Aug. 17, 1943. B. S. FERGUSON 2,326,935

CROWD AND RETRACT MECHANISM

Filed Sept. 4, 1941 2 Sheets-Sheet 1

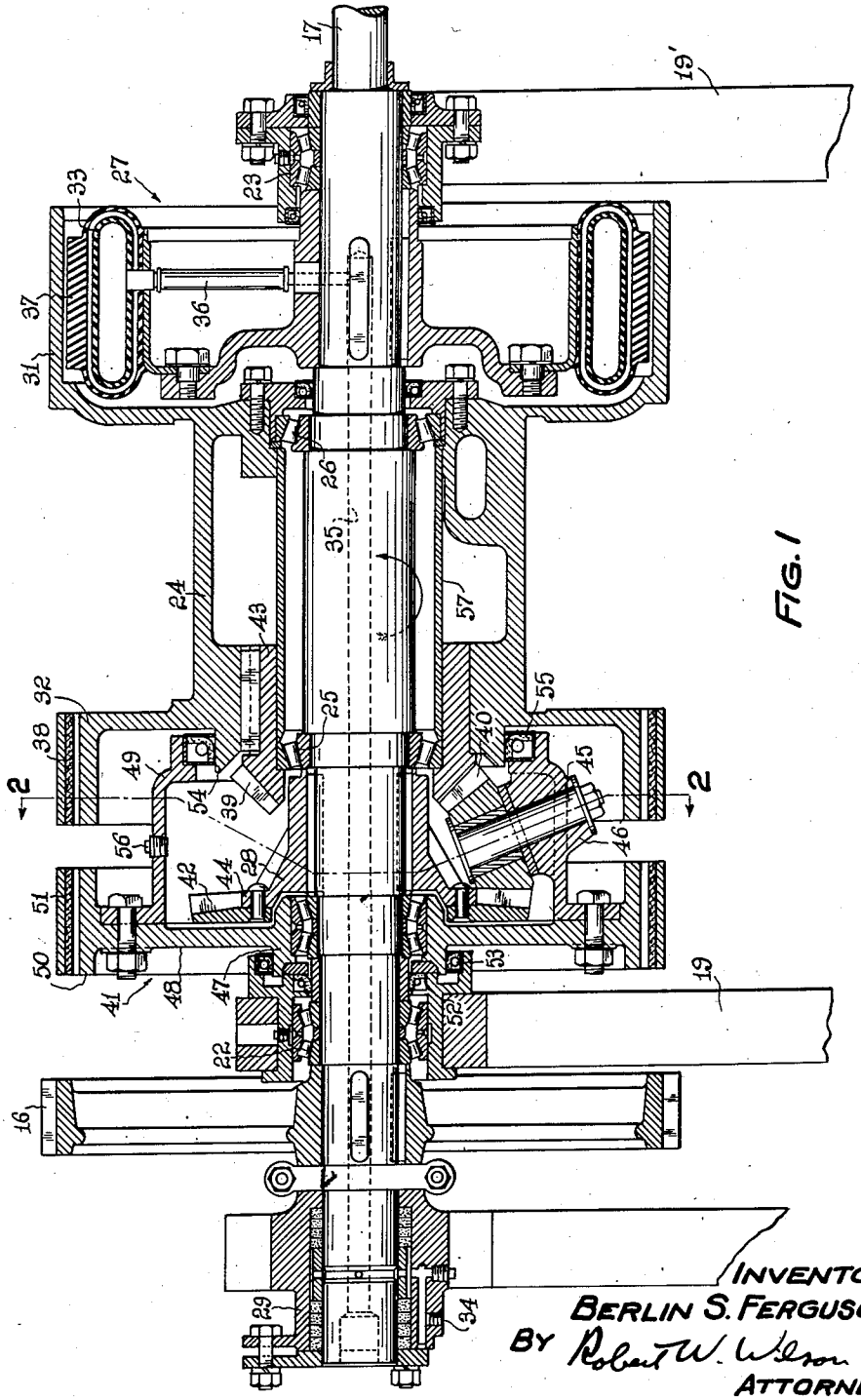


FIG. 1

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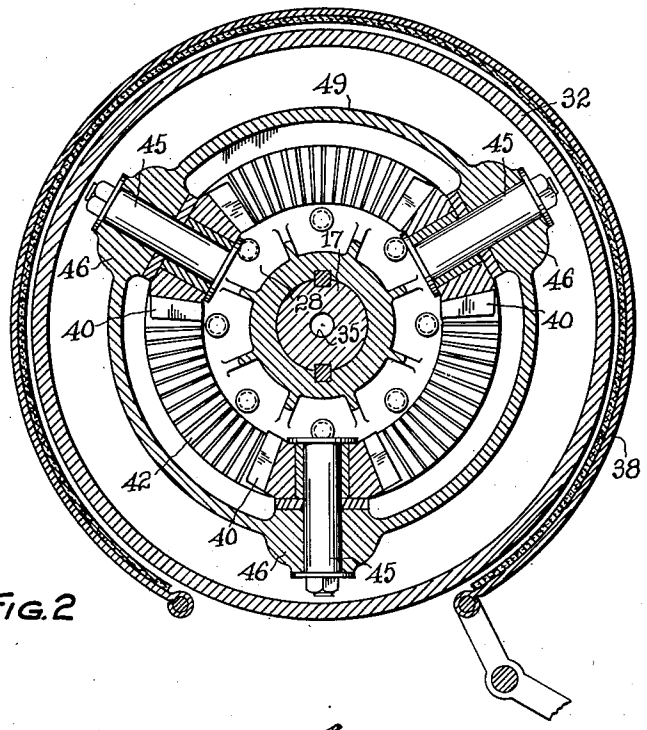


