Aug. 9, 1932. F. F. SEAMAN ET AL 1,870,385

HOISTING MECHANISM

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FIG 1

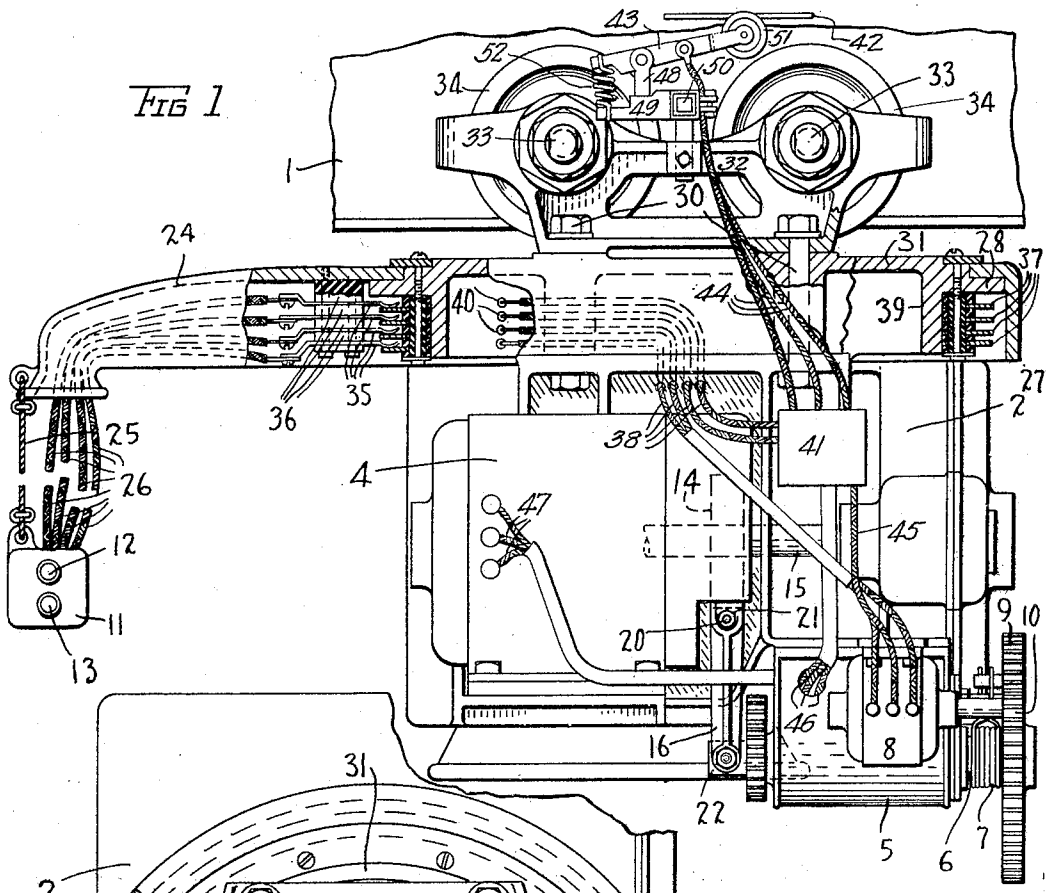
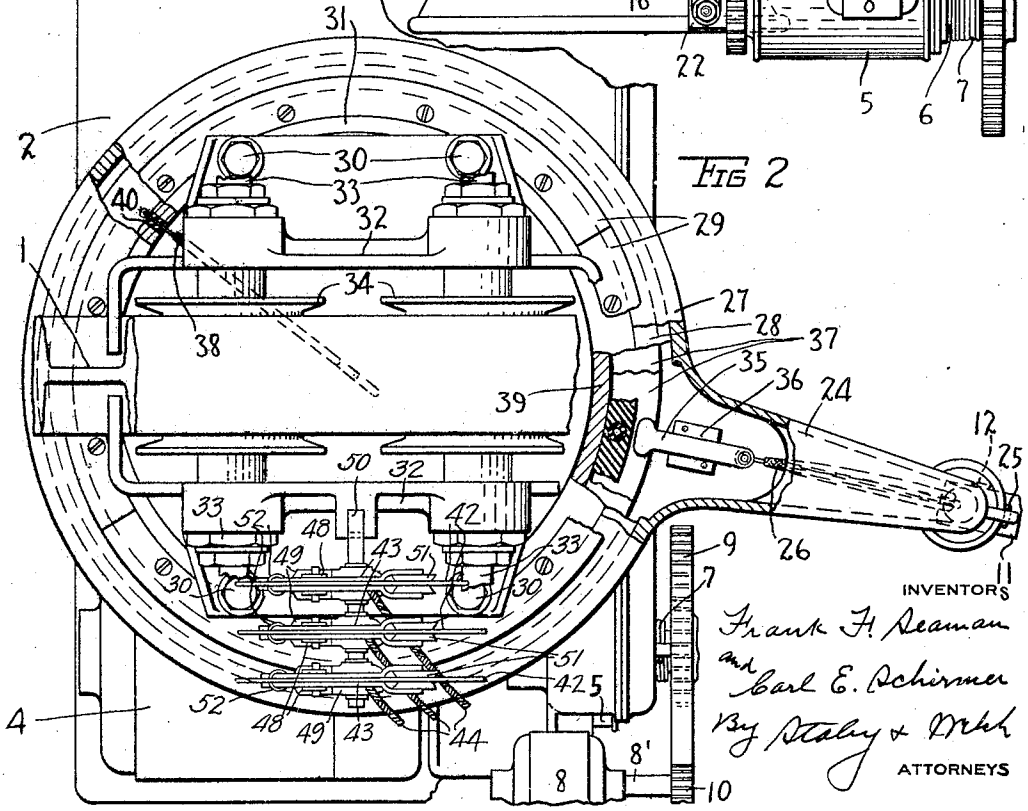


