March 22, 1932. K. BERGER 1,850,440

HOISTING AND CONVEYING APPARATUS

Filed July 23, 1929 2 Sheets-Sheet 1

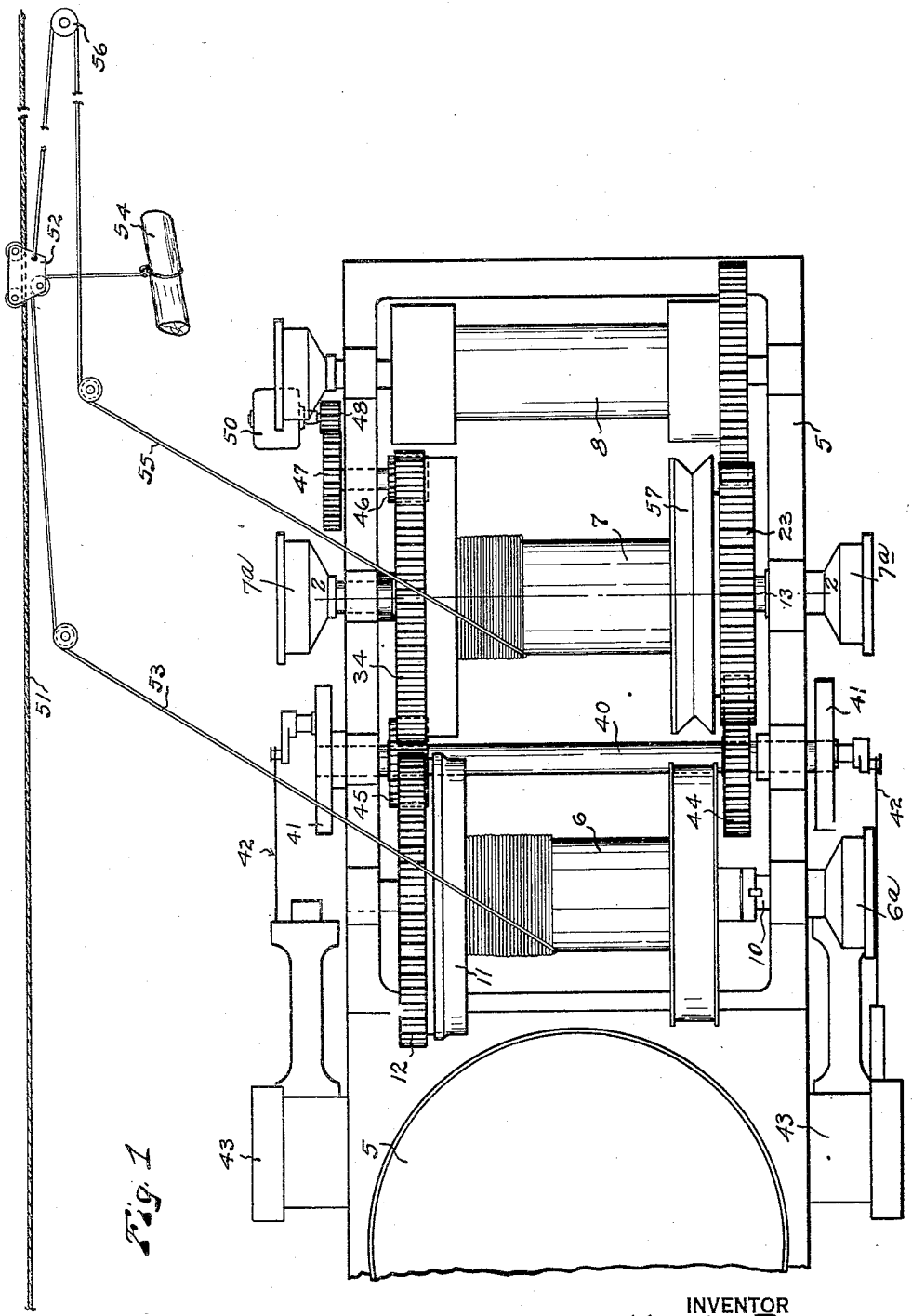


Fig. 1

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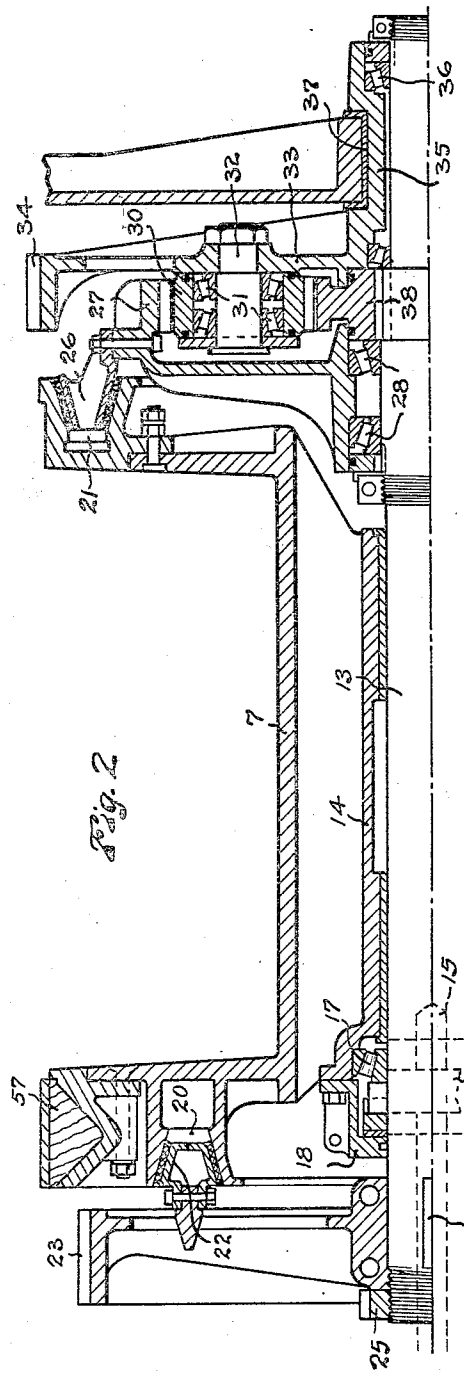


Fig. 2

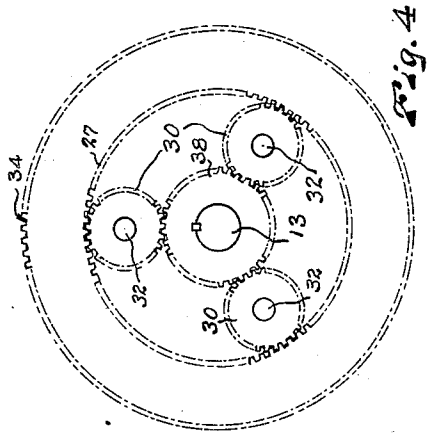


