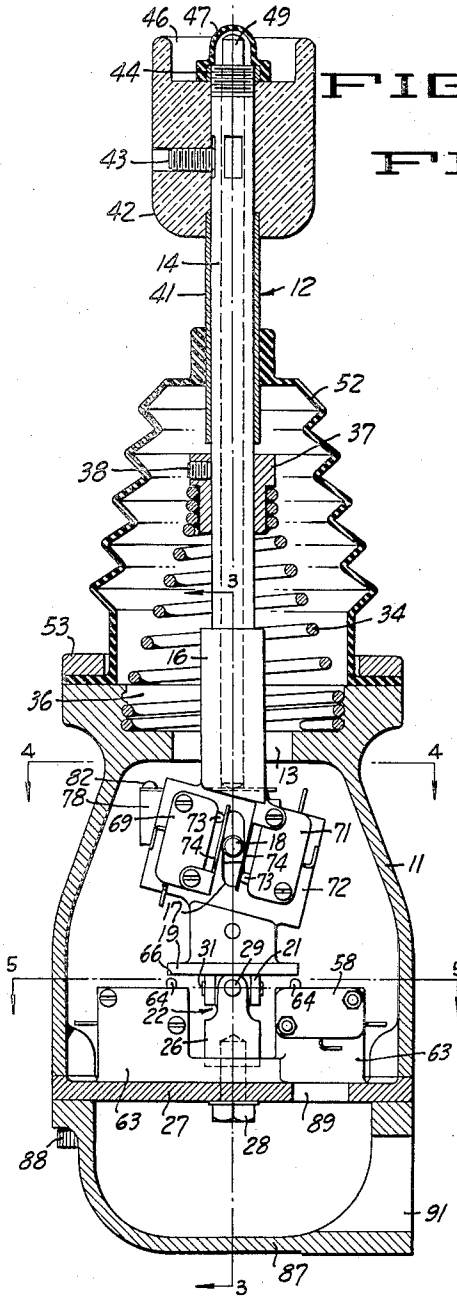
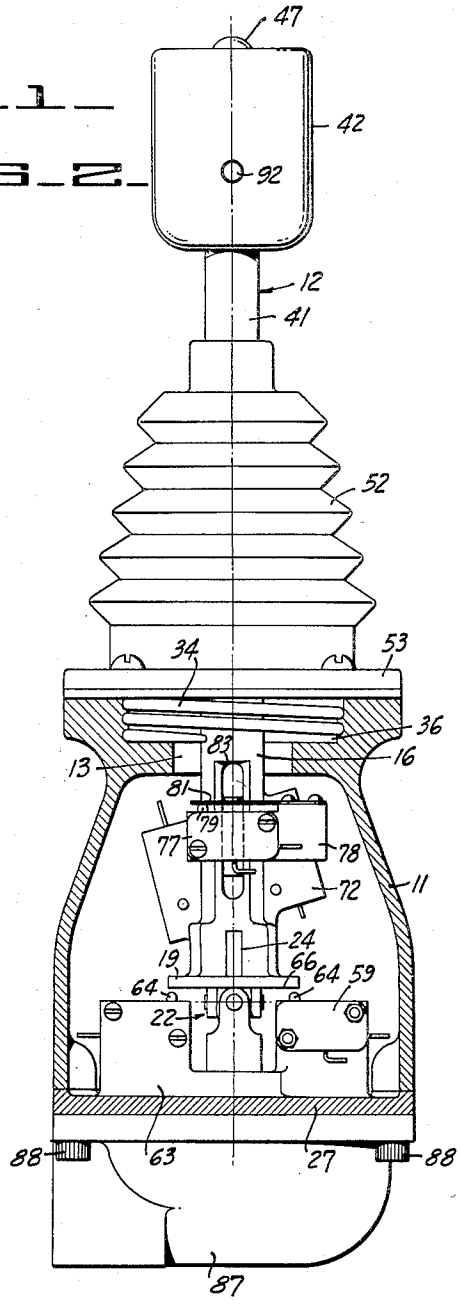


