Sept. 30, 1952 L. D. HAGENBOOK 2,612,361

MINING MACHINE

Filed March 16, 1951 3 Sheets-Sheet 1

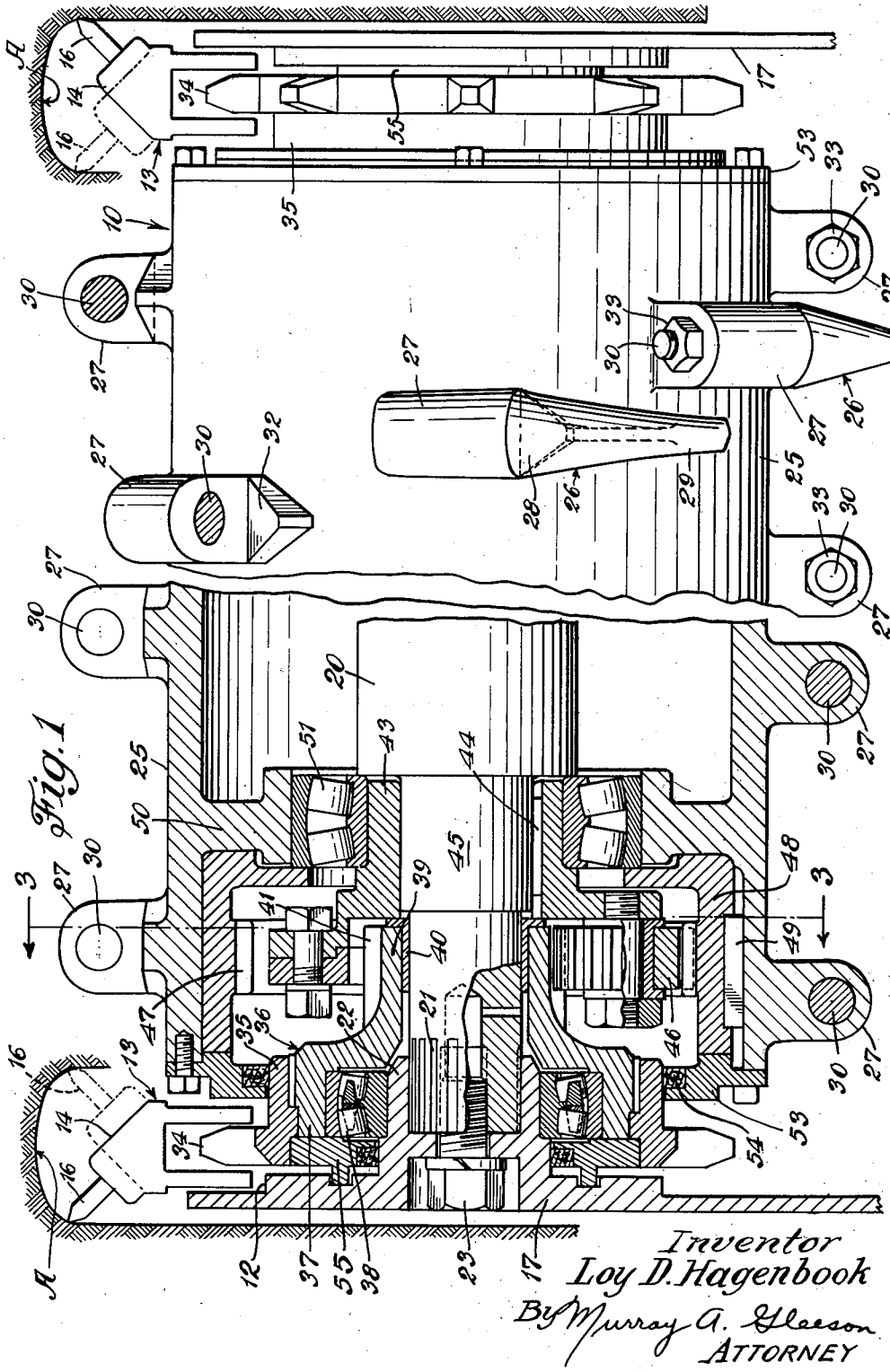


