Sept. 7, 1948. F. P. LAWLER 2,448,674

HOIST

Filed April 23, 1945 4 Sheets-Sheet 1

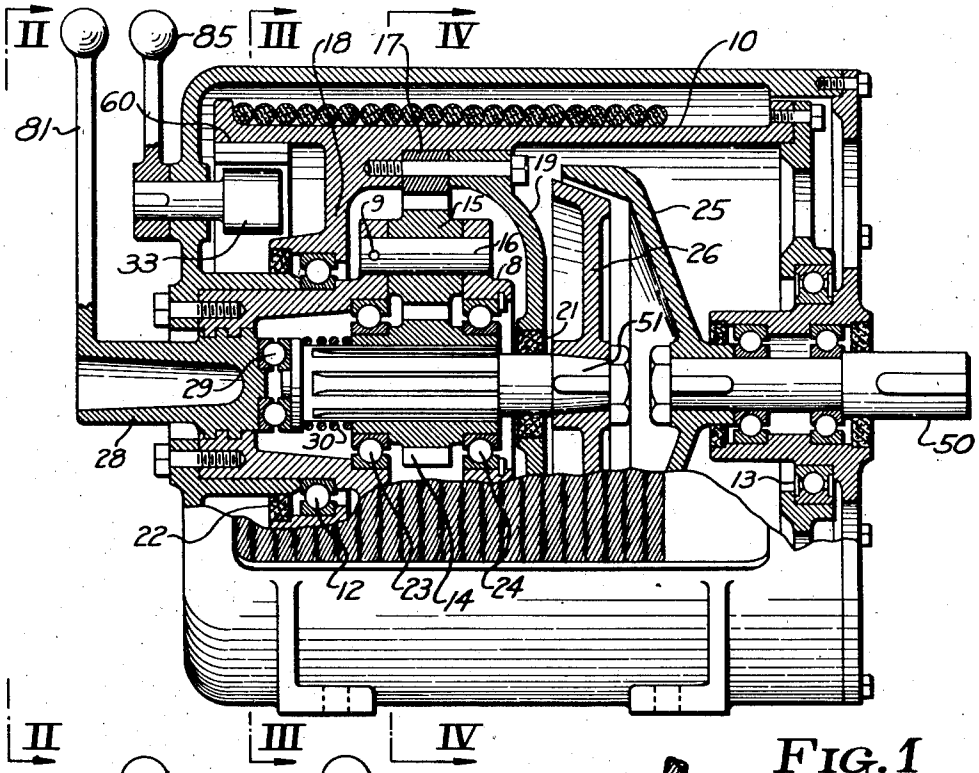


FIG. 1

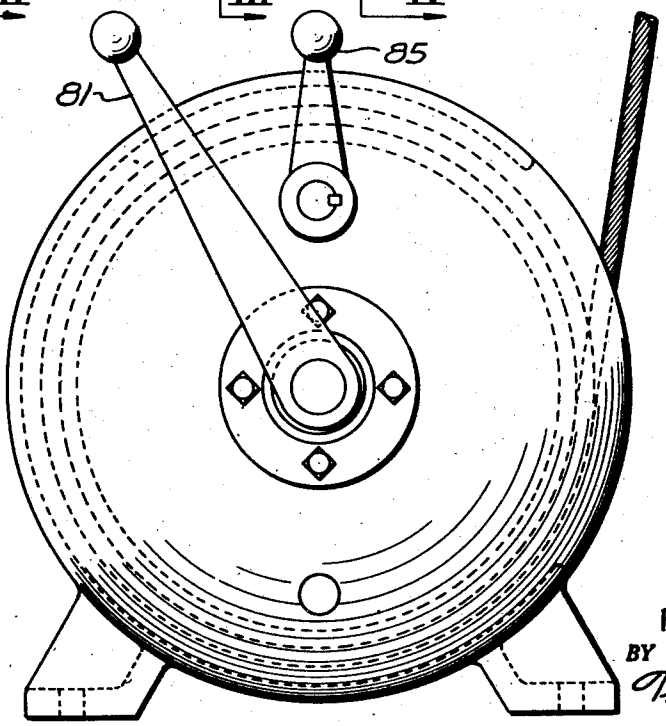


FIG. 2

INVENTOR.
FRANK P. LAWLER
BY
Thomas Castberg
ATTORNEY

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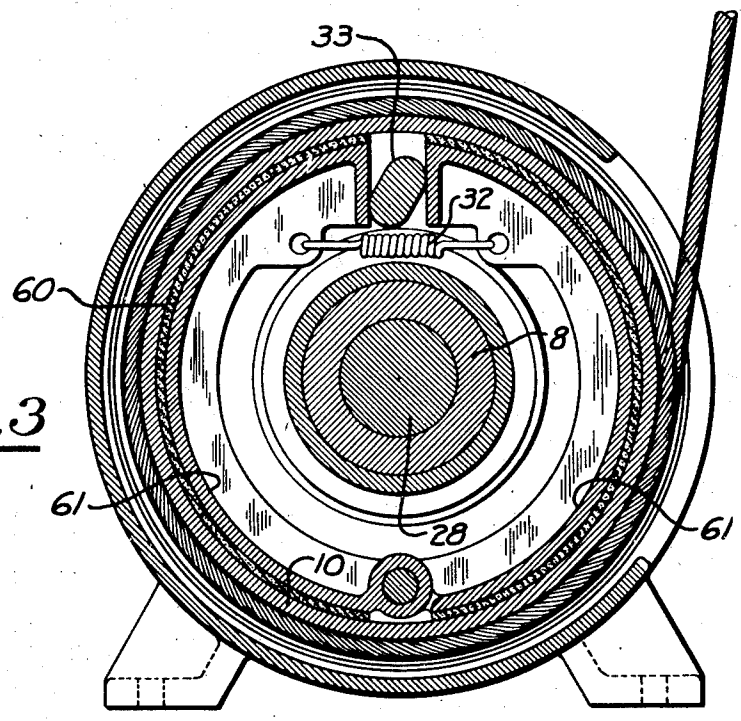


