F. E. LUTZ.

ELECTRICALLY OPERATED HOISTING APPARATUS.

APPLICATION FILED JUNE 8, 1909.

996,267. Patented June 27, 1911.

2 SHEETS—SHEET 1.

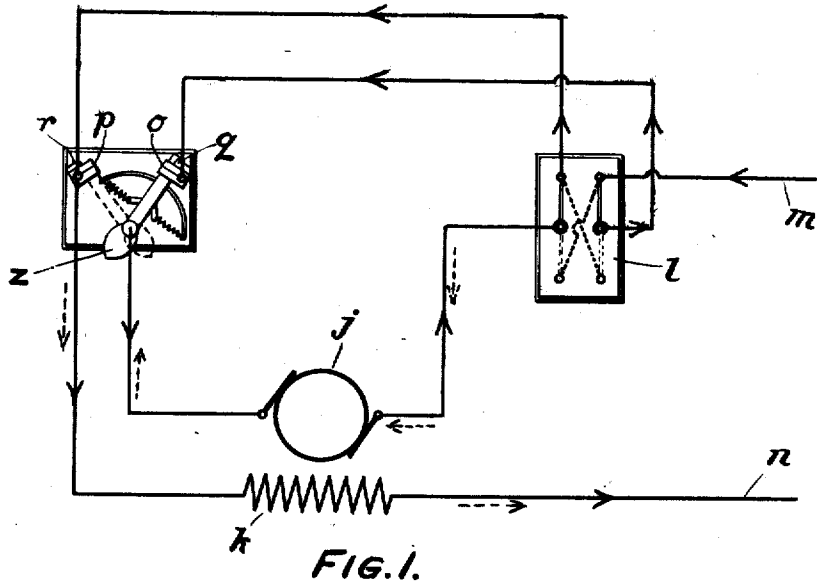


FIG. 1.

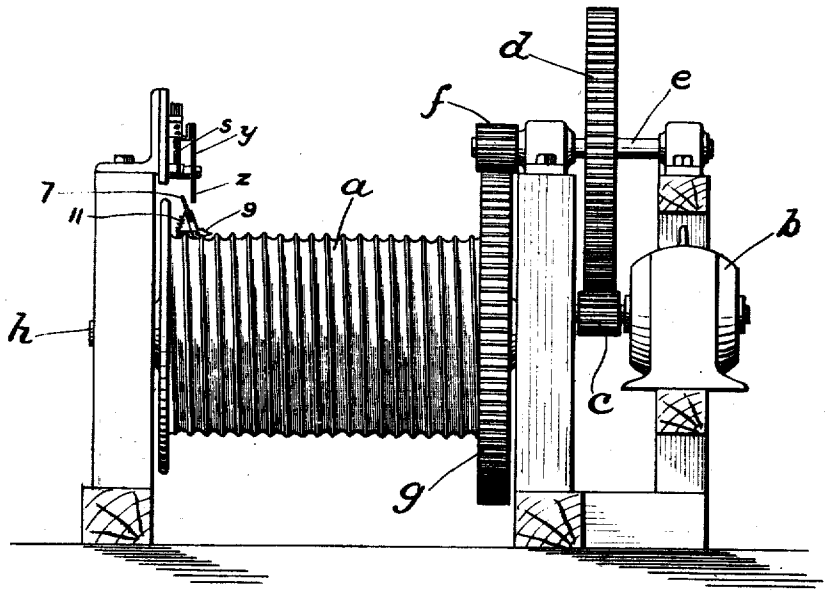


FIG. 2.

WITNESSES:

Robt. A. Ketchel.

A. M. Urian

INVENTOR

Frank Edward Lutz

BY

Munn & Munn

ATTORNEYS

F. E. LUTZ.

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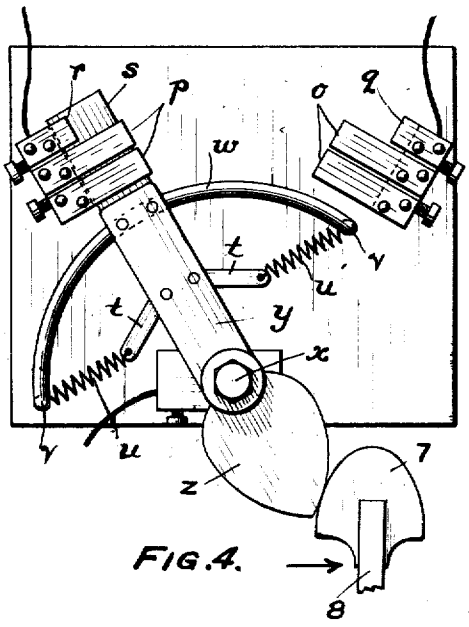


FIG. 4.