Fig. 1

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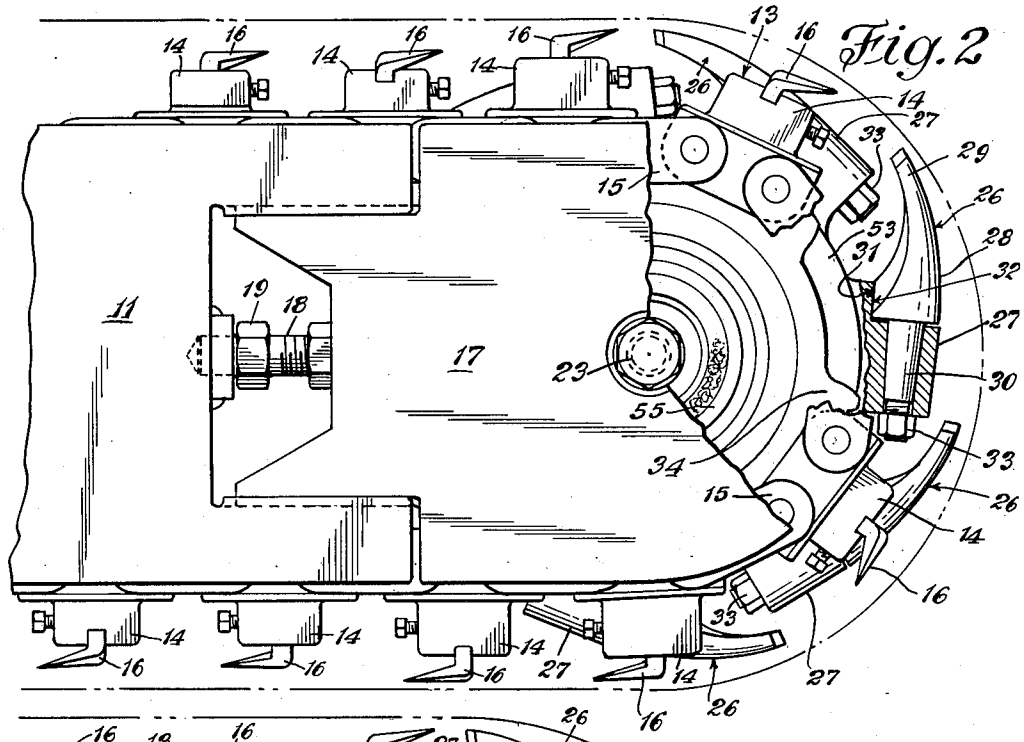


