

United States Patent

Anderson

[15] 3,684,067

[45] Aug. 15, 1972

[54] **HAULAGE MECHANISM FOR MINING MACHINES**

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[22] Filed: **Jan. 8, 1971**

[21] Appl. No.: **105,024**

[30] **Foreign Application Priority Data**

Jan. 15, 1970 Great Britain.....2,058/70

[52] U.S. Cl.192/4 R, 192/12 A, 192/18 A, 192/150 R, 254/187

[51] Int. Cl.F16d 67/00

[58] Field of Search.....192/4 R, 12 A, 17 A, 18 A, 192/148, 150; 254/187 R

[56] **References Cited**

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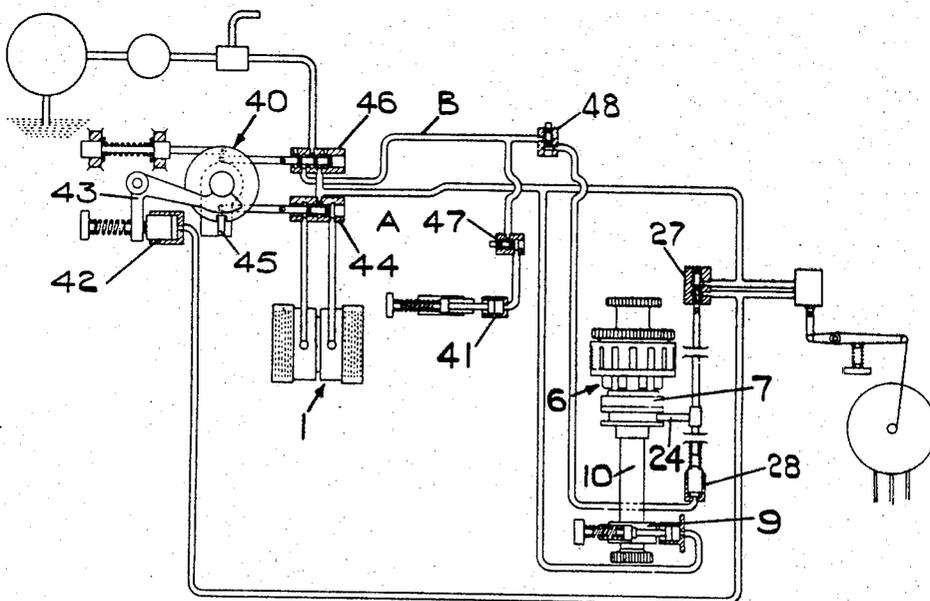
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[57] **ABSTRACT**

Haulage mechanism for mining machines according to the invention comprises a hydraulic driving clutch, control means for said clutch, gear selection means, hydraulically operated safety cut-out clutch device interposed between the output of the gear selection means and a reduction gear train to disconnect the driving connection between the reduction gear train and a driving power source when the driving member of the safety clutch device rotates relative to the driven member and at the same time apply brake means to the reduction gear train.

