Aug. 4, 1953

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2,647,725

HOIST STRUCTURE

Filed Nov. 23, 1949

3 Sheets-Sheet 1

FIG. 3

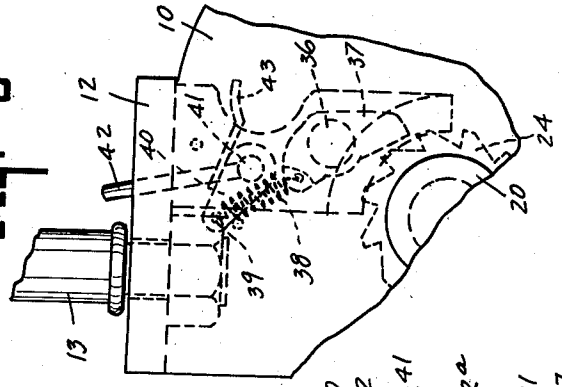


FIG. 2

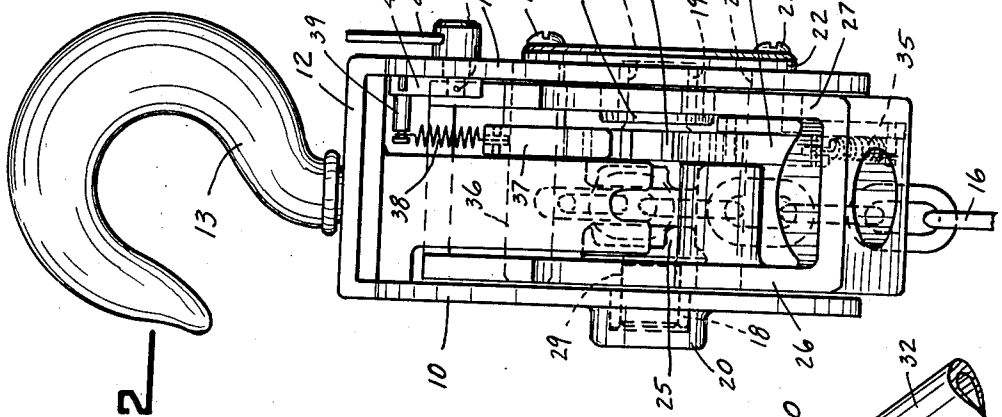
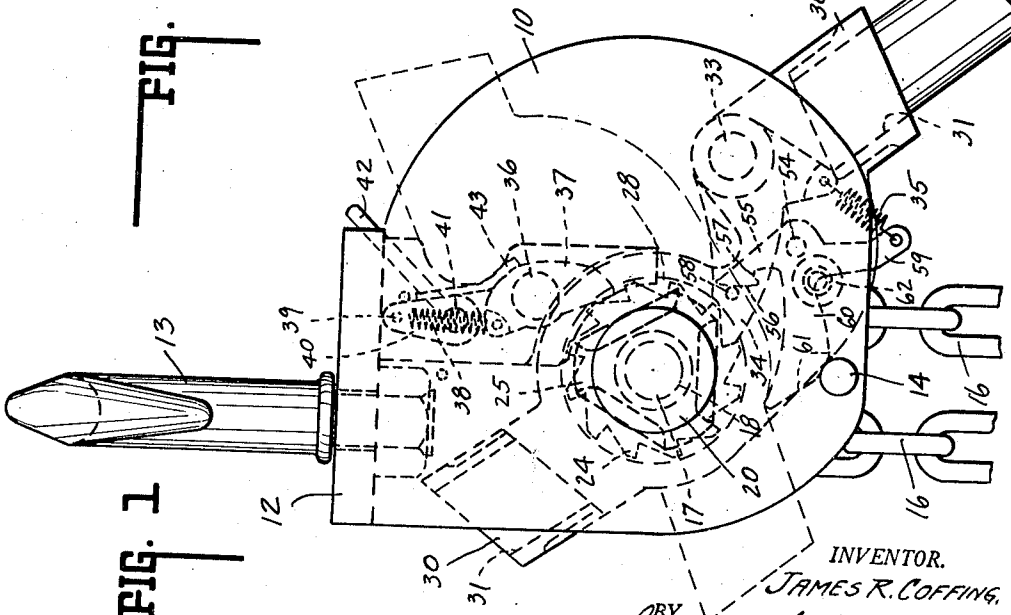


