Feb. 7, 1950 C. H. SCHRAMM ET AL 2,496,754

SUSPENDED TYPE HOIST

Filed Sept. 8, 1945 2 Sheets-Sheet 1

Fig. 1

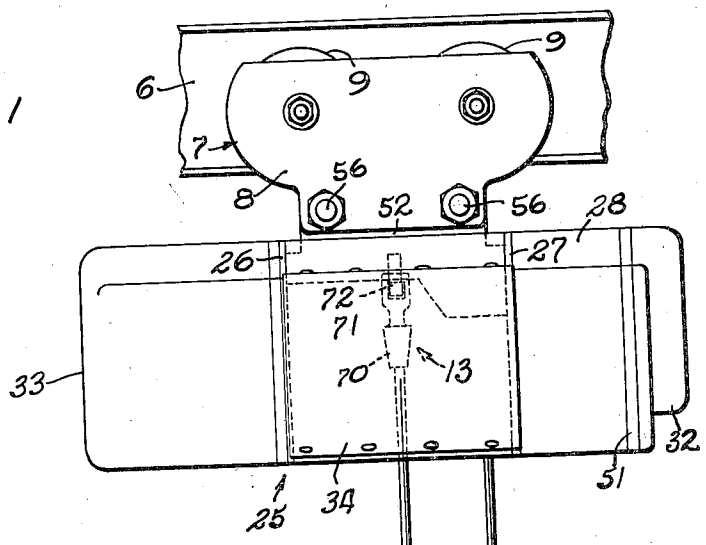
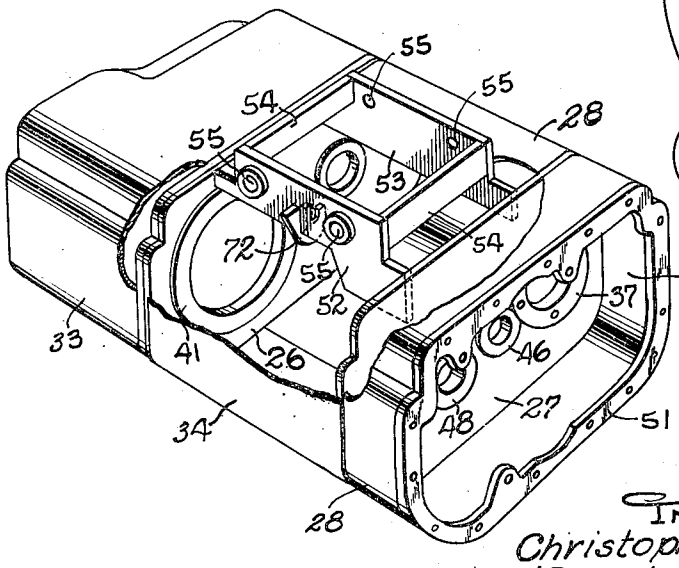


Fig. 2



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Filed Sept. 8, 1945 2 Sheets-Sheet 2

