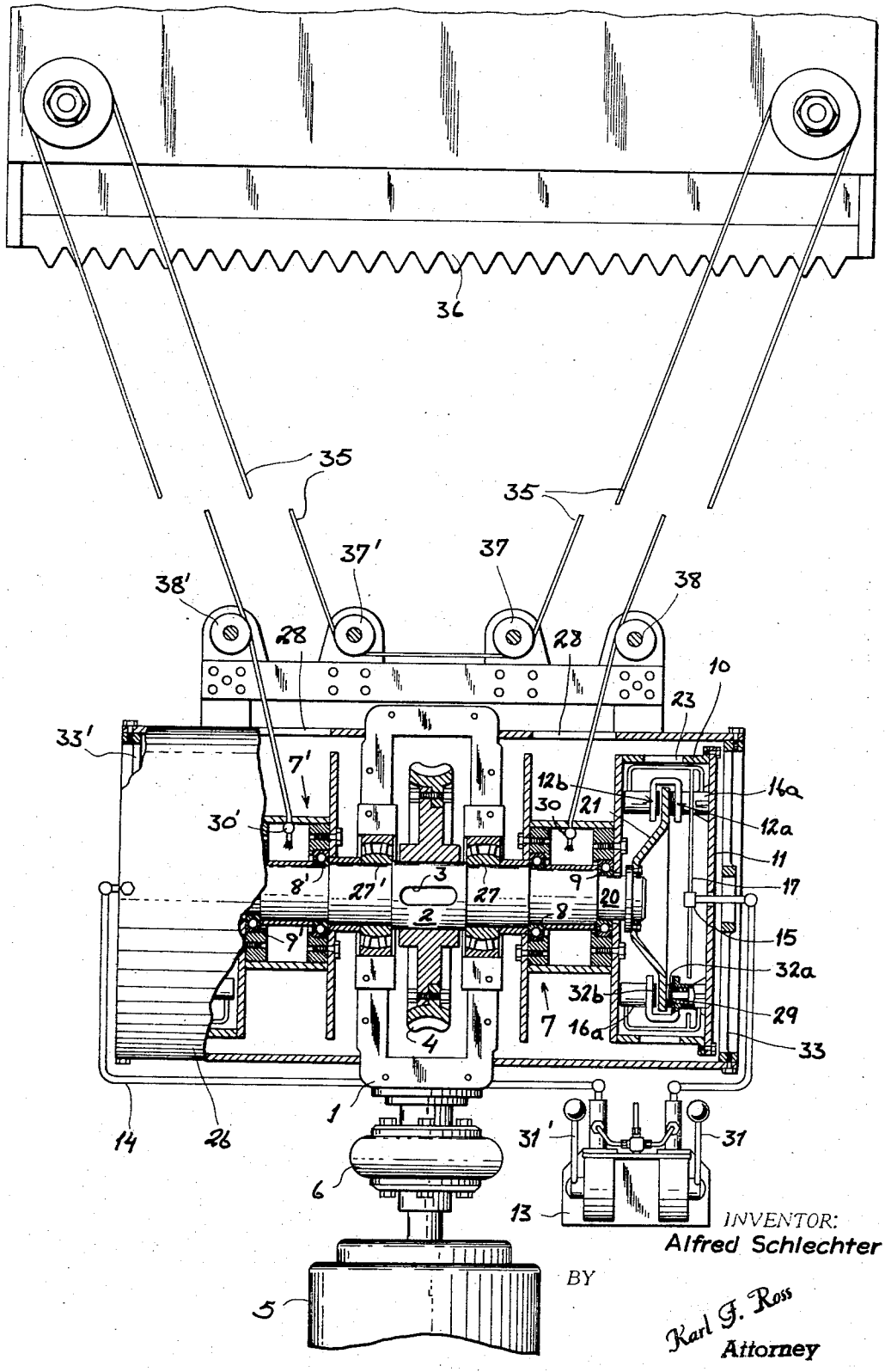
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DRAG-LINE WINCH

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DRAG-LINE WINCH

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The portion of the term of the patent subsequent to Dec. 13, 1983, has been disclaimed
2 Claims. (Cl. 254—185)

ABSTRACT OF THE DISCLOSURE

Drag-line winch having a pair of cable reels each having a respective cylindrical housing member at the outer end of the respective reel and entrainable therewith, a respective disk brake being mounted in each chamber for engagement with a disk keyed to or rigid with a shaft extending coaxially through the reels and the housing member, whereby the disk brakes respectively actuatable to couple the brake shoes with the disk and the respective reels with the shaft to drive the reels. The hydraulic fluid is delivered to the rotating brake cylinders by a fitting located on the axis of the device in the end wall of each chamber.

This application is a division of my pending application Ser. No. 380,859, filed July 7, 1964, now U.S. Patent No. 3,291,450 granted Dec. 13, 1966.