FIG 2



INVENTORS

Frank F. Seaman

and Carl E. Schirmer

By Staley & Welch

ATTORNEYS

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FIG. 5

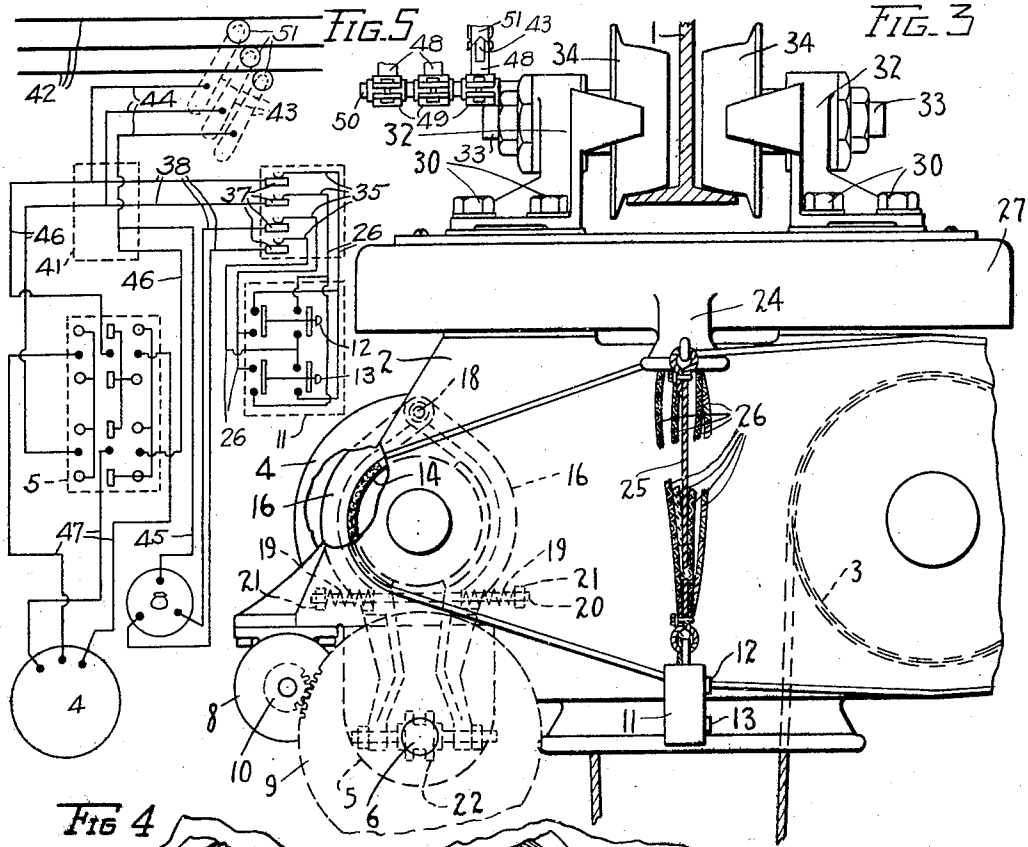
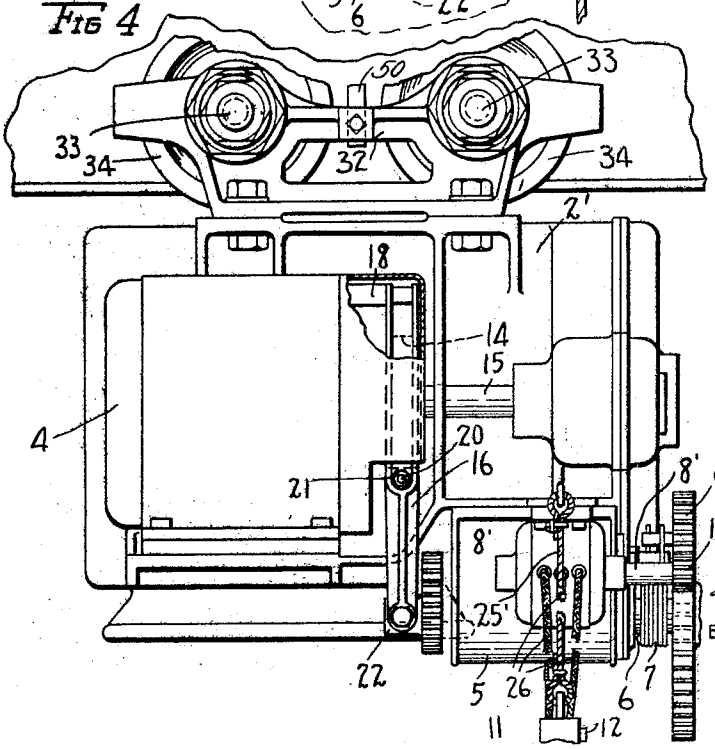


