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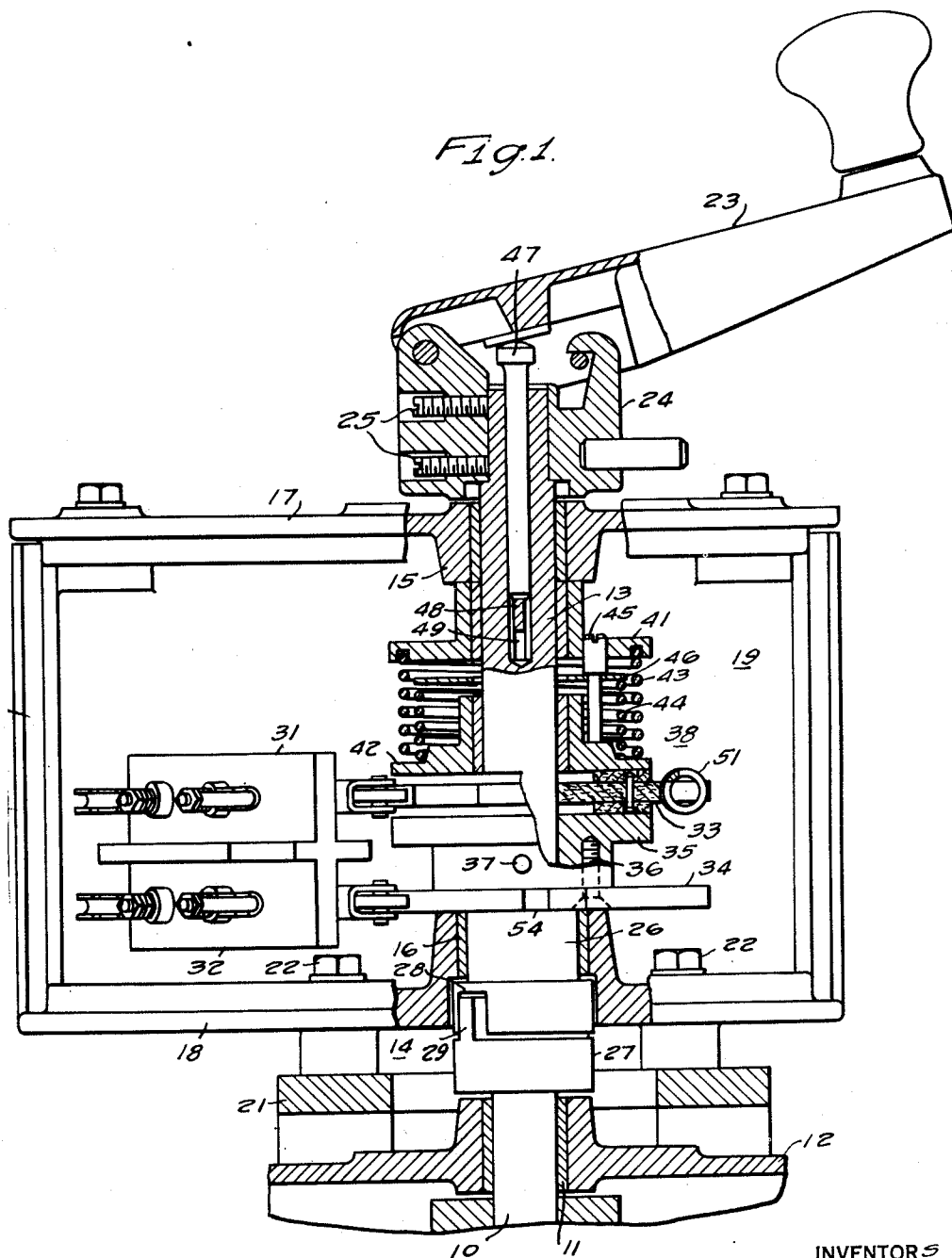
H. C. KRAPF ET AL

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SAFETY HANDLE FOR CONTROLLERS

Filed Dec. 18, 1947

2 Sheets-Sheet 1



WITNESSES:

E. A. McLeskey
M. E. Chiles

INVENTORS
Herman C. Krapf and
Paul L. Vollmer.
BY
G. M. Crawford
ATTORNEY

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H. C. KRAPF ET AL

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2 Sheets-Sheet 2

Fig. 2.