My present invention relates to drag-line winches as used, for example, in the mining industry.

In mining operations it is common practice to dislodge exposed strata of the material to be mined by dragging a heavy vessel, or bucket, along the surface. Often the lip of the vessel coming in contact with the surface is provided with a row of teeth which serve to take up, or loosen, the material. The equipment used for this purpose is known as a drag-line winch. It comprises the drag bucket, a cable to which the former is attached, and a motor-driven winch for reeling up the cable. Since it is necessary to handle the bucket in accordance with the load conditions acting on it, that is, since the bucket must be enabled to make frequent start-stop maneuvers to rake up the surface and must at other times be hauled in toward the winch at a steady pace, the winch is provided with a clutch adapted selectively to connect the drive means and the cable reel or reels of the winch. To avoid snapping of the control cables and to regulate the speed of the bucket it is necessary that the clutches provided in drag-line winches be able to operate for certain periods of time under conditions of slip.

Most drag-line winches now on the market utilize planetary-gear-type clutches for the aforedescribed purpose. However, it has been found that such clutches will not bear up well under the constant strain of slippage under load. In particular, insufficient heat dissipation is a cause of frequent and premature breakdown.

Other types of couplings, e.g. friction clutches, are also known for use in drag-line winches. Generally, however, these devices either suffer from overheating or, where this problem has been met by a special construction affording increased heat dissipation, are too bulky to be accommodated within the cable reel, being thus deprived of the positive seal required for protection against the dirt accumulations unavoidable in underground operations.

Accordingly, it is an object of the present invention to provide a drag-line winch not subject to the aforementioned disadvantages.

A more specific object is to provide a winch of compact proportions particularly suitable for use in subterranean operations.

A feature of my invention is the provision, in a drag-line winch having at least one cable reel, of a clutch constituted by a mechanism resembling a conventional fluid-operated automotive brake, this mechanism including a first coupling unit (e.g. a disk) on an extremity of a continuously driven shaft and a co-operating second coupling unit (e.g. a pair of spreadable brake shoes) on a carrier member which is rigid with the cable reel and extends generally transversely beyond the aforementioned shaft extremity so as to afford a convenient location for the attachment of a supply line for the operating fluid. Thus, the part of the clutch mechanism supported on the carrier member is provided with a fluid-responsive actuating element, such as a hydraulic cylinder, having an input connection at the center of the carrier member in line with the shaft axis, this connection communicating with a conduit from an external source of high-pressure fluid adapted to be selectively admitted therethrough for the establishment of frictional contact between the two coupling units against the force of a suitable restoring device such as a spring. This arrangement facilitates the admission of an actuating medium, specifically a hydraulic fluid, to the clutch mechanism without the need for using the rotating shaft itself as part of the supply system.

The carrier member, according to a more specific feature of my invention, is of a cup-shaped configuration and has an apertured annular peripheral wall forming an extension of the cable reel, the perforations of this annular wall facilitating the escape of frictional heat upon slippage of the clutch mechanism embraced thereby. The transverse end wall of the cup-shaped carrier member may also be perforated to promote cooling.

The arrangement set forth above is particularly suitable for use in systems with two reels mirror-symmetrically mounted on a common shaft.

The above and other objects, features and advantages of my invention will become more fully apparent from the following detailed description of certain embodiments, reference being made to the accompanying drawing in which:

The sole figure is an axial sectional view of a drag-line winch according to my invention.

A drag-line winch embodying my invention, as illustrated in the drawing, comprises a frame **1** having bearings **27, 27'** in which is journaled an elongated shaft **2**. Mounted on the shaft **2** at its center, by means of a keyway **3**, is a worm gear **4** adapted to rotate with the shaft. The worm gear **4**, and through it the shaft **2**, is powered by a suitable motive source, shown as an electric motor **5** and a step-down transmission **6**, acting on the centrally positioned gear **4** through a worm (not shown) in mesh therewith. Axially spaced from gear **4** and symmetrically arranged on opposite sides thereof are two cable reels **7, 7'** which are mounted on the ends of shaft **2** by way of respective pairs **8, 9** and **8', 9'** of ball bearings with freedom of independent rotation. These reels and their associated equipment being identical in design and operation, the following description will be limited to reel **7**, it being understood that reel **7'** is a mirror image thereof.

The peripheral wall of reel **7** is stepped to an annular sleeve **10** coaxial with the shaft. To the outer edge of this sleeve is secured a transverse carried plate **11** defining an end wall of a cup-shaped member whose peripheral wall is constituted by the sleeve **10**. A pair of brake shoes **12*a***, **12*b*** with linings **32*a***, **32*b*** are fastened to the side of the

plate **11** facing the interior of sleeve **10**. For purposes of actuation the shoes **12***a*, **12***b* are operatively associated with an external hydraulic power source represented by a pump **13** (shown schematically) via a fixed supply line **14**, terminating at the center of plate **11**, and a rotatable distributor **15** coupled to it in fluid-tight manner, the hydraulic fluid entering piston cylinders **16***a* and **16***b* by way of feeder line **17**; the axis of cylinders **16***a* and **16***b* are parallel to that of shaft **2** and reels **7**, **7'**.