Fig. 4

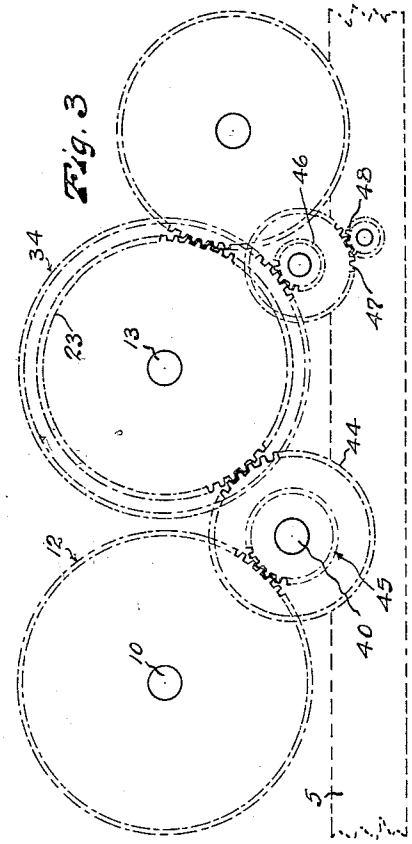


Fig. 3

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UNITED STATES PATENT OFFICE

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HOISTING AND CONVEYING APPARATUS

Application filed July 23, 1929. Serial No. 380,333.