FIG. 2

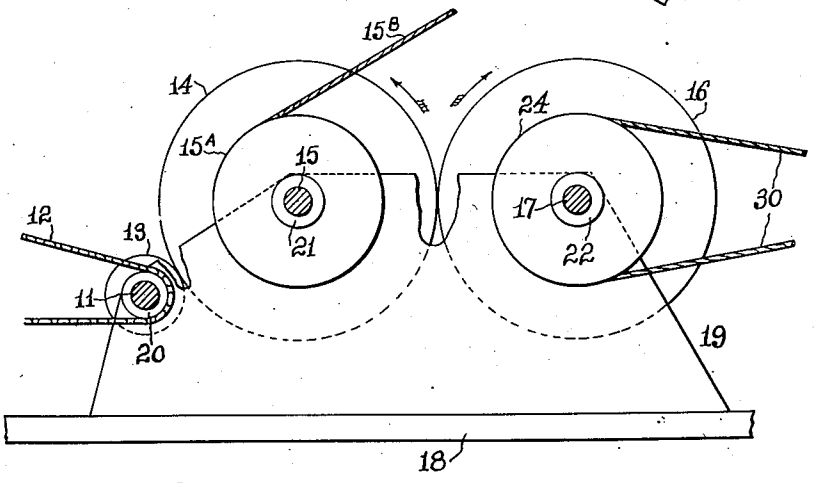


FIG. 3

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CROWD AND RETRACT MECHANISM

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Application September 4, 1941, Serial No. 409,593

1 Claim. (Cl. 254—187)

This invention relates to a crowd and retract mechanism for power shovels. It is the general practice in this art to drive the crowd and retract drum or sprocket in either direction by application of the same amount of power, but at lower speed to give adequate mechanical advantage for the heavy work of crowding, and at higher speed for the retracting motion. Various gear arrangements are known for the purpose. However, in shovel construction space is at a premium, and the machinery must stand up to very rough hard service. The lubrication problem is difficult and important both on account of the heavy duty required and because of the atmosphere of dust and grit which generally characterizes digging operations.

In view of these requirements, the purpose of the present invention is to provide such a mechanism in more compact and sturdy construction, more readily accessible for service and repairs, stronger and more durable, more easily clutched and unclutched for operation, constantly and easily lubricated, protected from dirt, and generally more efficient than previous mechanisms of this character.

In the accompanying drawings which show a preferred embodiment of the principles of my invention,

Fig. 1 is a vertical central section taken longitudinally of the shaft, with certain parts in elevation, looking towards the front of the shovel deck;

Fig. 2 is a transverse view approximately as indicated by line 2—2 of Fig. 1; and

Fig. 3 is a diagrammatic right side elevation showing the relation of the crowd-retract drum to other parts of the shovel mechanism.

Referring to the drawings, it will be understood that in accordance with the usual practice in power shovel construction, the mechanism includes an assembly of drums, clutches, brakes, gears, etc., carried by and connecting a number of shafts transverse to the shovel deck and all taking power from some prime mover, usually an internal combustion engine. Only so much of the complete operating mechanism is shown in the present application as is necessary to illustrate the immediate surroundings of the present invention.

In one practical organization of the mechanical assembly, such as diagrammatically indicated in Fig. 3, an engine not shown drives a jackshaft 11 by a chain 12. A pinion 13 on the jackshaft meshes with a large gear 14 on the hoist shaft 15, which in turn meshes with the large gear 16 (hereafter sometimes referred to as the driving gear) keyed to the crowd-retract shaft 17. A hoist drum such as 15A with hoist line 15B thereon is mounted on and driven from shaft 15. The assembly is supported from the shovel deck 18 by appropriate side frames such as 19, 19' and run in suitable bearings such as 20, 21, 22 and 23.

The crowd-retract drum 24 is rotatably carried, as by bearings 25 and 26, upon the shaft 17. A clutch 27 and collar 28 are fast to the shaft 17 at opposite ends of the drum 24, and a stuffing box 29 surrounds one end of the shaft, all for purposes to be described hereafter. As a matter of convenience for assembly purposes, the shaft 17 is formed to different diameters, largest in the center, successively diminishing outwardly. Since the shaft 17 rotates continuously in the direction indicated by arrows in Figs. 1 and 3 during the operation of the shovel, setting the clutch 27 rotates the drum 24 directly with the shaft to crowd the dipper or other instrumentality by the driving cables 30, whereas release of the clutch and actuation of certain gearings drives the drum 24 oppositely and faster, to retract.