FIG. 3

FIG 4



INVENTORS

Frank F. Seaman

and Carl E. Schirmer

BY

Staley & Welch

ATTORNEYS

Patented Aug. 9, 1932 1,870,385

UNITED STATES PATENT OFFICE

FRANK F. SEAMAN AND CARL E. SCHIRMER, OF SPRINGFIELD, OHIO, ASSIGNORS TO ROBBINS & MYERS, INC., OF SPRINGFIELD, OHIO, A CORPORATION OF OHIO

HOISTING MECHANISM

Application filed March 14, 1930. Serial No. 435,936.

This invention relates to improvements in hoisting apparatus having an electric motor to operate the hoisting drum, it more particularly relating to improvements in the method of and means for controlling the motor.

One of the objects of the invention is the provision of improved means whereby a small reversible electric motor is utilized to actuate a controller to control the flow of current to the hoist motor, the small motor being energized to run in either direction through the manipulation of a manually-operated switch placed in easy reach of the operator.

A further object of the invention is the provision of means for controlling the hoisting motor of a hoisting mechanism by a manually-operated electric switch in convenient reach of the operator such that the usual form of mechanically operated motor brake may be retained.

Another object of the invention is to provide manually-operated control devices for the controlling motor of a freely-movable character to enable the operator to retain control of the motor from various different positions of operation.

Other objects and advantages will appear from the following description and claims.

In the accompanying drawings:

Fig. 1 is a side elevation in partial section.

Fig. 2 is a top plan view in partial section.

Fig. 3 is a side elevation in partial section.

Fig. 4 is a side elevation of a modification.

Fig. 5 is a diagrammatic view of the electrical circuits.

In the present case the hoisting devices are supported by a trolley which is hung from an I-beam 1 in the usual manner. The main frame of the hoist is indicated at 2, the hoisting drum at 3 having the usual brake control (not shown), and the hoist motor at 4, the gearing between the hoist motor and drum not being shown in the present case as conventional practice has been followed in this respect. A semi-rotary controller of a well known type is indicated at 5 having a shaft 6 on which are contact points (not shown) which, on partial rotation of the shaft on either side of the off or neutral position close circuits by which the hoist motor is energized to rotate the drum in either the hoisting or lowering direction.

Heretofore, a usual manner in which to operate the controller of this type has been by the use of pendent ropes attached to a double armed lever fixed on the shaft 6, the operator pulling and holding downwardly on one of the ropes to elevate the load, and by releasing, allowing the upward travel to cease at any point, since the controller is returned to the neutral position by the coiled spring 7. When the load, or hook is to be lowered, the other rope was pulled and held downwardly, and released when desired. A disadvantage of this method may be readily seen when it is explained that an operator may have the desire to manipulate the crane hook with one hand and cannot conveniently reach the desired rope with the other hand, and cannot attempt to actuate the controller with both ropes in one hand without subjecting himself to possible injury.