FIG. 1



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FIG. 5

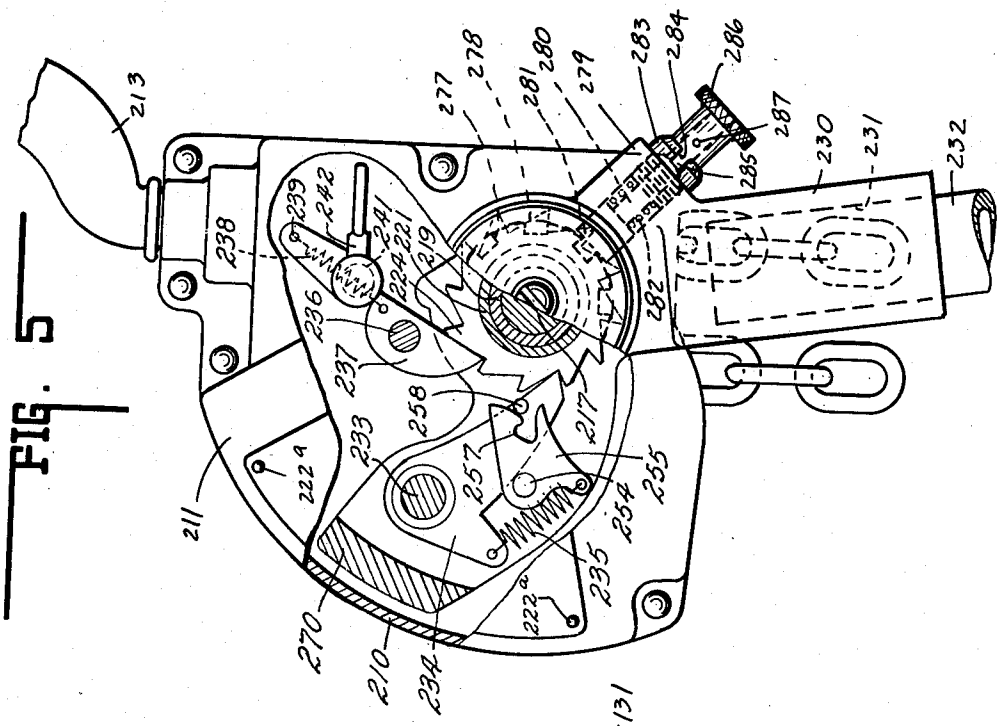
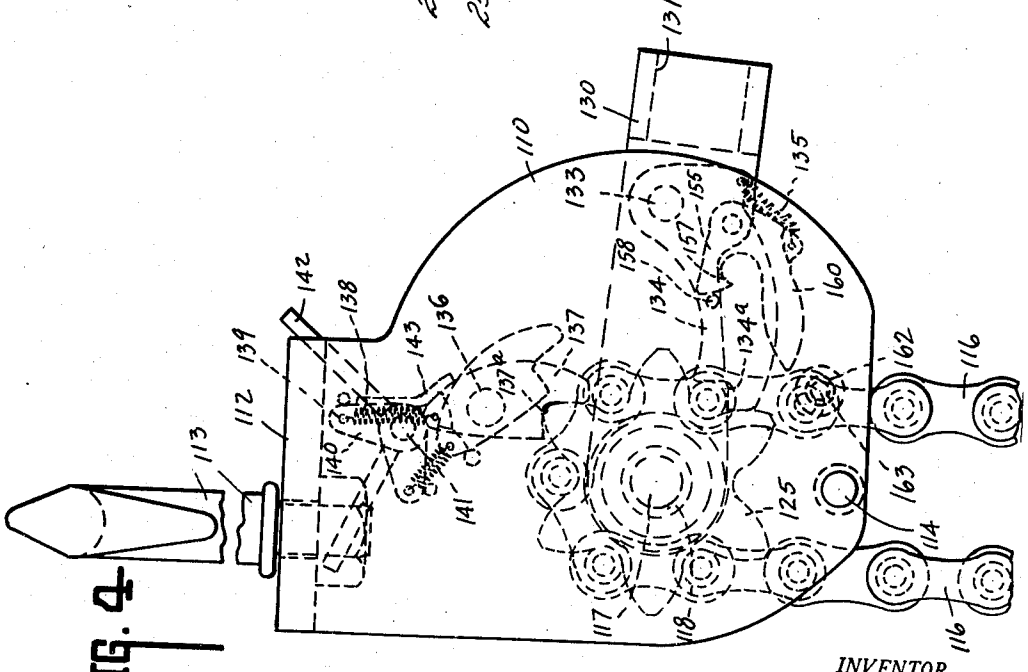