5 Claims, 4 Drawing Figures



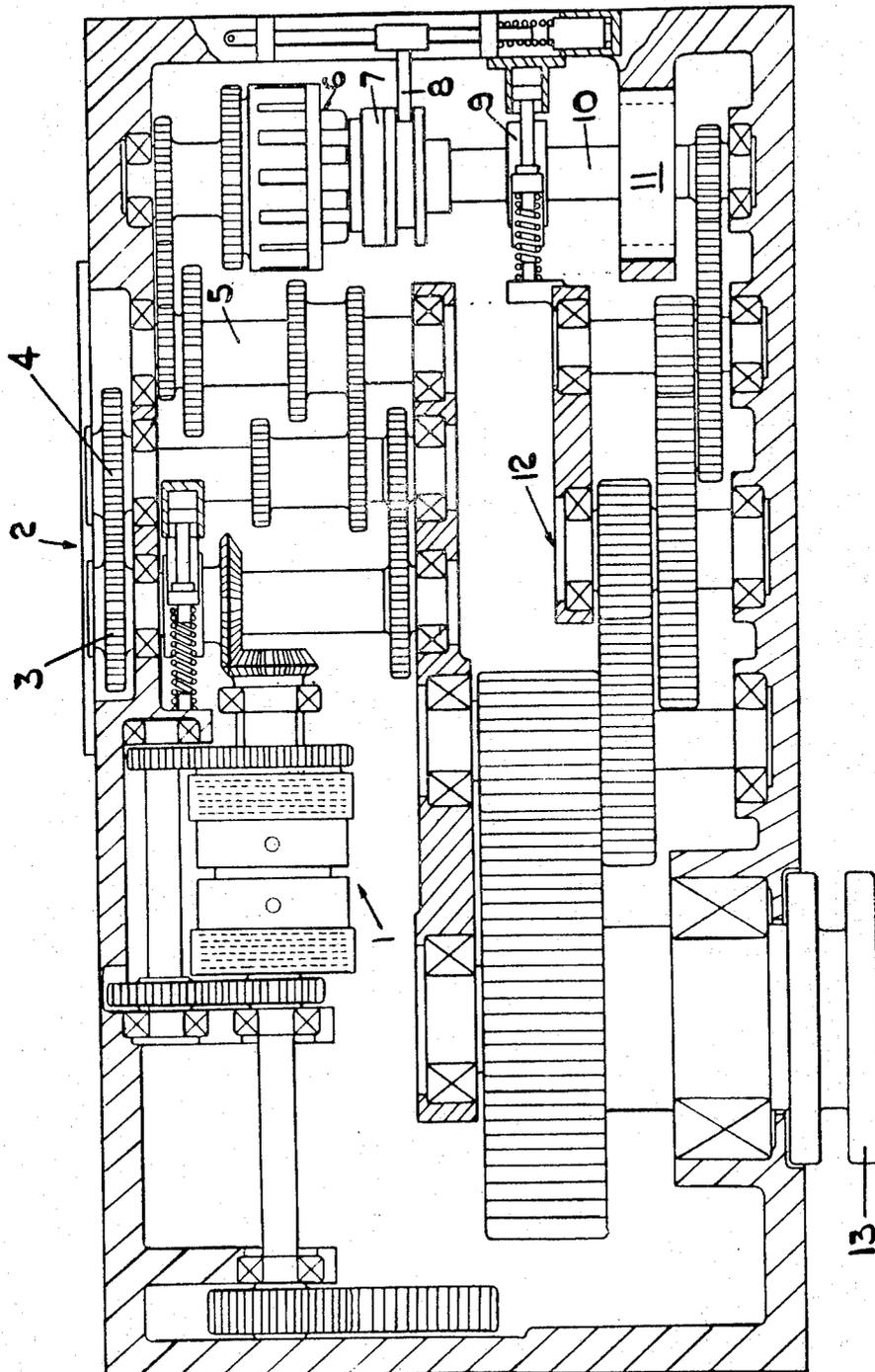


FIG. 1.

