Oct. 25, 1955 H. W. DRIEHAUS 2,721,733

CUTTER DRUM DRIVEN FLYWHEEL IN MINING MACHINES

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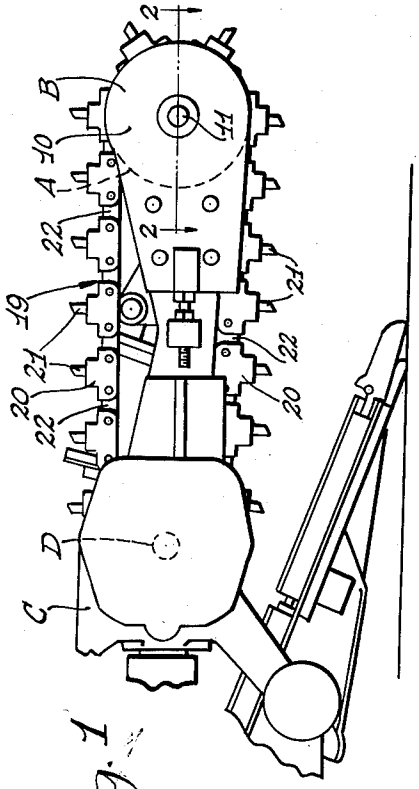


Fig. 1

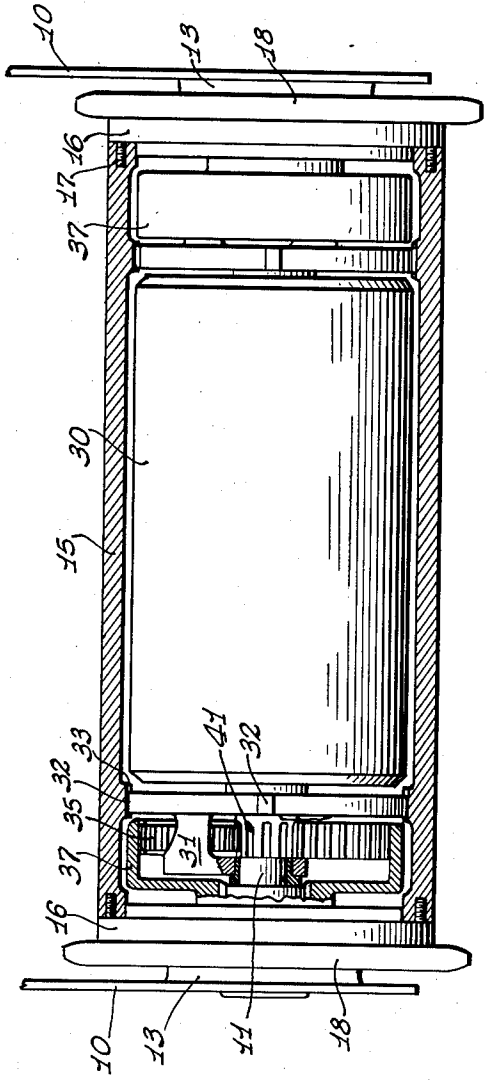


Fig. 4

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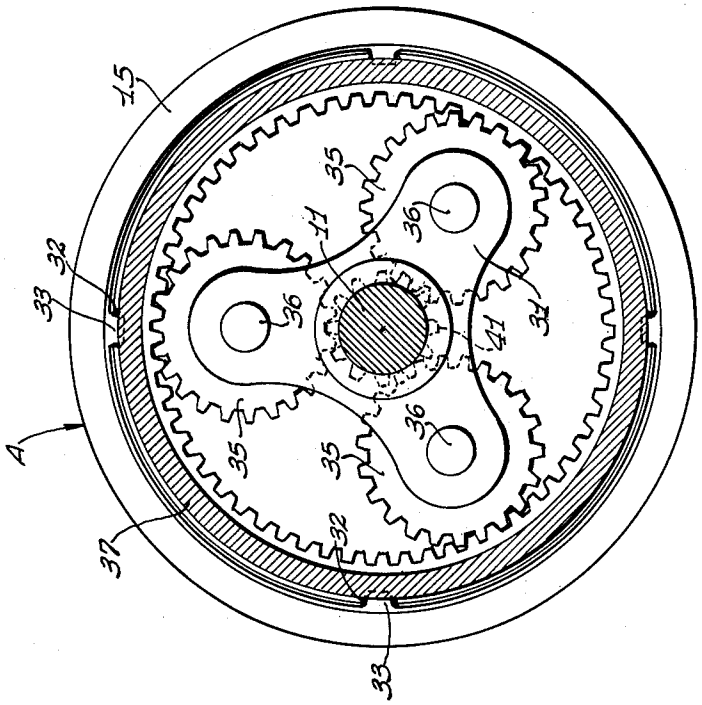