FIG. 3

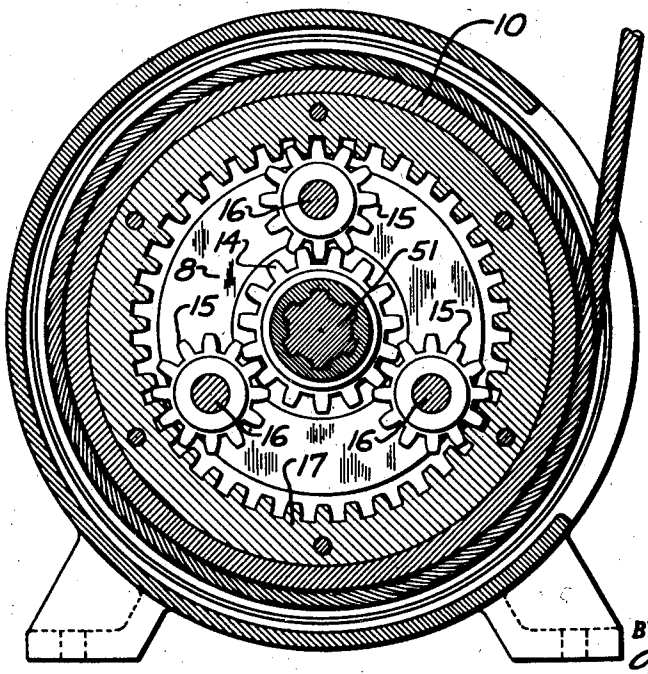


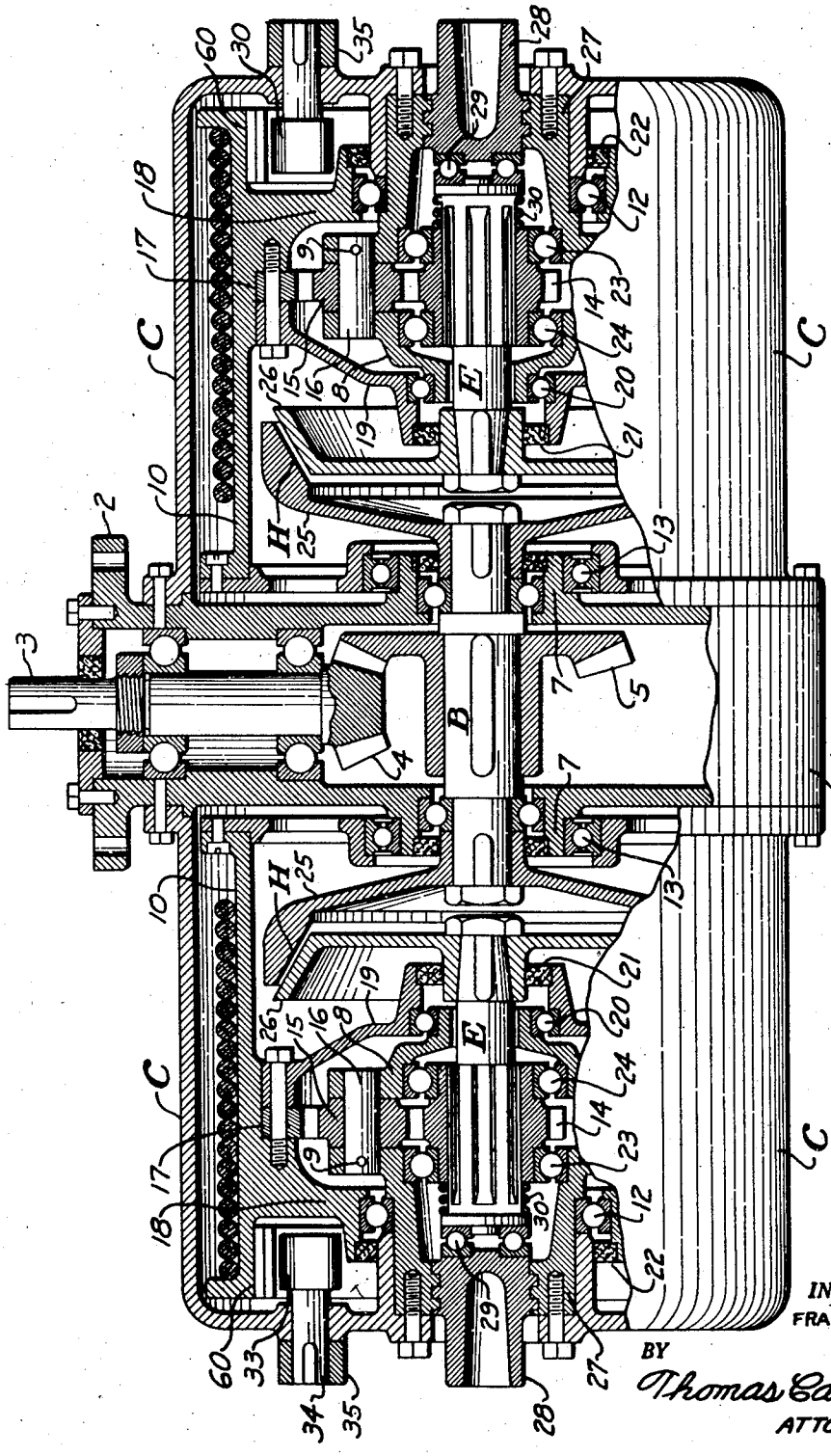
FIG. 4

INVENTOR.
FRANK P. LAWLER
BY
Thomas Castberg
ATTORNEY

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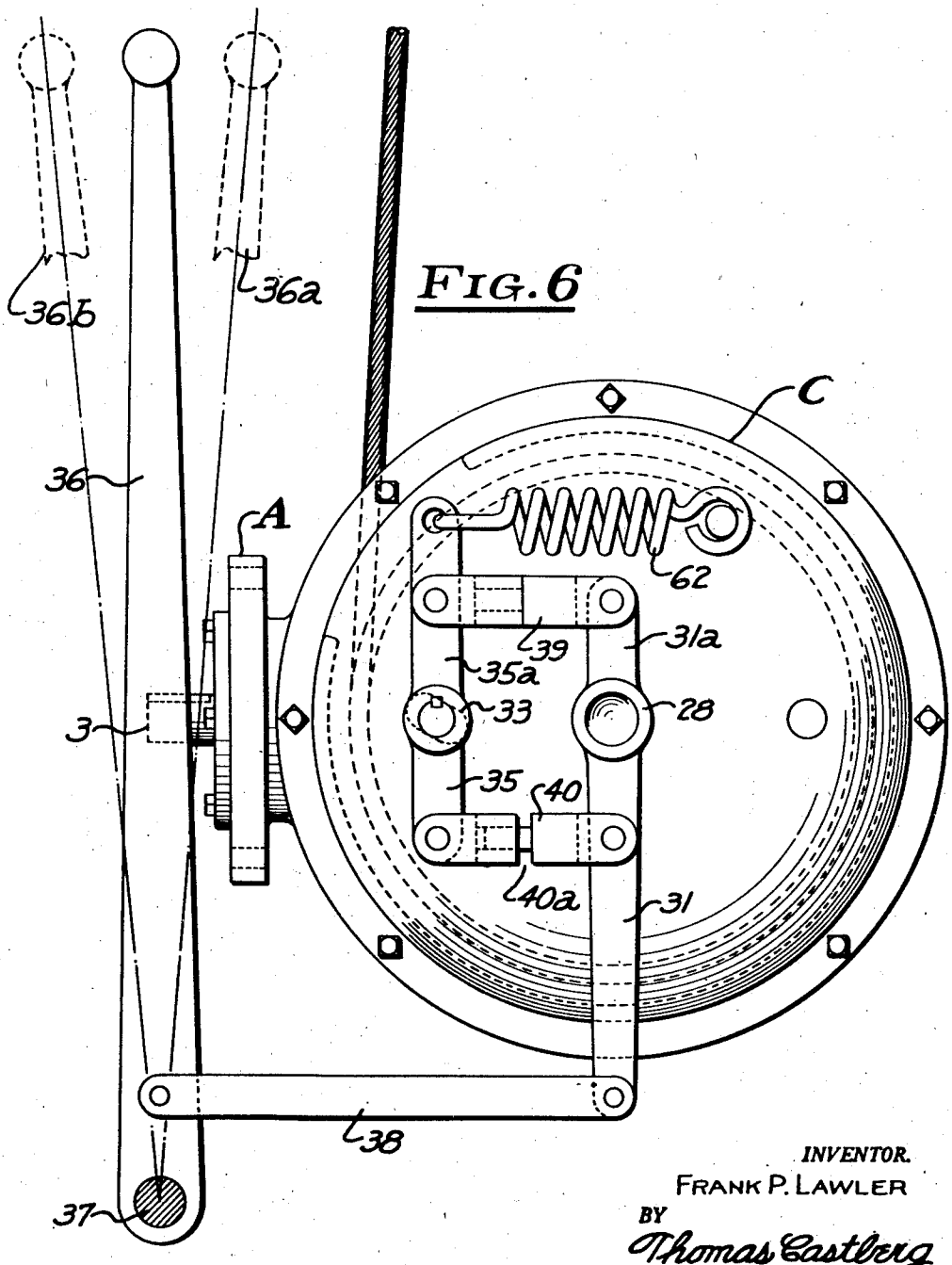


FIG. 6

INVENTOR.
FRANK P. LAWLER
BY
Thomas Eastberg
ATTORNEY

Patented Sept. 7, 1948

2,448,674

UNITED STATES PATENT OFFICE

2,448,674

HOIST

Frank P. Lawler, Chicago, Ill., assignor of one-third to Charles H. Grant, San Francisco, Calif., one-third to Frank P. Lawler, Chicago, Ill., and one-third to Paul J. Tyler, Oroville, Calif.

Application April 23, 1945, Serial No. 589,921

4 Claims. (Cl. 254—185)

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This invention relates to a hoist which is particularly designed for application to tractors and like power-operated machines, and especially to improvements in the operation and positioning of the clutches whereby power transmission to the hoist is controlled.

In my prior patents, No. 2,199,668, No. 2,354,386, No. 2,242,193, No. 2,350,120, and No. 2,354,387, and in fact in all commercially manufactured hoists of this character now in use, power is transmitted from a power takeoff shaft on the tractor through a series of reduction gears and then through a clutch to a cable drum of the hoist.

