Aug. 18, 1925. 1,550,114

W. E. SIMPSON

HOIST

Original Filed Sept. 10, 1920 2 Sheets-Sheet 1

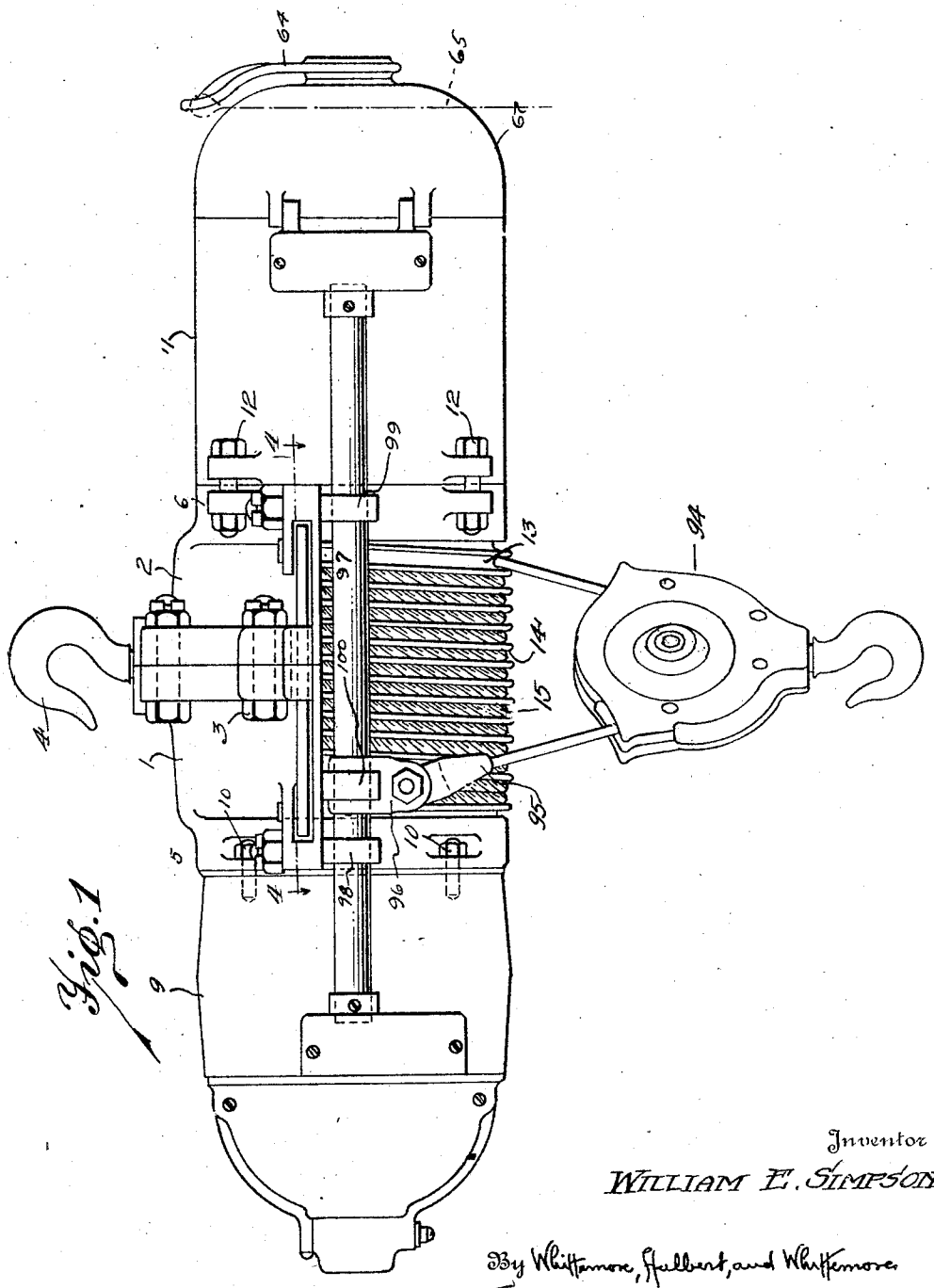


Fig. 1

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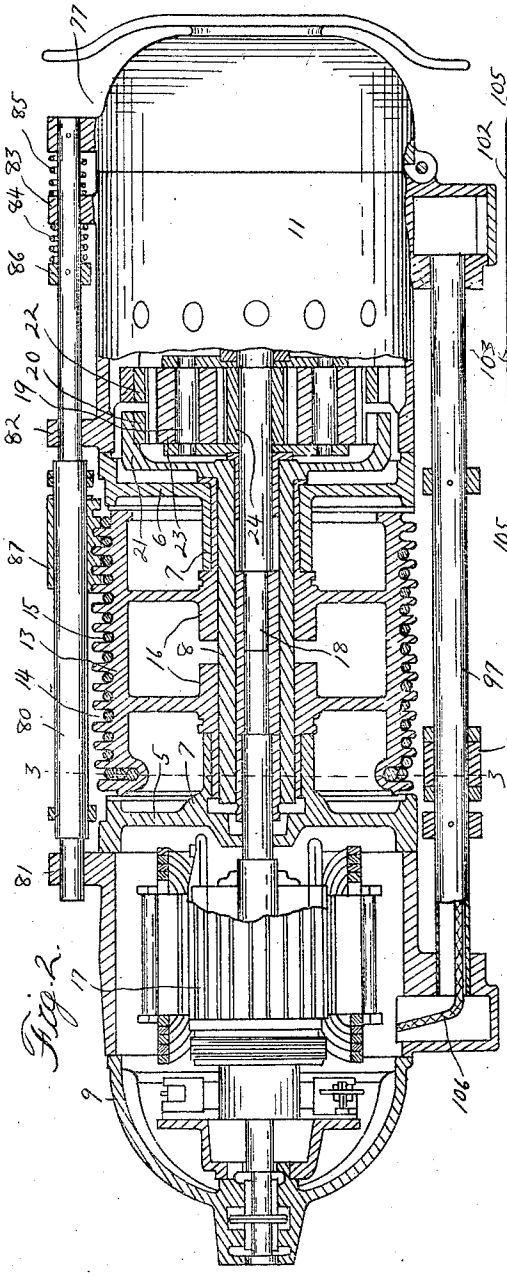


Fig. 2.

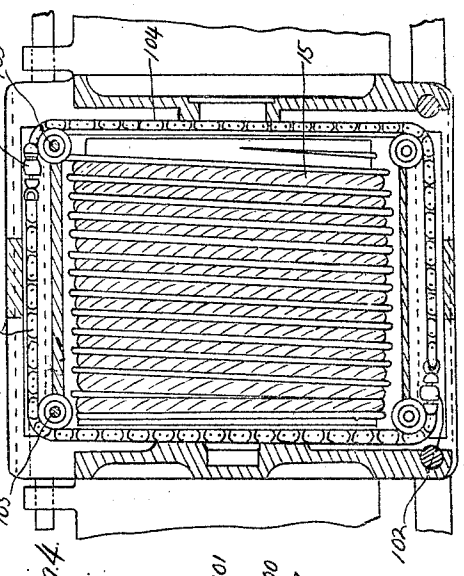


Fig. 4.

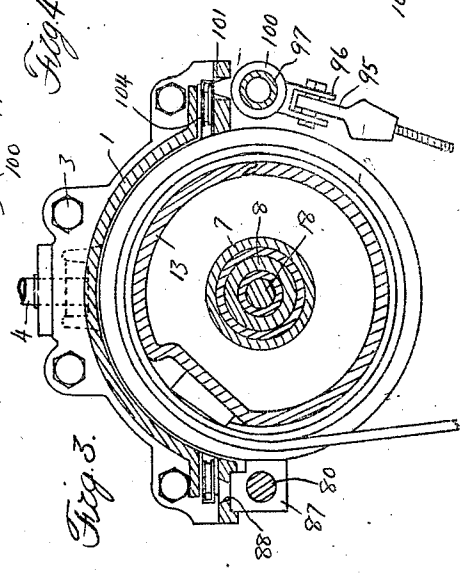


Fig. 3.

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Patented Aug. 18, 1925. 1,550,114

UNITED STATES PATENT OFFICE.

WILLIAM E. SIMPSON, OF HIGHLAND PARK, MICHIGAN.

HOIST.

Application filed September 10, 1920, Serial No. 409,436. Renewed January 26, 1925.

To all whom it may concern:

Be it known that I, WILLIAM E. SIMPSON, a subject of the King of Great Britain and Ireland, residing at Highland Park, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Hoists, of which the following is a specification, reference being had therein to the accompanying drawings.

