May 29, 1934. F. W. COFFING 1,960,371

AUTOMATIC CENTERING ELECTRIC HOIST

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FIG. 1

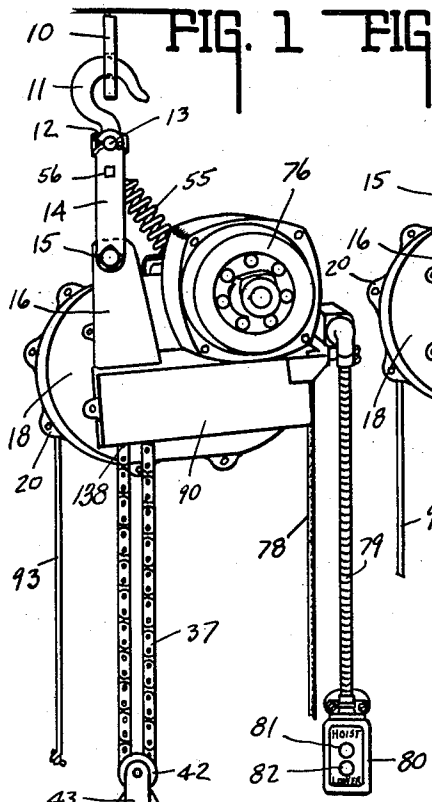


FIG. 2

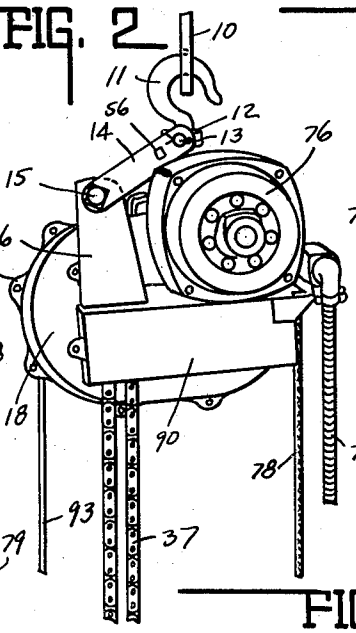


FIG. 3

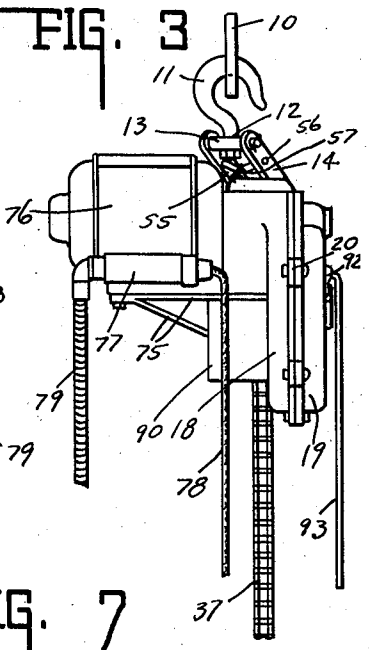


FIG. 7

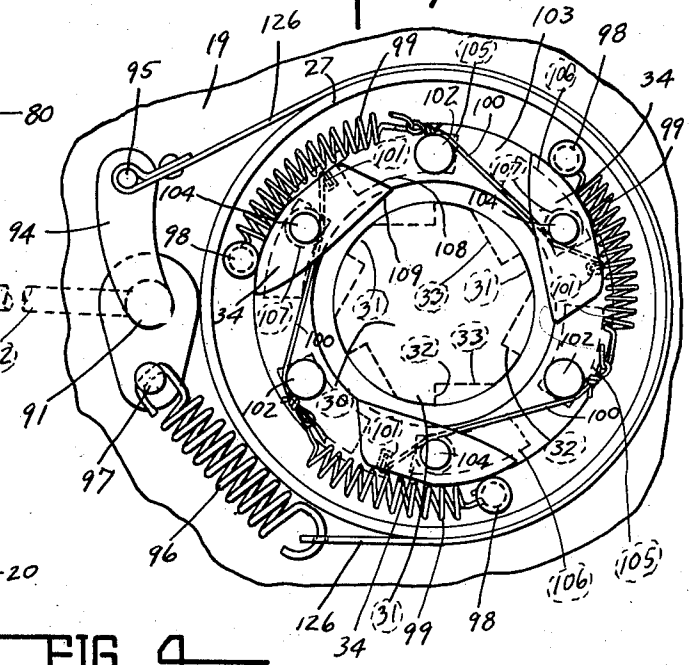
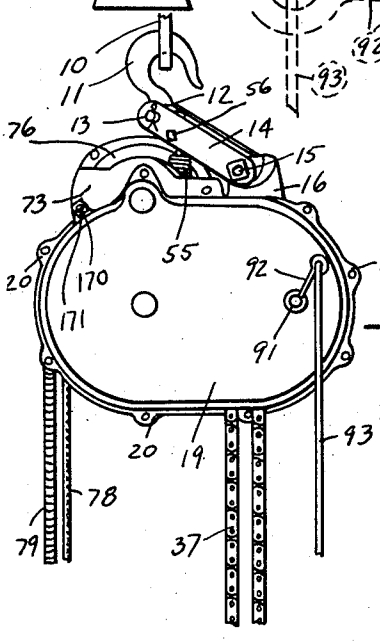