FIG_2_



INVENTOR.
Jay M. Eitel
BY Fleht & Swain
ATTORNEYS

July 1, 1958 J. M. EITEL 2,841,659

CONTROL MECHANISM

Filed April 20, 1956 2 Sheets-Sheet 2

FIG_4_

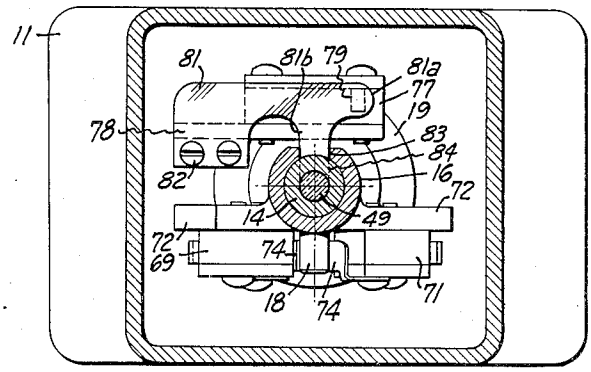


FIG_3_

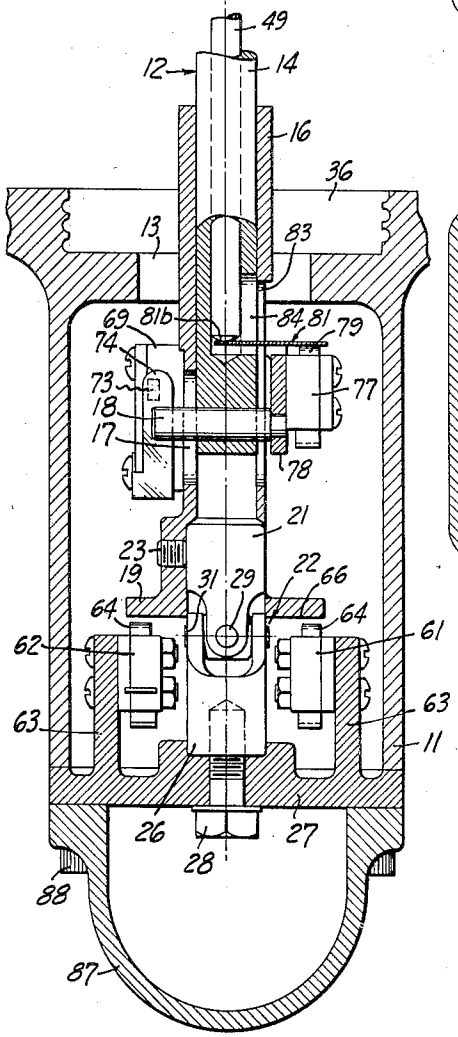


FIG_5_

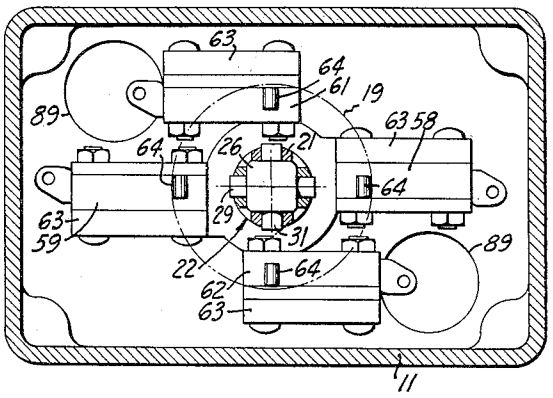
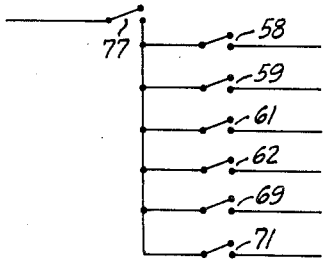


FIG_6_



INVENTOR.
Jay M. Eitel

BY Fleck & Swain

ATTORNEYS

United States Patent Office

2,841,659

Patented July 1, 1958

2,841,659

CONTROL MECHANISM

Jay M. Eitel, Los Altos, Calif.