Fig. 3

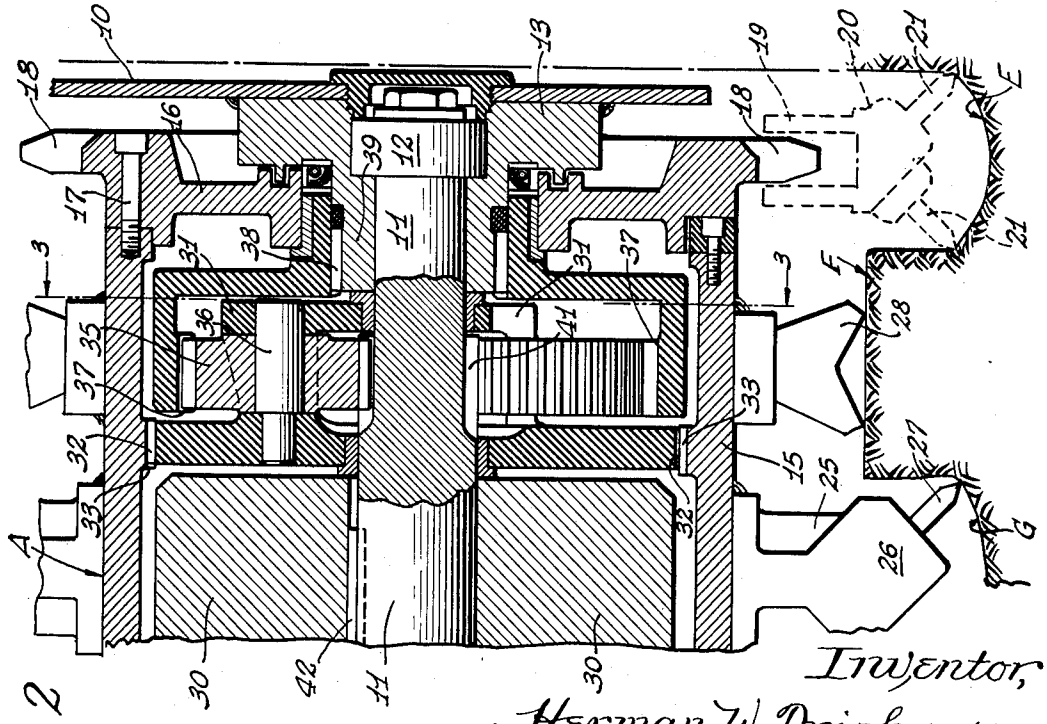


Fig. 2

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United States Patent Office

2,721,733

Patented Oct. 25, 1955

2,721,733

CUTTER DRUM DRIVEN FLYWHEEL IN MINING MACHINES

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Application October 23, 1952, Serial No. 316,437

3 Claims. (Cl. 262—9)

This invention relates to improvements in cutter drums for kerf cutting machines particularly adapted for use in continuous mining machines, although not necessarily limited to such use.

The principal object of the invention is to provide means for stabilizing the rotational speed of the cutter drum under conditions of varying load, as where the machine is cutting through layers of alternately hard and soft materials, or where it occasionally strikes the rock ledge or other relatively hard obstructions.

A further object to the invention is to provide means for protecting the drive chains for the cutter drum from excessive load shocks when the cutters strike hard obstructions.

In carrying out my invention, I utilize a large flywheel disposed inside the cutter drum and operable to transfer energy directly to the drum whenever the latter is slowed down by rough cutting.

The invention may best be understood by reference to the accompanying drawings in which:

Figure 1 is a fragmentary view in side elevation of the cutting head of a continuous mining machine of the type to which my invention is particularly adapted for use;

Figure 2 is an enlarged fragmentary section taken generally on line 2—2 of Figure 1, showing one end of the cutter drum with a portion of the mechanism for driving a flywheel enclosed in said drum;

Figure 3 is a detail section taken on line 3—3 of Figure 2;

Figure 4 is a reduced plan view also taken on line 2—2 of Figure 1, but with the cutter bits and drive chains omitted, and with the center portion of the drum in part section to show the duplicate drive mechanism for the flywheel in opposite ends of the drum.

Referring to details of the embodiment of my invention illustrated in the drawings, Figure 1 is a side view of a conventional form of cutter head used in a continuous mining machine wherein a horizontally disposed cutter drum A is mounted for rotation on a vertically swinging cutter frame B pivoted to a main frame C of a mining machine on transverse axis D. As shown in greater detail in Figures 2 and 3, the cutter frame B includes a pair of side plates **10, 10**, held in spaced relation to each other by a cross-shaft **11**, which in the form shown herein, is rotatably mounted at opposite ends in bearings **12, 12** supported in bearing plates **13, 13**, fixed to the inner face of the end plates **10**, as by welding.

The cutter drum A consists of hollow cylindrical body **15**, having end plates **16, 16** secured at opposite ends thereof, as by bolts **17**. The end plates **16** form the hubs for drive sprockets **18, 18** engaged by drive chains **19** at each end of the drum. These drive chains **19** form the power connection for rotating the drum at a cutting speed and may be driven from any suitable source of power on the main frame C of the mining machine. With some forms of mining machines of this class, it is customary to drive each of the two chains **19, 19** through suitable gear reductions from separate motors (not

shown), although the drive chains **19** can, if desired, be driven from a single motor.