Fig. 2

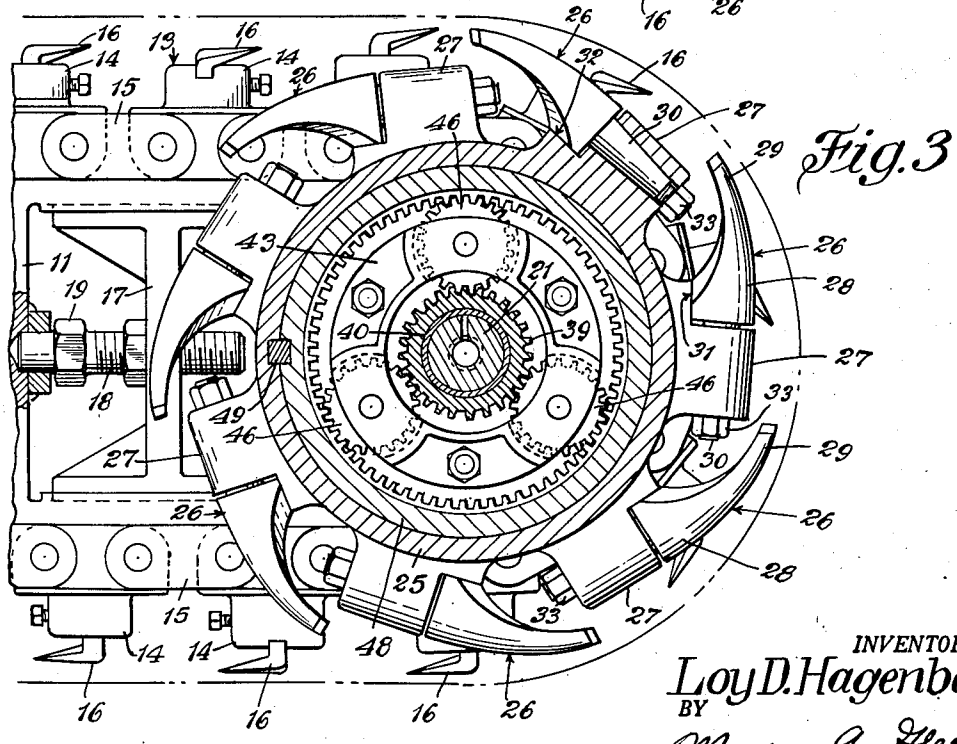


Fig. 3

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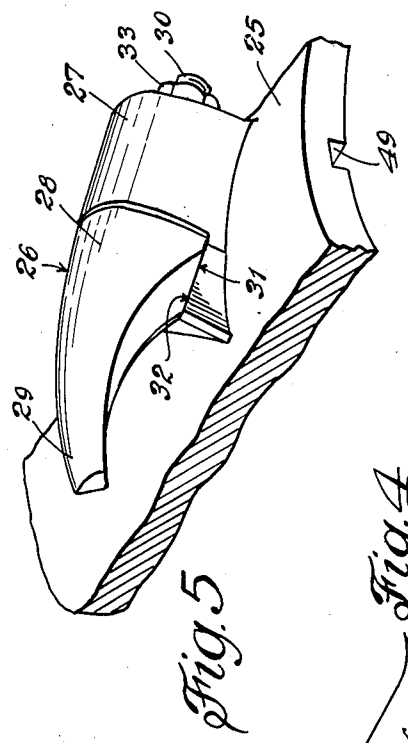


Fig. 5

Fig. 4

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Patented Sept. 30, 1952

2,612,361

UNITED STATES PATENT OFFICE

2,612,361

MINING MACHINE

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Application March 16, 1951, Serial No. 216,066

6 Claims. (Cl. 262—9)

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This invention relates to improvements in cutting heads for mining machines and, more particularly, to drum-type cutting heads especially adapted for coal cutting machines of the continuous cutter type, wherein the coal is removed from the solid face without previous blasting.

The principal object of the invention is to provide a drum-type cutting head having a bit-carrying drum with cutter chains at its opposite ends, and with gear means for driving the drum from said cutter chains at a lesser speed than the cutter chains so as to remove the coal from the working face in larger lumps.

A further object of the invention is to provide means for rotating the bit-carrying drum in an opposite direction to that of the cutter chains so as to tend to neutralize the torque imposed upon the main frame of the cutting machine from the cutter head, due to the reaction of the coal against the cutter bits.

Other objects and advantages of the present invention will appear from time to time as the following description proceeds.

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

Figure 1 is a fragmentary top plan view of the front end of a drum-type cutter head constructed in accordance with my invention, with parts broken away and with one end of the drum shown in horizontal section;

Figure 2 is a side view of the cutter head shown in Figure 1, drawn to a smaller scale and showing part of the side plate broken away and with parts of the drum shown in section;

Figure 3 is a detailed section taken on line 3—3 of Figure 1, but drawn to the same scale as Figure 2;

Figure 4 is an expanded composite view in perspective of the parts of the planetary gearing at one end of the drum;

Figure 5 is a fragmentary perspective view of one of the bits or picks carried on the drum.

