

Aug. 18, 1953

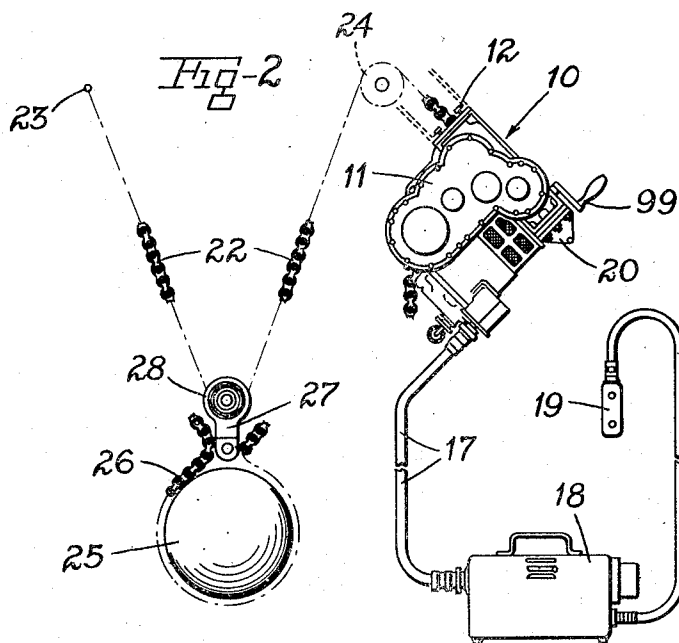
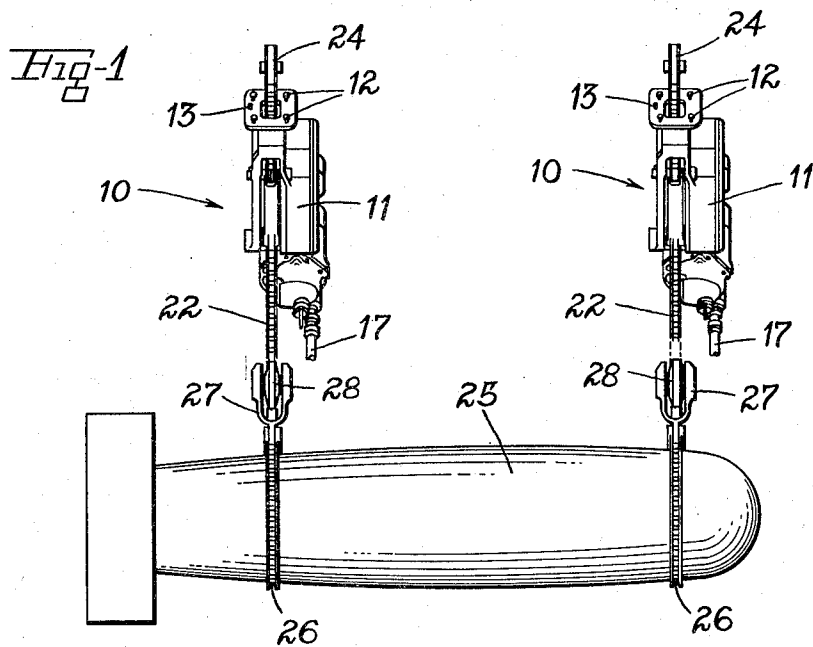
L. E. RAUSENBERGER ET AL