Fig. 3

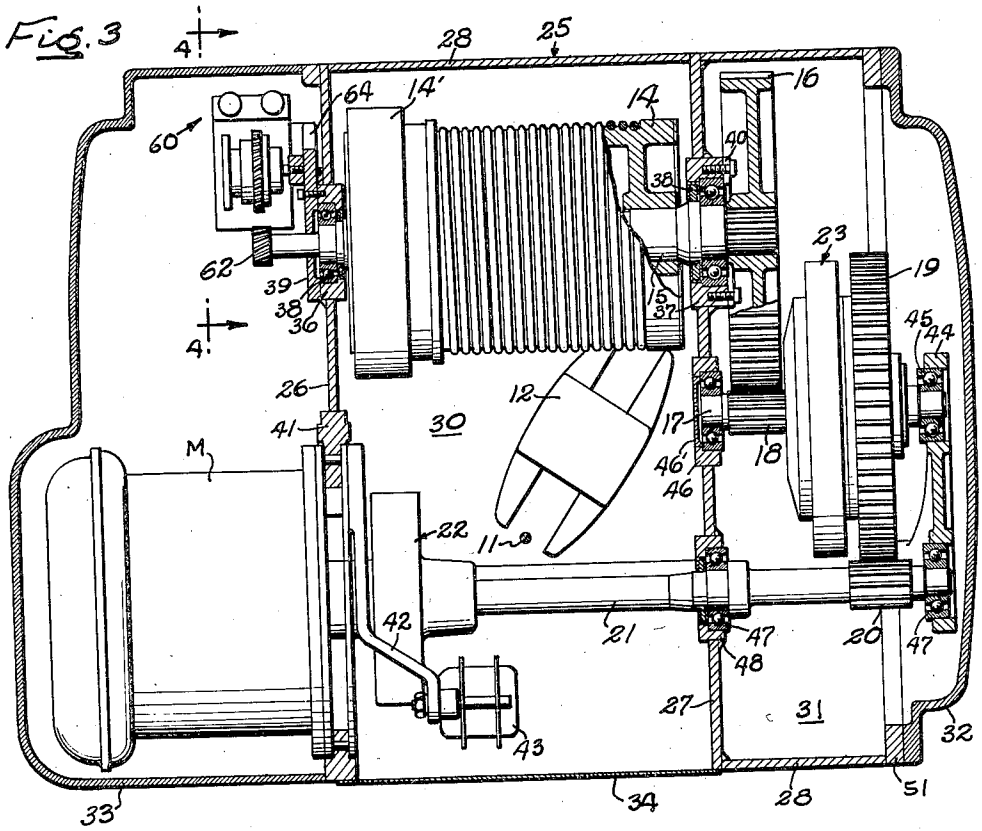
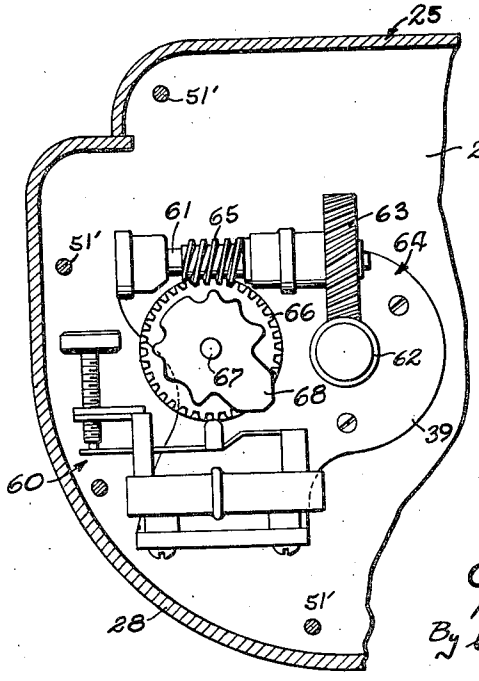


Fig. 4



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SUSPENDED TYPE HOIST

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3 Claims. (Cl. 254—168)

1

The invention relates to hoists generally and more particularly to electrically driven hoists of the suspended type.

The primary object of the invention is to provide in a hoist of the above general character, a combined frame and housing structure characterized by its strength and rigidity, coupled with simplicity, compactness, light weight and low manufacturing cost.

A more specific object is to provide a combined frame and housing structure for hoists which is adapted to be fabricated entirely from sheet or plate stock and embodying a novel arrangement of load carrying members which relieve the outer shell or casing of substantially all load strains.

Another object is to provide improved control mechanism for automatically stopping the hoist motor as the load hook approaches either its upper or lower limit position.

Other objects and advantages of the invention will become apparent from the following detailed description of the preferred embodiment illustrated in the accompanying drawings in which:

Figure 1 is a side elevational view of a hoist embodying the features of the invention.