The cutter head of the present invention is of the drum type particularly adapted for use in continuous mining machines of the kind illustrated in the copending application of Lindgren and Lundquist bearing Serial Number 186,326. Cutter heads of the general type referred to are usually mounted for vertical swinging movement at the front end of a continuous cutter mining machine, with the drum disposed on a horizontal axis. It will be understood, as the following description proceeds however, that the cutter head of the present invention is not necessarily limited for use on machines in which the cutter head is mounted for vertical swinging movement but that the principal features of the invention may also be applied to a cutter head which is advanced or sumped forwardly while held against swinging movement, or with its axis disposed either horizontally or vertically.

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Referring now to details of the form of cutter head indicated generally at 10 in the drawings, said head is carried on a pair of spaced parallel side bars 11, 11 which extend to a suitable support or base of a mining machine (not shown), such as that shown in the copending application of Lindgren and Lundquist hereinabove referred to. The side bars 11, 11 include chain guides 12, 12 along their upper and lower edges for receiving endless cutter chains 13, 13 which may be of conventional form including a plurality of cutter blocks 14, 14 and connecting links 15, 15. Cutter bits 16, 16 are mounted in the cutter blocks 14, 14 and extend at varying angles thereto, as usual, to cut relatively wide kerfs along opposite sides of the cutter head, as indicated in Figure 1.

The side bars 11 have telescopically adjustable end plates 17 at their forward ends extensible longitudinally of the side bars as by bolts 18, 18 and nuts 19, 19 to vary the tension on the cutter chains, as usual. The adjustable end plates 17 provide bearing support for a cross shaft 20 having reduced splined end portions 21, 21 fitting in bosses 22 projecting inwardly from the inner sides of said end plates. The splined end portions 21, 21 of said transverse shaft are held in place by bolts 23 countersunk in and passing through the outer faces of the end plates 17.

A rotatable bit-carrying member, indicated generally at 25, is rotatably mounted on the cross shaft 20. Said member consists of a hollow drum having a plurality of cutter bits or picks 26 on bit supports 27 mounted in staggered relation to each other and formed integrally with and projecting from the surface of the drum. In the preferred form shown, the bits 26, 26 each consists of a pick-like body including a base 28 and a tapering, curved, pick-like end portion 29. The base 28 of each bit has a tapered shank 30 seated in and passing through its bit support 27 in a direction substantially tangential to the drum, as shown in Figures 2 and 3. Each base also has a flattened under surface 31 adapted for seating engagement on a forward projection 32 of the bit support 27 to hold the bit against twisting movement in said support.

The bit shanks 30 are held in place by bolts 33 threaded on the rear end of its shank and engag-

ing the rear face of its bit support 27. All the arcuate bits 26 project in the same direction generally tangential to, but at a slight outwardly projecting angle to, the surface of the drum, so as to present, in effect, a series of picks in staggered spaced relation for successively engaging the coal face as the drum is rotated in the direction in which the picks project.

As will be seen from Figures 2 and 3, the pick point bits 26 carried on the drum are arranged to be rotated in a direction opposite to the path of movement of the cutter bits 16, 16 on the cutter chains 13, 13. Thus, as seen in these figures, the bits 26 on the drum 25 rotate in a counterclockwise direction whereas the cutter chains 13, 13 with their cutter bits 16 are orbitally movable in a clockwise direction around the forward end of the cutter head. The means for effecting this reversed rotation of the cutter chains 13 and the drum 25 may now be described as follows:

Each of the cutter chains 13 passes around a chain sprocket 34 having a hub 35. The hub 35 is splined along its inner end on an annular sleeve 36 having a recessed outer end portion 37 rotatably mounted on the boss 22 of the adjacent end plate 17 by an anti-friction bearing 38. The sleeve 36 also has an integral drive pinion 29 of reduced diameter separated from the cross shaft 20 by a bushing 40 and having gear teeth 41 thereon. A spider 43 is keyed as at 44 on an intermediate portion 45 of the cross shaft 20 and has a plurality of gears 46, 46 rotatably mounted thereon in meshing engagement on their outer peripheries with teeth 47 formed around the interior of a sleeve 48. The latter sleeve is keyed as at 49 to the interior of the drum 25 adjacent its outer end.

