United States Patent [19]

Lifferth

[11] **3,765,651**

[45] **Oct. 16, 1973**

[54] **HOIST**

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[22] Filed: **Aug. 2, 1971**

[21] Appl. No.: **167,992**

[52] **U.S. Cl.** ..... **254/186 HC,** 74/437

[51] **Int. Cl.** **B66d 1/00**

[58] **Field of Search** ..... 254/186, 186 HC, 254/175.7; 74/413, 435, 437

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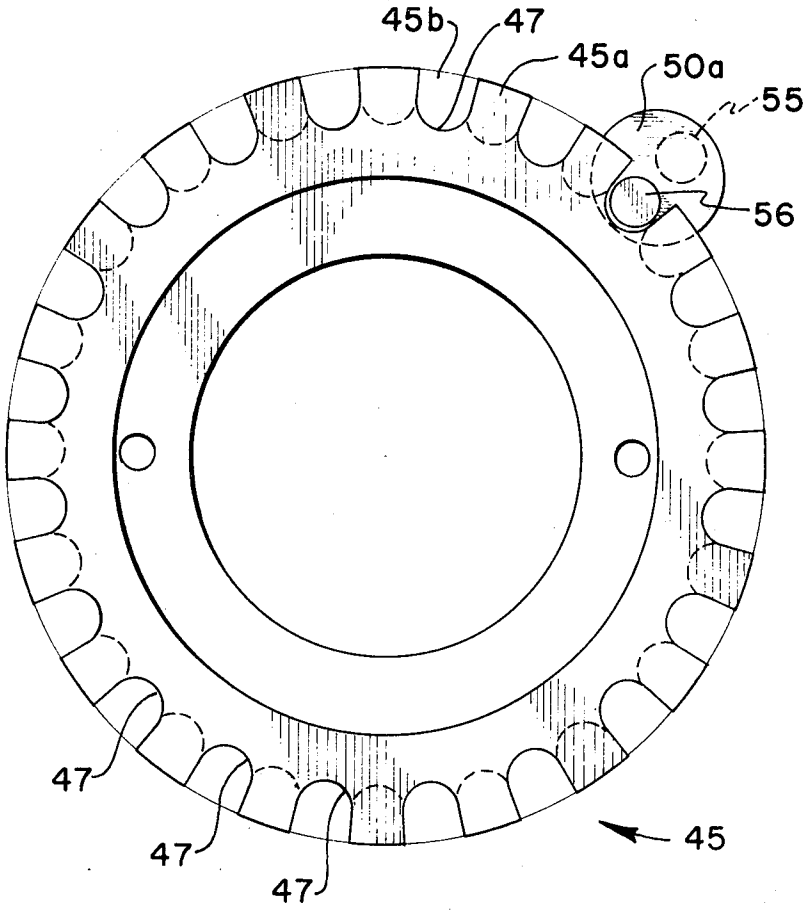
[57] **ABSTRACT**

A portable, compact hoist constructed of lightweight metals and high strength fabrics. The invention has a maximum lifting capacity and a minimum size and weight. A self-locking gear arrangement that can be overcome by momentum of an operating handle insures that a flat tape used for the hoist cable can be efficiently wound onto or off of the reel and that the tape can also be rapidly pulled from the real.