The drum 24 has an extended circumferential flange at each end, 31 at the right, 32 at the left. The flange 31 surrounds the clutch 27, which in the present illustrative embodiment is of the pneumatic type, with inner tube 33 actuated by compressed air admitted at the connection 34 through stuffing box 29, and reaching the clutch through a shaft passage 35 and hose 36. A tread 37 bears against the inner surface of flange 31 when air is admitted at 34, thereby carrying the drum 24 directly with the shaft to crowd the dipper, as previously stated.

The flange 32 is surrounded by a brake band 38 which, when set, holds the drum 24 against movement.

The gearing at the left end of the drum comprises a bevel gear 39 projecting leftward from the drum, a series of pinions 40 carried by a cage 41, and a crown gear 42 fast to the collar 28. As a matter of convenient construction, the gear 39 may be formed on the enlarged end of a sleeve 43 keyed in the structure of the drum 24, the crown gear 42 may be riveted to the enlarged recessed outer end 44 of the collar 28, and the pinions 40 turn on heavy pins 45 in bosses 46 in the cage 41.

The cage 41 is rotatable on the shaft 17 by a suitable bearing, the preferred construction shown comprises a hub 47 partly inside but clear

of the recessed end 44 of collar 28, a solid web 48 to which the housing 49 is bolted, and a circumferential flange 50. A brake, indicated by the band 51 can be set to hold the cage, in which situation the drum 24 is driven backwards and faster through the crown gear 42, pinions 40 and bevel gear 39, thus retracting the dipper by cables 30. It will of course be understood that the clutch 27 and the brake 38 are both released during retraction.

The lubricating and dust-proofing features of my invention will now be described.

At the left end the drum and gear system is sealed against ingress of dust and egress of oil or grease by sealing rings such as 52 and 53 and their associated parts, external to the cage hub 47. The inner end of the housing 49 overlaps a leftwardly-projecting inner flange 54 and the space here is closed by an oil seal 55. Lubricant which is supplied at a filling plug 56 cannot escape at 52, 53 or 55, but it can pass through the rollers of bearings 25 and 26. The drum 24, as usual, has large interior recesses, to reduce weight and for other purposes, and is generally made in sections, bolted together but not oil-tight. To prevent access of oil and grease to the drum interior, a lining tube 57 is used. The gear sleeve 43 is tight within the drum, and the tube 57 is tight within the sleeve; thus lubricant is not lost between these members. A seal outside the bearing 26 prevents escape of lubricant at the right end; thus the entire system of retract gears and drum bearings can be run in a bath of lubricant and protected from dust and dirt.

To recapitulate:

The gear housing 49 being filled with lubricant and the plug 56 closed, power is applied and the shaft 17 rotates, always clockwise as seen in Fig. 3 and at constant speed. The drum 24 remains stationary, held if desired by the brake 38. To crowd the shovel into its work the brake 38 is released and the clutch 27 is set, thereby carrying the drum around with the shaft. During this operation the gear cage brake 51 is off so that the cage can rotate and there is no driving effect between gears 42 and 39.

When the clutch is released the drum again stands stationary on the rotating shaft, held, if necessary, by the brake 38. To retract, the brake 51 is set, whereby the cage 41 is held fast and the pinions 40 transmit power from the crown gear 42, which is keyed to the shaft, to the bevel gear 39, and thus drive the drum 24 counterclockwise, and at a higher speed than that of the shaft, because gear 39 is smaller than 42. When the brake 51 is released the cage 41 again rotates freely and no power goes to the drum.

Having thus described a preferred embodiment of my invention, it is to be understood that changes may be made in the details of its embodiment without departing from the principles employed. For example, the well-known practice of using a sprocket and chain on the drum instead of the cables 30 may be followed, other types of clutch and of brake might be used, and so on.

In the claim the term "drum" includes sprocket or other driving connection mounted on the shaft and having flexible elements such as chains or ropes connecting to the implement being crowded and retracted, superposed on the drum or otherwise, such equivalents or substitutes for drums being well known in the art.

I claim:

In a crowd-retract mechanism of the type comprising a driven shaft, a drum, and bearings at each end of said drum carrying said drum rotatably on said shaft, circumferential flanges on each end of said drum of larger diameter than said drum extending axially outwardly from said drum; a clutch within one of said flanges adapted selectively to connect said drum to said shaft to rotate directly therewith; and a gear train partly shrouded by the other said flange, said gear train comprising a bevel gear fast to the end of said drum surrounding said shaft but radially clear therefrom, a cage rotatable on said shaft, journals carried by said cage disposed radially to said shaft but disposed at an angle to the shaft axis, and a crown gear of greater diameter than said bevel gear fast to said shaft, pinions on said journals connecting said crown and bevel gears, a sleeve fast on said shaft nested at one end within but rotatably clear of said bevel gear, the nested end of said sleeve constituting an end retention for a bearing of said drum, said crown gear being secured to said sleeve, said cage including a bearing on said shaft partly nested within but rotatably clear of said crown gear sleeve, and means for selectively holding said cage against rotation.

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