Fig. 2 is a perspective view of the combined hoist frame and housing structure with one end cover removed and parts of the outer shell broken away to show details of construction.

Fig. 3 is a horizontal sectional view of the hoist.

Fig. 4 is a fragmentary sectional view taken in a vertical plane substantially on the line 4—4 of Fig. 3 showing the control mechanism.

While the invention is susceptible of various modifications and alternative constructions, we have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that we do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring to Fig. 1 of the drawings, the hoist selected to illustrate the invention is adapted to be suspended in an elevated position from an overhead I-beam 6. Support for the hoist is provided, in this instance, by a trolley 7 having a generally rigid frame 8 fitted with opposed sets of flanged wheels 9 adapted to engage the lower flange of the beam 6.

Hoisting is effected through the medium of a load hook 10 and a flexible lifting member 11, herein shown as a rope or wire cable. The cable

2

11 runs through a pulley block 12 secured to the hook 10 and one end is anchored to a stationary part of the hoist by a connecting device 13 of novel construction. The other end of the cable 11 is wound on a drum 14 (Fig. 3) supported for rotation about a horizontal axis and adapted to be driven by a reversible electric motor M through suitable reduction gearing.

In the exemplary hoist, the drum 14 is non-rotatably fixed on a shaft 15 which projects at opposite ends of the drum and has a spur gear 16 keyed to one of the projecting ends. The gear 16 comprises a part of the reduction gearing above referred to which includes also an intermediate shaft 17 having a pinion 18 and a gear 19 keyed thereto. The pinion 18 meshes with the gear 16 of the drum shaft while the gear 19 meshes with a pinion 20 fast on a main drive shaft 21 connected with the shaft of the motor M by a coupling 22 which also serves as a brake for the motor. A load brake 23 of any suitable and well known type is provided on the intermediate shaft 17 for preventing undesired rotation of the drum 13 under the influence of a load.

In accordance with the invention, the operating elements of the hoist above described are supported by and completely enclosed in a combined frame and housing structure 25 of novel and advantageous construction. The frame and housing structure 25, in the preferred form shown in Figs. 2 and 3 of the drawings, comprises a pair of load carrying members 26 and 27 in the form of flat generally rectangular elements adapted to be cut from heavy sheet or plate stock. The members are disposed within an elongated hollow sheet metal shell or casing 28 and extend transversely across the shell to divide its interior into a main compartment 30 and an end compartment 31. The compartment 31 is closed by a cover 32 while a substantially deeper cover 33 removably secured to the other end of the shell 28 provides a compartment for the motor M and other elements of the hoist structure to be described hereinafter. An opening is provided in the lower portion of the shell 28 for the cable 11 and another opening in the side provides access to the interior of the compartment 30. The latter opening is conveniently closed by a cover 34 of sheet metal or other suitable material as shown in Fig. 3.

In the exemplary hoist, the cable drum 14 is mounted within the compartment 30 and is supported entirely by the load carrying members 26 and 27. To this end, the members are pro-

vided with alined bearing supporting elements 36 and 37 in the form of annular bushings dimensioned to receive anti-friction bearings 38 for rotatably supporting the drum shaft 15. The bushings 36 and 37 may be mounted in apertures in their respective load carrying members and are preferably secured thereto as by welding. Retainers 39 and 40, removably secured to the outer faces of the bushings, serve to hold the bearings in place therein.

The load carrying member 26, in addition to supporting one end of the drum shaft 15, also supports the driving motor M which is mounted within the compartment formed by the cover 33 as shown in Fig. 3. To facilitate the mounting of the motor and to provide rigid support therefor, the member 26 is fitted with a motor mounting ring 41 seated in an aperture in the member and welded thereto. A bracket 42 secured to the ring 41 within the compartment 30 supports a brake solenoid 43 for actuating the brake band associated with the brake drum 22.