As is also common with conventional cutter heads of the type shown herein, the two drive chains **19, 19** are made up of a plurality of cutter blocks **20, 20**, each having cutter bits **21** projecting outwardly therefrom at varying angles (see Figure 2) to cut kerfs E in a working face F of a mine. The cutter blocks **20, 20** are connected as usual by links **22**.

A series of suitable material cutting devices may also be mounted as usual in spaced relation along the outer surface of the drum. In the illustrative form shown in Figure 2, these cutting devices consist of a plurality of rings **25**, each carrying a plurality of peripherally spaced blocks **26** having cutter bits **27** supported in position to cut a plurality of kerfs G in the working face. A series of alternately disposed breaker devices **28** may also be mounted on the outer surface of the drum. Since these cutting and breaking devices form no part of the present invention, further description thereof need not be given. For convenience in illustration, such cutting and breaking devices are omitted from Figures 3 and 4 of the drawings.

Referring now more particularly to the flywheel stabilizing mechanism forming the principal feature of the present invention, a cylindrical flywheel **30** is mounted on the shaft **11** so as to fill substantially the full interior diameter of the drum body **15**, but being spaced from opposite ends of the latter so as to afford room for step-up driving connections between the drum and each end of the flywheel. In the form of drive connections shown herein, duplicate drive gearing of the planetary type is employed in each end of the drum. The details of one of the planetary gear drives are shown in Figures 2 and 3. In these latter figures, a cage **31** has a plurality of splines **32** on its outer periphery engaging in corresponding grooves **33**, formed on the interior surface of the drum body **15**. This cage carries three planetary gears **35, 35** on stub shafts **36, 36**. Said planetary gears are meshed with a stationary internal gear **37**, which is splined at **38** on a hub portion **39** formed integrally with the adjacent end bearing plate **13**. The planetary gears are also meshed with gear teeth **41** cut in the rotatable center shaft **11**.

The flywheel **30** is keyed at **42** on the center shaft **11**. The arrangement is such that the flywheel rotates faster than the drum A, at a speed which can be calculated with well-known formulas. For instance, the ratio of the gearing shown in the drawings is about 5½ to 1 between flywheel and drum.

In conventional drum type mining heads which are driven by two chains and which are not stabilized by means of a flywheel in accordance with the present invention, there is often chain breakage caused by the sudden stoppage of the drum in very heavy cutting, causing a surge of power in the chains which breaks them. By the present arrangement, the flywheel makes it very difficult to stop the drum suddenly. Even in the heaviest cutting it tends to slow down rather than stop suddenly, thereby relieving to a great extent the surges of power which break chains.

The use and operation of the mechanism is as follows:

The drum A is rotated in the usual manner by the two cutter chains **19, 19**, engaging the sprockets **18, 18** at opposite ends of the drum. The cutter bits **21**, carried by the cutter chains, move around the two chain sprockets to cut kerfs E, while the cutter bits **27** rotate at substantially the same peripheral speed to cut intermediate kerfs G. The flywheel **30** within the drum is rotated at a substantially greater speed than the drum A, although in the same direction.

It will be understood that the energy stored up in the flywheel **30**, while rotating at a relatively high rate, will

tend to stabilize the rotation of the drum while the latter is operating under varying cutting loads. Thus, when the cutter bits encounter heavy cutting, which would otherwise tend to reduce the peripheral speed of the drum abruptly, a part of the energy from the flywheel will be transferred into the drum so as to minimize the loss in peripheral cutting speed of the drum. On the other hand, when the drum is cutting under heavy load conditions which become suddenly relieved, the flywheel **30** tends to prevent any tendency of the drum to race or "run away."

The provision of duplicate planetary gearing at opposite ends of the drum is particularly desirable when the two drive chains **19**, **19**, connected to the chain sprockets **18** at opposite ends of the drum, are driven from separate motors, as is often the case in mining machines of this character. In such instances, the flywheel **30** and the two planetaries will have more or less direct connection with the drive sprockets at each end of the drum so as to form with the drum body interconnecting drive means between the two drive motors for the cutter chains, rather than depending upon the drum body alone for such interconnection between the two drive motors.

Although I have shown and described certain embodiments of my invention, it will be understood that I do not wish to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In a mining machine, a hollow rotating cutter drum with bearing supports at opposite ends thereof, a drive chain operatively connected with said drum, a flywheel rotatably mounted on said bearing supports concentrically within said drum, and drive gearing also mounted within said drum and driven from the latter for rotating said flywheel in the same direction and at a greater speed than said drum.

2. A structure of claim 1, wherein the drive gearing consists of planetary gear mechanism, including a cage driven from the drum, an internal gear fixed to the bearing supports, and planetary gears carried by the cage and meshed with said internal gear and also in driving connection with the flywheel for rotating the latter in the same direction and at a greater speed than the drum.

3. A structure of claim 1, wherein a pair of separately-driven drive chains are directly connected with both ends of the drum, and similar planetary gear mechanisms are disposed in opposite ends of the drum affording duplicate driving connection between the drum and the opposite ends of the flywheel.

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