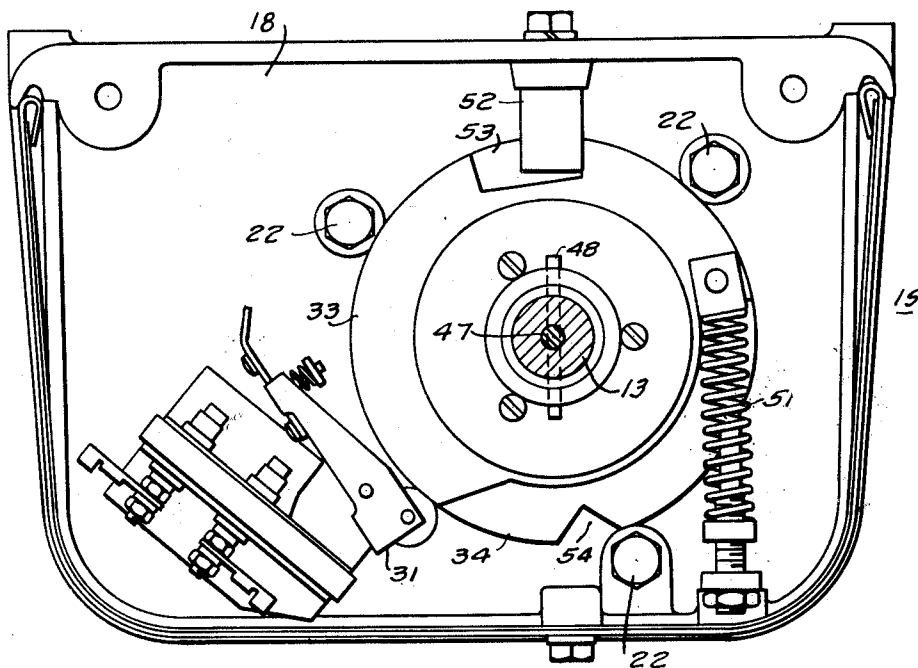


Fig. 3.

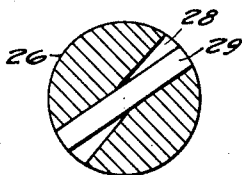
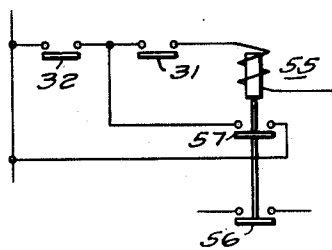


Fig. 4.



WITNESSES:

E. A. M. M. M.
H. C. K.

INVENTORS

Herman C. Krapf and
Paul L. Vollmer.

BY
G. M. Crawford
ATTORNEY

UNITED STATES PATENT OFFICE

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SAFETY HANDLE FOR CONTROLLERS

Herman C. Krapf and Paul L. Vollmer, Wilkesburg, Pa., assignors to Westinghouse Electric Corporation, East Pittsburgh, Pa., a corporation of Pennsylvania

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7 Claims. (Cl. 200—18)

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Our invention relates, generally, to controllers and, more particularly, to safety handles for controllers of a type suitable for controlling the operation of electric locomotives.

Many locomotives, cars, and other equipment now in service, particularly in mines, require the addition of safety devices in order to meet the safety requirements set by industry and government regulations.

An object of our invention, generally stated, is to provide a safety handle for a controller which shall be simple and efficient in operation and which may be economically manufactured and installed.

A more specific object of our invention is to provide a safety handle which may be readily attached to existing controllers.

Another object of our invention is to provide a controller handle which must be depressed while power is applied to the motors controlled by the controller.

A further object of our invention is to so operate a contactor disposed externally of a controller that circuit interrupting duty is removed from the controller.