To counterbalance the weight of the motor M, the reduction gearing of the hoist is conveniently mounted in the housing compartment 31. Support for the intermediate shaft of the reduction gearing is provided by the load carrying member 27 and a yoke 44 rigidly secured to the end of the shell 28. The shaft is preferably journaled in anti-friction bearings 45 one of which is seated in an annular bushing 46 welded to the member 27. Preferably, the opening in the bushing is closed by a plug 46' to prevent loss of lubricant from the gear compartment 31.

In the exemplary hoist, the main drive shaft 21 is arranged to extend through the compartment 30 into the end compartment 31 enclosing the reduction gearing. Support for the shaft 21 is provided by a pair of anti-friction bearings 47. One of the bearings is seated in a bushing 48 similar to the bushings 37 and 46 heretofore described and, like them, welded or otherwise rigidly secured to the load carrying member 27. The other bearing 48 is carried by the yoke 44 as shown in Fig. 3.

To provide for attachment of the cover 32 to the frame and housing structure 25, the shell 28 is provided with an end plate 51 shaped to define an inwardly projecting flange extending entirely around the shell. The end plate is preferably cut from heavy sheet or plate stock and is secured to the shell by a continuous weld. A plurality of suitably spaced holes in the end plates are threaded for the reception of cap screws or the like by which the cover is secured in place. The cover 33 is similarly secured in place by screw threading in apertures 51' (Fig. 4) in the supporting member 26.

Novel means is provided for supporting the frame and housing structure on the trolley 7 so that the outer shell or casing 28 is relieved of substantially all load strains. To this end, a pair of inverted T-shaped spacing members 52 and 53 are interposed between the load carrying members 26 and 27 and are rigidly connected thereto as by welding. The narrow end portions of the members 52 and 53 are extended through a rectangular opening in the upper portion of the shell 28 and are preferably connected by transverse spacing members 54 welded thereto and forming therewith a generally rectangular frame structure. This frame structure is preferably dimensioned to fit within the frame 8 of the trolley 7 and the members 52 and 53 forming the sides thereof are provided with alined sockets 55

adapted to receive pins 56 (Fig. 1) extending through complemental sockets in the trolley frame. Thus substantially the entire weight of the operating elements of the hoist as well as the weight of the load are transmitted to the trolley 7 through the supporting members 52 and 53 without imposing any substantial strains on the shell or casing 28.

As the shell 28 is connected to the supporting members 26 and 27 around their entire respective peripheral edges, an extremely rigid construction is obtained without the use of interior braces or reinforcing members. The supporting members 52 and 53 also impart rigidity to the structure and additionally cooperate with the members 26 and 27 in supporting the weight of the hoist elements. The outer shell or casing 28 may therefore be constructed of relatively light sheet metal which, together with the elimination of internal bracing members, reduces the weight of the hoist structure without sacrificing necessary strength or rigidity.

Novel control means is provided for automatically stopping the hoist motor M as the load hook 10 approaches either its upper or lower limit position thus effectually avoiding any possibility of damage to the hoist or load through carelessness of the operator. The control means in its preferred form comprises a normally closed electrical switch 60 (Figs. 3 and 4) connected in the supply circuit for the motor M and adapted to be actuated at appropriate times by mechanism driven in timed relation with the rotation of the cable drum 14.

The switch actuating mechanism, as herein shown, comprises a shaft 61 arranged transversely of the drum shaft 15 and adapted to be driven therefrom by a spiral pinion 62 and spiral gear 63. The shaft is journaled in a bracket 64 herein shown as formed integrally with the retainer 39 for the shaft bearing 38. A worm 65 on the shaft 61 acts through a worm wheel 66 to drive a shaft 67 having a cam device 68 positioned in operative relation to the switch 60. The cam 68 is shaped so as to open the switch 60 when rotated to a predetermined angular position and the gearing or gear ratios provided in the driving mechanism are such that this position is attained as the load hook approaches either the upper or the lower limit position. The range covered by this mechanism may be adjusted for any desired conditions by a simple change in the driving gear.