4 Claims, 7 Drawing Figures



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2 Sheets-Sheet 1

FIG 1

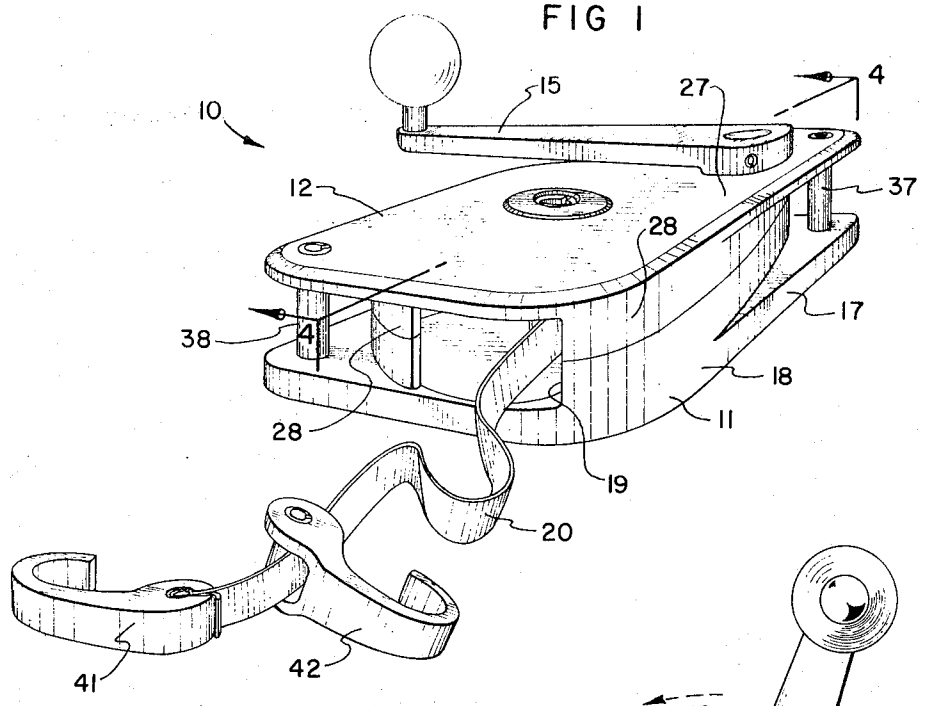

FIG 2

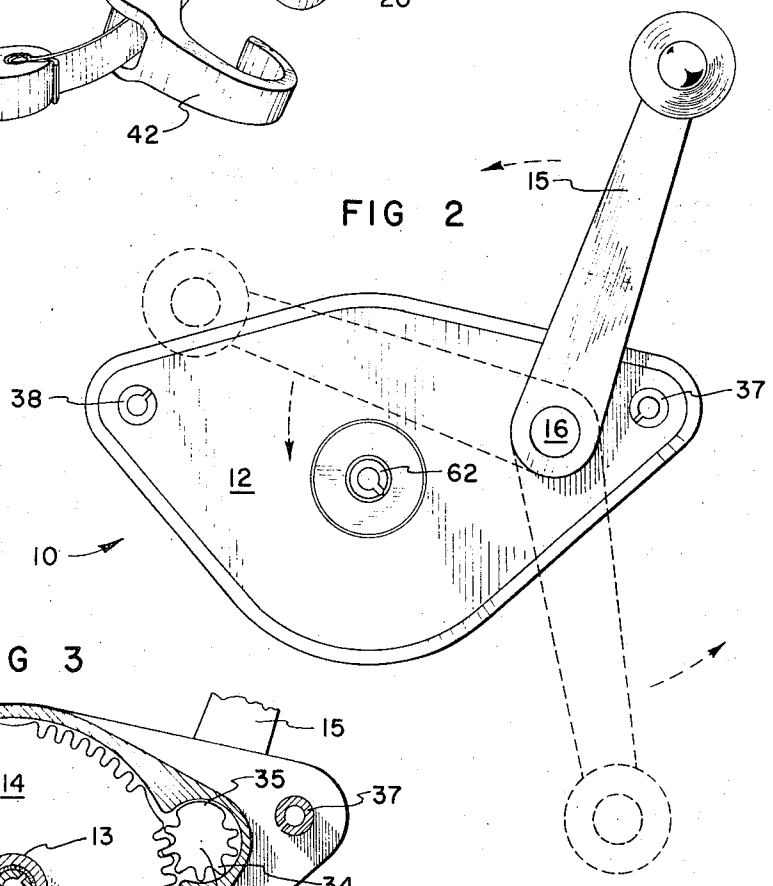

FIG 3

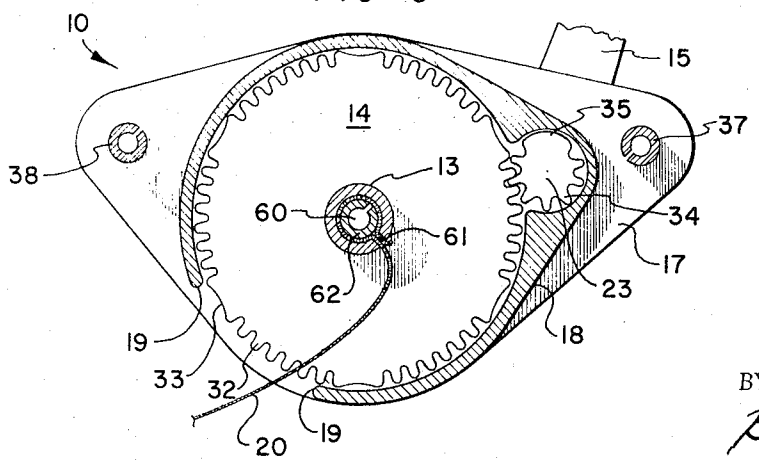