FIG. 4



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FIG. 6

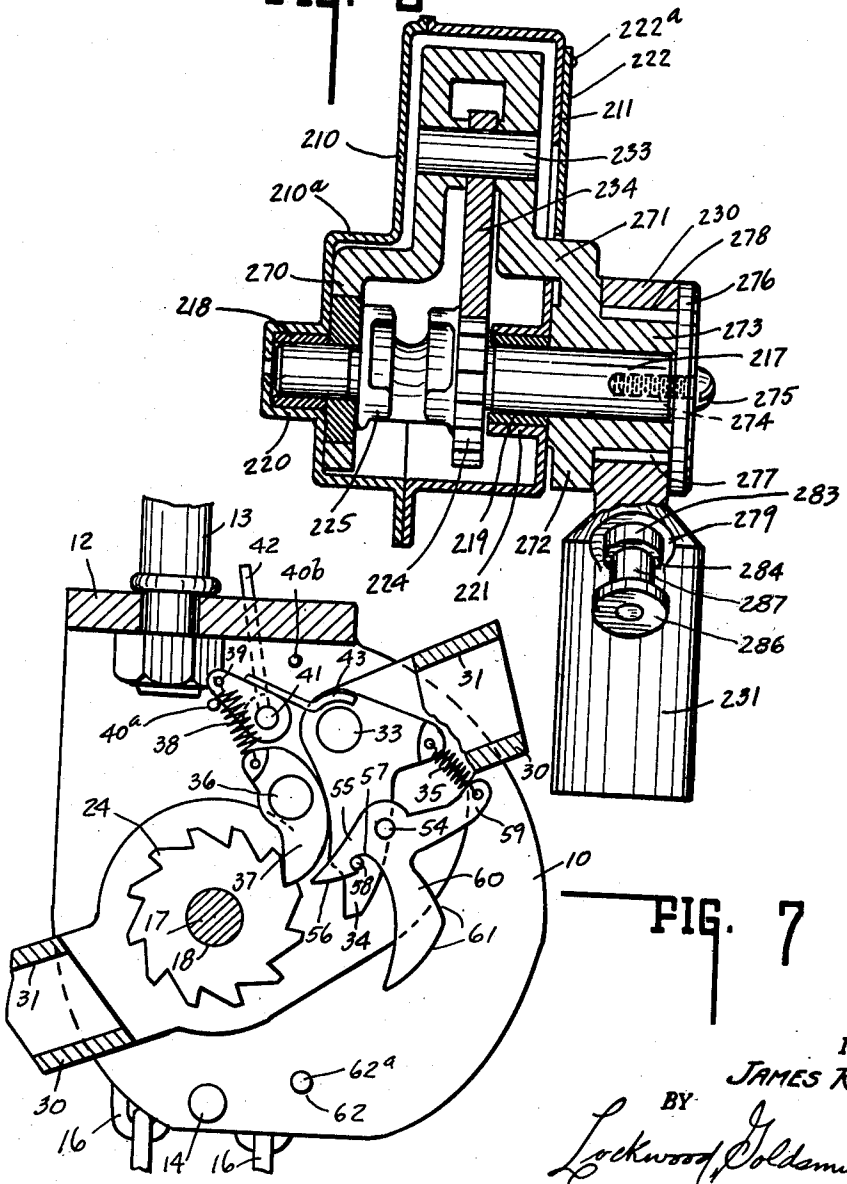


FIG. 7

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HOIST STRUCTURE

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8 Claims. (Cl. 254—169)

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This invention relates to a hoist structure.

One object of the invention is to simplify a hoist structure of the ratchet type and which is capable of load lowering and load elevation as well as free running action, commonly called free-chain action when a chain is used in the hoist. The chain may be of the roller or link type or of the coil or log type.