The connecting device 13 for anchoring the cable 11 to the frame and housing structure is constructed to permit convenient disconnection of the cable while effectually preventing accidental disconnection of the same. For this purpose, the end of the cable is fitted in a conventional socket 70 having a U-shaped yoke 71 at its upper end. The yoke is adapted to fit over a depending hook-shaped member 72 welded or otherwise rigidly secured to the supporting member 52. The parts are so proportioned that the yoke may be slipped over the hook only when held in a substantially horizontal position. Thus, as long as the hook is in its normal vertical position, accidental disengagement by the pulley block 12 is effectually prevented.

It will be apparent from the foregoing that the combined hoist and housing structure provided by the present invention is very compact and light in weight, yet strong and extremely rigid. Weight reduction without sacrifice of strength and rigidity is obtained by the novel construction and relationship of the parts of the

structure and the fabrication of such parts from sheet or plate stock joined by welding. More specifically, the improved frame and housing structure is arranged so that the operating elements of the hoist are supported on a pair of load carrying members which are rigidly joined together and braced for rigidity by a shell-like casing which also serves to enclose the operating elements. The enclosing shell is relieved of substantially all load strains and can thus be fabricated at low cost from relatively light gauge sheet material.

The invention also provides novel safety mechanism for automatically stopping the hoist as the load hook approaches either its upper or lower limit position. The mechanism is arranged for actuation by the cable drum of the hoist and is thus not dependent for operation upon the movements of the load hook itself. Moreover, it may be readily adjusted for operation within a wide variety of hoisting ranges.

We claim as our invention:

1. In an electric hoist, in combination, a hoisting drum, a sheet metal shell forming a housing for said drum, a pair of metal plates extending transversely across said shell in parallel spaced relation and having their marginal edges welded to the shell to form therewith a rigid unitary structure, bearings carried by said plates rotatably supporting said drum, means for supporting the hoist including a pair of T-shaped load carrying members extending through said shell and having their oppositely directed arms welded to the respective transverse plates, a load hook including a pulley block, a cable having one end wound on said drum and the other end reeved through said pulley block and anchored directly to one of said load carrying members, an electric motor supported on one of said transverse plates, speed reduction gearing drivingly connected with said drum and supported in part by the other of said transverse plates, and a shaft operatively connecting said motor and said gearing, said motor and said gearing being located on the outer faces of said plates so as to effectually balance the hoist, and said shaft being spaced laterally from said drum to provide clearance for the pulley block.

2. In an electric hoist, in combination, a housing including a sheet metal shell, a pair of sheet metal plates extending transversely across said shell in parallel spaced relation and welded to the shell adjacent their marginal edges, a cable drum enclosed in said housing between said plates and rotatably supported thereon, a motor supported on one of said plates, speed reduction gearing supported in part on the other of said plates and drivingly connecting said motor with said drum, supporting means for the hoist comprising a generally rectangular frame structure having depending side members each formed with arms projecting laterally at opposite sides of the frame and being welded to the respective transverse plates, said shell having an opening in its upper portion to permit said frame structure to project therefrom for attachment to a supporting trolley.

3. In an electric hoist, in combination, a housing comprising a pair of sheet metal plates disposed in spaced parallel relation, a hoisting drum, bearings carried by said plates supporting said drum at opposite ends, a motor supported on one of said plates at the side opposite said drum, a shaft extending from said motor through the other of said plates and having a bearing support thereon, speed reduction gearing supported in part on the other of said plates at the side opposite said drum and drivingly connecting said shaft with the drum, a sheet metal shell mounted on said plates and enclosing said drum and said gearing, and a pair of load carrying members extending between said plates and rigidly connected at opposite ends to the plates, said load carrying members extending generally parallel to said drum and projecting above the top of the housing for attachment to a supporting structure.

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