The invention relates to hoists and is especially adapted to be used in cranes and the like, operated by electric power or by any suitable fluid pressure motor. The invention has for some of its objects: to provide a guard which will retain the flexible hoisting element within the grooves of the hoist drum or sheave at all times, regardless of side-pull or other abnormal operating conditions; and to provide means whereby the hoist hook is maintained constantly in vertical alignment with the center of gravity of the hoist as a whole and with the suspension point, notwithstanding considerable lateral travel of the flexible hoisting element along the hoist drum or sheave. Other objects of the invention reside in the novel arrangements and combinations of parts as more fully hereinafter set forth.

In the drawings:—

Figure 1 is a side elevation of a hoist embodying my invention;

Figure 2 is a sectional plan view thereof;

Figure 3 is a cross section on the line 3—3 of Figure 2;

Figure 4 is a cross section on the line 4—4 of Figure 1.

As shown, particularly in Figures 1, 2 and 3 the main frame of the hoist comprises a pair of housings 1 and 2 secured to each other on the vertical central line of the hoist, as by the bolts 3, the upper adjoining edges of these housings being suitably secured to the hook 4, by which the hoist is suspended. 5 and 6 are circular diaphragms at the outer ends of the housings 1 and 2, having the hollow bosses 7, in which is journaled the hollow hoist drum shaft 8. 9 is a motor housing suitably secured to the circular diaphragm 5 as by means of the studs 10. 11 is a housing suitably secured to the circular diaphragm 6 as by means of the bolts 12.

13 is a hoist drum having its external peripheral surface formed with spiral grooves 14 for receiving the flexible hoisting element 15, which in the present instance is a rope. The hoist drum 13 has a pair of hubs 16 non-rotatably secured upon the drum shaft 8. For rotating the hoist drum 13 from the motor 17, which is mounted in the motor housing 9, there is a drive shaft 18 connected to the motor and extending through the drum shaft 8 and driving the same through the planetary gearing 19 in the housing 11. The planetary gearing comprises the annular gear 20 secured to a cylindrical flange 21 upon the drum shaft, an annular gear 22 secured to the housing 11 and planetary pinions 23 meshing with the annular gears 20 and 22 and with the drive pinion 24 upon the drive shaft 18. The annular gears 20 and 22 have different numbers of teeth so that for every complete revolution of the planetary pinions 23 within the annular gears, the drum shaft will be rotated through an angle equal to the number of teeth difference between the two annular gears.

The housing 11 also incloses the braking mechanism including the controller for governing the motor, this mechanism being shown and claimed in my co-pending application Serial No. 409,435, filed September 10, 1920.

80 is a rod slidably supported in bearings 82 and 83 upon the housing 11 and in the bearing 81 upon the housing 9, this rod being maintained in a neutral or central position by two springs 84 and 85 surrounding the rod, the spring 84 bearing against the collar 86 fixed upon the rod and one side of the supporting bearing 83, while the spring 85 bears against the other side of the supporting bearing 83 and against the yoke 77, these springs being of equal strength.

Upon the rod 80 is slidably mounted a rack 87 having teeth adapted to engage the grooves 13 of the hoist 14, these grooves being of such depth as to receive these teeth in addition to the flexible hoisting element 15. By this arrangement, the rack 87 which travels back and forth as the drum is rotated in one direction or the other serves to maintain the hoisting element 15 within the grooves at all times regardless of side pull. The rack 87 is prevented from rotating by the inner faces of the slot 88 within which it projects, this slot being formed in the segmental housings 1 and 2 near their corresponding lower edges.

For the purpose of maintaining the hoist block 94 constantly in vertical alignment with the center of gravity of the hoist as

a whole the dead end of the flexible hoisting element 15 instead of being anchored to a fixed point upon the hoist frame is attached by a link 95 to a clevis 96 slidably mounted upon the tubular rod 97, and the live end of the flexible hoisting element is suitably secured to the hoist drum or sheave 13 at one end thereof. The tubular rod 97 is supported within lugs 98 and 99 attached to the housings 1 and 2 respectively. Upon the rod 97 is slidably mounted a block 100 adapted to engage between the bifurcated upper portions of the clevis 96 and to project between the inner faces of the slot 101 in the lower corresponding edges of the housings 1 and 2, whereby rotation of the block relative to the main frame of the hoist is prevented. Upon the upper faces of the rack 87 and the sliding block 100 are mounted studs 102 to which are secured the ends of chains 103 and 104 which pass around rollers 105 mounted upon pins secured to the housings 1 and 2. The arrangement is such that the chains together with the studs 102 form a complete circuit or loop and cause the sliding block 100 with the clevis 96 and dead end of the flexible hoisting element to move in one direction as the rack 87 which follows the live end of the rope moves in the other direction, thereby maintaining the hoist block 94, which is supported in the bight of the rope, constantly in vertical alignment with the center line of the hoist as shown in Figure 1.