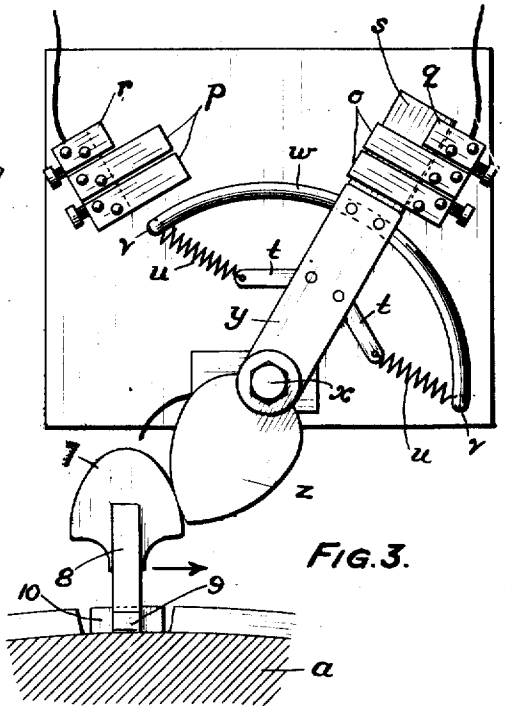


FIG. 3.

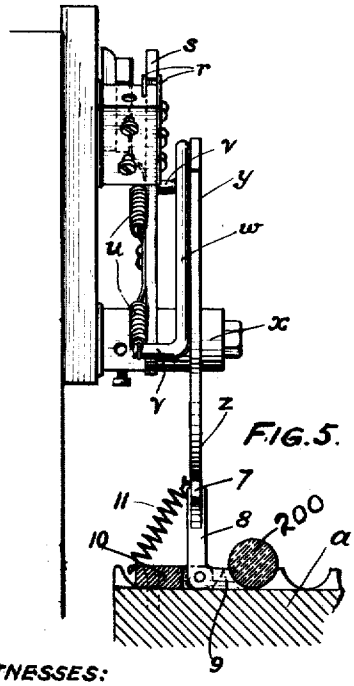


FIG. 5.

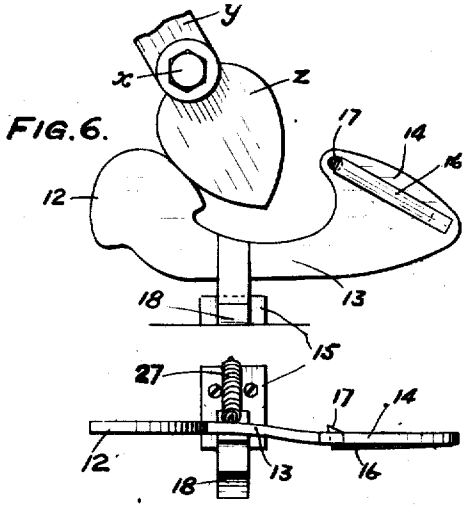


FIG. 6.

FIG. 7.

WITNESSES:

Robt. R. Ritchel.

A. M. Willian.

INVENTOR

Francis Edward Lutz

BY Munn & Co

ATTORNEYS.

# UNITED STATES PATENT OFFICE.

FRANK EDWARD LUTZ, OF PHILADELPHIA, PENNSYLVANIA.

## ELECTRICALLY-OPERATED HOISTING APPARATUS.

996,267. Specification of Letters Patent. **Patented June 27, 1911.**

Application filed June 8, 1909. Serial No. 500,877.

*To all whom it may concern:*

Be it known that I, FRANK EDWARD LUTZ, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Electrically-Operated Hoisting Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to certain improvements in limiting the movement of machinery or apparatus propelled by electric motors, as, for instance, the limiting of the lifting or lowering of hoisting apparatus or the limiting of the vertical or horizontal movement of other moving apparatus.

Particularly, the invention relates to a three point switch with switch blade pivoted at one point and the switch operating arm pivoted at the same point and providing a projection or trip for opening the operating arm. The switch may either be placed on the moving member and the trip on a fixed point or vice versa.