In a hoist of this character, it is obvious that the power takeoff shaft and all of the reduction gears are running or in operation at all times and the cable drum only when the clutch is engaged. This results in unnecessary wear and tear to the constantly moving parts and it also increases power consumption particularly when the tractor is doing other work and the hoist drum is inoperative over long periods. In addition it also increases the difficulty of shifting gears in the main transmission of the tractor due to parasitic drag or, in other words, the inertia resulting from the revolving mass of all the parts in motion.

The object of the present invention is to generally improve and simplify construction and operation of hoists of the character described; to provide a hoist in which substantially all of the reduction gear train remains idle or stationary at all times, except when the hoist drum is in actual operation, so as to eliminate parasitic drag, reduce power consumption and minimize unnecessary wear and tear. A further object is to position the clutch whereby the cable drum is controlled at the point of power input rather than at the end of the reduction gear train as has heretofore been practiced; and further, to provide a structure which permits the use of a drum having a large barrel diameter to reduce bending stresses in the cable and abrasion resulting from piling of the cable, thereby minimizing cable wear, said drum also functioning as a housing for the reduction gear train, the clutch mechanism and the brake.

The hoist is shown in the accompanying drawings, in which:

Fig. 1 is a side elevation partially in section showing a single drum hoist;

Fig. 2 is an end elevation taken on line II—II of Fig. 1;

Fig. 3 is a cross section taken on line III—III of Fig. 1 showing the brake arrangement;

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Fig. 4 is a cross section taken on line IV—IV of Fig. 1;

Fig. 5 is a plan view of a double drum hoist, said view being partially in section; and

Fig. 6 is a diagrammatic end elevation showing a combined brake and clutch control mechanism.

Referring to the drawings in detail, and particularly Fig. 5, A indicates in general a drive gear housing, the inner end of which is provided with a flange 2 whereby it may be bolted or otherwise secured to a suitable support, for instance the transmission gear housing of a tractor or the like.

Extending into the housing A and journaled in bearings mounted therein is a power takeoff shaft 3 on which is secured a bevel gear 4. Extending through the housing in a direction transverse to the power takeoff shaft is an intermediate shaft B and secured thereto is a bevel gear 5 which is in constant mesh with the gear 4.

Secured on opposite sides of the housing A are a pair of cable drum housings C—C and disposed in each of said housings and in alignment with the intermediate shaft B are a pair of driven shafts E—E. Formed on opposite sides of the housing A are hub-like extensions 7—7 and secured to the outer end of each of the housings C—C are planet gear carrier housings 8—8. Inasmuch as the cable drums are driven in an identical manner, and the same mechanism is employed, the description of one will suffice, and similar numerals have also been applied to the corresponding parts of Fig. 1.

Disposed within the housing C is a cable drum 10 which is journaled at the outer end on the planet gear carrier 8 by means of bearing 12 and at the inner end on the hub-like extension 7 by bearing 13 and as such the drum is free to rotate within its housing C. A reduction gear train connects the cable drum with its adjacent driven shaft. Any suitable type of reduction gear drive may be employed. In this instance a sun pinion 14 is splined or otherwise mounted to be driven by the driven shaft E. This sun gear meshes with a plurality of planetary gears 15 which are journaled on pins 16 secured in the planet gear carrier 8 as by bolts 9. The planetary gears in turn mesh with an internal gear 17 which is secured to the cable drum. One annular flange such as shown at 18 is formed at the outer end of the cable drum and this flange is supported by and rotates about the bearing 12. An annular cover flange 19 is secured on the other side of the ring gear and rotates about a steady bearing 20. Oil seals are placed at the points indicated at 21 and

22, thus permitting lubricant to be retained for the purpose of lubricating the reduction gear train and also to exclude dust, dirt and moisture. Bearings such as shown at 23 and 24 are disposed within the planet gear carrier 8 and these support the sun pinion 14 and the driven shaft E extending therethrough.

A cone clutch H is provided for the cable drum. Cone clutches are here illustrated, but obviously any suitable type of clutch may be employed. One member 25 of the clutch is secured to the intermediate shaft B while the cone or cooperating member shown at 26 is secured to the driven shaft E and as the driven shaft is splined and slidably mounted within the sun gear 14, the clutch member 26 may be moved into and out of engagement with the cooperating member 25.