The tubular rod 97, besides forming a support for the dead end of the flexible hoisting element, as above described, is utilized as a conduit for the electric conductors 106 through which current is transmitted from the controller at one end of the hoist to the motor at the other end thereof.

From the above description, it will be readily seen that means is provided for moving the dead end of the flexible hoisting element in a direction opposite to that taken by the live end and at a corresponding rate of movement so that the hoist block is maintained in the vertical central line of the hoist. The tubular rod upon the hoist frame and to which the dead end of the flexible hoisting element is slidably secured houses the electrical conductors between the motor and the control mechanism therefor, thereby protecting the same.

What I claim as my invention is:

1. In a hoist, the combination with a frame, a winding drum, a flexible hoisting element having a live end attached to said drum and a dead end slidably supported in said frame, and helical grooves in said drum having intermediate flanges projecting outwards beyond said hoisting element, of a longitudinally movable rack having teeth adapted to project between said flanges and retain said live end in place and means actuated by said rack for moving said dead end in one direction when said live end moves in the opposite direction.

2. In a hoist, the combination with a frame, a winding drum, a flexible hoisting element having a live end attached to said drum and a dead end slidably supported in said frame, a hoist block carried by said hoisting element, and helical grooves in said drum having intermediate flanges projecting outwards beyond said hoisting element, of a longitudinally movable rack having teeth adapted to project between said flanges and retain said live end in place, and an endless flexible member connecting said rack with said dead end so as to move said dead end in one direction when said live end moves in the opposite direction.

3. In a hoist, the combination with a winding drum having helical grooves, a rack having teeth engaging in said grooves, so as to be moved longitudinally by rotation of said drum, and means for controlling the rotation of said drum, of an operating lever normally in engagement with said controlling means, means actuated by said rack for disengaging said controlling means from said operating lever, and a spring device for returning said controlling means to the inoperative position when so disengaged.

4. In a hoist, the combination with a winding drum having helical grooves, a rack having teeth engaging in said grooves so as to be moved longitudinally by rotation of said drum, and means for controlling rotation of said drum, of an operating lever normally in engagement with said controlling means, means for disengaging said controlling means from said operating lever, a longitudinally sliding member connected with said disengaging means, projections on said member adapted to be moved by said rack so as to effect said disengagement, and a spring device for returning said controlling means to the inoperative position when so disengaged.

5. In a hoist, the combination with a winding drum having helical grooves, of a motor adjacent to one end of said winding drum, means for controlling said motor at the opposite end of said winding drum, a tubular member at the side of said winding drum, a member slidably supported upon said tubular member, a flexible hoisting element having a live end attached to said winding drum and a dead end attached to said member slidably mounted upon said tubular member, means for moving said last-mentioned member in a direction opposite to that taken by the live end of said flexible hoisting element, and conductors extending through said tubular member and connected to said motor and controlling means.

6. In a hoist, the combination with a

frame, a winding drum having its external peripheral surface formed with relatively deep spiral grooves, a flexible hoisting element engaging said grooves and having an end attached to said drum, said hoisting element also having an end slidably supported in said frame, of a longitudinally movable rack having means adapted to engage the grooves in said drum and to retain said hoisting element therein, and means actuated by said rack for moving the slidably supported end of said hoisting element in one direction when the other end of said hoisting element moves in the opposite direction.

7. In a hoist, the combination with a frame, a winding drum, a flexible hoisting element wound upon said drum and having one end thereof attached to said drum, said hoisting element also having an end slidably supported in said frame, of a longitudinally movable member having means for preventing said hoisting element from sliding longitudinally of said drum, and means for moving the slidably supported end of said hoisting element in one direction when the other end of said hoisting element moves in the opposite direction.

In testimony whereof I affix my signature.

WILLIAM E. SIMPSON.