Further, the invention relates to certain electric circuits controlled by the switch, whereby in one position of the switch the current can pass in one or an opposite direction to the motor while in another position of the switch it can pass in one direction only.

Further, as particularly applicable to a hoisting drum, it relates to a trip mounted upon the drum and having its operative position determined by the winding of the rope upon the drum.

This, and certain details of construction of the trip and other mechanism, generally speaking, form the subject-matter of my invention.

I will now describe the embodiments of my invention as applied to a hoisting apparatus, as shown in the accompanying drawings, and then point out the invention in the claims.

In the drawings: Figure 1 is a diagrammatic view of the electric circuits. Fig. 2 is an elevation of a hoisting drum, etc. Fig. 3 is a detail view of switch and trip, etc. Fig. 4 is a similar view with switch in another position. Fig. 5 is a side view of switch, etc. Fig. 6 is an elevation of another view of trip. Fig. 7 is a plan view of trip of Fig. 6.

$a$ is the winding drum, $b$ the motor, $c$ a gear on the motor shaft, $d$ a large gear on shaft $e$ with which gear $c$ meshes, $f$ a small gear on shaft $e$ meshing with gear $g$ on drum shaft $h$.

$j$ is the armature of the motor and $k$ the field.

$l$ is the reversing switch, $m$ the lead wire from one pole of current supply and $n$ the lead wire to the other pole. In this circuit is interposed a controlling switch having the spring contacts $o$ and $p$ in electrical connection with wires of the circuit. In addition to the contacts $o$ and $p$ are the somewhat tighter contacts $q$ and $r$, the purpose of which will hereinafter be fully described.

The switch proper consists of the blade $s$ to which one wire of the circuit connects and the circuit passes through the blade to the one of the contacts $o$ or $p$ to which the blade is connected. The blade is pivotally mounted at $x$.

$t$ are projections from the blade, to each of which is connected a spring $u$. The other ends of the springs are connected to the depending portions $v$ of the yoke $w$. The yoke $w$ is centrally connected to the arm $y$, also pivoted at $x$ and having on its outer end the heart cam $z$.

As may be seen, when the arm $y$ is moved in one direction it throws one of the springs $u$ into tension and when the depending portion $v$ strikes the blade and moves it sufficiently to free the blade from the contacts, the tension of the spring is sufficient to snap the switch blade across the space between contacts and into electrical connection with the other contact. The springs, also, after this, bring the operating arm to normal position.

The auxiliary spring clips or contacts $q$ and $r$ insure the proper holding of the contact with blade until the action of the depending portion $v$ positively moves the blade. This switch is mounted near to the drum so that the cam $z$ is in line with a trip mounted on the drum in one position of the trip. This trip consists of the trip proper 7 of heart shape on the end of the arm 8, having the projecting tongue 9. The arm 8 is pivoted to the frame 10 and a spring 11 connects the trip with the frame to retain it normally in inoperative position. The stand 10 is fixedly mounted so that the tongue 9 is in line with the groove in the drum, so that the rope 200 entering this

groove will bear against this tongue and move the trip into alinement with cam *f*. This tongue is generally placed in line with the groove corresponding with a point just before the limit of the winding.

The controlling switch being in the position shown in full lines, Figs. 1 and 3, and the reversing switch in the position shown in Fig. 1, and the grooves being free, the spring 11 holds the trip in the position shown in Fig. 2. The current then passes through the circuit, Fig. 1, as indicated by the full arrows. The motor is then operated to rotate the drum to wind the cable. When the cable reaches the groove in the drum in line with which the tongue on the trip rests, the cable will move the tongue downward against the action of the spring. This will bring the cam of the trip in line with the cam of the switch as shown in Fig. 5. Further movement of the drum will cause the cam of the trip to move, the cam of the switch (see Fig. 3) moving the arm and expanding one of the springs *u*. The blade will then be positively moved by the depending portion *v of* the yoke *w* until moved free from the auxiliary clips *q* and *r* or free from the clips when the springs will snap the blade across the gap to the opposite contacts. The springs will also return the operating arm to operative position when the cam trip passes beyond it. The position of the arm and the blade in this position is shown in Fig. 4 and the position of the blade in dotted lines, Fig. 1. With the blade in this position shown in Fig. 1, no current will pass to the motor with the reversing switch in its initial position for operating the motor to rotate the drum to wind the cable (see full arrows). When, however, the reversing switch is reversed to allow the motor to revolve to rotate the drum to unwind, the current will pass as indicated by the dotted arrows, Fig. 1. By this arrangement it is impossible, after the trip has acted, to operate the reversing switch except to cause the motor to operate in the opposite direction, *i. e.*, to unwind the rope.