2,649,280

CHAIN HOIST MECHANISM

Filed May 31, 1950

3 Sheets-Sheet 1



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Fig-3

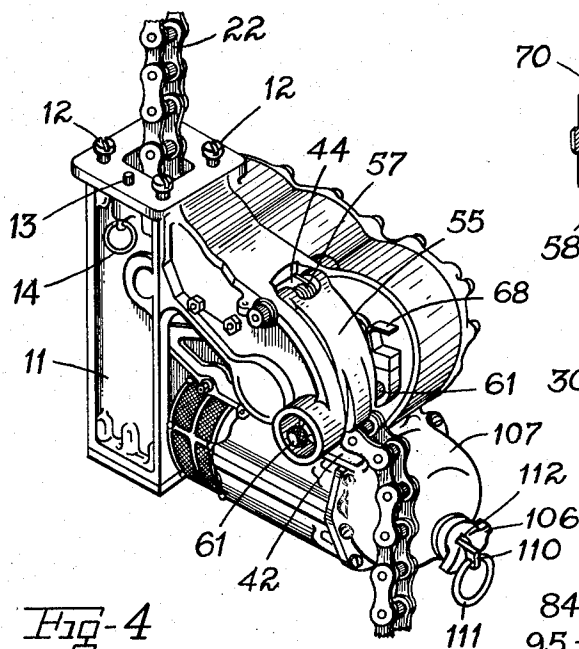


Fig-4

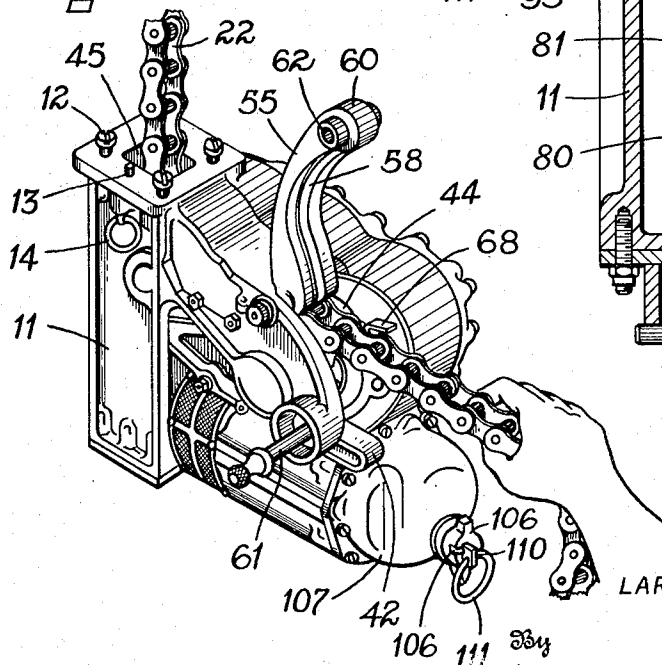
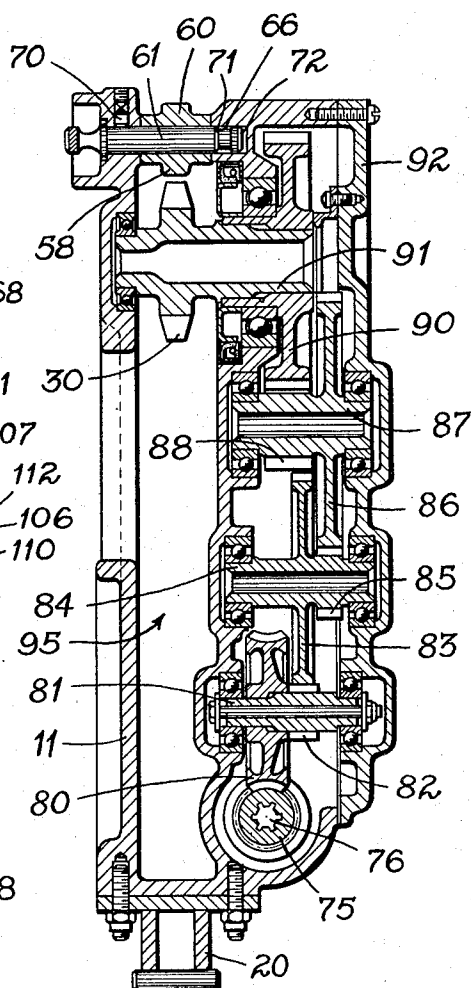