A cylindrical housing **26**, rigid with frame **1**, surrounds the entire brake assembly as well as the reels **7**, **7'** which are accessible through ports **28**, **28'** that enable the passage of respective lengths of cable **35** attached to these reels at **30**, **30'** in order to be payed out as required. The housing **26** is also open, for cooling purposes, at least at its ends which are formed by spider arms **33**, **33'** supporting the conduits **14**, **14'** from pump **13**.

The extremity **20** of shaft **2** carries the brake disk **21** within the cup-shaped enclosure defined by sleeve **10** and end plate **11**. This end plate, supporting the distributor **15** which communicates with the supply conduit **14** from a source of hydraulic fluid not shown in this figure, carries a plurality of brake-cylinder pairs **16***a*, **16***b* whose feeder lines **17** have their inlets at the distributor. The pistons of each pair of cylinders **16***a*, **16***b* face each other across the disk **21** and are normally biased by individual restoring springs **29** away from contact with the disk surface. When hydraulic fluid under pressure is admitted to distributor **15** via conduit **14** and the intervening fluid coupling, these pistons are urged toward each other so tht the brake linings **32***a*, **32***b* on their confronting ends engage the disk surfaces for entrainment of the reel **7** with or without slippage. Sleeve **10** is apertured at **23** to facilitate circulation of cooling air within housing **26**.

In operation, motor **5** and transmission **6** maintain the shaft **2** in continuous rotation. Whereas the independently jouraled reels **7**, **7'** are not directly affected by this movement, the brake disks rotate with the shaft. If the operator wishes to reel up some of the cable on reel **7** or **7'** in order to bring in the associated bucket, he connects the hydraulic source **13** to conduit **14** or **14'** by means of a respective control lever **31** or **31'** provided thereon. Fluid now flows through, say, line **14** into the distributor **15** and from there via the feeder line **17** into the cylinders **16***a* and **16***b*. The two pistons of the latter move axially outwardly and cause the brake shoes **32***a* and **32***b* to bear upon the inner surfaces of disk **21** against the force of the restoring spring **29**. Since the brake shoes are positively coupled with the reel **7** via their support plate **11**, a frictional connection has thus been established between the shaft **2** and the reel **7** and the latter is now entrained for synchronous or lagging rotation with the shaft, depending upon the resistance encountered by a drag bucket **36** on the far end of the length of cable **35** wound about the reel. The degree of slip of reel **7** may, of course, be controlled by varying the pressure exerted on the brake shoes by the hydraulic source.

The cable **35** shown in the figure is assumed to lead to horizontally spaced points along the edge of a single drag bucket **36** adapted to be tilted or straightened out by the operator through concurrent or selective actuation of the control levers **31** and **31'**, the frame **1** being provided with idler rollers **37**, **38** and **37'**, **38'** to guide the several reaches of the cable. Naturally the same dual-reel arrangement could also be used for individual control of two separate buckets hauled in from different directions by means of reels **7** and **7'**, respectively.

The invention described and illustrated is believed to admit of many modifications within the ability of persons skilled in the art, all such modifications being considered within the spirit and scope of the appended claims.

I claim:

1. A drag-line winch, comprising a frame; a shaft rotatably journaled in said frame at a central portion of the shaft; a pair of cable reels coaxial with said shaft and journaled on opposite ends thereof for independent rotation thereabout; a generally cup-shaped carrier member coaxially rigid with each of said reels, said member having an end wall extending generally transversely of said shaft beyond a respective extremity thereof and an apertured annular peripheral wall surrounding said extremity; a clutch mechanism for each reel including a disk rigid with the respective extremity of the shaft and co-operating coupling means supported on the respective end wall, each of said coupling means including a pair of axially shiftable brake shoes in said member flanking each of said disks and engageable therewith while being provided with a fluid-responsive actuating element for said shoes including a hydraulic cylinder having an input connection at a location of said end wall in line with the shaft axis; a source of hydraulic fluid for each of said cylinders provided with a respective conduit terminating at said input connection; respective control means individual to each reel for selectively admitting hydraulic fluid from said source to the respective input connection via the respective conduit to urge the respective shoes into frictional contact with the respective disk; respective restoring means for disengaging said shoes from said disks in the unoperated condition of the respective control means; and drive means between said reels for continuously rotating said shaft.

2. The improvement defined in claim **1** wherein said brake shoes of each coupling means are each provided with a respective hydraulic cylinder, further comprising a yoke connecting said cylinders, said input connection being joined to said cylinders of each coupling means in parallel.

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