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FIG 4

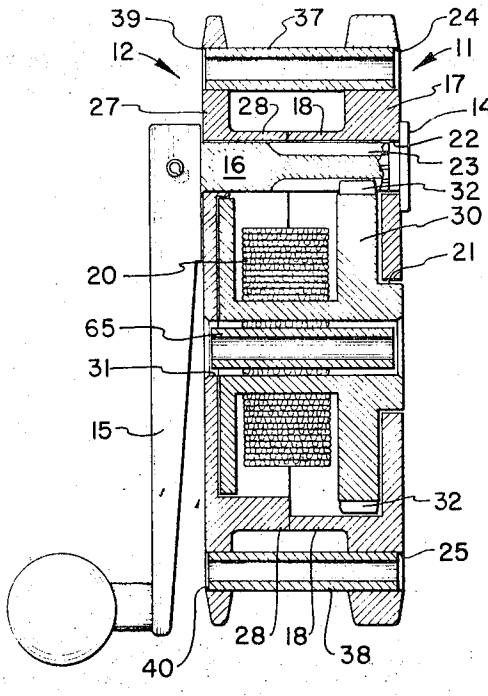


FIG 5

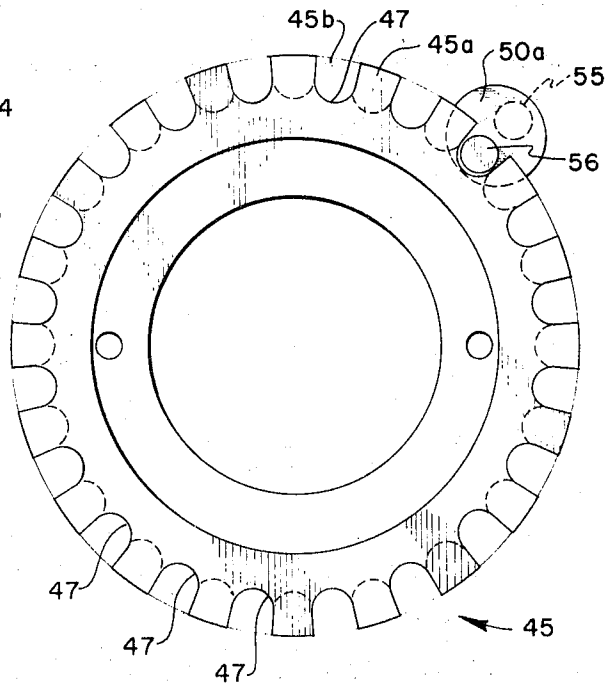


FIG 6

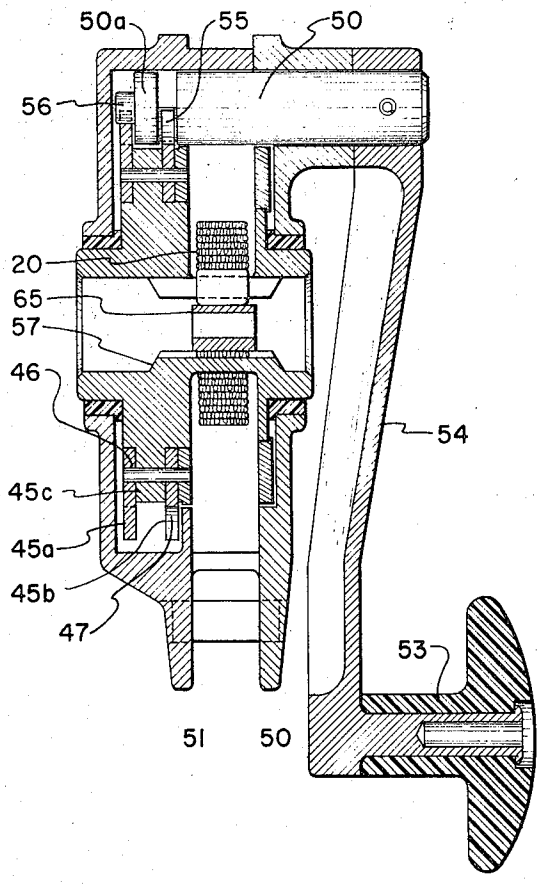
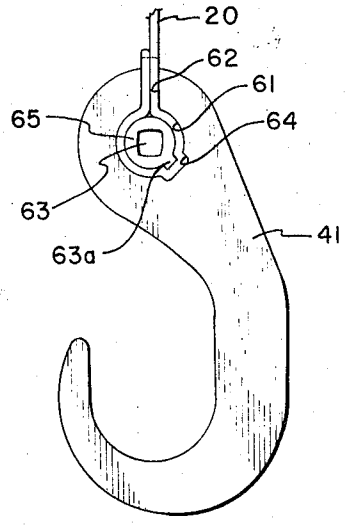