Fig-5



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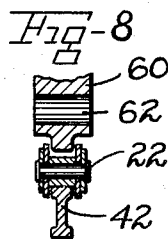
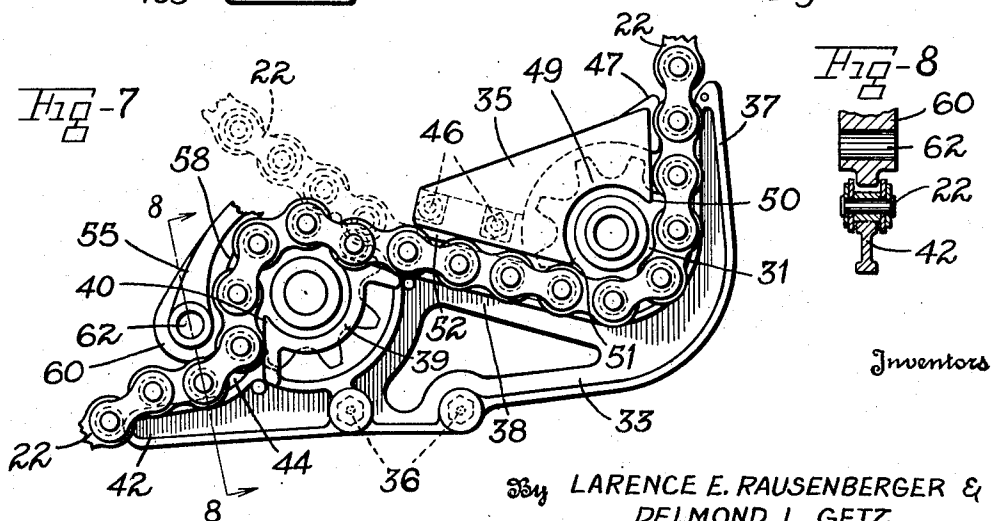
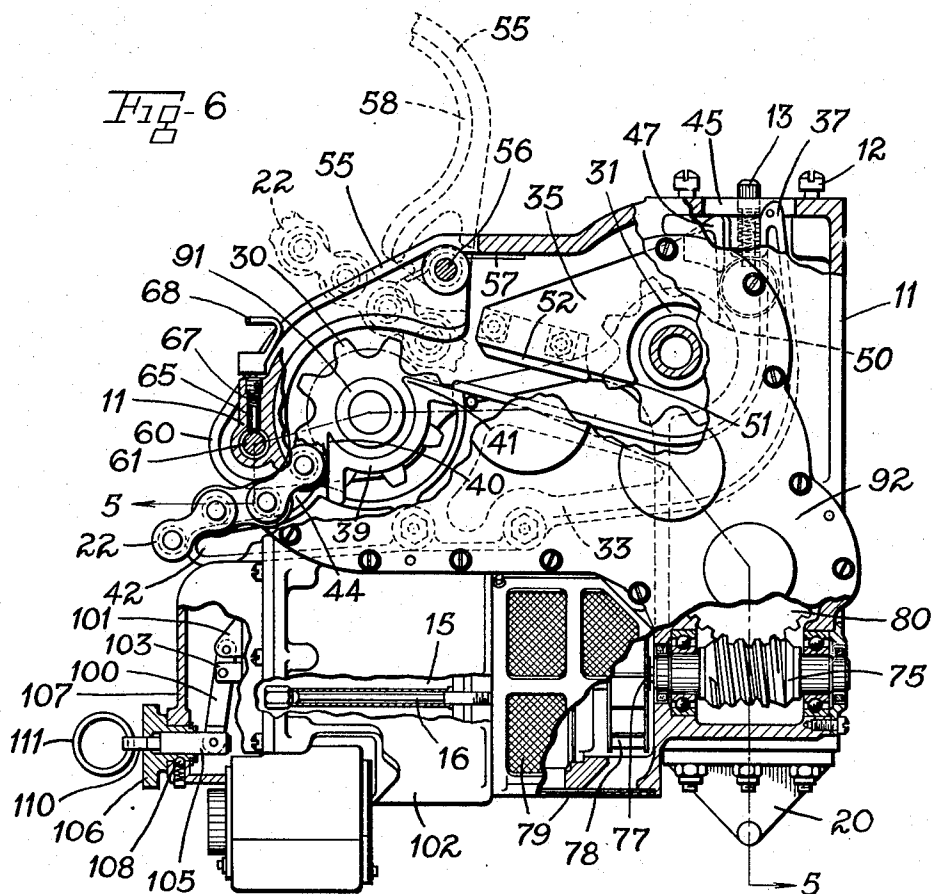
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CHAIN HOIST MECHANISM

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4 Claims. (Cl. 254—168)

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This invention relates to chain hoists.