Any suitable means may be employed for actuating the clutch. In this instance the outer hub end 27 of the planet gear carrier 8 is internally threaded. An exteriorly threaded plug 28 extends through and engages the threads. A thrust bearing 29 is disposed between the inner end of the plug and the driven shaft E. A compression spring 30 is disposed between the sun gear 14 and a shoulder provided on the driven shaft E for disengaging the clutch members 25 and 26. A lever 31 may be applied to the plug member 28 and by swinging the lever in one direction, the plug moves inwardly causing the thrust bearing 29 to engage the outer end of the driven shaft E and thereby move it longitudinally through the sun gear 14 so as to force the clutch member 26 into engagement with its cooperating member 25. In this manner the clutch is engaged and power is transmitted from the drive shaft 3 through the gears 4 and 5 to the intermediate shaft B, then through the clutch H to the driven shaft E and then through the planetary gears to the cable drum 10. By swinging the lever in the opposite direction, the clutch is released due to the action of spring 30 and the cable drum is disconnected from the drive.

A cable drum of this character also requires a brake. A braking surface or drum is accordingly formed at the outer end of the cable drum 10 and interior thereof as indicated at 60. A brake band or shoes 61 engage this surface and they are normally held in contracted position by a spring 32 (see Fig. 3). The shoes are expanded in the usual manner by a cam 33 secured on a shaft 34 and this is in turn provided with a lever 35. By actuation of this lever the drum may be locked against rotation or it may be released for free reeling or controlled reeling as, for instance, when lowering a load, and it should also be released when the clutch H is engaged. Individual levers may be employed one for the plug 28 for control of the clutch and one for the cam 33 whereby the brake shoes 61 are actuated. They may be independently operated or they may be controlled from a common lever. For instance in Fig. 6 a common lever is employed. In this instance 36 indicates the main operating lever and this is pivoted as at 37. A link 38 connects this lever with the lever 31 which is secured to the plug 28. This lever has another extension as indicated at 31*a*. The levers 31 and 31*a* are connected with the levers 35 and 35*a* through means of extensible telescopic links 39 and 40.

When the lever 36 (Fig. 6) assumes the full line or central position shown, the cooperating clutch will be released and the cable drum will be held stationary by the action of spring 62, the tension of which applies the brake shoes 61 by means of the cam 33. If the lever 36 is moved towards the dotted line position as indicated at 36*a*, the brake only will be released due to link 39 pushing lever 35*a* in a direction to neutralize the tension of spring 62 and the drum 10 will become free reeling to lower a load. As the lever 36 is moved towards the left or to the position indicated at 36*b*, the clutch will first be engaged due to lever 31 turning the plug 28, and then the brake will be released due to link 40 actuating levers 35 and 35*a* in the direction necessary to neutralize the tension of spring 62. There is a slight overlap between clutch engagement and brake release when the operating lever 36 is moved to position 36*b* and this is due to the brake release action being delayed as a result of the telescopic gap 40*a* provided in link 40 for this purpose. No particular claim is made to this control as it is already fully disclosed in my copending application entitled "Hoist," filed April 5, 1944, Serial No. 529,883, now Patent No. 2,418,267, dated April 1, 1947, but it is illustrated, nevertheless, to show that the brake and clutch mechanism may be actuated in this manner.

It was previously stated that in my patents, No. 2,354,386, etc., and in fact in all commercial manufactured hoists of this character now in general use, that power is transmitted from the power take-off shaft through a series of reduction gears and then through a clutch to the cable drum. In hoists of this character it is obvious that the power takeoff shaft, and all of the reduction gears are running or in operation at all times while the cable drum is in operation only when the clutch is engaged. This results in unnecessary wear and tear; it increases power consumption particularly when the tractor is doing other work, and the hoist drum is inoperative, and it increases the difficulty of shifting gears in the main transmission of the tractor due to parasitic drag, or in other words the inertia of the rotating reduction gears. All these objections are overcome in the present structure. For instance, if the tractor is in operation, the only part of the hoist that is being driven is the power takeoff shaft 3, the gears 4 and 5 and the intermediate shaft B. If clutches H—H are disengaged, the driven shafts, the reduction gear trains, the cable drums, etc., will all remain stationary. However, the moment either clutch is engaged, power will be transmitted to one or both cable drums and it is then and then only that they and their driving parts are subjected to load and wear. The moment the clutches are disengaged, these parts come to rest and the power unit or engine on the tractor is accordingly relieved of this load, and all parts come to rest except the power takeoff and the intermediate shaft. Power consumption is thus reduced, parasitic load which interferes with gear shifting is substantially eliminated, and so are other objectionable features.

