June 4, 1968 B. P. CLARKE 3,386,549

MINE HOIST CLUTCH

Filed Jan. 6, 1966 3 Sheets-Sheet 1

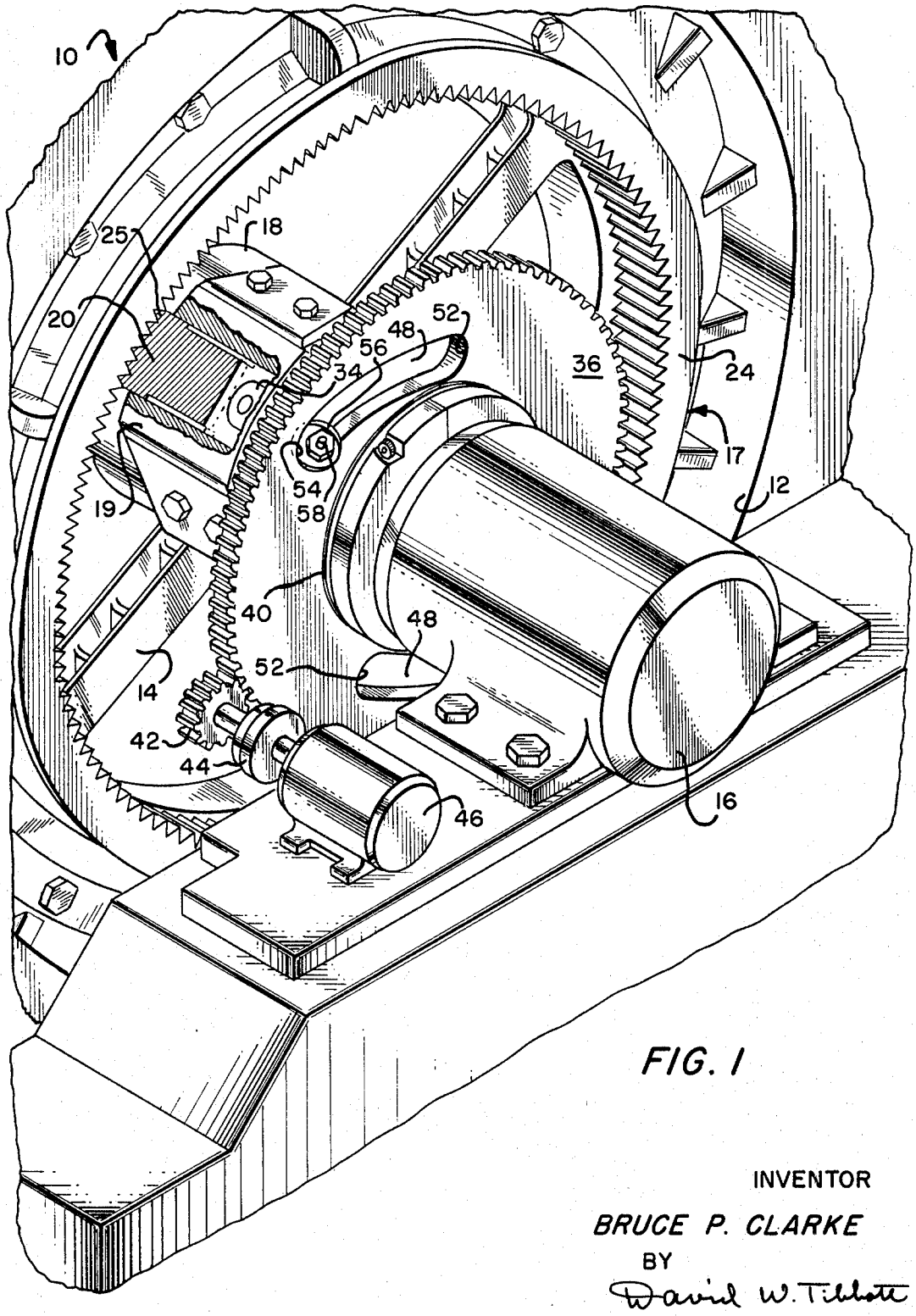


FIG. 1