FIG 7



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HOIST

BRIEF DESCRIPTION OF THE INVENTION

1. Field of the Invention

This invention relates to self-contained hoists or lifting devices.

2. Prior Art

It has long been recognized that there is a need for a lifting device that is small enough and light enough to be easily carried conveniently by an individual such as a hunter, and that is capable of providing a sufficient mechanical advantage that the individual, using the device can lift significant weight, such as the weight of a slain animal, with a minimum effort on the part of the individual. Hoists heretofore known, having elevating capacities similar to those of the present invention are bulky and have been much heavier, being generally of steel construction, and not compactly designed to be portable.

At the same time, it is desirable that the same principals of operation of the small hoist be adaptable to other uses, such as for use in large hoists and even those that may be motor driven.

Various types of block and tackle arrangements have been proposed for the purpose and usually they include some kind of a braking arrangement for locking the tackle at a particular position. These braking arrangements may take the form of clamps, ratchets on the drums on which the tackle are wound or they may be of other different configurations. The tackle is generally woven of wire rope and the entire assembly is bulky to carry, store and handle.

Other types of lifting devices have also been proposed, but, so far as I am aware, none have been entirely satisfactory from the standpoints of convenience of use, durability, weight and compactness.

SUMMARY OF THE INVENTION

Principal objects of the present invention are to provide an easily used, efficient, durable, lightweight and compact, self-contained hoist.

To achieve these objects, I have provided, as features of my invention a two-piece readily cast and assembled housing, a combined take-up reel and driven gear and a handle turned drive gear arranged to mesh with the driven gear. A flat tape is wound onto the reel as the hoist cable, and means, including the drive and driven gears are provided for automatically locking the tape against further unwinding from the reel.

In one embodiment, the tape can be pulled rapidly from the reel, and in both illustrated embodiments the housing is assembled such that the tape can be connected thereto to increase the lifting force that can be handled by the unit and the handle is arranged so as to be readily operated but such that the overall thickness dimension of the hoist unit is kept at a minimum.

Additional objects and features will become apparent to those skilled in the art from the following detailed description and claims, taken with the accompanying drawings.

THE DRAWINGS

FIG. 1 is a perspective view showing an assembled hoist of the invention;

FIG. 2, a side elevation view, with alternate handle positions shown by dotted lines;

FIG. 3, a horizontal section, taken on the line 3—3 of FIG. 1 and showing one embodiment of drive arrangement;

FIG. 4, a vertical section, taken on the line 4—4 of FIG. 1;

FIG. 5, a view like that of FIG. 3, but showing another embodiment of drive arrangement;

FIG. 6, a view like that of FIG. 4, but showing the embodiment of FIG. 5; and

FIG. 7, a sectional view showing how a hook is secured to a hoisting tape of the invention.

DETAILED DESCRIPTION

Referring now to the drawings:

In the embodiment of FIGS. 1–5, the hoist 10 of the invention comprises a pair of housing members 11 and 12 arranged to have a tape reel 13, FIG. 3, and a drive unit 14 therein. A handle 15 is secured to a drive shaft 16, exteriorly of housing member 12.

The housing members 11 and 12 are preferably cast from an aluminum alloy or other suitably strong but lightweight material. Housing member 11 includes a side wall 17 and an inwardly projecting circular central wall 18 that has an opening therein at 19 for a portion of the central wall length. As will be further explained, the central wall serves as a guide for a hoisting tape 20 and the opening 19 will allow the tape 20 to be unwound from or to be wound onto the reel 13.