Application April 20, 1956, Serial No. 579,689

7 Claims. (Cl. 200—5)

This invention relates generally to control mechanisms and more particularly to control mechanisms for use with electrically operated apparatus.

In lifting equipment of the type described in my copending application Serial No. 560,621, filed January 23, 1956, it is often desirable to provide a control mechanism in the work basket so that the worker in the work basket can cause movement of the boom and the work basket attached thereto to the desired position. A control mechanism of this type is disclosed in my Letters Patent No. 2,627,560; however, it has been found that the use of such a control mechanism is objectionable because the workman in the basket may accidentally bump the operating lever and cause undesired movement of the boom and work basket. This may in turn cause damage to the lifting equipment if the boom and work basket should happen to strike a pole or other object. Accidental movement of this type may also cause injury to the workman.

In general, it is an object of the present invention to provide an improved control mechanism which cannot be accidentally operated by the workman bumping against the operating lever of the control mechanism.

Another object of the invention is to provide a control mechanism with safety means which prevents operation of the control mechanism even though the operating lever is accidentally struck by the workman.

Another object of the invention is to provide a control mechanism of the above character in which the safety means must be operated before the control mechanism will be effective.

Additional objects and features of the invention will appear from the following description in which the preferred embodiment is set forth in conjunction with the accompanying drawings.

Referring to the drawings:

Figure 1 is a side elevational cross sectional view of the control mechanism embodying the present invention.

Figure 2 is a side elevational view partly in cross section showing the side of the control mechanism opposite that shown in Figure 1.

Figure 3 is a cross sectional view taken along the line 3—3 of Figure 1.

Figure 4 is a cross sectional view taken along the line 4—4 of Figure 1.

Figure 5 is a cross sectional view taken along the line 5—5 of Figure 1.

Figure 6 is a circuit diagram for the control mechanism.

In general, the present invention consists of an improved control mechanism in which a safety switch must be operated before the other switches in the mechanism can be effective. The safety switch is adapted to be operated by particularly novel means which prevents accidental operation of the safety switch and which makes it possible to hold the safety switch in an operated position in any position of the control lever.

The control mechanism illustrated in the drawing consists of a housing 11 formed of suitable material such as

an aluminum casting. A control lever 12 extends through an opening 13 in the upper portion of the casting 11. The control lever 12 comprises an upper tubular member 14 which is slidably mounted in a lower tubular member 16. The lower tubular member 16 is provided with a slot 17 which cooperates with a pin 18 mounted on the lower end of the upper tubular member 14 to limit the relative movement between members 14 and 16.

The lower tubular member 16 is provided with an enlarged flanged portion 19 which is fastened to the upper portion 21 of a universal joint 22 by suitable means such as a set screw 23. One side of the lower tubular member 16 is provided with a slot 24 which exposes the upper portion 21 of the universal joint and makes it possible to determine when the upper portion 21 is properly seated.

The lower portion 26 of the universal joint is mounted upon a base plate 27 by suitable means such as a screw 28. The upper and lower portions of the universal joint are connected together by pins 29 and 31 extending at right angles to each other. The universal joint 22 permits swivelling or pivotal motion of the control lever 12 in a manner well known to those skilled in the art. Thus, the lever 12 may be moved in any lateral direction within a predetermined range without rotary motion.

The control lever 12 is normally held in an inoperative position by suitable resilient means consisting of a conical-shaped spiral spring 34 which has its larger end seated within a circular seat 36 formed in the upper portion of the housing 11. The smaller upper end of the spring 34 engages a collar 37 which is fixed to the tubular member 14 by suitable means such as a set screw 38. By adjustment of the collar 37 axially of the tubular member 14 it is possible to adjust the compression of the spring 34 and the position of member 14 with respect to member 16, for a purpose hereinafter described. The spring normally holds the operating lever 12 in a vertical position but permits tilting or lateral movement of the lever. The spring also permits axial movement of the member 14 relative to the member 16.