Still another object of our invention is to provide a controller handle which must be returned to the "off" position and then advanced to re-apply power to the motors after a power failure.

Other objects of our invention will be explained fully hereinafter or will be apparent to those skilled in the art.

In accordance with one embodiment of our invention, a safety handle device is so constructed that it may be readily attached to the top of an existing controller. The operating shaft of the handle is connected to the controller shaft by a lost motion device which permits the handle to be rotated a suitable number of degrees before the controller shaft is rotated. Cam switches disposed within the safety device are so operated and connected in the controller circuits that power is shut off if the operator releases the handle or moves the handle toward the "off" position. Power cannot again be applied until the controller is returned to the "off" position and then advanced in the usual manner.

For a better understanding of the nature and objects of our invention, reference may be had to the following detailed description, taken in conjunction with the accompanying drawings, in which:

Figure 1 is a view, partially in longitudinal section and partially in elevation, of a portion of a controller embodying our invention.

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Fig. 2 is a view, partially in transverse section and partially in plan of the safety handle attachment for the controller.

Fig. 3 is a sectional view through the lost motion device for connecting the operating shaft and the controller shaft, and

Fig. 4 is a diagram showing part of the circuit connections for the controller.

Referring to the drawings, and particularly to Fig. 1, the structure shown therein comprises a portion of a controller having a main shaft 10 which is rotatably mounted in a bearing 11 disposed in the top of a casing 12. The main shaft 10 is connected to a coaxially disposed operating shaft 13 through a lost motion device 14. The operating shaft 13 is rotatably mounted in bearings 15 and 16 which are disposed in the top 17 and the bottom 18 respectively of a safety handle device 19 which may be mounted on top of the controller casing 12.

The safety device 19 may be attached to the controller by means of an adapter plate 21 which may be riveted or bolted to the top of the controller casing 12. The bottom 18 of the safety device 19 may be bolted to the adapter plate 21 by means of bolts 22.

The safety device 19 is provided with a handle 23 which is pivotally mounted in a bracket 24 which may be secured to the operating shaft 13 by set screws 25. The handle 23 may be actuated in a vertical plane as well as in a horizontal plane, as will be explained more fully hereinafter.

The lost motion device 14 which connects the two shafts 10 and 13 comprises a sleeve 26 which is secured to the shaft 13 and a collar 27 which is secured to the shaft 10. The sleeve 26 has a groove or slot 28 cut therein and the collar 27 is provided with a rib 29 which is disposed in the slot 28 as shown in Fig. 3. The slot 28 is so machined that the sleeve 26 can rotate a predetermined amount before the side of the slot 28 engages the rib 29.

As shown in Figs. 1 and 2, two cam switches 31 and 32 are so mounted in the safety device 19 that they may be actuated by cams 33 and 34, respectively. The cam 34 is attached to a flanged collar 35 by screws 36 and the collar 35 is secured on the shaft 13 by a pin 37. Therefore, the cam 34 rotates with the shaft 13.

The cam 33 is driven by the shaft 13 through a friction clutch 38. The friction clutch 38 comprises two flanged collars or plates 41 and 42 which are rotatably mounted on the shaft 13. The collars 41 and 42 are separated by a spring 43 and

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a spring 44 which is mounted inside of the spring 43.

The initial pressure of the spring 44 is set by screws 45 which engage a washer 46 disposed on top of the spring 44. The pressure of the spring 43 is increased by actuating the handle 23 in a vertical plane which transmits force to the collar 41 by depressing a plunger 47 to cause a key 48 which is disposed in a slot 49 to engage the collar 41 and lower the collar against the spring 43. As the collar 41 is lowered, it engages the washer 46 to increase the pressure of the spring 44.

In this manner the cam 33 is gripped between the collars 42 and 35 and is rotated by the collar 35 against the compression of a spring 51. As shown in Fig. 2, one end of the spring 51 is connected to the cam 33 and the other end is adjustably connected to the housing of the safety device 19.