FIG. 4



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FIG. 5

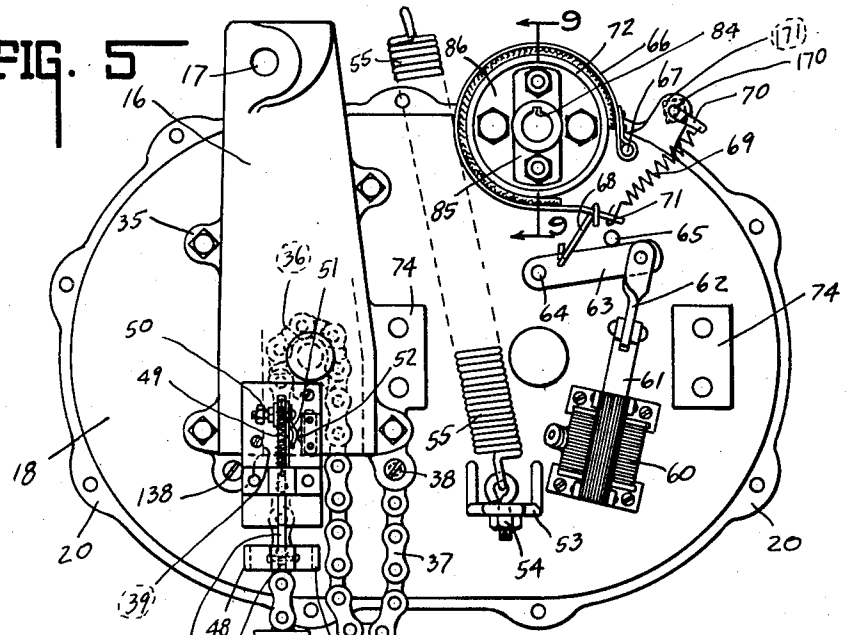


FIG. 6

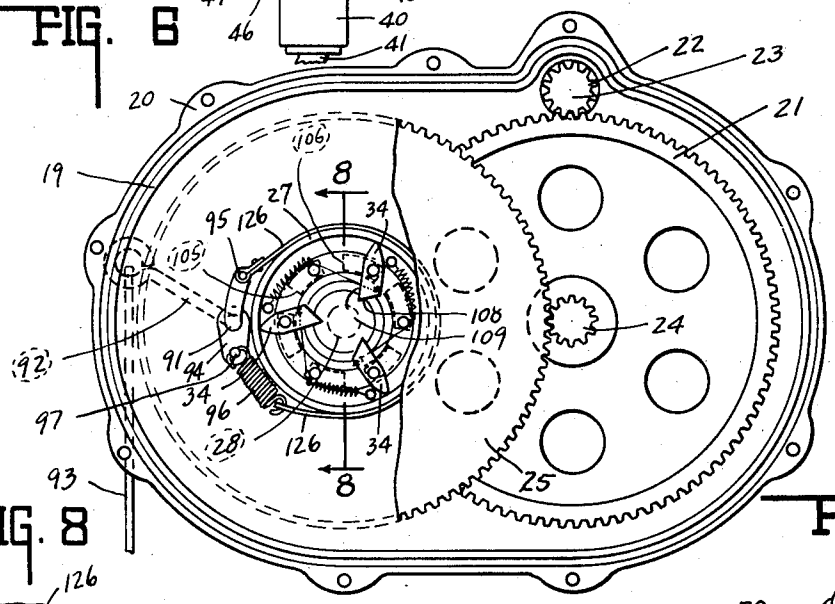


FIG. 8

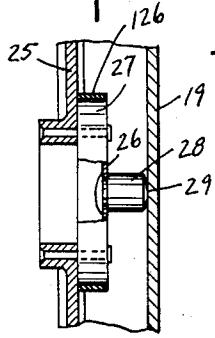


FIG. 9

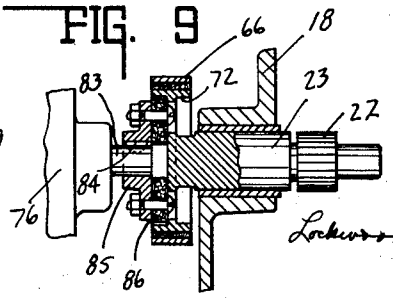
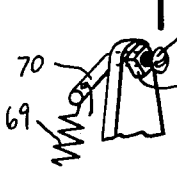


FIG. 10



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AUTOMATIC CENTERING ELECTRIC HOIST

Frederick W. Coffing, Danville, Ill.

Application October 3, 1932, Serial No. 635,919

4 Claims. (Cl. 254—168)

This application relates to a self-contained power operable hoist construction for the raising and lowering of loads.

One object of the invention is to provide a construction wherein the unit is sustained relative to the direction of hoisting or lowering of the load so that the centers of gravity of unit and load are balanced or the unit is automatically centered relative to the load and a support.

Another object of the invention is to provide means to automatically secure the hoisting mechanism in proper position and hold the same therein when the hoist is not operable for moving a load.

Another object of the invention is to permit the hoisting chain to be quickly positioned, this being known as "free chain positioning", in either direction.

Another object of the invention is to provide a control whereby the power will not be supplied to the unit after the load has been positioned immediately adjacent the unit, thereby preventing the wrecking of the unit.

The chief feature of the invention consists in the construction and arrangement of the parts whereby the aforesaid objects are accomplished.