A tubular sleeve 41 of suitable insulating material encloses the portion of the tubular member 14 extending above the collar 37. A knob 42 of suitable insulating material is mounted on the upper end of the tubular member 14 and provides a convenient means for grasping the control lever 12. The knob 42 is positioned on the member 14 by suitable means such as a set screw 43 and is also held in position by nut 44 which is threaded onto the upper portion of the member 14. The nut 44 is mounted within an annular depression 46 in the upper end of the knob 42 and is provided with a cap 47 of resilient material.

An operating rod 49 is slidably mounted within the tubular member 14 and is adapted to be urged downwardly by pressure upon the resilient cap 47 for a purpose hereinafter described.

A protective covering 52 of suitable resilient material such as rubber encloses the spring 34 and extends from the tubular sleeve 41 and is fastened to the upper portion of the housing 11 by a clamping ring 53.

Four switches 58, 59, 61 and 62 of a suitable type such as "microswitches" are disposed in a horizontal plane within the housing 11 and are carried by mounting brackets 63 which are an integral part of the base plate 27. Switches 58 and 59 form one pair of switches and are disposed on opposite sides of the operating lever 12 and switches 61 and 62 form another pair of switches and are mounted on opposite sides of the operating lever 12 at right angles to switches 58 and 59. Each of the switches is provided with an operating lever 64 which is adapted to be engaged by the bottom surface 66 of the enlarged flanged portion 19 of the lower tubular member 16. Thus, when the control lever 12 is tilted

to the right as viewed in Figure 1, switch 58 is operated, and when it is tilted to the left, switch 59 is operated. When the operating handle is tilted forwardly as viewed in Figure 1, switch 62 is operated, and when it is tilted rearwardly, switch 61 is operated. If the operating lever is tilted diagonally, two switches may be operated at the same time.

Another pair of switches 69 and 71, similar to those hereinbefore described, are mounted upon lateral extensions 72 disposed on opposite sides of slot 17 and are an integral part of the lower tubular portion 16. Each of the switches 69 and 71 carries an operating lever 73 which is adapted to be operated by the pin 18. The pin 18 is adapted to slidably engage a leaf spring member 74 mounted on each of the switches 69 and 71. One end of the leaf spring member is fixed to the switch and the free or other end is adapted to engage the operating lever 73.

As shown in Figure 1, the operating lever normally rests in a position intermediate the ends of the slot 17. The position of the pin 18 is adjusted by positioning of the collar 37 relative to the upper tubular member 14. Thus, when the operating lever 12 is pulled upwardly, the upper tubular member 14 moves axially of the tubular member 16 and causes movement of the pin 18 within the slot 17, and upon reaching a position adjacent the upper end of the slot 17, the switch 69 is operated. Upon release of the operating lever 12, the pin 18 returns to a position intermediate the ends of the slot 17. If the operating lever 12 is pushed downwardly, the switch 71 is operated and upon release, the operating lever 12 again returns to its normal position.

It is apparent that by moving the operating lever 12 upwardly or downwardly and sideways at the same time, either of the switches 69 and 71 and one or two of the switches 58, 59, 61 and 62 can be operated simultaneously.

A switch 77 is disposed on the side of the tubular member 16 opposite that of switches 69 and 71 and is carried by a mounting block 78 which is fixed to the pin 18. Switch 77 is provided with an operating lever 79 which is adapted to be operated by a leaf spring member 81. One end of the leaf spring member is fixed to the mounting block 78 by suitable means such as screws 82. The leaf spring member is provided with two free ends 81*a* and 81*b*. Free end 81*a* overlies the operating lever 79, whereas free end 81*b* extends at right angles to free end 81*a* and extends into an elongated slot 83 in member 16 and an elongated slot 84 in member 14. As can be seen from Figure 3, the end portion 81*b* extends for a substantial distance into tubular member 14 and serves as a support for the operating rod 49. Thus, when the operating rod 49 is pushed downwardly by depression of the resilient cap 47, a force is applied to the free end 81*b* to cause a downward movement of the free end 81*a* and operation of the operating lever 79.