My invention relates to improvements in hoisting and conveying apparatus in which cables and drums are used, and the object of my invention is to provide means for varying the relative speed of two interlocked drums to compensate for changes in their effective diameter due to the winding and unwinding of cables on said drums.

In logging operations employing what is known as the "sky line system", it is common practice to provide an overhead supporting cable, known as a sky line, having a carriage mounted thereon and arranged to be moved by a hauling or inhaul cable and an outhaul cable. These two cables are ordinarily wound on separate drums which are capable of being interlocked for rotation in such a manner as to simultaneously wind in one cable and pay out the other cable. This method of operation is objectionable where the relative speed of rotation of the two drums can not be varied because the effective diameters of the two drums are changed by the winding and unwinding of the respective cables thereon, the result being that the relative speed of winding and unwinding of the two cables varies and the load on the inhaul cable may rise and fall during the process of bringing it in, making it possible for this load to be lowered onto the ground or to be drawn up against the carriage with damaging results. To compensate for this difference in the speed of inhaul and outhaul cables on interlocked drums, it has heretofore been common practice to slip the clutch on one of the drums during the inhaul operation or to stop the carriage and raise or lower the load vertically during the inhaul operation. The slipping of the clutch is productive of excessive wear, and stopping to raise or lower the load once or more during the inhaul operation consumes time and slows up the operation of hauling in the load.

My present invention overcomes both of these objections by providing drum interlocking means by which the relative speeds of two interlocked drums may be varied during the inhaul operation without loss of time or slippage or releasing of any of the clutches, the variable speed means being flexible and fully under control of the operator and capable of any amount of variation which may be required.

A more specific object is to provide a separately and independently controlled planetary gear transmission for controlling the relative speeds of two interlocked winding drums, said planetary gear constituting part of the means for interlocking the two drums.

Other and more specific objects of the invention will be apparent from the following description taken in connection with the accompanying drawings.

In the drawings Figure 1 is a plan view of a hoisting and conveying apparatus constructed in accordance with my invention showing, somewhat diagrammatically, the arrangement of a sky line, a carriage, and inhaul and outhaul cables.

Fig. 2 is a longitudinal section taken substantially on the line 2—2 of Fig. 1, showing half of the driving mechanism for the outhaul drums, the other half which is of duplicate construction being omitted.

Fig. 3 is a somewhat diagrammatic side elevation showing the arrangement of the driving mechanism.

Fig. 4 is a somewhat diagrammatic view in end elevation of planetary driving gear mechanism embodied in the invention.

Referring to the drawings, throughout which like reference numerals designate like parts, 5 is a logging engine of the form commonly used for hoisting and hauling logs and 6, 7 and 8 are winding drums mounted on the frame 9 which supports said engine. The drum 6, hereinafter termed the hauling drum, is mounted on a shaft 10 and is movable longitudinally on said shaft to engage with, or to release, clutch mechanism 11 by which said drum may be rotatably connected with, or disconnected from, a relatively large gearwheel 12. The drum 7, hereinafter termed the outhaul drum, is rotatably mounted on a shaft 13 in a manner more clearly shown in Fig. 2, and more fully hereinafter described. The drum 8 is a slack pulling line drum of well known form and does not concern this invention.