In Fig. 1 a slightly modified form of the hoist is shown; this hoist is known as a single drum hoist and is particularly designed for industrial hoisting applications. Only two shafts are required in this single drum unit, to wit, the drive shaft 50 which may be connected in any suitable manner to any kind of a prime mover and a driven shaft 51 which is connected with the drive shaft through the same type of clutch as previously described. The rest of the mechanism is identical and should require no further explanation. Individual lever control may be employed as indicated by the levers 31 and 35 as

shown in Figs. 1 and 2, or the common control may be employed as shown in Fig. 6.

While the dual drum structure has been described as especially designed for use on tractors and like machinery, it is obvious that this structure is adapted for other applications and uses, and while this and other features of the invention have been more or less specifically described and illustrated, it should be understood that changes may be resorted to within the scope of the appended claims and that the materials and finish of the several parts employed may be such as the experience or judgment of the manufacturer may dictate or varying conditions or uses may demand.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a double drum hoist, a central housing, a pair of cable drum housings disposed one on each side of the central housing and secured thereto, a drive shaft journaled in the central housing, an intermediate shaft also journaled in said housing but at right angles to the drive shaft, a driven shaft mounted in each cable drum housing, a cable drum disposed within each cable drum housing, said intermediate and driven shaft being concentric to the cable drums, a reduction gear train mounted within each cable drum and completely enclosed thereby, said reduction gear train connecting the driven shafts with the respective cable drums, a clutch interposed between each driven shaft and the intermediate shaft, and means for selectively engaging or disengaging the respective clutches to drive both or either cable drum.

2. In a double drum hoist, a central housing, a pair of cable drum housings disposed one on each side of the central housing and secured thereto, a drive shaft journaled in the central housing, an intermediate shaft also journaled in said housing but at right angles to the drive shaft, a driven shaft mounted in each cable drum housing, a cable drum disposed within each cable drum housing, said intermediate and driven shafts being concentric to the cable drums, a reduction gear train mounted within each cable drum and completely enclosed thereby, said reduction gear train connecting the driven shafts with the respective cable drums, a clutch interposed between each driven shaft and the intermediate shaft, brakes to arrest motion of the cable drums when the clutches are disengaged, a pair of control levers one for each cable drum, and means actuated by each lever for selectively engaging or disengaging either the clutch or the brake on an adjacent cable drum.

3. In a hoist of the character described, an elongated housing, a reduction gear carrier secured to one end of the housing and extending into the housing, a hub-like member formed in the opposite end of the housing, a cable drum journaled at one end on the hub-like member and at the other end on the reduction gear carrier and concentric to the housing, a driven shaft and a reduction gear train journaled in the gear carrier to drive the cable drum, a hub formed on the inner end of the reduction gear carrier, a cover plate secured at its outer periphery to the cable drum and rotatable about said last-named hub, packing means preventing leakage of lubricant between the plate and the driven shaft, packing means preventing leakage of lubricant between the reduction gear carrier and the end of the cable drum journaled thereon, and means for transmitting power to the driven shaft.

4. In a hoist of the character described, an elongated housing, a reduction gear carrier secured to one end of the housing and extending into the housing, a hub-like member formed in the opposite end of the housing, a cable drum journaled at one end on the hub-like member and at the other end on the reduction gear carrier and concentric to the housing, a driven shaft and a reduction gear train journaled in the gear carrier to drive the cable drum, a hub formed on the inner end of the reduction gear carrier, a cover plate secured at its outer periphery to the cable drum and rotatable about said last-named hub, packing means preventing leakage of lubricant between the plate and the driven shaft, packing means preventing leakage of lubricant between the reduction gear carrier and the end of the cable drum journaled thereon, a clutch through which power is transmitted to drive the driven shaft, a brake to arrest motion of the cable drum when said clutch is disengaged, and means for selectively engaging the clutch or the brake.

FRANK P. LAWLER.

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