Another feature of the invention consists in the control for the power unit whereby the latter may be reversed as desired for raising or lowering the hoisting element.

Other features of the invention will be set forth more specifically hereinafter.

The full nature of the invention will be more clearly understood from the accompanying drawings and the following description and claims:

Fig. 1 is a perspective view and almost a side elevation of the unit arranged for so-called "multi-power" movement, the unit being shown in a centered position corresponding to the center of gravity of the load and the unit. Fig. 2 is a similar view of the unit with the load removed, parts of the unit being shown in the centering position corresponding thereto. Fig. 3 is an end elevation of the unit disconnected from the load. Fig. 4 is a side elevation of the unit disconnected from the load and is taken approximately from the opposite side from that shown in Fig. 2. Fig. 5 is an enlarged side elevational view of a portion of the unit, certain housing portions being removed to illustrate the automatic brake and the travel limit control, and when the unit is utilized as a single power construction. Fig. 6 is a plan view of the clutch construction and reduction gear associated therewith, parts being shown in engaging relation for holding the load. Fig. 7 is an enlarged plan view of the clutch construction in the so-called free chain lowering position. Fig. 8 is a transverse sectional view taken on line 8—8 of Fig. 6 and in the direction of the arrows. Fig. 9 is a transverse sectional view taken on the line 9—9 of Fig. 5 and in the direction of the arrows. Fig. 10 is an enlarged perspective view of the external adjustment of the coupling brake.