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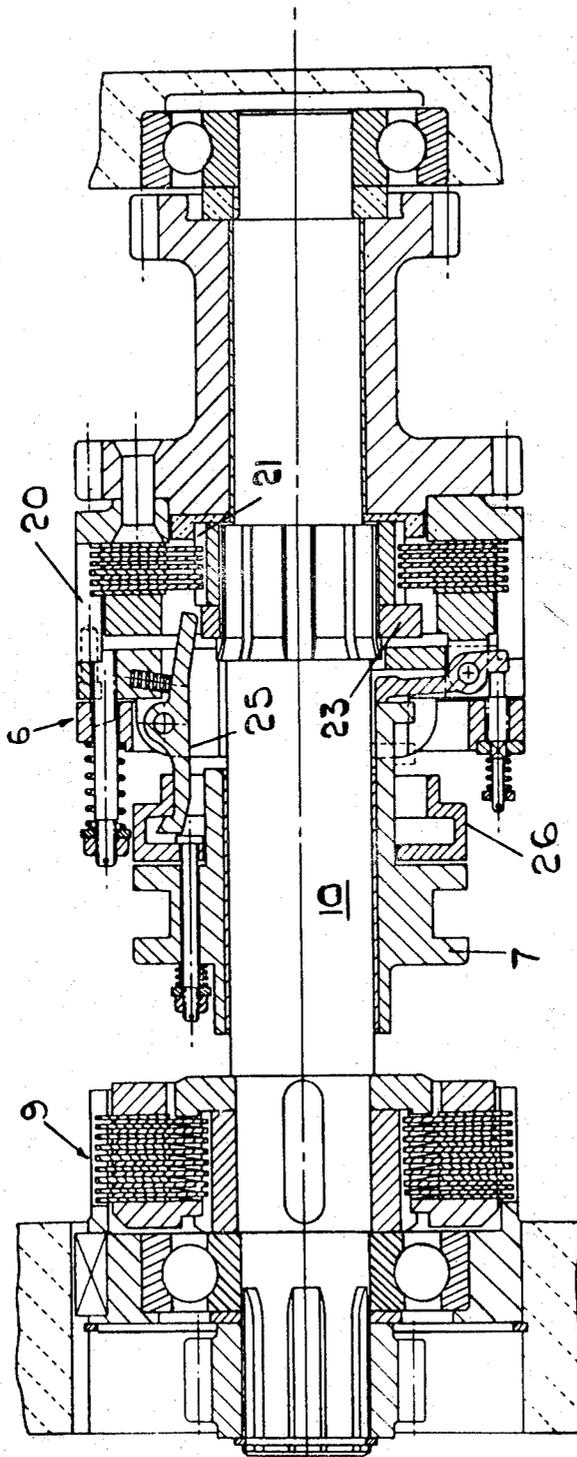


FIG. 2

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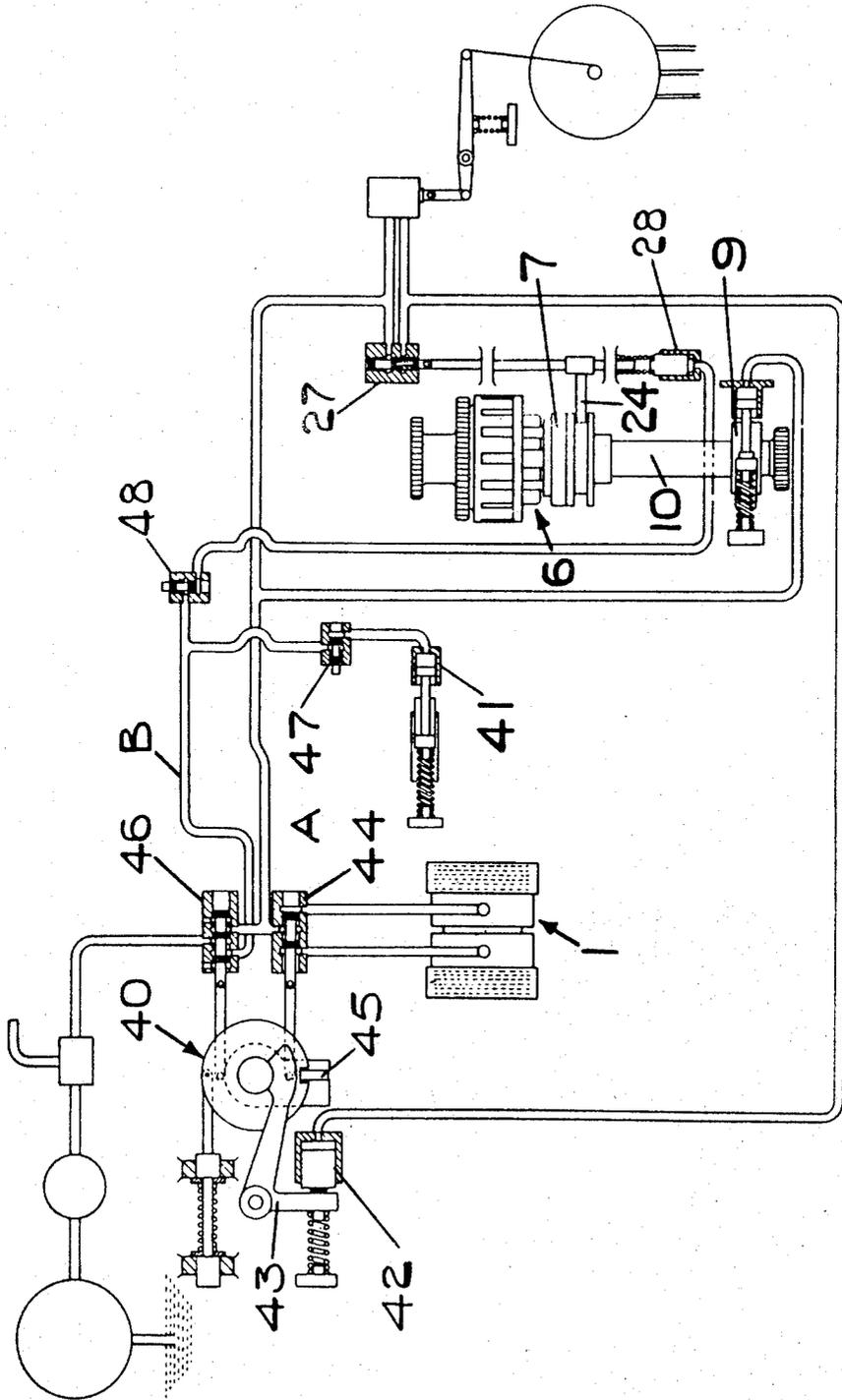