The invention has particular relation to chain hoists adapted for special uses such as for loading bombs in an airplane and the like. For example, the invention is applicable to a drive unit for a chain hoist of the type adapted to be used for loading and unloading bombs wherein one end of the chain is fixed in the plane and the other end is driven through a drive unit, with the load being carried by a sling supported by the loop of the chain between its fixed end and the drive unit.

In a unit of this type intended for use in handling bombs and the like, several factors are important for optimum efficiency in operation. For example, it is especially desirable for the operator to be able to insert the chain in the drive unit and to remove it therefrom easily and quickly, both to facilitate handling and transporting of the hoist and also to reduce the size of the individual containers for the several parts of the hoist, since the chains for such hoists are commonly required to be of substantial length and are not readily moved manually because of their resulting weight and bulk.

Another advantage of quick insertion of the chain in the drive unit is to facilitate mounting of the hoist for use in an airplane, it being readily apparent that a matter of minutes or even seconds may be of the utmost importance in connection with a bomb loading operation in time of war. Also it is important that assembly of the hoist for use be accomplished with minimum likelihood of injury to the operator, such as possible pinching or crushing of the fingers when inserting and guiding the free end of the chain into the drive unit, and similarly it is important to provide maximum assurance against jamming of the drive unit by improper guiding of the chain therethrough either during initial insertion thereof or during subsequent operation.

The present invention provides a drive unit for a chain hoist which gives highly desirable and satisfactory results from all of the above standpoints. This unit is so constructed that the free end of the chain is readily inserted therethrough and positively engaged with the driving sprocket while the power is shut off and without requiring rotation of the sprocket, thus assuring maximum safety to the operator as well as accelerating assembly of the hoist. These desirable results are facilitated by the provision of a retainer for the chain which cooperates with the driving sprocket to maintain a positive drive on the chain during operation and which also forms a removable

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closure for an opening in the housing through which the sprocket and the portion of the chain within the housing are freely accessible when the retainer is moved to its open position. The arrangement is such that when the retainer is in open position, the sprocket is exposed in such manner that the chain can be manually inserted in the housing in positive engagement with the sprocket while the latter is stationary, and when the retainer is then closed, the chain is held in engagement with the sprocket in readiness for application of the power drive.

It is accordingly one of the principal objects of the present invention to provide a chain hoist having a driving unit into which the chain can be quickly and easily inserted for operation while the drive is shut off and thus to assure maximum safety to the operator as well as to the unit and also to minimize the possibility of improper assembly of the hoist.

Another object is to provide a chain hoist wherein the drive unit includes guides for the chain which operate to effect continuous guiding of the chain while it is moved through the drive unit under power and to strip the chain continuously from both driving and idler sprockets for maximum assurance against binding or jamming.

It is also an object of the invention to provide a chain hoist wherein one of the guides for the chain in the drive unit serves in addition as a retainer to hold the chain in driven engagement with the drive sprocket and also as a removable closure for an opening in the housing providing access to the interior of the housing for quick and easy insertion of the chain in driven engagement with the drive sprocket.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings—

Fig. 1 is a somewhat diagrammatic elevational view showing a pair of chain hoists in accordance with the invention arranged in position for a loading or unloading operation;

Fig. 2 is an elevational view at right angles to Fig. 1;

Fig. 3 is a perspective view of the drive unit of the hoist and showing the chain in operating position;

Fig. 4 is a view similar to Fig. 3 showing the chain retainer in its open position for insertion or removal of the chain;

Fig. 5 is a developed section on the line 5—5

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of Fig. 6 showing the driving parts of the drive unit and with the chain guiding members omitted for simplicity of illustration;

Fig. 6 is a side elevational view of the drive unit which is partly broken away and in section to show details of internal construction and operation;

Fig. 7 is a skeleton view similar to Fig. 6 but showing only the guides and sprockets for the chain; and

Fig. 8 is a fragmentary section on the line 8-8 of Fig. 7.