A conduit box 87 is mounted on the bottom of the base plate 27 and is fastened to the housing by suitable means such as screws 88 which serve to clamp the conduit box and the plate 27 to the housing. The base plate 27 is provided with holes 89 to accommodate wiring (not shown) for the switches. The conduit box is provided with a suitable opening 91 for mounting a suitable coupling (not shown) for connecting the control mechanism to the apparatus to be operated.

Switches 58, 59, 61, 62, 69 and 71 can be wired in any desired manner. Each of these switches may be connected to a device or apparatus it is desired to control. As shown in the circuit diagram in Figure 6, these switches may be of the normally open type and thus are adapted to close a circuit when they are operated. Switch 77 is always connected in such a manner that it is in series with each of the switches 58, 59, 61, 62, 69 and 71 so that none of them can be effective to energize a circuit before switch 77 has been operated. Switch 77 may also be of the normally open type and thus must be closed before the devices controlled by the other switches can be energized.

Operation of my control mechanism may now be described as follows: Let it be assumed that the control mechanism has been connected to suitable apparatus such as that shown in my copending application Serial No. 560,621, filed January 23, 1956. In that application I have shown an extensible boom structure which can be rotated about a vertical axis and swung about a horizontal axis. Thus, one reversible motor can be used for extending and retracting the boom, another reversible motor can be made for rotating the boom about a vertical axis, and another reversible motor can be used for swinging the boom about a horizontal axis. Thus, switches 58 and 59 can be connected to the reversible motor for extending and retracting the boom. Switch 59 can be used for extending the boom, and switch 58 can be used for retracting the boom. Switches 61 and 62 can be connected to the reversible motor for rotating the boom about a vertical axis. Switch 61 can be used for rotating the boom in a clockwise direction, whereas switch 62 can be used for rotating the boom in a counterclockwise direction. Switches 69 and 71 can be connected to the reversible motor for swinging the boom about a horizontal axis. Switch 69 can be used for raising the boom and switch 71 can be used for lowering the boom. If desired, however, the switches can be connected to any other apparatus it is desired to control.

As explained previously before the switches 58, 59, 61, 62, 69 and 71 can be effective to energize the apparatus to which they are connected, switch 77 must be closed because it is connected in series with these switches. Thus, in operating the control mechanism the resilient cap 47 must be depressed to move the rod 49 downwardly to operate switch 77. Switch 77 must be held in an operative position as the control lever 12 is moved up and down or tilted to operate the desired switch or switches. For example, if it is desired to rotate the boom structure in a clockwise direction, extend the boom and at the same time raise the boom structure, the control lever 12 is lifted upwardly to cause operation of switch 69 and tilted sideways to operate both switches 59 and 61. All the motions of the boom are directly related to the motions of the control lever 12. Thus, an operator standing in the work basket may readily control his position by moving the operating lever in the direction he wishes to move.

The apparatus connected to switches 58, 59, 61, 62, 69 and 71 cannot be accidentally energized by accidental bumping of the operating lever 12 because switch 77 must first be closed before operation of the other switches will be effective. The cap 47 for operating switch 77 is seated in the depression 46 and thus is protected by the knob 42. The control mechanism is completely waterproof and will not be adversely affected by bad weather conditions. The drain hole 92 serves to prevent water collection in the annular depression 46 of the knob 42.

The means provided for operating switch 77 is particularly adapted for a control mechanism of this type because it permits any type of movement of the control lever 12 while the switch 77 is maintained in an operative position.