A central opening 21, FIG. 4, is provided through side wall 17 to journal one end of the tape reel 13. Another opening 22 is provided through central wall 18 to journal a drive gear 23 of the drive unit 14, one end of which forms the drive shaft 16 to which handle 15 is connected. Other openings 24 and 25 are provided through side wall 17 at opposite ends of the housing member 11 and are used to hold the housing members together, as will be more fully described.

Housing member 12 has side wall 27 with a circular central wall 28 projecting inwardly therefrom. Central wall 28 is open at 29, FIG. 3, to form an opening through which the tape is passed. When the unit is assembled, central wall 28 abuts central wall 18, but the inner diameter of wall 18 is made larger than the inner diameter of wall 28 so that wall 18 will surround a driven gear 30 fixed to tape reel 13. As shown, the driven gear is integral with the tape reel, but they can be made separate and then be interconnected for rotation together.

A central opening 31 through side wall 27 serves to journal the other end of tape reel 13 and the driven gear 30.

Driven gear 30 is provided with the usual gear teeth 32 around the greatest portion of its periphery but with a tooth removed at equal spaced distances around the periphery and a concave surface 33, FIG. 3, interconnecting the adjacent teeth.

The drive gear 23 is formed with teeth 34 arranged to mesh with teeth 32 and a convex surface 35 interconnecting teeth 32 and having a greater degree of curvature than does each concave surface 33, arranged to engage each of the surfaces 33.

In operation, turning of the handle 15 fixed to drive shaft 16 also turns drive gear 23. The teeth 34 on the drive gear mesh with the teeth 32 to turn the driven gear and the tape reel 13 affixed thereto. There is a momentary hesitation in the turning of the driven gear and reel 13 as the convex surface 35 turns within a concave

surface 33, but turning continues as soon as the gear teeth again mesh.

Thus, by turning handle 15 the tape reel is turned to pay out or to wind up the tape fixed thereto. The direction of turning of the handle determines whether the tape is payed out or wound on.

However, if the handle 15 is not turned and is placed in its lowered position with respect to the openings 19 and 29, pulling on the tape 20 will merely turn the tape reel and the driven gear until a corner of a concave surface 33 engages a convex surface 35 to lock the gears against further rotation.

If the handle 15 is positioned above its lowered position with respect to the openings 19 and 29 and is allowed to swing freely as the tape is pulled, the momentum of the handle as it swings past its lowermost position will turn the concave surface within the convex surfaces so that teeth will continue to mesh and the tape can be pulled without locking of the unit.

Thus, the hoist unit described can be used by turning handle 15 to pay out tape 20, or the tape can be rapidly pulled out, if desired. The tape can be readily taken up by turning the handle and the unit is self locking.

Roll pins 37 and 38 are respectively inserted through openings 24 and 25 in housing member 11 and corresponding aligned openings 39 and 40 in housing member 12 and their natural tendency to expand frictionally holds the housing members together. In addition, these pins, which could be replaced by nuts and bolts, provide means whereby the hoist can be suspended and as a means to which the end of tape 20 can be secured, as by a hook 41 should it be desired to use a double strand support and a running hook 42 threaded onto the tape for lifting purposes.

In FIGS. 5 and 6, there is shown another driving unit 44 that can be used, in place of the driving unit 14.

As shown, driving unit 44 includes a ring 45, which serves as a driven gear, fixed to the tape reel 46. Ring 45 has a pair of flanges 45*a* and 45*b* separated by a spacer 45*c*. Equally spaced notches 47 are formed in each flange and the notches 47 in flange 45a are offset from the notches 47 in flange 45*b*.

A cylindrical crank shaft 50 serves as a driving gear and extends through housing members 51 and 52, corresponding to the housing members 11 and 12 previously disclosed to be journaled therein, and a handle 53 is connected by a crank arm 54 to one end of the shaft, exteriorly of the housing 12. The crank shaft has a pair of diametrically opposed, circular crank pins 55 and 56 formed thereon and spaced apart by a portion 50*a* of the crank shaft such that the pins will be arranged to fit within the notches 47 and the portion 50*a* will be between the flanges 45*a* and 45*b*.