The drum 25 has suitable bearing support on the cross shaft 20, in the form shown said drum being provided with a plurality of inwardly extending annular ribs 50 supported by anti-friction roller bearings 51 on the hub of the spider 43.

The ends of the drum 25 are closed by annular end plates 53 having sealing rings 54 on their inner peripheries engaging the hubs 35 of the drive chain sprockets 34. The anti-friction bearings 38 in sleeves 36 are closed by a sealing ring 55 mounted for rotation within the sprockets 34 and abutting the end faces of the sleeves 36.

The use and operation of the cutter head is as follows:

The cutter chains 13, 13 are driven in unison by power from any suitable drive connections on the mining machine (not shown) so as to pass about their drive sprockets 34 in a clockwise direction shown in Figure 2. As will be seen in Figure 1, said cutter chains with their bits 16, 16 project forwardly beyond the cylindrical surface of the drum 25 at opposite ends of the latter so as to cut well-defined kerfs, as indicated at A in Figure 1, when the cutter head is moved into cutting engagement against the working face. The chain sprockets 34 are driven in unison by the cutter chains to rotate the drive pinions 39. The gears 46 in spider 43 act as reach gears to transmit power to the sleeves 48 which are keyed to the drum, so as to rotate the drum in a direction opposite to the direction of rotation of the chain sprockets 34. Due to the difference in pitch diameter of the drive pinions 39 and the internal gear teeth 47 of sleeves 48, the drum will be driven at a lesser peripheral speed than that of the chain sprockets 34 and the cutter chains 13 carried thereby.

As a result of this reversal of rotation of the drum and the reduction in speed of the latter with respect to the cutter chains, the pick points or bits 26 carried on the drum will attack the coal at a reduced speed as compared to the normal cutting action of the cutter bits 16 on the cutter chains, so as to tend to dislodge the coal in considerably larger lumps than in previous drum-type cutter heads, where cutter bits are mounted on the drum and move at substantially the same peripheral speed as the cutter chains.

It will further be understood that the arrangement, whereby the drum and its bits rotate in reverse direction to that of the cutter chains, tends to minimize the torque effective upon the cutter head as a whole due to the reaction of the coal as it is engaged by the cutter bits. With the arrangement of the present invention, the reaction on the cutting bits of the cutter chain and the reaction on the cutting bits of the drum tend to balance each other so as to stabilize the cutter head as a whole and reduce to a large degree the torque transmitted to the main frame of the machine while it is in operation.

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 cutter head for mining machines, a pair of spaced side bars having power-driven cutter chains guided for orbital movement thereabout, a rotatable bit-carrying member disposed transversely between the forward ends of said side bars, and gearing operatively connecting the chains with the rotatable member for driving the latter in reverse direction to said cutter chains.

2. A cutter head in accordance with claim 1, wherein the gearing operatively connecting the chains with the rotatable member also drives the member at a less peripheral speed than that of the cutter chains as they pass about the opposite ends of said member.

3. A cutter head in accordance with claim 1, wherein the gearing for driving the rotatable member includes chain sprockets rotatably supported by said side frames concentrically with the rotatable member, and with cutter bits on said cutter chains projecting radially beyond the cutter bits on said rotatable member.

4. A cutter head in accordance with claim 2, wherein the gearing for driving the rotatable member includes a chain sprocket rotatably supported on the side frames, a pinion driven by said sprocket, a reach gear supported eccentrically of said pinion and driven thereby, and an internal gear fixed to said rotatable member and driven by said reach gear.

5. A cutter head in accordance with claim 4, wherein the rotatable member consists of a hollow drum, and the pinion, reach gear and internal gear are disposed within said drum.

6. A cutter head in accordance with claim 5, wherein the side frames are rigidly connected by a tie rod passing through the rotatable member, and the chain sprockets, pinion, reach gear support and drum are supported on said tie rod.

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No references cited.