It is apparent from the foregoing that I have provided a new and improved control mechanism of a simplified construction which cannot be accidentally operated by bumping of the control lever. The additional safety switch will prevent operation of any of the apparatus controlled by the control mechanism until the safety switch has been operated by the worker. Accidental operation of the safety switch is practically impossible.

I claim:

1. In a control mechanism, a housing, a plurality of switches mounted in said housing, a control lever having one end pivotally mounted in said housing, a section of said control lever being movable axially tiltable about the pivotal connection of the control lever, means mounted on said control lever and adapted to cause operation of said switches as said section of said control lever is tilted, an additional switch mounted on said section of said lever for movement with said section, and means carried by said control lever for operating said additional switch in any position of said control lever independent of axial movement of the lever.

2. A control mechanism as in claim 1 together with circuitry connecting said first named switches and said additional switch to prevent said first named switches from being effective before said additional switch has been operated.

3. In a control mechanism, a housing, a plurality of switches disposed in a horizontal plane in said housing, a control lever comprising a lower tubular member and an upper member, the upper member being slidably mounted in said lower tubular member for axial movement with respect to said lower tubular member, means for pivotally connecting the lower end of said lower tubular member to said housing to permit tilting movement of said control lever in any radial direction, means carried by the lower tubular member and adapted to operate said switches as the control lever is tilted, a switch mounted on said lower tubular member, means carried by said upper tubular member adapted to operate said switch as the upper member is moved axially, an additional switch mounted on said upper member, and means carried by said upper member for operating said additional switch in any position of said control lever.

4. A control mechanism as in claim 3 together with circuitry connecting said switches and said additional switch to prevent said switches from being effective before said additional switch has been operated.

5. A control mechanism as in claim 3 wherein said last named means comprises an operating rod slidably mounted in said upper member for movement axially of the upper member, and means carried by said additional switch and adapted to be engaged by said operating rod whereby upon axial movement of said operating rod said additional switch will be operated.

6. In a control mechanism, a housing, a plurality of switches disposed in a horizontal plane in said housing, a control member comprising a lower tubular member and an upper tubular member, the upper tubular member being slidably mounted in said lower tubular member, means for pivotally connecting one end of said lower tubular member to said housing to permit tilting of said control lever, means carried by the lower tubular portion adapted to operate said switches as the lever is tilted, a switch mounted on said lower tubular member, means carried by said upper member adapted to operate said switch on said lower tubular member as the upper member is moved axially of the lower tubular member, an additional switch mounted on said upper member, an operating rod slidably mounted in said upper member for movement axially of the upper member, means mounted on said additional switch adapted to be engaged by said operating rod whereby upon axial movement of said operating rod said additional switch is operated, and circuitry connecting said switches to said additional switch to prevent said switches from being effective before operation of said additional switch.

7. In a control mechanism, a housing, a control lever mounted in said housing, a switch mounted in said housing, means carried by said control lever adapted to operate said switch upon axial movement of a portion of said control lever, an additional switch mounted on the axially movable portion of said control lever, and means carried by said control lever for operating said additional switch in any position of said control lever.

References Cited in the file of this patent

UNITED STATES PATENTS

1,065,804	Heffley	June 24, 1913
1,343,232	Simmon	June 15, 1920
2,453,035	Ponsy	Nov. 2, 1948
2,543,450	Feagin	Feb. 27, 1951
2,622,161	Harter	Dec. 16, 1952
2,728,844	Terney	Dec. 27, 1955

FOREIGN PATENTS

125,829	Australia	Nov. 6, 1947

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,841,659 July 1, 1958

Jay M. Eitel

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 5, after "axially" insert -- and --.

Signed and sealed this 5th day of July 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 2,841,659 July 1, 1958

Jay M. Eitel

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 5, line 5, after "axially" insert -- and --.

Signed and sealed this 5th day of July 1960.

(SEAL)
Attest:

KARL H. AXLINE
Attesting Officer

ROBERT C. WATSON
Commissioner of Patents