FIG. 3.

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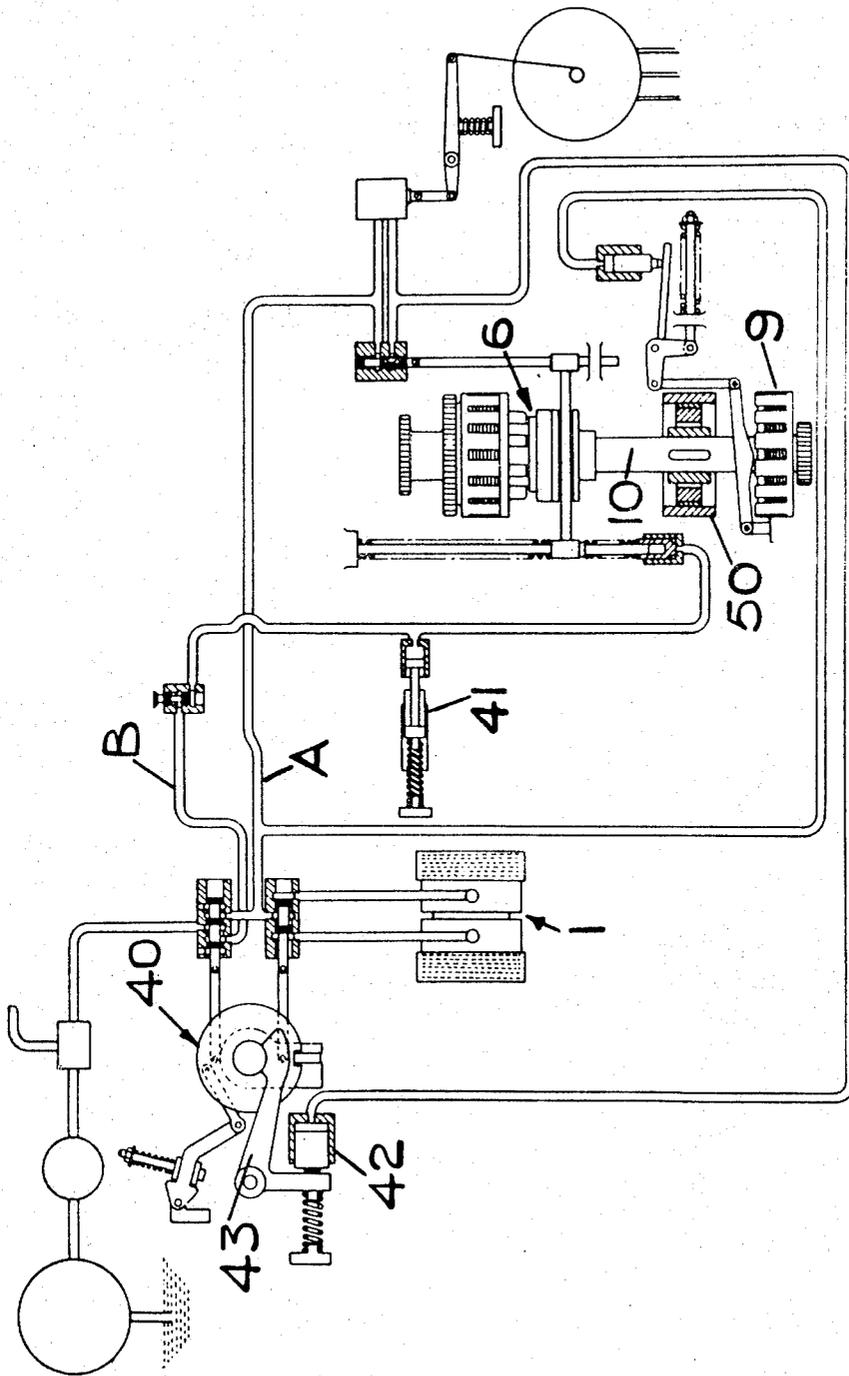