Another object of the invention is to provide, in certain forms thereof, an oscillatory cradle that is handle operable; the handle being selectively associated with either end of the cradle so that it can be disposed at either side of the hoist, thereby permitting use in different positions determinable by available clearance, or in such a manner that when the hoist is inverted the handle still can be pulled downward for normal operation comparable to load elevation operation.

A further object of the invention is to provide a selective control whereby handle oscillation to its full throw either secures maximum step by step movement of the chain in either direction or approximately half that movement in those directions, the latter instance permitting closer control for location purposes when desired or required.

Still another object of the invention is to provide in certain embodiments thereof a swing adapter for disposing the operating handle to one side of the hoist and in any desired angular position whereby the available clearance can be utilized for handle oscillation to the best advantage for hoist operation.

One feature of the invention, when a coil chain is not used, resides in the utilization of the power sprocket as a ratchet member and associating therewith an oscillatory handle which mounts a sprocket engaging pawl, a second pawl being disposed adjacent to and also engaging the sprocket, together with control mechanism for each pawl and a selective inter-control therebetween.

Another feature of the invention when desired resides in the so-called swing type bearing member for the sprocket and shaft, which bearing member is adjustably and selectively associated with an actuating handle for minimum operational clearance accommodation purposes and a corollary thereof resides in disposing the handle in outboard relation relative to the hoist housing whereby the operating mechanism may be fully enclosed.

Other objects and features of the invention will be set forth more fully hereinafter.

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

In the drawings,

Fig. 1 is a side elevation of a coil or log chain hoist embodying the invention, the cradle thereof being shown in the lowest position at the end of the maximum possible load elevating stroke.

Fig. 2 is an end elevation thereof with the handle omitted to show the parts with greater clarity.

Fig. 3 is a view similar to Fig. 1 and of the upper portion only of said hoist, parts being conditioned for load lowering.

Fig. 4 is a view similar to Fig. 1 and of a chain or roller embodiment of the invention, the cradle being shown in the lowest load elevating position when what might be termed half stroke operation is desired.

Fig. 5 is a side elevation of a modified form of hoist with the swing adapter incorporated therein and as applied to the coil type chain, with parts broken away and in section.

Fig. 6 is a sectional view through such a hoist and in the plane of the adapter axis with parts in elevation and parts removed.

Fig. 7 is the same view as Fig. 1 with parts removed and parts broken away, the cradle thereof being shown in the extreme elevated position at the end of a load lowering stroke.

In Figs. 1 and 2 of the drawings there is illustrated a hoist housing comprising a pair of spaced and parallel sides 10 and 11 connected at the top by bridge 12, the latter having swiveled hook 13 thereon. The opposite ends of the plates are maintained in spaced relation by a sleeve and bolt or rivet 14, same having a stop function to be specified hereinafter.

Herein the hoist is provided with a log or coil chain 16 and this passes through an elongated generally rectangular cradle member comprising a hub that is oscillatably supported within the housing upon a support shaft 17 having opposite ends bushed as at 18 and 19 and supported in cup boss 20 on side 10 and sleeve 21 on closure 22 seated in the enlarged aligned opening 23 in housing 11 and secured as at 22a.

The cradle or hub is passed inwardly between the side plates from either side of the hoist. Then the shaft 17, that has rigid therewith ratchet 24 and chain load wheel 25, is passed through opening 23, the latter being large enough for such purpose, and secured in place within both housing and cradle as shown.

The cradle referred to comprises a pair of

spaced side walls 26 and 27 and has in side 27 a hole 28 large enough to pass the wheel and ratchet. The other side 26 has hole 29 to pass the shaft 17. The cradle thus is oscillatable upon shaft 17 and is oscillatable upon sleeve 21 of closure 22.

Each end 30 of the cradle terminates in a handle socket 31 that is adapted to detachably and interchangeably take an elongated handle member such as pipe 32. The detachable connection can be of any desired or required type or may merely comprise a thread connection.

Disposed inwardly and upon cradle wall 27 there is pivotally supported at 33 an activating load pawl 34 normally constrained by spring 35 to ratchet engagement. Pivotally carried interiorly by wall 11 of the hoist housing and at 36 is load holding pawl 37 normally constrained to ratchet engagement by spring 38.

This spring at the end opposite that secured to the holding pawl is connected to a pin 39 carried as an offset portion by a positioning arm 40 in turn secured to rock shaft 41 that projects through the housing wall 11 and externally mounts a manually operable control member 42. In Fig. 1 pawl 37 is disposed in the load elevating position. In Fig. 3 it is disposed in the load lowering position. The positioning arm 40 carries a stop extension 43 positioned to be engaged by the heel of the load pawl 34 when raised to its extreme position for the beginning of a load elevating movement, as shown by dotted lines in Fig. 1. Such engagement assures positioning of the holding pawl in its locking and ratcheting engagement with the ratchet 24 or load wheel, and that arm 40 has moved spring 38 to its over center position to so position the pawl. The positioning arm 40 is limited in its swinging movement into and out of load lowering position by the stops 40*a* and 40*b* carried by the housing.

When the control member 42 is disposed as shown in Figs. 3 and 7, the holding pawl 37 is constrained to ratchet free position for load lowering. Upon load lowering it is cammed into ratchet tooth engagement by the upper curved camming surface of the load pawl 34 when it is elevated to its extreme uppermost position at the end of a load lowering stroke as shown in Fig. 7. Thus, when the holding pawl is in its free position shown in Figs. 3 and 7, engagement thereof by the load pawl 34 cams it into ratchet tooth engagement against the tension of spring 38 where it is held by its angle of draft of the tooth of ratchet 24 in contact with the tooth of the wheel, and in turn holds the load while the load pawl 34 is being returned to a new load receiving position in engagement with the ratchet wheel 24. As load pawl 34 moves into ratchet tooth engagement, the ratchet may be slightly moved to take the pressure off of the holding pawl 37, which will then snap free of its ratchet holding position under tension of the spring 38 to permit a load lowering step. The camming action between the load pawl and the holding pawl above described will swing the load pawl to a position to be latched by the latch 60 from ratchet tooth engagement during the return stroke for load lowering as hereinafter described.

The above briefly explains the relative pawl movements for load lowering. For load elevation the usual pawl and ratchet association is effected. For free chain operation, with no load upon the chain, the control is disposed for load lowering and pawl 34 is manually disengaged. This frees both pawls and the chain can be pulled freely through the hoist in either direction without pawl interference.

Reference will now be had to the lower portions of Figs. 1 and 2. Pivotally mounted upon the hub or craddle wall 27 at 54 is a catch and latch member 55 having cam face 56 and catch shoulder 57. Disposed adjacent thereto is cam pin 58 carried by pawl 34.

The latch member is formed with an arm 59 to which the other end of spring 35 is secured. Said latch member also has a cam extension 60 formed with a cam face 61. Normally the spring 35 holds the cam face 56 of said member in inoperative engagement with the pin 58 carried by the pawl 34. Since the latch member is pivotally mounted at 54 on the cradle, the load pawl is thus biased into ratchet engagement about its pivotal mounting 33. Said latch and load pawl remain in this relation during load lifting operations. However, when the control member 42 of the holding pawl is moved to load lowering position as shown in Figs. 3 and 7, and load pawl 34 is swung to its extreme uppermost position into camming engagement with the holding pawl, it not only forces the holding pawl into ratchet engagement against tension of spring 38, but forcibly swings the load pawl relative to the latch member against tension of spring 35 until catch shoulder 57 locks over the cam pin 58. This has the effect of permitting the load pawl to be moved downwardly free of ratchet engagement with the holding pawl in holding position as shown in Fig. 7. Upon downward stroke of the load pawl to a new ratchet engaging position for load lowering the cam face 61 of the latch member engages the stop bolt 14 swinging the catch shoulder out of engagement with the pin 58 to thus release the hold pawl into its new ratchet engagement, whereupon the above described lowering movement of the pawls will take place. This action may be described as a full load lowering step wherein two to three ratchet teeth may be passed over in moving the pawl back to a new load lowering position. When a short or so-called half stroke operation is desired, a pin 62[a] may be inserted in the threaded hole 62 of the hub or cradle as shown in Fig. 7. With this pin in place, the cam face 61 of the latch will engage therewith and release the pawl 34 following a shorter stroke, whereupon it will re-engage with the ratchet following only a one tooth free movement. Thus with the pin 62[a] out of place, stop bolt 14 by reason of its position will permit free movement of the pawl over a plurality of teeth before re-engaging which will enable the load to be lowered more rapidly than by a tooth to tooth lowering effected when the pin 62[a] is in position. Thus the operator has the choice of rapid lowering or a short tooth to tooth or step by step lowering of the load.

This activation or operation is as follows:

For load elevation the control member 42 is positioned as shown in Fig. 1. Pawls 37 and 34 ratchet upon ratchet 24 in handle oscillation within the limits for full or half stroke. The chain advances accordingly. For load lowering the control 42 is positioned as shown in Figs. 3 and 7. When the handle nears the top of the stroke pawl 37 is engaged by pawl 34 and forced inwardly into ratchet engagement to take over the load theretofore carried by the load pawl 34. Continued handle elevational movement then causes the back face of pawl 37 to ride farther in on pawl 34 to tilt it upon pivot 33 sufficient for

pin 58 on the load pawl to tilt trigger catch 55 so that the hook 57 engages or locks upon the pin. This results, through spring 35, in freeing the load pawl from the ratchet and disposing it so that, while the load is held by holding pawl 37, the handle 32 and load pawl 34 (now in retracted position) can be returned to the bottom of the stroke whether it be of full or half stroke type. In Fig. 1, full type, cam 61 engages stop 14 to tilt the trigger-catch 60—55 to release it from pin 58, whereupon spring 35 causes load pawl 34 to engage the ratchet. Then the handle is slightly lowered to turn ratchet 24 a few degrees clockwise, see Fig. 1, which results in taking the load off pawl 37. Due to its constraint, pawl 37 immediately moves to inactive position, see Fig. 3. Then the handle carried load is lowered by elevating the handle until pawl 34 engages pawl 37 as initially described. Free chain is effected in either direction by having no load on the chain, and with pawl 37 positioned as shown in Fig. 3 and pawl 34 latched in the inoperative position by the catch 57. Load pawl 34 must, by means of lowering handle 32, be positioned so as to allow pawl 37 to clear ratchet 24.

Reference will now be had to Fig. 4 wherein a link chain or roller chain embodiment is illustrated. This form illustrates the omission of the ratchet, the pawls acting directly upon the chain rollers in lieu thereof. Herein also the half stroke type of operation is illustrated. The pawl-chain direct contact, if desired, can be employed in the log chain embodiment as well in which event the ratchet would be omitted. In all instances pawl draft is of importance to prevent pawl release accidentally.

In Fig. 4 numerals of the one hundred series indicate parts identical, similar or equivalent to parts shown in Figs. 1 to 3 and designated by the primary numerals. Herein 163 indicates the half stroke determiner stop disposed in hole 162. Herein also the shape of pawls 134 and 137 are different in that each is toothed or notched at 134a and 137a respectively. Also the load wheel 125 now is in the form of a toothed sprocket wheel and the ratchet is omitted.

The several parts are assembled in a manner substantially comparable to that previously described. When a ratchet wheel is to be employed with the sprocket wheel the pawls may be identical to those (34 and 37) shown in Figs. 1 and 2. Since Fig. 4 of the invention operates substantially the same as the first form, no further description of operation is believed necessary.

It will be obvious that in both forms of the invention described the handle is oscillated in a plane between the planes defined by the housing side plate portions. This of course requires the space between these plates to be open. In certain industries this is objectionable. This condition is especially accentuated when the cradle is of the interchangeable handle accommodating type, the purpose of which was set forth initially herein, as well as to dispose the handle oppositely when clearance demands it, as frequently happens when elevating a load in a corner and when it is initially lifted it turns with the hoist body and handle say 90 or so degrees into the corner.

Whenever it is desired to substantially close the hoist housing except for openings for the chain to enter and leave, the handle is disposed at one side of such housing. However with a predetermined fixed handle-cradle connection it would frequently occur that clearance would not

be available for full or half stroke purposes essential for hoist operation. Accordingly the handle when so disposed in an outboard relation, as it were, is adjustably associated with the hoist operating interior mechanism and it it swung to such position that the required handle travel can be attained.