Referring to the drawings, which illustrate a preferred embodiment of the invention, the driving unit of the hoist is indicated generally at 10, and it includes a housing 11 adapted to be mounted in an airplane by means of the mounting bolts 12 as indicated in dotted lines in Fig. 2. A spring pressed locating pin 13 adjacent the mounting bolts 12 provides for locating and releasably securing the housing in mounted position, and it is provided with a pull ring 14. The drive unit 10 includes a drive motor 15 which is held within the housing 11 by mounting bolts 16 and is shown as connected by a cable 17 with a junction box assembly 18 adapted to be connected to a power source and controlled by a hand switch unit 19. The housing 11 is also provided with an alternative mounting arrangement comprising the loop shaped bracket 20, which is bolted thereto as shown in Figs. 5 and 6 and is adapted to receive a hook or similar mounting device supported in the plane or other place of use of the hoist and serving to suspend the drive unit for use.

The roller chain 22 is adapted to have one end thereof fixed within the airplane as indicated at 23, and its other end is guided over one or more idlers 24 to and through the drive unit 10. For handling an elongated load such as the bomb 25 shown in Figs. 1 and 2, two hoists are used, and the bomb 25 is shown as supported on the loop of each chain between its fixed end 23 and the idler 24 by means of a chain sling 26 and a yoke 27 which supports the sling 26 and also forms a mounting for an idler 28 riding on the loop portion of the chain 22.

Within the housing 11 is a driving sprocket 30 for the chain 22 and an idler sprocket 31, and two cooperating guides 33 and 35 are mounted within the housing for guiding the chain there-through and over the two sprockets. Referring particularly to Fig. 7, the guide 33 is bolted in the housing at 36 and includes an upwardly projecting portion 37 extending partly around the idler sprocket 31 and cooperating with an intermediate portion 38 of the guide to form a track for the chain extending towards the middle of the housing to the driving sprocket 30. A pair of sector shaped webs 39 on guide 33 straddles a portion of the driving sprocket, and each web includes projections 40 and 41 which cooperate to strip the chain from the sprocket as it is driven in either direction. The guide 33 also includes a forwardly extending track portion 42 which projects outwardly of the housing through an opening 44 therein for the chain.

Another opening 45 for the chain is provided in the housing above the guide portion 37, and the guide 35 is mounted within the housing just below this opening 45. As shown, the guide 35 is bolted in the housing at 46, and it includes a guiding lug or track portion 47 opposite the guide projection 37 and a pair of stripping webs 49

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similar to the webs 39 which straddle the idler sprocket 31 and are similarly formed with stripping projections 50 and 51 for the chain. The portion 52 of guide 35 forms a track which lies above and parallel with the track portion 38 of guide 33 for guiding the chain towards the driving sprocket.

The opening 44 in the housing is shown as an elongated slot overlying the driving sprocket 30, and a retainer 55 for the chain is mounted in this slot for movement between an operating position shown in Fig. 3 and in full lines in Fig. 6 wherein it holds the chain in engagement with the driving sprocket and an open position shown in Fig. 4 and in dotted lines in Fig. 6 for providing access to the driving sprocket and chain through the opened slot 44. One end of the retainer 55 is pivoted adjacent an end of slot 44 by means of a bolt 56, and a torsion spring 57 is arranged to urge the retainer normally towards its open position.

The retainer 55 is formed with a rib portion 58 which is concentric with the sprocket 30 in the operating position of the retainer to form a guide track for the chain as shown in Figs. 6 to 8, and its free end or head 60 is rounded for cooperation with the guide projection 42 in guiding the chain out through the outlet passage which is left through the opening 44 between the head 60 and guide portion 42 in the closed or operating position of the retainer. A locking pin 61 is mounted for sliding movement in the housing and through the bore 62 in the head 60 of retainer 55 to hold the retainer in operating position. This pin 61 is releasably held in its locking position by means of a locking plunger 65 which is slidable in the housing and engages within a peripheral groove 66 on pin 61. The plunger 65 is normally urged to locking position by a spring 67 and is provided with a handle 68 for manually pulling it to a release position against spring 67. A detent 70 at the opposite side of the housing from plunger 65 is adapted to engage in groove 66 when pin 61 is pulled out for releasing retainer 55 to prevent the pin from being pulled free of the housing. The pin 61 is beveled at 71 and 72 to facilitate its release from the detent 70 and its engagement with plunger 65 respectively.