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MINE HOIST CLUTCH

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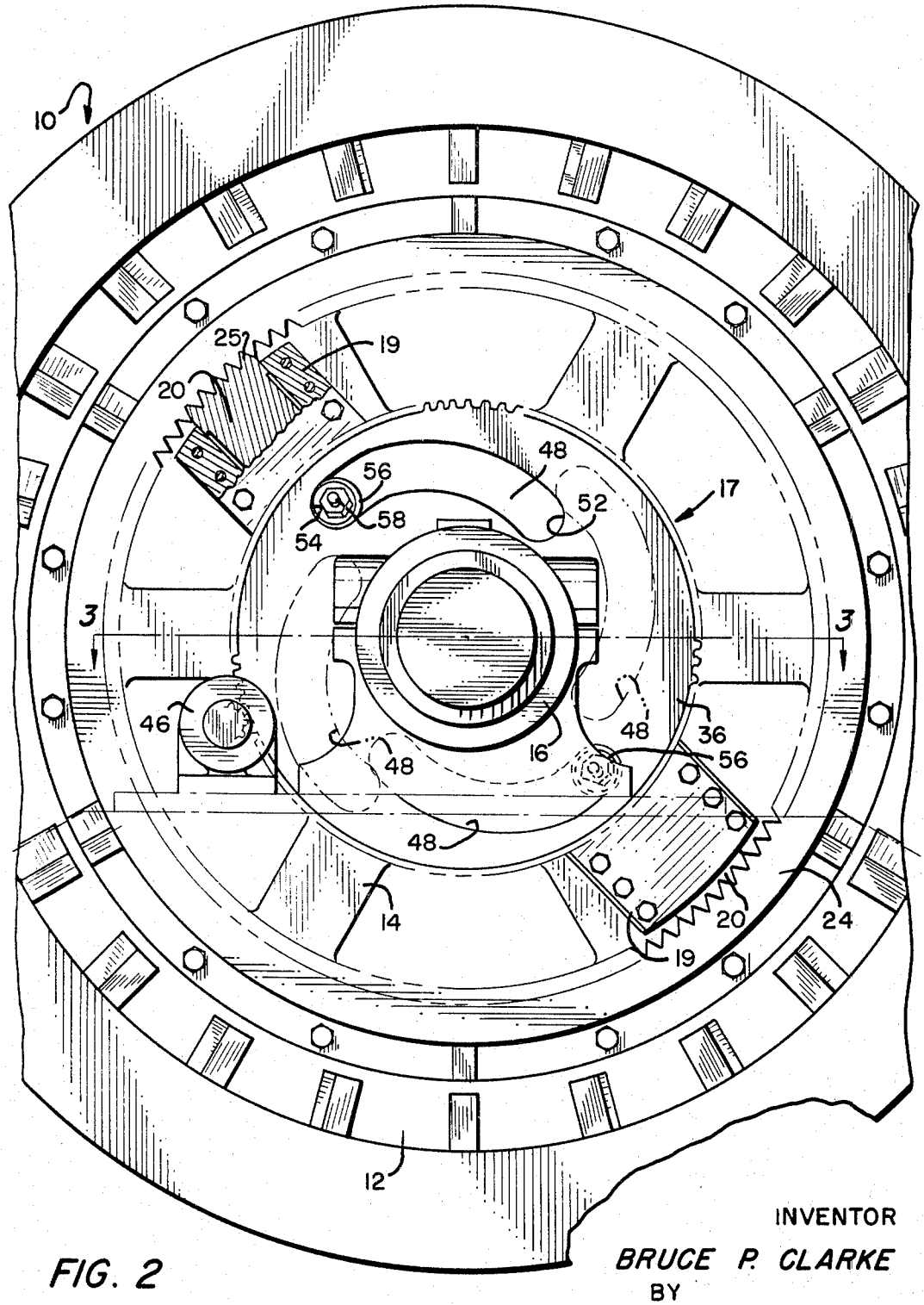