As also shown in Fig. 2, the rotation of the cam 33 is limited by a stop pin 52 which is mounted on one side of the housing of the safety device 19 and is disposed in a slot 53 in the cam 33. After the cam 33 has been rotated to the limit of its travel permitted by the stop pin 52, it remains in this position so long as the handle 23 is depressed and rotated in the same direction. When the cam 33 has reached the limit of its travel, the friction clutch 33 slips thereby permitting the handle to be rotated further.

Assuming that the handle 23 is rotated in a clockwise direction from the "off" position to apply power to the motors controlled by the controller, pressure is applied to the cam 33 in the manner hereinbefore described by depressing the handle 23. When the handle is rotated in a clockwise direction, the cam 33 is rotated a predetermined amount, for example 15°, against the spring 51 until further rotation of the cam is stopped by the stop pin 52. At the end of the 15° rotation of the cam 33, the contact members of the cam switch 31 are closed.

As explained hereinbefore, the lost motion device 14 which connects the operating shaft 13 to the main shaft 10 has a predetermined amount of lost motion, for example, 15°. Thus, the main controller shaft 10 is not rotated until after the end of the 15° motion is reached.

As shown in Fig. 2, a notch 54 is provided in the cam 34. The notch 54 is so located that as the main controller shaft 10 is rotated into the first operating position of the controller, the contact members of the cam switch 32 are closed.

As shown in the diagram in Fig. 4, when the cam switches 31 and 32 are both closed, the actuating coil of a line switch 55 is energized, thereby closing the line switch and applying power to the motors (not shown) through contact members 56 of the line switch. Auxiliary contact members 57 on the line switch 55 are also closed at this time to bridge the contact members of the cam switch 32.

Further rotation of the handle 23 operates the controller to shunt resistance from the motor circuit in the usual manner. When the controller is rotated past the first operating position, the cam switch 32 is opened by the cam 34. However, the energizing circuit for the actuating coil of the line switch 55 is maintained through the auxiliary contact members 57.

If the line switch is opened for any reason, as, for example, by operation of an overload protective device, it cannot be reclosed until the controller is returned to the "off" position and then

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actuated to the first operating position in the regular manner to reclose the cam switches 32 and 31. Therefore, the power cannot be reapplied to the motors without the full amount of the resistance being inserted in the motor circuit.

If the operator releases the handle 23 with the controller in any operating position, the pressure of the friction clutch 38 on the cam 33 is released and the spring 51 rotates the cam 33 in the counterclockwise direction 15° to open the contact members of the cam switch 31 which opens the circuit for the actuating coil of the line switch 55, thereby opening the line switch and cutting off power from the motors.

If the handle 23 is moved from any operating position toward the "off" position, the first 15° of motion opens the cam switch 31 which, in turn, causes the line switch 55 to open. The 15° of counterclockwise motion which opens the cam switch 31 must be completed before the controller drum is rotated counterclockwise because of the lost motion device 14 between the controller shaft 10 and the operating shaft 13. In this manner, the motor circuit is always opened by the line switch 55, thereby preventing the contact members of the controller from opening the motor circuit.

In order to close the circuit for the actuating coil of the line switch 55, the 15° of lost motion must first be taken up and then the controller rotated to the first operating position to close the line switch 55 in the manner hereinbefore explained. This necessitates that the handle 23 be returned to the "off" position, depressed and then rotated in the manner hereinbefore described.

From the foregoing description it will be seen that the safety handle device functions to cause power to be shut off if the operator releases the handle. Power is also shut off when the handle is moved from any operating position toward the "off" position and power cannot again be applied until the controller is rotated to the "off" position and notched up in the regular manner.

Thus, the device requires that the operator keep his hand on the operating handle while power is applied to the motor. The device so controls the operation of a line switch that circuit interrupting duty is removed from the controller, thereby reducing the possibility of flash-over and reducing controller maintenance.

Furthermore, the device requires that the controller be returned to the "off" position and notched up in the regular manner in case of a power failure of any kind, thereby preventing the motor from being started unless the full amount of starting resistance is in the motor circuit. This reduces the possibility of the motor flashing and prevents the equipment from starting with sudden jerks which might throw the operator from his seat.