FIG. 4

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HAULAGE MECHANISM FOR MINING MACHINES

This invention relates to haulage mechanism for mining machines.

More particularly the invention relates to safety cut-out mechanism for mechanical haulage mechanism suitable for high powered mining machines.

In mechanical high powered haulage mechanism for mining machines of 30 horse power and upward difficulty has been found in providing a satisfactory cut-out mechanism as friction clutches normally used slip until cut-off by an operator. During the period of slip damage can be caused to the clutch. It has therefore been the practice to use hydraulic haulage mechanism for such high power machines which can be provided with satisfactory cut-out mechanism.

An object of the present invention is to provide mechanical haulage mechanism for high powered mining machines with safety cut-out mechanism comprising a clutch device which provides, upon relative movement of a driving and driven member of the clutch device, for disconnecting the driving connection between the driving power source and the haulage rope or chain and at the same time providing a means for applying brake means to the haulage rope or chain and arrest run-back or overrun of the haulage chain.

Haulage mechanism for mining machines according to the invention comprises a hydraulically operated driving clutch operatively connected to gear selection means for selecting a preferred haulage speed in a forward or reverse direction, control means for said driving clutch, an output shaft from the gear selection means operatively connectable through safety cut-out mechanism to a reduction gear train adapted to be connected to a haulage chain or the like, said safety cut-out mechanism including a friction clutch device having a driving member and a driven member operative to apply brake means to the reduction gear train and to actuate control means for the driving clutch when the driven member and driving member rotate relative to one another.

The driving clutch is hydraulically operable to provide a high speed and low speed and is provided with hydraulic control means including valve means manually operable for selecting either speed with an intermediate "off" or inoperative position. The control means when in either operative position is latched and is biased to return to the "off" position when released.

The gear selector means comprises speed control gear mechanism operatively connected to the driving clutch and providing preselected speeds in forward and reverse directions. Two of the gear wheels in the gear mechanism may be readily changeable by replacement gears to provide different combination of gear ratios.