As soon as the drum moves to unwind, the trip will act to operate the controlling switch and bring it back to its initial position, Fig. 1, the trip passing beyond the cam *z* of the arm *y* of this switch. The blade then contacts with contact *q*. The wiring in this position is such as to allow the current to continue to pass in the same direction as with the blade in contact with contact *p*, and the drum can continue to descend. When the rope passes from contact with the tongue of the trip in the movement of the drum to unwind, the spring moves the trip to inoperative position where it remains until again brought into action by the cable in the rotation of the drum to ascend.

The trip device shown in Fig. 6 is one that may be used and has the advantage over the trip shown in Figs. 3 and 4 in that of making certain the return of the blade of the controlling switch, which would not occur in the switches of Figs. 3 and 4 if the trip failed to pass beyond the cam on the end of arm *y*. This trip consists of a heart-shaped cam 12 like that of Figs. 3 and 4, which forms part of a frame 13 having a cut-away portion between cam 12 and projection 14. This projection has a spring blade 16 connected to its rear surface to which is connected a pin or projection 17, projecting through an orifice in line with the active face of cam 12. This frame 13 is pivoted to a bracket or frame 15 and also connected thereto by spring 27. The frame 13 has also a tongue 18. The bracket is supported so that the tongue 18, like the tongue 9 of the trip shown in Figs. 3 and 4, will be in line with a groove in the drum. The frame 13 is brought into action by the cable pressing upon the tongue and moved out of action by the spring.

As may be seen, in the winding of the drum if for any reason the cam 12, corresponding to the cam 7 of the trip of Figs. 3 and 4, should not pass beyond the cam *z* in the reverse movement of the drum, the pin 17 will strike the cam *z* and bring the blade of the controlling switch back to its initial position.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:—

1. In an apparatus of the character described, a controlling switch device comprising, in combination, two contacts, a pivoted switch blade adapted to swing from one contact to the other, a pivoted arm, projections thereon, one adapted to engage said blade and move it from its position of tight engagement with one contact toward the other contact, and the other adapted to engage said blade and move it from its position of tight engagement with the second contact toward the first contact, and a spring connecting said arm and said blade adapted to be thrown into tension during the movement of the arm until one of its projections engages and releases the blade and to thereafter snap said blade into engagement with the other contact.

2. In an apparatus of the character described, a controlling switch device comprising, in combination, two contacts, a pivoted switch blade adapted to swing from one contact to another, an arm pivoted on the axis of the switch blade and normally occupying a position parallel thereto when the switch blade is engaged with either contact, means to swing said arm from one to the other of its normal positions, a spring connecting said arm and blade adapted to be thrown into tension during the swinging movement of the arm, and means on the arm adapted dur-

ing its movement to engage and move said blade out of tight engagement with its contact thereby permitting the spring to act to throw said blade into engagement with the other contact.

3. In an apparatus of the character described, a controlling switch device comprising, in combination, two contacts, a pivoted switch blade adapted to swing from one contact to another, an arm pivoted on the axis of the switch blade and normally occupying a position parallel thereto when the switch blade is engaged with either contact, means to swing said arm from one to the other of its normal positions and projections carried on opposite sides of said arm and springs connecting said blade with the respective projections, said blade being in line of travel of one of said projections when the arm is swung as aforesaid; whereby the blade is first moved from tight engagement with one contact by means of said projections and then snapped toward the other contact by the spring that is thrown into tension during the movement of the arm.

4. In an apparatus of the character described, a controlling switch comprising, in combination, two sets of contacts, each comprising a contact adapted to hold the switch blade relatively loose and one to hold it relatively tight, a pivoted switch blade adapted to swing from one set of contacts to another, a pivoted arm, projections thereon adapted, toward the completion of the swinging movements of the arm, to engage said blade and release it from the tight contacts respectively, and a spring connecting the arm and the blade adapted to be thrown into tension during the movement of the arm to snap the blade, after its release from a tight contact, out of engagement with the corresponding loose contact and into engagement with the other set of contacts.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, on this 4th day of June 1909.

FRANK EDWARD LUTZ.

Witnesses:
M. M. HAMILTON,
A. M. URIAN.