To obviate this disadvantage and to make the operation of a trolley hoist more safe and convenient, we have devised a method and means for actuating the controller which will now be described. At 8 a small reversible motor is indicated, this motor being preferably of the type which may be stalled across the line, and is known by various names such as torque motor, revolving magnet motor, and the like. This type motor is well-known and by its design is well adapted to the purposes for which we utilize it inasmuch as by suitable reduction gearing such as is indicated by the large gear 9 on the controller shaft 6 and the pinion 10 on the controller motor shaft 8', the controller shaft may be caused to be given a partial rotation to either of the

operative positions and there held so long as the switch supplies the current is maintained in this closed position.

It will be understood that the small controller motor 8 is "stalled" when the connected controller shaft has been put in either of the operative positions, the rotor of the controller motor having revolved only so long as was necessary to cause the controller to reach an operative position, there being positive stop mechanisms (not shown) incorporated in the controller mechanism, but by reason of the ability of this type of motor to stall across the line, no injurious effects are produced. When the switch is opened, the fields of the controller motor are de-energized and the controller shaft 6 returns to the neutral position through the action of the spring 7, which is put in torsion, either tending to be wound tighter or to be unwound, when the controller is placed in either of the operative positions. It should be understood that when the controller is being returned to the neutral position the rotor of the controller motor is being revolved solely by the action of the spring.

A convenient switch mechanism for the control of the controller motor in the form of a push-button device in which two circuit closing buttons 12 and 13 and the proper contacts are carried by a single box or casing 11. This device is equipped with a well known form of interlock (not shown) to prevent the closing of both switches (in the present case) at the same time. It is preferable to employ the upper button 12 to start the hoisting motor to lift the load or hook, while the lower button 13 controls the lowering movement, in either case the button pressed being held down until the desired movement is accomplished and returned by a spring (not shown). To stop the hoisting motor, it is only necessary to release the pressure on the button which has been depressed.

In hoisting mechanism of this character it is usual to employ a brake for the hoisting motor and gearing to prevent coasting of the hoist hook. A preferable form of brake is one of the mechanically-operated type, preferably cam-operated, because of its simplicity. Such a brake is shown in Fig. 3 in which 14 represents the brake drum which is fixed on the motor shaft 15. Cooperating with the periphery of the drum is a pair of arms 16 equipped with friction brake lining, the upper ends of the arms being pivoted on a stud 18 projecting from the motor head. Coil springs 19 on a rod 20, passing through the arms, and interposed between the arms and nuts 21 on the rod, serve to normally put the necessary spring tension upon the arms to afford a suitable braking effect on the drum 14. This braking effect however is relieved during the time that the hoist motor is operated by the action of a double-faced cam 22 fixed on an extended portion of the controller shaft 6, this cam acting to spread apart the lower ends of the arms 16 when the shaft 6 is rotated. In the drawings, the cam is shown in its inoperative vertical position, in which position the control is at the neutral point and the brake drum is held by the brake arms 16.

One of the important advantages of our invention is that we are enabled to retain such a form of brake, whereas in other hoisting mechanisms where push button control of the hoist motor is employed it has been necessary to use the more complicated magnetic type of motor brake because of the fact that such other mechanisms all embody a motor controller of the contactor-panel type wherein the circuits are closed and opened by means of magnets energized through the closing and opening of the circuits by the push buttons, the use of such a type of controller affording no means for operating the simpler form of brake employed in our apparatus.

For further convenience in the operation of a hoist of this character, provision has been made to suspend the push-button control device by means of an arm which may be swung about the hoist, so that the operator may stand at the most advantageous point. Referring to Figs. 1 and 2, an arm 24 is extended far enough to clear the entreme corners of the frame of the hoist, and on the end of this arm the push-button contact box 11 is suspended by a metallic cable 25 by which any strain such as may occur when the operator pulls the hoist along the runway is assumed by the cable and not by the conductor wires 26. The arm 24 is preferably integrally attached to and supported by a ring-like member 27 which is fitted to revolve freely on a circular flange 28 which is a part of the frame construction, the ring being held to its seat by a split circular collar, the halves of which are indicated at 29. Bolts 30 pass through the part 31 to which the flange 28 is secured, and attach the hoist frame proper to the trolley members 32, these members being provided with studs 33 on which are journalled the trolley wheels 34.

The conductor wires leading from the push-button control device 11 pass through the hollow arm 24 and at their upper ends are connected to wiper fingers 35 secured in blocks 36 of insulating material and secured to the inside portion of the arm. These wiper fingers bear on flat, circular conductor rings 37, which, in the present case, are mounted one above the other and concentrically disposed with respect to the center of the flange 28, and are insulated from each other and from the frame by suitable insulating material. Each conductor wire is therefore electrically connected to its corresponding conductor ring, so that as the arm is

swung about current will always be supplied to, or conducted from the push-button control device. Connections are made to the conductor rings by means of other wires 38 which pass through openings in the flange 39 through tubular insulators 40 fitted therein. There are four of these wires 38, two going to the junction box 41 and two to the controller motor 8. Current is collected from three overhead conductors 42 by collector arms 43, wires 44 leading from these collector arms to the junction box 41 and a single wire 45 leads from the junction box to the motor 8 and three wires 46 also lead from the junction box to the controller 5. From the controller 5, three wires 47 lead to the main motor 4. Each collector arm 43 is pivoted on a forked standard 48 supported from an arm 49 which is secured to and insulated from a support 50 on the frame 32 of the trolley, the collector arm carrying a grooved wheel 51 which is held in contact with its conductor wire by a spring 52.

Although we have shown herein only the manner of collecting current and the other essentials to the stopping and starting of the reversible controller motor by which the hoist motor is controlled, it should be understood that it is a simple matter to enlarge the number of parts whereby the control of travel motors or such motors as make possible the power traverse of the hoist along the runway or beam, is effected without departing from the spirit of the invention, in which case the number, location and function of the various buttons in the push button device is altered correspondingly.

It will be seen that the operation of a hoist constructed as herein described is reduced to the simple pressing of the desired push-button to accomplish the elevating, lowering or traversing movements, if it be equipped for the latter function, with the added advantage that the operator is permitted one-hand manual control at points most convenient for his personal safety or for the facilitation of the work to be done. Furthermore, by the selection and grouping of the various units as disclosed we are enabled to accomplish the desired results with the minimum initial outlay, depreciation and maintenance charges.

In Fig. 4 a modification of the invention is shown. In this construction, the swinging arm is omitted, the pendent push-button control device being suspended by the cable 25′ directly from the frame 2′, all other parts similar to those shown in the other figures being given the same reference characters.

Having thus described our invention, we claim:

1. In an apparatus of the character described, an overhead support, an electric motor located on said support, a rotatable arm carried by said support, electrical conducting means carried by said support leading to said motor, cooperating electrical conducting means carried by said arm, a remote control switch located in convenient reach of the operator, and conductors leading from said switch to said arm conductor means.

2. In an apparatus of the character described, an overhead support, an electric motor on said support, a rotatable arm mounted on said support, a plurality of conductor rings carried by said support, a plurality of wipers carried by said arm in contact with said rings, electrical connections between the rings and the motor, a remote control switch located in convenient reach of the operator, and conductors leading from said switch to said wipers.

3. In an apparatus of the character described, an overhead support, a motor carried by said support, conductors carried by said support extending to said motor, a rotatable arm carried by said support, conductors carried by said arm electrically connected with the conductors on said support, a remote switch box, means for suspending said switch box from said arm, and conductors other than said suspension means extending from said switch box to the conductors on said arm.

4. In an apparatus of the character described, an overhead support, a motor carried by said support, conductors carried by said support extending to said motor, a rotatable arm carried by said support, conductors carried by said arm electrically connected with the conductors on said support, a freely-movable member depending from said arm for swinging said arm, a switch box attached to the lower end of said member, and conductors extending from said box to the conductors on said arm.

5. In an apparatus of the character described, an overhead support, an electric motor carried by said support, a horizontal rotatable conducting ring mounted on said support, an arm connected with said ring, means extending to within convenient reach of the operator to swing said arm, stationary current conducting means cooperating with said ring and leading to said motor, and a switch and connections for controlling the current, said switch being suspended to within convenient reach of the operator.

6. In an overhead hoisting apparatus, an electric motor, a controller for same, a reversible electric motor to operate said controller, a support depending from said apparatus to a point in convenient reach of the operator, said support being freely movable so that the lower end thereof may be carried by the operator from one point to another, a switch box carried by the lower end of said support, and flexible electrical conductors extending from said structure to said box.

7. In an overhead hoisting apparatus, an electric motor, an arm mounted on said appa-

ratus to swing in a horizontal plane, electrical contact means carried by said arm, a member suspended from said arm and extending in convenient reach of the operator for swinging said arm, said member being freely movable to permit the lower end of the same to be carried by the operator to different points, a control switch carried by the lower end of said suspended member, and conductors leading from said switch to said apparatus.

In testimony whereof we have hereunto set our hands this 12th day of March 1930.

FRANK F. SEAMAN.
CARL E. SCHIRMER.