An anti-gear-spinning brake may be provided on the input shaft of the gear selector mechanism to assist in gear selection. The brake being operable to prevent the gears spinning when not in mesh.

The output shaft of the gear selector mechanism is operatively connected to safety cut-out mechanism which is operative to actuate hydraulic means for applying brake means to the reduction gear train and to release the latch means on the control means for the driving clutch.

Centrifugally actuated brake means may also be provided on the driven side of the safety cut-out mechanism.

The safety cut-out mechanism comprises a friction-type clutch device including a driving member adapted to be operatively connected to the output side of the gear selection mechanism and a driven member having a driven shaft operatively connected to the reduction gear train, means for releasably retaining the driving and driven members in driving engagement means for releasing the retaining means when the driving and driven members rotate relative to one another and means for actuating hydraulic means to apply the brake means to the driven shaft and to release the latch means on the control means for the driving clutch.

Preferred embodiment of the invention are illustrated by way of example in the accompanying drawings in which:

FIG. 1 is a schematic illustration of the layout of hydraulic haulage mechanism according to the invention;

FIG. 2 is a sectional view of safety cut-out mechanism included in the haulage mechanism of FIG. 1;

FIG. 3 is a schematic illustration of a hydraulic system of the mechanism; and

FIG. 4 illustrates an alternative hydraulic system and brake mechanism.

Referring to the drawings a two speed hydraulic driving clutch denoted generally at 1 is operatively connected to gear selection mechanism 2 in which gear selector means (not shown) provide for selecting a predetermined gear ratio in forward or reverse direction. The gear selection mechanism 2 includes two readily replaceable gear wheels 3 and 4 to provide a different range of gear ratios and an output shaft 5 from the gear selection mechanism 2 is operatively engageable with safety cut-out mechanism 6.

The safety cut-out mechanism 6 as illustrated in FIG. 2 of the drawings comprises a clutch mechanism having a driving member 20 operatively engageable with the output shaft 5 of the gear selection mechanism, and a driven member 21 on a driven shaft 10 which is operatively connected to a reduction gear train 12, the output of which is operatively connected by means of a driving member 13 to a haulage rope, chain or the like (not shown).

A plurality of latch levers 25 are pivotally mounted on and annularly spaced about the driving member 20 of the clutch mechanism 6 and are releasably engageable with an annular retaining member 26 mounted on a sleeve member 7 which is mounted on the driven shaft 10. The latch levers 25 engage the retaining member 26 to retain the driven member 21 in operative engagement with the driving member 20.

A cam member 23 on the driven member is operative to disengage the latch levers 25 when the driving and driven members rotate relative to one another whereby the sleeve member 7 is moved axially of the driven shaft 10 under the influence of spring means.

Referring to FIG. 3 the sleeve member 7 is operatively connected by a finger member 24 to actuate a valve 27 in a hydraulic system which actuates control means 40 for the driving clutch 1 and also makes available hydraulic pressure to actuate a piston cylinder device 28 through a valve 48 for resetting the latch levers 25 into engagement with the retaining member 26 and actuates brake means 9 on the driven shaft.

The control means 40 for the driving clutch device 1 is manually operable for selecting high or low speed and an intermediate "off" or inoperative position. When in either operative position the control means 40 is latched and is biased to return to the "off" or inoperative position when released.

A piston device 42 in the hydraulic circuit is operatively associated with an actuating lever 43 of the control means 40 to release the latch means 45 when the piston device is actuated.

The control means 40 is associated with control valves 44 and 46. The control valve 44 provides for actuating the driving clutch 1 and for selecting high or low speed drive. A conduit A from the valve 44 is connected to a valve for actuating the brake means 9 on the driven shaft 10 and to a valve associated with the finger member 24 on the sleeve member 7 and to the piston device 42 associated with the control means 40.