The drive from the motor 15 to the driving sprocket 30 is shown in detail in Figs. 5 and 6. A worm 75 is journaled in the housing 11, and it is formed with a grooved bore 76 for splined engagement with the motor shaft 77, which also carries the fan 78 having air screens 79. The worm 75 engages a worm gear 80 keyed or splined to a shaft 81 having gear teeth 82 thereon which engage a larger gear 83 on a shaft 84 similarly formed with gear teeth 85. These teeth 85 engage a large gear 86 on a shaft 87 formed with gear teeth 88, and the teeth 88 in turn engage a large gear 90 splined to the hollow shaft 91 which is formed integrally with the driving sprocket 30. A removable cover 92 is bolted to the housing 11 to provide ready access to this chain of gears, and the chain 22 and guides 33 and 35 are located within the space 95, which is shown in Fig. 5 as of exaggerated length because Fig. 5 is a developed view.

Provision is made for manual operation of the hoist by means of a hand crank 93 (Fig. 2) having a splined end portion adapted to engage within the grooved bore 76 of the worm 75. For such manual operation, it is necessary to release the brake on the motor shaft, which is preferably a

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braking mechanism such as that shown in the copending application of L. E. Rausenberger, Serial No. 13,160, filed March 31, 1948, and issued August 19, 1952, as Patent No. 2,607,445 to the same assignee as this application. This braking mechanism is located at the opposite end of the motor shaft from the fan 78, and it is arranged to be applied by springs when the motor is shut off and to be released by a magnet energized simultaneously with the motor.

In order to release this brake, a lever 100 is pivoted in a pair of yoke arms 101 on the outer end of the motor housing 102 and is connected by means of a slidable shaft or stud 103 with the movable member of the brake mechanism. A plunger 105 is connected to the free end of lever 100 and is slidable in a locking member 106 rotatable in the end cap 107 and provided with a detent 108 for releasably holding it in its locked or release position. The outer end 110 of plunger 105 is provided with a pull ring 111 and is flattened as shown in Figs. 3 and 4 for engagement within a slot 112 in the outer end of the locking member 106. The drawings show the plunger 105 in its released position for power operation of the hoist. In order to release the brake for manual operation, the plunger 105 is pulled out until its flattened end is free of the slot 112, and the locking member 106 is then turned through 90° to hold the plunger in this outer position as shown in Fig. 4.

In assembling this hoist for use in the manner shown in Figs. 1 and 2, one end of the chain 22 may first be fixed in place as at 23 in Fig. 2, and the free end is then inserted in the driving unit as shown in Figs. 4 and 6. In order to insert the chain, the retainer 55 is first released from its operating position by releasing the locking plunger 55 and then pulling the locking pin 61 free of the bore 62 in the retainer head 60, whereupon the retainer is swung by the torsion spring 57 to its open position shown in Fig. 4 and in dotted lines in Fig. 6. The free end of the chain is then inserted in the opening 44, and it is guided through the housing by the guide portions 37 and 47 to the open space beyond the guide 35 and overlying the driving sprocket. In this position, the end of the chain is readily grasped by the hand of the operator as shown in Fig. 4 and pulled manually through the driving unit until approximately a foot or more of chain extends beyond the unit. Since with the housing 11 in the position shown in Fig. 4 the chain is overlying the driving sprocket, it readily engages the teeth of the sprocket when the free end is released. Then when the retainer 55 is moved to its closed or operating position and locked in place by the pin 61, the chain is positively held in engagement with the sprocket, and the driving unit can be manually lifted to its mounted position in the plane, or the motor can be started to cause the unit to climb the chain to the desired height.

It will thus be seen that with this driving unit constructed as described, assembly of the hoist for operation may be effected quickly and easily with minimum likelihood of damage to the apparatus or injury to the operator. Thus instead of requiring hand operation for initial engagement of the chain with the driving sprocket, or operation of the motor while manually forcing the free end of the chain into the housing, the arrangement of the releasable chain retainer as disclosed makes it possible to thread the chain through the housing and to lock it in positive

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engagement with the driving sprocket while the power is shut off. Furthermore, manual insertion of the chain with the driving unit of the present invention is materially quicker than when the unit is power driven, since the desired length of the chain can be pulled through the housing in a matter of a few seconds whereas for power operation, the device is geared down to a low lifting rate, for example a rate of the order of 2 feet per minute for a bomb hoist. This advantage of increased speed is also available when disassembling the hoist, which can be done by approximately the reverse of the operation shown in Fig. 4, with the free end of the chain being lifted clear of the driving sprocket by one hand while the chain is pulled out through the opening 45 by the other hand.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A hoisting device adapted for use with a chain comprising a housing, means forming inlet and outlet openings in said housing adapted to receive said chain therethrough for driving movement through said housing, a driving sprocket for said chain within said housing and adjacent said outlet opening, an idler sprocket for said chain within said housing and adjacent said inlet opening, guides cooperating with said idler sprocket to receive said chain through said inlet opening and to guide the same around said idler sprocket, stripper means on one of said guides adapted to straddle a portion of said idler sprocket for stripping said chain therefrom to prevent winding of said chain on said sprocket, guides cooperating with said driving sprocket to receive said chain from said first named guides and to guide the same into driven engagement with said driving sprocket and through said outlet opening, and stripper means on one of said second named guides adapted to straddle said driving sprocket for stripping said chain therefrom to cause said chain to pass through said outlet opening.

2. A hoisting device adapted for use with a chain comprising a housing, means forming inlet and outlet openings in said housing adapted to receive said chain therethrough for driving movement through said housing, a driving sprocket for said chain within said housing and adjacent said outlet opening, an idler sprocket for said chain within said housing and adjacent said inlet opening, guides cooperating with said idler sprocket to receive said chain through said other opening and to guide the same around said idler sprocket, stripper means on one of said guides adapted to straddle a portion of said idler sprocket for stripping said chain therefrom to prevent winding of said chain on said sprocket, guides cooperating with said driving sprocket to receive said chain from said first named guides and to guide the same into driven engagement with said driving sprocket and through said outlet opening, stripper means on one of said second named guides adapted to straddle said driving sprocket for stripping said chain therefrom to cause said chain to pass through said outlet opening, means forming an elongated slot through said housing radially overlying said driving sprocket, means releasably securing one of

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said second named guides within said slot in overlying relation with said driving sprocket to maintain said chain in driven engagement with said sprocket, and means for effecting movement of said retaining guide outwardly of said slot to provide access to said sprocket through said slot.

3. A hoisting device adapted for use with a chain comprising a housing having inlet and outlet openings therein for receiving said chain therethrough, a drive sprocket for said chain within said housing and adjacent said outlet opening, an idler sprocket for said chain within said housing and adjacent said inlet opening, a first chain guide within said housing including a track portion adapted to receive said chain from said inlet opening and guide the same around said idler sprocket to said driving sprocket and a stripper portion adapted to straddle said driving sprocket for stripping said chain therefrom to prevent winding of said chain on said sprocket, a second chain guide within said housing including a track portion adjacent said inlet opening for guiding said chain to said first guide and a stripper portion adapted to straddle a portion of said idler sprocket for stripping said chain therefrom, said outlet opening being elongated in radially overlying relation with said driving sprocket, a chain retainer pivoted in said outlet opening for movement between an open position providing access to said sprocket through said outlet opening and an operating position partially closing said outlet opening for retaining said chain in driven engagement with said driving sprocket, and means for releasably securing said retainer in said operative position.

4. A hoisting device adapted for use with a chain comprising a housing having inlet and outlet openings therein for receiving said chain therethrough, a drive sprocket for said chain within said housing and adjacent said outlet opening, an idler sprocket for said chain within said housing and adjacent said inlet opening, a first chain guide within said housing including

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a track portion adapted to receive said chain from said inlet opening and guide the same around said idler sprocket to said driving sprocket and a stripper portion adapted to straddle said driving sprocket for stripping said chain therefrom to prevent winding of said chain on said sprocket, a second chain guide within said housing including a track portion adjacent said inlet opening for guiding said chain to said first guide and a stripper portion adapted to straddle a portion of said idler sprocket for stripping said chain therefrom, said outlet opening being elongated in radially overlying relation with said driving sprocket, a chain retainer pivoted in said outlet opening for movement between an open position providing access to said sprocket through said outlet opening and an operating position partially closing said outlet opening for retaining said chain in driven engagement with said driving sprocket, and means on said first guide and said retainer cooperating in said operating position of said retainer to guide said chain over said driving sprocket and through said outlet opening.

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