In the drawings 10 indicates a suitable support to which the unit is attached by means of a hook 11. The hook 11 is swiveled at 12 to a cross bar 13 carried by a pair of links 14 pivoted at 15 to a vertical housing portion 16. As shown in Fig. 5, the swivel axis of the opening 17 is biased with respect to the plane of the housing of the unit.

The housing of the unit includes a substantially elliptical main housing 18 and a complementary cover portion 19, these being secured together through the portions 20 and in the usual arrangement by bolts, but if desired, may be secured together by rivets.

Enclosed within this housing construction is a gear 21 that meshes with a driving pinion 22 carried by a driving shaft 23. Rigid with gear 21 is a pinion 24 that meshes with a gear 25. Gear 25 (see Fig. 8) supports a clutch construction including a drum 27, the side 26 of which supports a projecting stud 28 (see Fig. 8) that bears at 29 upon the housing portion 19. The clutch construction is operatively associated with a driving ratchet 30 which has teeth 31 thereon, the same having a face 32 and a face 33, see Fig. 7. The relationship of these faces to the pawls 34 will be set forth hereinafter. The ratchet 30 supports in the housing 16 (see Fig. 5) which is detachable and connected to the main housing 18 as at 35, a sprocket 36. Chain 37 is operatively associated with approximately 300° of this sprocket 36. One end of the chain is anchored as at 38 to the housing structure.

The other end of the chain passes downwardly through the mouth 39 of the housing 16 and may be connected (see Fig. 5) to a coupling 40 of a hook 41 or as shown in Fig. 1, said chain may pass around a sprocket 42 and return to hoist frame and dead ended at 138. Member 43 carries sprocket 42 on one end and hook 44 on the other end to which the load 45 may be attached. When the chain is connected as shown in Fig. 1, it will be apparent that for every inch of chain movement through the hoist, the load will move but one-half inch and, therefore, twice the load can be moved that could be moved by the chain when connected as shown in Fig. 5, al-

though when so connected it moves at twice the speed as when connected as shown in Fig. 1. In other words, the chain and the hoist are stronger than the power available so that the power available is the limiting factor with respect to the load that can be moved and it will also be apparent that by anchoring one end of the chain for single power movement of the load as at 38, the chain will not run out through the sprocket.

To prevent wrecking of the unit due to the member 40 or member 43 from jamming in the mouth 39 of the housing, there is provided a travel limit switch construction which herein is of electrical character. A stop member consists of a bifurcated construction anchored as at 46 (see Fig. 5) to a reciprocating member 47. Member 46 includes the arms 48 and in the upward movement of the chain when the load approaches the hoisting unit, the coupling 40 or member 43 engages the arms 48 and moves the member 47 upwardly. The member 47 is normally retained in the lowered position by the spring 49 and also carries in insulated relation a terminal 50 which is associated with a spring contact member 51 adapted when the member 47 is in the lowered position to engage a contact 52 insulatably supported and stationarily supported upon the housing 16. When the member 47 is elevated in the raising of the load as it dangerously approaches the unit, the circuit through the contacts 51 and 52 is broken and this circuit is the motor circuit so that the power is immediately shut off to the motor.

Mounted upon the housing 18 is a bracket structure 53 and adjustably supported thereby as at 54 is an eye-bolt that supports one end of a coil spring 55, the other end of which (see Figs. 1 and 3) is connected to a cross bolt 56 as at 57, said cross bolt being carried by the links 14. This spring is the unit centering device.

Also supported upon the housing member 18 is a solenoid 60 (see Fig. 5) having a core 61 connected to a link 62, in turn connected to a lever 63 pivoted at 64. A stop 65 limits the upward movement of this lever 63. Lowering movement of the lever is obtained by energization of the solenoid. A brake band 66 is anchored to the post 67 at one end and is connected at its opposite end to the lever 63 by a link 68. A spring 69 (see Fig. 10) is anchored at one end to an arm 70 externally adjustable by member 170 and locked by nut 171 and is connected at its opposite end at 71 to the free end of the brake band. Spring 69, when the solenoid is not energized, normally positions the lever and core in the position shown in Fig. 5 so that the lever engages the stop 65. In this position the spring 69 is also effective to secure braking action between the band and the brake drum 72, to which reference will be had later.

A cover member 73 (see Fig. 4) encloses the brake construction and the upper portion of the solenoid operable brake mechanism.

Suitably supported upon the boss 74 (see Fig. 5) and projecting outwardly therefrom are the bracket members 75 (see Fig. 3) and these support the motor base and thereby support the motor 76. The motor base has mounted on it a junction box or electrical fixture 77 into which leads the power cable 78 and from which extends a flexible conduit 79. The flexible conduit 79 (see Fig. 1) terminates in a switch box or control station 80 which has two switch members 81 and 82 therein associated with current carrying wires that lead to the motor and are connected also to the supply lines in the cable 78.

When the motor is energized to elevate the load, the switch 81 is held depressed and the motor is energized to rotate the sprocket 36 to raise the load. The motor 76 includes the shaft 83 (see Fig. 9) which is keyed as at 84 to one member 85 of a coupling. A flexible disc 86 also is secured to a similar but transversely positioned member and said member is suitably secured to the shaft 23 which mounts the driving pinion 22 (see Fig. 6 and Fig. 9).

As soon as current is supplied to the motor for either raising or lowering movement, the solenoid 60 (see Fig. 5) which is connected across the supply lines, is energized and immediately the brake band 66 is released from the coupling supported brake drum 72 so that the power is immediately transmitted through the gearing and the ratchet clutch to the sprocket 36. Immediately upon disconnection of the power by releasing the depressed switch member 81 or 82, the solenoid 60 is deenergized and the spring 69 causes the band 66 to engage the drum 72 which is rigid with the driving member of the coupling carried by the shaft 23 or rigid with said shaft. This immediately stops further rotation of the gearing and also the rotating part of the motor so that there will be no creepage due to the momentum of the rotation of the rotating part of the motor upon the current being discontinued thereto.

A suitable housing 90 (see Figs. 1, 2 and 3) suitably encloses the travel limit switch, the solenoid and the anchorage for the centering spring 55. The housing 73 as before mentioned suitably encloses the coupling construction.

It will be quite apparent that the device is arranged to raise or lower the load by reversing the motor. Whenever there is a load on the chain, the pawls and the ratchet teeth have that cooperation due to the shape of the former and the draft of the latter that the pawl and ratchet arrangement is not disturbed so there is no danger of dropping the load in either the raising or the lowering thereof.

Whenever there is no load on the chain and it is desired to quickly position the hook adjacent the load, the chain is grasped and pulled through the hoist, the sprocket turning and the teeth of the ratchet ratcheting over the pawls.

When there is no load on the chain and it is desired to quickly position the load sustaining element adjacent the load and it is necessary to move the chain in a direction the reverse of the aforesaid, then the pawls must be removed from ratchet tooth engagement. The mechanism for obtaining this pawl release is illustrated clearly in Figs. 4, 6 and 7. Extending through the cover 19, see Fig. 4, is a rock shaft 91 having an arm 92 exposed and connected at its other end to a cord 93. The rock shaft within the housing 18 and cover 19 (see Fig. 7) mounts a lever arm 94 connected as at 95 to a strap 126 that partially encircles the drum 27. The other end of the strap 126 is connected to a coil spring 96 anchored as at 97. When the cord 93 is pulled down, the lever arm 94 first causes the band 126 to engage the drum 27 and then additional movement causes the spring 96 to elongate and causes the drum to rotate.

As shown in Figs. 6 and 7, the drum carries three stationary pins or studs 98 and each secures one end of a coil spring 99, the opposite end of which is connected to a spring member

100 which has at least one coil 101 around pin 104 and then engages pawl 34. The spring 100 bears against the stud 102 that is carried by a lower ring 103. Each of the pawls is pivoted as at 104 upon a post carried by the ring 103. The drum 27 is provided with a plurality of annularly arranged slots 105 and 106, slots 105 being those into which the posts 102 extend while slots 106 are those in which the pawl pivots 104 extend, each pawl pivot terminating in an enlarged head portion 107. An upper ring not shown completes the structure.

As shown in Fig. 6 when the cord is not pulled down, the pawls 34 have their faces 108 and 109 engaging the faces 32 and 33, respectively, of the ratchet 30 and when the cord is pulled down, the first movement of the cord causes the band 126 to grip the drum 27 and additional movement causes the drum 27 with the pawls to rotate counter-clockwise with respect to the supporting gear (see Fig. 7) and retracts the pawls from the ratchet teeth by contact of cam face on pawl 34 against pin 98 which causes the face of pawl 34 to be lifted from ratchet tooth 31. When this retraction is obtained and as long as strain is maintained on the cord, the chain may be moved for free chain movement and this permits the sprocket and ratchet to move independently of the gearing. As before stated, the draft of the teeth on the pawl and the ratchet is such that the pawl release movement cannot be obtained whenever there is a load on the chain.

While the invention has been described in great detail in the foregoing specification, the same is to be considered as illustrative and not restricted in character and it is recognized that various modifications will readily suggest themselves to those skilled in this art, and such modifications are all considered to be within the broad scope of this invention, reference being had to the appended claims.

The invention claimed is:

1. A free chain hoist including in combination a ratchet, a driving gear, a pawl carrier rotatable with the gear, a plurality of pawls pivoted on the carrier, said pawls and ratchet having cooperating surfaces preventing pawl release when the hoist is subjected to load, and manually operable means for moving the pawls relative to the carrier for disconnecting the pawls from the ratchet for free chain operation in a direction opposed to overrunning.

2. A free chain hoist including in combination a ratchet, a driving gear, a pawl carrier rotatable with the gear, a plurality of pawls pivoted on the carrier, said pawls and ratchet having cooperating surfaces preventing pawl release when the hoist is subjected to load, manually operable means for moving the pawls relative to the carrier for disconnecting the pawls from the ratchet for free chain operation in a direction opposed to over-running, said means including a drum having limited rotation relative to the carrier, cam means carried by the drum and engageable by the pawl, spring means normally retaining the drum, pawl and carrier in pawl and ratchet engaging position, and manually operable mechanism for causing said limited rotation to free the pawls from the ratchet.

3. A free chain hoist including in combination a ratchet, a driving gear, a pawl carrier rotatable with the gear, a plurality of pawls pivoted on the carrier, said pawls and ratchet having cooperating surfaces preventing pawl release when the hoist is subjected to load, manually operable means for moving the pawls relative to the carrier for disconnecting the pawls from the ratchet for free chain operation in a direction opposed to over-running, said means including a drum having limited rotation relative to the carrier, cam means carried by the drum and engageable by the pawl, spring means normally retaining the drum, pawl and carrier in pawl and ratchet engaging position, manually operable mechanism for causing said limited rotation to free the pawls from the ratchet, said manually operable mechanism including a drum associatable band, a spring connected to the band and normally retaining the band in non-associating position, and a manually operable member arranged upon actuation to initially cause drum and band association and then cause drum rotation relative to the carrier in opposition to the band connected spring.

4. In a centering hoist, the combination of a hoist body, a supporting member hingedly connected thereto, a power member supported by the body to one side of the member and body connection, and yielding means operatively connecting the member to the body for hoist centering relative to the load applied thereto.

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