The drum 7 has a hub 14 which is movable

endwise on the shaft 13 by means of plunger 15 and cross key 16. The longitudinal movement of both the drums 6 and 7 is preferably accomplished by air or steam pressure as is usual in this class of devices, but inasmuch as the means for applying such power is well understood, I have not deemed it necessary to show the full equipment for supplying such power, but call attention to the part 6^a, and the two members 7^a, 7^a, in connection with the drums 6 and 7, respectively, said parts indicating ordinary chests for steam or compressed air. The key 16 engages with a roller bearing 17 to move the drum in one direction and with a bracket bearing member 18 to move the drum in the opposite direction. The drum 7 has annular conical clutch recesses 20 and 21 respectively in its opposite ends. The clutch recess 20 is adapted to engage with a male clutch member 22 on a gearwheel 23 which is secured as by a key 24 and nut 25 to the shaft 13. When the drum 7 is moved to the left (as viewed in Fig. 2) to engage the clutch elements 20 and 22 said drum will rotate with the gearwheel 23 and shaft 13. When operating in this manner there will be no friction between the key 16 and bearing bracket 18 and for this reason no roller bearing is needed.

The clutch recess 21 at the other end of the drum is adapted to engage with a male clutch member 26 which is secured to the circumferential portion of an internal gear 27. The internal gear 27 is rotatably mounted on the shaft 13 by means of a roller bearing 28. The internal gear 27 meshes with a plurality of planetary pinions 30 which are mounted by roller bearings 31 on bearing pins 32 which are rigidly secured to the web 33 of a gearwheel 34. The gearwheel 34 has a relatively long hub 35 within which the shaft 13 is journaled as by roller bearings 36 and said hub 34 is rotatably supported within a frame bearing 37. The pinions 30 mesh with a gearwheel 38 which is keyed onto the shaft 13, thus completing a planetary transmission, the operation of which is hereinafter described.

The driving mechanism embodies a shaft 40 connected by crank discs 41 and connecting rods 42, as indicated in Fig. 1, with suitable engines 43. A larger, high speed pinion 44 on the shaft 40 meshes with the gearwheel 23 on the outhaul drum shaft 13 and a smaller low speed pinion 45 on said shaft 40 meshes with the gearwheel 12 on the hauling drum shaft 10. The gearwheel 34 is connected by speed reduction gears 46, 47 and 48 with separate and independently controlled driving means as a motor 50.

The hoisting drums and driving mechanism hereinbefore described may be used in connection with an overhead supporting cable or sky line 51 upon which is a carriage 52. A hauling cable 53 is wound on the hauling drum 6 and passes outwardly over suitable sheaves in the carriage and drops down so that a load, as a log 54, may be attached thereto. An outhaul cable 55 is wound on the outhaul drum 7 and extends away from the carriage approximately to the farthest point where loads are to be picked up where it passes around a sheave 56 and thence back to the carriage.

In the operation of this apparatus the shaft 40 is driven thereby rotating the gearwheel 12 in one direction and the gearwheel 23 in the same direction and gearwheel 27 in the opposite direction. When the clutches 11 and 20—21 are both disengaged these gearwheels may turn freely, the shaft 13 turning with the gearwheel 23, and causing the internal gear 27 to rotate idly, it being assumed that the clutch 21—26 is also disconnected. To move the carriage 52 outwardly on the sky line 51, the clutch 11 is released and the clutch 20—22 is engaged allowing the outhaul drum to be driven by the high speed driving pinion 44; the outhaul line 55 being wound onto the drum 7 pulls the carriage outwardly, and, at the same time, unwinds the hauling cable 53 from the drum 6, which is released so as to run freely. When the carriage has been drawn well outwardly toward the end of the sky line it is apparent that the hauling line may be substantially unwound from the drum 6 while the outhaul line will be wound on the drum 7 enough to substantially increase the effective diameter of said drum 7. After the carriage has been drawn out the desired distance the outhaul drum 7 may be disconnected from its clutches and held immovable as by a brake 57 while a load 54 is picked up off of the ground preparatory to hauling it in. To haul the load in the clutches 11 and 21—26 are engaged to rotate the hauling and outhaul drums oppositely, the hauling drum 6 winding in the hauling cable 53 and the outhaul drum 7 paying out the outhaul cable 55 at the same time, the outhaul drum being driven at substantially the same speed as the hauling drum through gearwheels 44 and 23, shaft 13, gearwheel 38, planetary pinions 30 and internal gear 27. The gear ratios are preferably such as to cause the two drums 6 and 7 to rotate at substantially the same speed when the gearwheel 34 from which the planetary pinions 30 are supported is held stationary.

By rotating said gearwheel 34 in either direction, through the agency of the motor 50 and gears 46, 47 and 48, it is possible to increase or decrease the speed of the outhaul drum sufficiently to compensate for the change in size of the drums due to the winding and unwinding of the cables. This control provides for varying the speed any amount which may be desired and does not require slowing up nor stopping of the hauling drum, nor slippage of any clutches.

The foregoing description and accompanying drawings clearly disclose a preferred embodiment of my invention but it will be understood that this disclosure is merely illustrative and that such changes in the device may be made as are fairly within the scope and spirit of the following claims.

What I claim is:—

1. Winding apparatus for logging cables embodying an inhaul and an outhaul drum, driving means connected with both said drums, a shaft for the outhaul drum arranged to be rotated by the driving means, an internal gear connected by a clutch with the outhaul drum, a smaller gear on said shaft within said internal gear, planetary pinions intermeshing with said smaller gear and said internal gear, a member rotatable on said shaft and carrying the axles of said pinions and means for rotating said member in either direction to vary the speed of the outhaul drum.

2. Winding apparatus of the class described embodying an inhaul drum, a driving member therefor, a clutch interposed between the driving member and the inhaul drum, an outhaul drum, means at one end of said outhaul drum for driving the same in the outhaul direction, a clutch between said outhaul drum and said driving means, a shaft in the outhaul drum rotatable with the outhaul driving means, an internal gear at the other end of said outhaul drum, a clutch for connecting said internal gear and said outhaul drum, a smaller gear secured to said shaft inside of said internal gear, planetary pinions intermeshing with said smaller gear and said internal gear, a larger gear rotatable on the shaft and carrying the bearings for said planetary pinions, and independent means for rotating said larger gear in either direction.

3. Winding means of the class described comprising in combination a drive shaft, two drums, one at each side of and parallel with said shaft, means for connecting said drums with the shaft for rotating the drums simultaneously in the same direction, other means for connecting one of said drums with said shaft and adapted to rotate such last mentioned drum in the opposite direction, and independently controlled means for varying the speed of rotation of said last mentioned drum.

4. Winding means of the class described comprising in combination a drive shaft, two drums, gear means interposed between said shaft and each of said drums adapted to rotate both drums in the same direction, other gear means also interposed between said shaft and one of said drums and adapted to rotate such drum in the opposite direction from that given it by the other gear means, independent means for varying the speed of rotation of said last-described gear means, and clutch mechanisms for independently connecting the two drums with said shaft.

5. Winding apparatus of the class described comprising in combination an inhaul and an outhaul drum, means for driving said inhaul drum in the inhaul direction, means for driving said outhaul drum in the opposite direction to said inhaul drum, means for driving the outhaul drum in the same direction as the inhaul drum, each of said driving means comprising a shaft outside of either drum and separate gear devices interposed between the shaft and each of the drums, and independently driven mechanism for varying the driving ratio of the outhaul drum relatively to the inhaul drum.

6. Winding apparatus of the class described comprising in combination an inhaul drum, an outhaul drum, means for driving said outhaul drum in the outhaul direction and for driving both of said drums in the inhaul direction, said driving means comprising a shaft outside of either drum and separate gear mechanisms connected with said shaft, the gear mechanism for driving said outhaul drum in the inhaul direction including planetary transmission mechanism, and separately controlled means for driving said planetary transmission to vary the speed of said outhaul drum without varying the speed of said inhaul drum.

In testimony whereof I have hereunto affixed my signature.

KNUTE BERGER.