The aforesaid embodiment of the invention is illustrated in Figs. 5 and 6 wherein numerals of the two hundred series designate parts identical, similar or equivalent to parts designated by the primary series of numerals in Figs. 1 to 3. Herein also the invention is shown as of the coil or log chain type but it will be obvious it can be of the chain link or roller chain type. Furthermore it can include a ratchet or omit it, all as previously described hereinbefore.

In Figs. 5 and 6, 211 indicates one side of a hoist housing arranged to house chain wheel 225 carried by a shaft 217. Herein both are integral. Side 210 is embossed at 210a and includes bearing portion 220 accommodating bushing 218 taking the adjacent end of said shaft. A yoke member having arm 270 is rotatably supported thereby. This at its opposite end 271 is enlarged as at 272 and is disposed exteriorly of housing portion 211 as shown.

Portion 272 is elongated outwardly and coaxially at 273 to form a sleeve in which is disposed the other end of said shaft 217. The said free end is tapped at 274 to take bolt 275 for securing thereto a retainer cap 276. Shaft 217 is bushed at 219 in the inwardly directed collar portion 221 of housing portion 211.

Pivotally supported on a pin 233 carried by the arm 270 of the yoke member there is provided a load pawl 234 adapted to engage the ratchet teeth 224 secured about the shaft 217. Associated with the load pawl there is provided a latch member 255 having a catch shoulder 257 thereon. Said latch member is pivoted at 254 on the arm 270 of the yoke member adjacent the load pawl 234. The load pawl and latch member are biased toward each other through the tension of the spring 235 secured to the latch member at one end and to the pawl at the other end. The pawl 234 carries a latch pin 258 adapted to be engaged by the catch shoulder 257 of the latch member for holding the pawl out of tooth engagement somewhat in the manner illustrated by the correspondingly enumerated elements of Fig. 7.

Pivoted on the housing adjacent the pawl and ratchet teeth there is a holding pawl 237 pivoted on the housing at 236 and positioned to swing into and out of holding engagement with said teeth. Adjacent the other end of the pawl there is provided a manually operable control 242 pivoted at 241 upon the housing and yieldingly connected with the adjacent end of the holding pawl by the spring 238 extending to the far end of an arm portion and secured thereto at 239. Thus movement of the control from one position to another will throw the tension spring 238 over center for biasing said holding pawl into and out of position for tooth engagement. The holding pawl 237 is in such position and so related to the load pawl 234 that upon moving the yoke member to extreme position to bring the load pawl into camming engagement with the holding pawl, said load pawl will be cammed thereby free of toothed engagement and into latched engagement, shoulder 257 interlocking with pin 258 in the manner illustrated by the relative position of comparable elements as shown in Fig. 7.

Where desired the housing may be provided with a removable cover plate 222 secured at 222a to the housing portion 211. The outwardly projecting end 273 of the yoke member 270, 271 provides a swing adaptor broadly comparable to the cradle of the embodiment of the invention as disclosed in Figs. 1, 2, 3 and 7, and includes a toothed periphery 277. The handle portion 230 includes a socket 231 to take an extension handle 232.

The handle portion is provided with a circular bore 278 the surface of which is rotatably supported by the crests of teeth 277 and includes boss 279 which slidably supports stem 280 of a latch member 281 normally constrained to interlocking engagement with the teeth 277 by spring 282. Member 283 is threaded to the handle and passes stem 280 and backs spring 282. It is slotted at 284 to take an aligning tooth 285. Stem 280 upon its outer end mounts knob 286 at 287. When the latch is in latching position the handle is locked to the yoke member in adjusted position. When the handle requires a different position due to lack of clearance it may be moved to such position with the latch disengaged, so that it can be oscillated through a half or full stroke without interference. When so adjusted, the latch is again engaged with the toothed end 273 of the yoke member.

It is to be noted that contrary to many hoist handles capable of 360° movement, the present invention provides for limiting the handle movement by the load holding pawl which functions as a stop. Hence, complete rotation of the handle is impossible in event the operator's hand slips from the hoist handle. This constitutes a safety feature of the present invention.