FIG. 2

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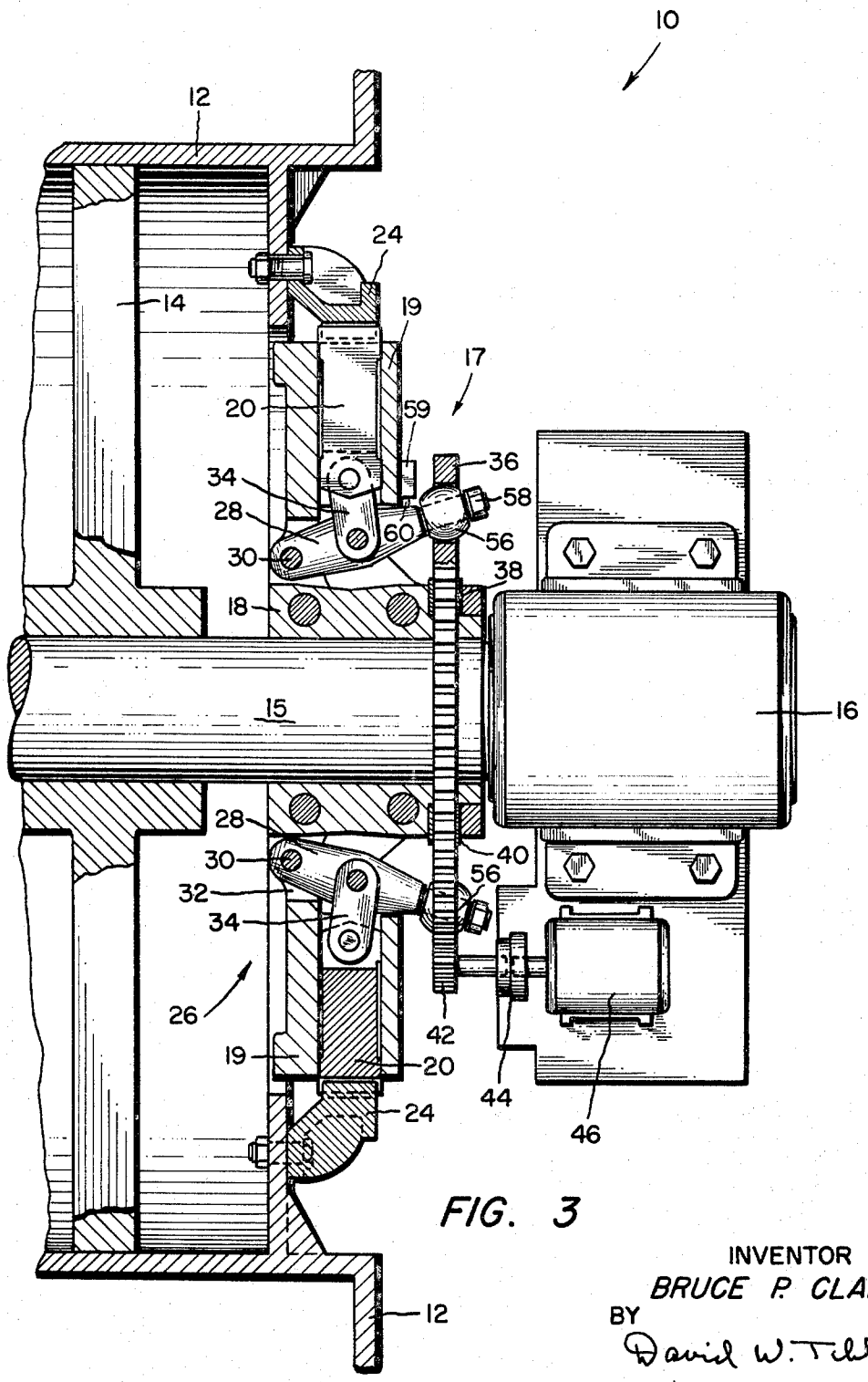


FIG. 3

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3,386,549

Patented June 4, 1968



3,386,549

# MINE HOIST CLUTCH

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Filed Jan. 6, 1966, Ser. No. 519,120
3 Claims. (Cl. 192—71)

## ABSTRACT OF THE DISCLOSURE

A clutch mechanism for interconnecting a hoist drum to a drive shaft and including a radially slidable jaw block, a gear plate journalled on the drive shaft and containing an eccentric slot, a cam follower connected between the eccentric slot and the jaw block for moving the jaw block radially as the gear plate is rotated on the drive shaft, and a drive motor for selectively rotating the gear plate relatively on the drive shaft.

This invention relates generally to clutch mechanisms and more particularly to clutch mechanisms of the type having internal expanding jaws for selectively providing a positive connection between a driving member and a driven member.

Briefly, this invention comprises a clutch mechanism for interconnecting a rotatable drive shaft to a drum or pulley for driving purposes. The clutch mechanism includes a plurality of sliding jaws or blocks carried by the drive shaft, which jaws may be selectively cammed into positive gripping engagement with means on the drum by a novel clutch operating mechanism.

Prior clutch mechanisms of this general type were provided with slidable sleeve means which were longitudinally slidable on the drive shaft in order to provide camming action for the axially movable jaws. These prior art mechanisms have proved to be inefficient and unsatisfactory in use inasmuch as the sliding of the sleeve along the drive shaft results in excessive wear of the parts, and thus there is required expensive repair and maintenance as well as frequent adjustments to the mechanisms. These prior art mechanisms also required the outboard bearing for the drive shaft to be spaced from the shaft sufficiently to provide room for the sliding movement of the sleeve means, thus reducing the rigidity of the drive shaft and increasing the area occupied by the hoist.

Accordingly, it is an object of the instant invention to provide a novel clutch mechanism which substantially eliminates sliding motion between parts and hence, attendant wear and frequent adjustment, increases the rigidity of the hoist drive shaft and reduces the area occupied by the hoist.

It is another object of the instant invention to provide a novel and unique camming mechanism for use in drum clutch mechanisms.

It is another object of the instant invention to provide an improved clutch mechanism including electrically operated shut-off means for use therewith.

These objects are attained, in brief, by the use of a rotatable plate containing eccentric slots engaging levers for engaging and disengaging the clutch jaws with the drum.

The invention will be more fully understood by reference to the drawings which illustrate a preferred embodiment of the invention and in which similar reference characters refer to similar parts:

FIG. 1 is a perspective view of an end of a drum hoist containing the clutch mechanism of this invention;

FIG. 2 is an end elevational view of the hoist of FIG. 1; and



FIG. 3 is a horizontal section and plan view taken on the line 3—3 of FIG. 2.

Referring to the drawings, reference numeral 10 generally denotes a drum hoist including a hoist drum 12 having spokes 14 rotatably mounted on a drive shaft 15. The drive shaft 15 is rotatably mounted in a journal bearing 16 and is adapted to be driven by a conventional electric motor (not shown). A clutch mechanism 17 is mounted on the shaft 15 for selectively locking the shaft 15 to the drum 12 by driving the drum 12. All of the foregoing structure is conventional in large hoists, such as are used in mines.

The clutch mechanism 17 includes an annular clutch hub 18 fixed on the shaft 15. The clutch hub 18 includes a pair of diametrically extending arms 19 carrying respective clutch jaws 20 slidably mounted on the arms 19 for movement radially inward or outward thereon.

The drum 12 includes an internally toothed annular ring gear 24 fixedly mounted within the drum 12 and surrounding the clutch hub 18 adapted to be engaged by the jaws 20 for locking the shaft 15 and drum 12 together. The jaws 20 have external teeth 25 for positively mating with the ring gear 24 for driving purposes.

The jaws 20 are moved on the arms 19 radially inwardly and outwardly by means of respective lever assemblies 26. Each lever assembly includes a lever 28 having an end pivotally mounted on a pivot 30 located in an opening 32 formed in the clutch hub 18. Each lever assembly 26 further includes a link 34 pivotally connected at one end to the middle of the lever 28 and at the other end to a jaw 20.

A gear plate 36 is rotatably mounted in a peripherally extending groove 38 formed in the hub 18 and containing a bushing 40. The gear plate is engaged by a pinion gear 42 which is driven through a conventional magnetic clutch 44 by a low r.p.m., high torque electric gear motor 46.

The gear plate 36 contains a pair of spinal or eccentric slots 48 therein. Each slot has a first end 52 located radially closer to the center of gear plate 36 than the opposite end 54. Each of the levers 28 has a ball joint 56 mounted on the end thereof by a threaded nut 58 and is slidably disposed in one of the slots 48. Thus, it will be observed that as the gear plate 36 is rotated by the motor 46, the ball joints 56 will ride in the slots 48 and will thereby act as cam followers in the slots 48, the ball joints 56 being cammed radially inwardly or outwardly with respect to the center of plate 36. As the ball joints 56 are so moved, the levers 28 are pivoted on their pivots 30 causing the links 34 to move the jaws 20 radially within the arms 19.

It should be understood that in order for the jaws 20 to be cammed into driving engagement with the ring gear 24, the drive shaft 15 is stopped, the magnetic clutch 44 is engaged and the gear motor 46 is energized to drive the pinion gear 42 causing the gear plate 36 to rotate. As the gear plate 36 is rotated counterclockwise (viewing FIG. 2) through an arc determined by the length of the slots 48, the jaws are cammed into engagement with the ring gear 24.

A limit switch 59 having a switch member 60 extending therefrom is mounted on the arm 19, the switch member 60 being in the line of movement of the lever 28. The limit switch 59 provides means for automatically disengaging the magnetic clutch 44 when the jaws 20 are in their outermost or drum-connecting position. When the switch member 60 is contacted by the lever 28, the switch 59 is opened. The switch 59 is connected in the magnetic clutch circuit by conventional means, such as contact rings mounted on the hub 18, so that opening the switch 59 will cause the magnetic clutch 44 to disengage.

At this time, the drive shaft 15 may be rotated in either clockwise or counterclockwise direction, and the drum

12 will be driven by it. If the drum is to be disconnected from its operative driving connection to drive shaft 15 by declutching of the clutch mechanism 10, it will be necessary to stop the drive shaft 15 and drum 12 and to electrically energize the magnetic clutch 44 and the motor 46 to rotate the gear plate 36 on the clutch hub 18.

It will be appreciated that the disconnection of the magnetic clutch 44 may be effected manually as well as by use of the switch 59. In addition, the switch 59 must be bypassed by a conventional circuit for energizing the magnetic clutch 44 to retract the jaws 20 from engaging or clutching positions with the ring gear 24. No attempt is made to disclose the specific circuits for the clutch 44 and the motor 46 because such circuits can easily be designed by an electrical designer.

The elimination of the prior art sliding sleeve by this invention, enables the bearing 16 for the drive shaft 15 to be placed closer to the end of the drum 12, thus reducing the floor area occupied by the hoist and increasing the rigidity of the drive shaft 15. In addition, the e'imination of the sliding sleeve eliminates the prior art wear problems existing between the sleeve and drive shaft.

Although only a single embodiment of the invention is described in detail, it will be understood that the invention is not limited simply to this embodiment but contemplates other embodiments and variations which utilize the concepts and teachings of this invention.

Having described my invention, I claim:

1. A clutch mechanism for clutching a drive shaft to a drum comprising:

at least one radially extending arm on said drive shaft;

a jaw member slidably mounted in said arm for radial movement with respect to the drive shaft;

means on said drum for receiving said jaw member in order to drivingly connect said drive shaft to said drum;

means for selectively connecting said jaw member to said receiving means whereby said drum will be rotatably driven by said drive shaft;



said connecting means including a peripherally toothed gear plate journalled on said drive shaft and having an arcuately extending eccentric slot;

a cam follower operatively connected between said jaw member and said eccentric slot;

said cam follower having one end in said slot and being positioned for movement with respect to said gear plate, the other end of said cam follower being pivoted to said drive shaft for radial movement as said gear plate is rotated;

means for rotating said gear plate on said drive shaft whereby said cam follower will move said jaw member radially with respect to said drum; and

said rotating means including a prime mover having gear means thereon for meshing with said gear plate.

2. The combination of claim 1 including:

linkage means connected between said cam follower and said jaw member whereby the pivotal movement of said cam follower causes radial sliding movement of said jaw member.

3. The combination of claim 1 including:

clutch means for connecting said prime mover to said prime mover gear means; and

switch means positioned on said arm and in the path of said cam follower for disconnecting said clutch means upon actuation of said switch means by said cam follower.

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