Turning of the handle 53 will rotate the crank shaft 50 to sequentially move the crank pins 55 and 56 into the notches 47, which are curved at their lower ends to match the curvature of the pins.

As the turning continues one pin, i.e. pin 55 moves into a notch 47 and then pushes the ring 45. As the pin 55 is turned with the crank shaft it moves the notch 47 and rolls out of the notch while at the same time pin 56 moves into a notch. Continued turning will then cause pin 56 to push the ring until it rolls out of its notch, at which time pin 55 is again moving into a notch. The operation is continued as long as it may be desired to turn the tape reel 46 and to take up or pay out the tape 57 connected thereto.

As with the previously described driving unit, unless the crank arm 54 and handle 53 are arranged to swing as a pendulum, to thereby provide momentum to the turning of the crank shaft 50, tape 57 cannot be pulled from the tape reel 46 and the drive unit is locked. When the unit is locked the pins 55 and 56 act as solid rods preventing movement of the ring 45.

Regardless of the drive unit used, it is generally preferred, for a small hoist, to use a flat tape that can be wound on the reel and that will lay flat and take up little space. A tape made of reinforced nylon or other suitably strong material is satisfactory. The tape 20 may be secured to the reel, as best shown in FIG. 3, by inserting it into the irregularly shaped open center 60 of the reel through a slot 61 and then inserting a mating irregular member 62 into the opening to frictionally clamp the tape between the mating irregularities of the opening.

A somewhat similar securement is used to connect the hook 41 to the other end of the tape. Thus, as best seen in FIG. 7, the tape 20 is inserted into an opening 63 provided in the hook, through a slot 64. An expansion pin 65 is inserted into the opening to frictionally hold the tape against the wall of the opening. To provide better securement, a groove 66 can be provided, extending off of opening 63 and the eppansion pin can be provided with a corresponding projection 65*a* to fit into the groove. A similar groove, expansion pin and projection can be provided in the reel, if desired, or necessary for adequate holding.

While the drive unit of FIGS. 5 and 6 has been shown and described as including two spaced crank pins cooperating with notches in two spaced flanges, and this has proven satisfactory in that it imparts a substantially continuous rotation to the reel and gives a very advantageous gear ratio, more crank pins and cooperating notched flanges can be used, if desired. Also, the angular relationship of the side walls of the notches can be changed to provide more or less continuity to the operation of the unit.

In both embodiments of the invention, the reinforced tape is used because it will lie flat, thereby reducing bulk when it is taken up and because of the strength that can be obtained. It has been noticed that after considerable use the edges of the tape may tend to curl and may get caught in the reel mechanism. To prevent such undesired curling, the tape is preferably treated with a flexible plastic .coating 67 of a material such as urethane. The tape will then retain its flat characteristics and will have an increased useful life. The flexible plastic can be brushed or sprayed on, but preferably is applied by dipping the tape therein.

Also, while the drive units herein disclosed have been illustrated in compact, small-type hoists, it should be apparent that they can be used with hoists of any desired size.

Although preferred embodiments of my invention have been herein described, it is to be understood that the present disclosure is by way of example and that variations are possible, without departing from the scope of the hereinafter claimed subject matter, which subject matter I regard as my invention.

I claim:

1. A hoist comprising

a housing;

a cable reel journaled for rotation in said housing;

a flat tape of reinforced fabric having one end fixed to said reel and extending through said housing to serve as a hoist cable;

means for rotating said reel, said means including a driven gear fixed to the reel, said driven gear comprising a ring fixed to the reel and having a plurality of spaced apart flanges at the periphery thereof and spaced notches around said flanges, the notches of each said flange being offset with respect to the notches of each other flange and a drive gear comprising a cylindrical crank shaft having a plurality of eccentric crank pins formed axially thereof, each of said crank pins being adapted to mesh with the notches of one of said flanges.

2. A hoist as in claim **1,** further including

a rotating weight affixed to the drive gear whereby continuous rotation of the driven gear will rotate the drive gear as a result of pendulum action of the weight.

3. A hoist as in claim **2,** wherein the rotating weight includes

a handle mounted on one end of a crank arm, the other end of which is connected to the drive gear.

4. A hoist as in claim **1,** wherein the flat tape has a flexible plastic coating on the surfaces thereof.

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