While the invention has been illustrated and described in great detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. In a hoist structure for raising and lowering a load, a housing having bearings for supporting a shaft, a tooth load wheel on said shaft for operating a flexible load raising and lowering means, an oscillating hub rotatably mounted upon said housing concentrically with said shaft, a load pawl pivotally mounted on said hub normally biased into tooth engagement with said load wheel, a holding pawl pivoted on said housing, a control member rockable on said housing having a spring connection with said holding pawl movable to yieldingly constrain said pawl to load wheel holding position when moved in one direction and free thereof when moved in the opposite direction, a latch pivotally mounted on said hub adjacent said load pawl movable into latching engagement therewith upon said load pawl being oscillated to operative engagement with said holding pawl for latching said load pawl out of wheel operating position while forcing said holding pawl to its holding position during a load lowering operation, and a camming element on said housing engageable by said latch upon said hub being oscillated a predetermined distance away from said holding pawl for camming said latch to release said load pawl to load wheel operating position.

2. A hoist structure as set forth in claim 1 wherein said camming element is selectively positioned for varying the distance of movement of the load pawl free of said load wheel during the load lowering operation.

3. A hoist structure as set forth in claim 1 wherein with the flexible load raising and lowering means free of load and the load pawl arrested in an intermediate position between its latched out and latch camming positions, said load wheel may be moved in either direction free of said pawls.

4. In a hoist structure as set forth in claim 1 wherein said oscillating hub comprises a cradle having a handle receiving socket extending from opposite sides thereof to provide for selective positioning of an operating handle on either side of said structure.

5. In a hoist structure as set forth in claim 1 wherein said hub is provided with an extension at one side thereof having a series of peripherally disposed teeth, a handle portion rotatably mounted about said toothed hub extension, and a latch member mounted in said handle portion normally constrained to tooth engagement with said hub portion for interlocking the handle portion therewith and movable free thereof for selectively positioning said handle portion relative to said hub portion.

6. In a hoist structure for raising and lowering a load, a housing having bearings for supporting a shaft, a toothed load wheel on said shaft for operating a flexible load raising and lowering means, an oscillating hub rotatably mounted upon said housing concentrically with said shaft, a load pawl member pivotally mounted on said hub movable into and out of tooth engagement with said load wheel, a holding pawl pivoted on said housing positioned for opposed engagement with the teeth of said wheel, a control member rockable on said housing having spring based connection with said holding pawl, a manually operable handle connected with said control member for rocking it to opposite positions for yieldingly throwing said holding pawl into and out of holding engagement with said load wheel, and a stop extension carried by one of said members positioned for operative engagement by the other said member for positively forcing said holding pawl into tooth engagement upon the beginning of a load lifting stroke.

7. In a hoist structure for raising and lowering a load, a housing having bearings for supporting a shaft, a toothed load wheel secured to said shaft for operating a flexible load raising and lowering means, an oscillating hub rotatably mounted upon said housing concentrically with said shaft, a load pawl pivotally mounted on said hub movable into and out of tooth engagement with said load wheel, a holding pawl pivoted on said housing positioned for opposed engagement with the teeth of said wheel, a latch associated with said load pawl movable into latching engagement therewith for holding it free of load wheel engagement during movement thereof from the end of a load lowering stroke to the beginning of the next load lowering stroke, and a member on said housing engageable by said latch for effecting its release of said pawl upon reaching a predetermined position relative to said wheel.

8. In a hoist structure for raising and lowering a load, a housing having bearings for supporting a shaft, a toothed load wheel on said shaft for

operating a flexible load raising and lowering means, an oscillating hub rotatably mounted upon said housing concentrically with said shaft, a load pawl pivotally mounted on said hub movable into and out of tooth engagement with said load wheel, a holding pawl pivoted on said housing positioned for opposed engagement with the teeth of said wheel, a control member rockable on said housing having a spring connection with said holding pawl, a manually operable handle connected with said control member for rocking it to opposite positions for yieldingly throwing said holding pawl into and out of holding engagement with said load wheel, and a latch associated with said load pawl movable into latching engagement therewith for holding it free of load wheel engagement during movement thereof from the end of a load lowering stroke to the beginning

of the next load lowering stroke, said latch being actuated to release said pawl into load wheel engagement upon said pawl reaching a predetermined position relative to said wheel, and means for rendering said latch inoperable relative to said load pawl during the load raising operation.

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