Since numerous changes may be made in the above-described construction, and different embodiments of the invention may be made without departing from the spirit and scope thereof, it is intended that all matter contained in the foregoing description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

We claim as our invention:

1. In a controller, in combination, a main shaft, an operating shaft disposed coaxially with the main shaft, a handle pivotally mounted on the operating shaft and movable in a vertical plane and in a horizontal plane, a lost motion device for connecting the operating shaft to the

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main shaft, a friction clutch actuated by movement of the handle in a vertical plane, a cam driven by the operating shaft through the friction clutch, switching means actuated by said cam prior to rotation of the main shaft by the handle through the lost motion device, an additional cam secured to the operating shaft, and additional switching means actuated by said additional cam independently of the friction clutch.

2. In a controller, in combination, a main shaft, an operating shaft disposed coaxially with the main shaft, a handle pivotally mounted on the operating shaft and movable in a vertical plane and in a horizontal plane, a lost motion device for connecting the operating shaft to the main shaft, a friction clutch actuated by movement of the handle in a vertical plane, a cam driven by the operating shaft through the friction clutch, switching means actuated by said cam means prior to rotation of the main shaft by the handle through the lost motion device, an additional cam secured to the operating shaft, and additional switching means actuated by said additional cam after rotation of the main shaft by the handle through the lost motion device.

3. In a controller, in combination, a main shaft, an operating shaft disposed coaxially with the main shaft, a handle pivotally mounted on the operating shaft and movable in a vertical plane and in a horizontal plane, a lost motion device for connecting the operating shaft to the main shaft, a friction clutch actuated by movement of the handle in a vertical plane, a cam rotated by the operating shaft through the friction clutch, switching means actuated by said cam, an additional cam rotated by the operating shaft independently of the friction clutch, and additional switching means actuated by said additional cam.

4. In a controller, in combination, a main shaft, an operating shaft disposed coaxially with the main shaft, a handle pivotally mounted on the operating shaft and movable in a vertical plane and in a horizontal plane, a lost motion device for connecting the operating shaft to the main shaft, a friction clutch actuated by movement of the handle in a vertical plane, a cam rotated by the operating shaft through the friction clutch, switching means actuated by said cam prior to rotation of the main shaft by the operating shaft through the lost motion device, an additional cam rotated by the operating shaft independently of the friction clutch, and additional switching means actuated by said additional cam.

5. In a controller, in combination, a main shaft, an operating shaft disposed coaxially with the main shaft, a handle pivotally mounted on the operating shaft and movable in a vertical plane and in a horizontal plane, a lost motion de-

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vice for connecting the operating shaft to the main shaft, a friction clutch actuated by movement of the handle in a vertical plane, a cam rotated by the operating shaft through the friction clutch, stop means for limiting the rotation of the cam, switching means actuated by said cam, an additional cam rotated by the operating shaft independently of the friction clutch, and additional switching means actuated by said additional cam.

6. In a controller, in combination, a main shaft, an operating shaft disposed coaxially with the main shaft, a handle pivotally mounted on the operating shaft and movable in a vertical plane and in a horizontal plane, a lost motion device for connecting the operating shaft to the main shaft, a friction clutch actuated by movement of the handle in a vertical plane, a cam rotated by the operating shaft through the friction clutch, stop means for limiting the rotation of the cam, switching means actuated by said cam, and spring means for rotating said cam to open said switching means when the friction clutch is released, an additional cam rotated by the operating shaft independently of the friction clutch, and additional switching means actuated by said additional cam.

7. In a controller, in combination, a main shaft, an operating shaft disposed coaxially with the main shaft, a handle pivotally mounted on the operating shaft and movable in a vertical plane and in a horizontal plane, a lost motion device for connecting the operating shaft to the main shaft, a friction clutch actuated by movement of the handle in a vertical plane, a cam rotated by the operating shaft through the friction clutch, switching means actuated by said cam, an additional cam secured to the operating shaft, and additional switching means actuated by said additional cam independently of the friction clutch.

HERMAN C. KRAPP.
PAUL L. VOLLMER.

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