A conduit B from the control valve 46 is connected to valve means 47 to actuate an anti-gear spinning brake device 41 operable on the input shaft of the gear selection mechanism to assist in gear selection and prevent gears spinning when not in mesh. The conduit B is also connected through the valve means 48 to actuate the piston cylinder device 28 which axially moves the finger member 24 and thus the sleeve 7 to reset the latch levers 25 into engagement with the retaining member 26.

The safety cut-out mechanism is operable when the driving and driven members of the safety clutch device 6 rotate relative to one another to release the latch levers 25 thus allowing the sleeve member 7 to move axially to actuate the valve 27 to provide pressure to the piston device 42 in the hydraulic circuit to disengage the latch device 45 on the control means 40 so that the control means returns to the "off" or inoperative position and the control valves exhaust the hydraulic line A to disengage the driving clutch and apply the brake means 9 and at the same time the hydraulic line B is pressurized to make available hydraulic pressure, through the valve 48 to reset the sleeve member 7 so that the latch levers 25 can engage the retaining member 26, and through a valve 47, to actuate the anti-gear spinning brake device 41.

FIG. 4 illustrates a further embodiment of the invention which includes a centrifugal brake 50 mounted on the driven shaft 10 to operate when the speed of the shaft is in excess of maximum working speed and to restrain the shaft 10 until the brake means 9 is applied thereto, for example during run-back of the haulage

chain.

The driven member on the safety cut-out device may be resiliently connected to the driven shaft and this may be provided by the driven shaft being splined or keyed to the driven member and resilient means being interposed between the grooves in the shaft and the keys in the driven member. The resilient connection being provided to allow torsional yield between the driven member and the driven shaft.

10 What is claimed is:

1. Haulage mechanism for mining machines comprising a hydraulically operated driving clutch operatively connected to gear selection means, control means for said driving clutch, said gear selection means having an output shaft, safety cut-out mechanism including a friction clutch device having a driving member and a driven member, said output shaft operatively connectable to said driving member and said driven member operatively connected to a reduction gear train, said friction clutch device operative, when the driving and driven members rotate relative to one another to actuate brake means for said reduction gear train and to actuate the control means for the driving clutch.

2. Mechanism according to claim 1 wherein the driven member is secured to a driven shaft operatively connected to said reduction gear train, retaining means releasably retain the driving and driven members in driving engagement and release means for the retaining means operative when the driving and driven members rotate relative to one another, to actuate means for actuating hydraulic means to apply said brake means to the driven shaft and actuate the control means for the driving clutch.

3. Mechanism according to claim 2 wherein the retaining means comprises a plurality of latch levers on the driving member and engageable with a retaining member associated with a sleeve member on the driven member and the means for releasing the retaining means comprises a cam member mounted on the driven member and operable when the driven and driving rotate relative to one another to disengage the latch levers from the retaining member.

4. Mechanism according to claim 2 wherein a sleeve member, movable axially of the driven shaft upon release of said retaining means, actuates said hydraulic means.

5. Mechanism according to claim 1 wherein said brake means includes a centrifugal brake adapted to prevent the reduction gear train exceeding a predetermined maximum working speed.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,684,067 Dated August 15, 1972

Inventor(s) Forrest Symington Anderson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

IN THE HEADING:

[73] Assignee: delete "Anderson Manor Limited" and insert
--Anderson Mavor Limited--.

Signed and sealed this 8th day of May 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

. UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTIONPatent No. 3,684,067 Dated Aug. 15, 1972Inventor(s) Forest Symington Anderson

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 54, delete "combination" and insert --combinations--;
line 59, after "gears" insert --from--;

Column 2, line 13, delete "embodiment" and insert --embodiments--;

line 41, after "5" insert --FIG. 1--;
line 43, after "12" insert --FIG. 1--;
line 45, after "13" insert --FIG. 1--;

Column 3, line 24, after "gears" insert --from--;

Column 4, line 33, after "and" insert --to--;
line 41, after "driving" insert --members--;
line 49, after "train" insert --from--.

Signed and sealed this 23rd day of January 1973.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents