Nov. 5, 1963 E. J. HLINSKY 3,109,636

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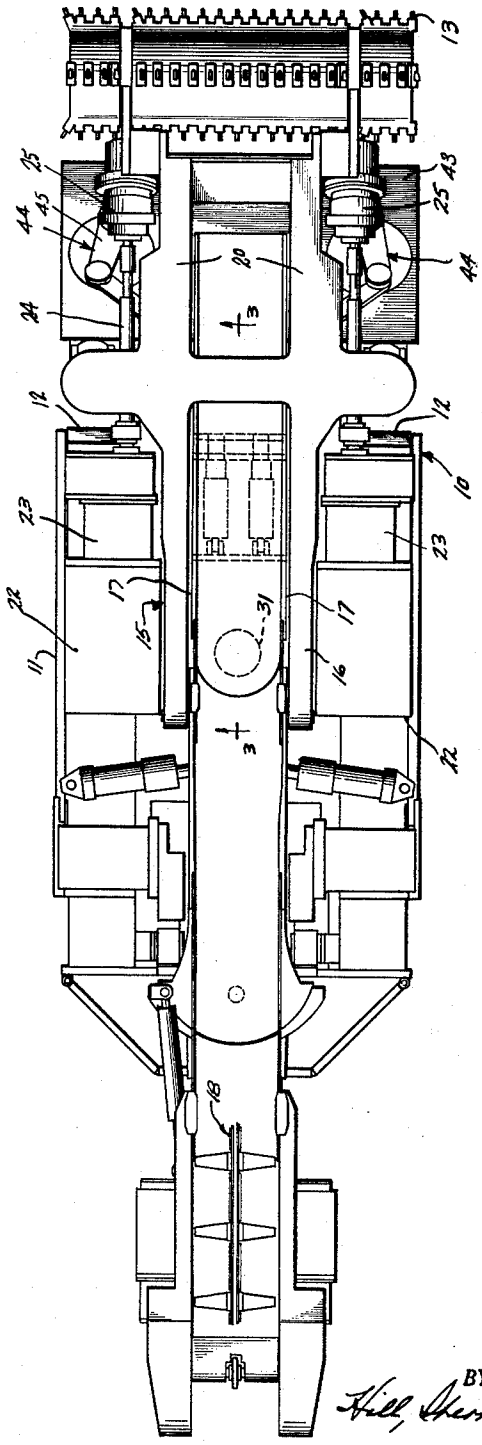


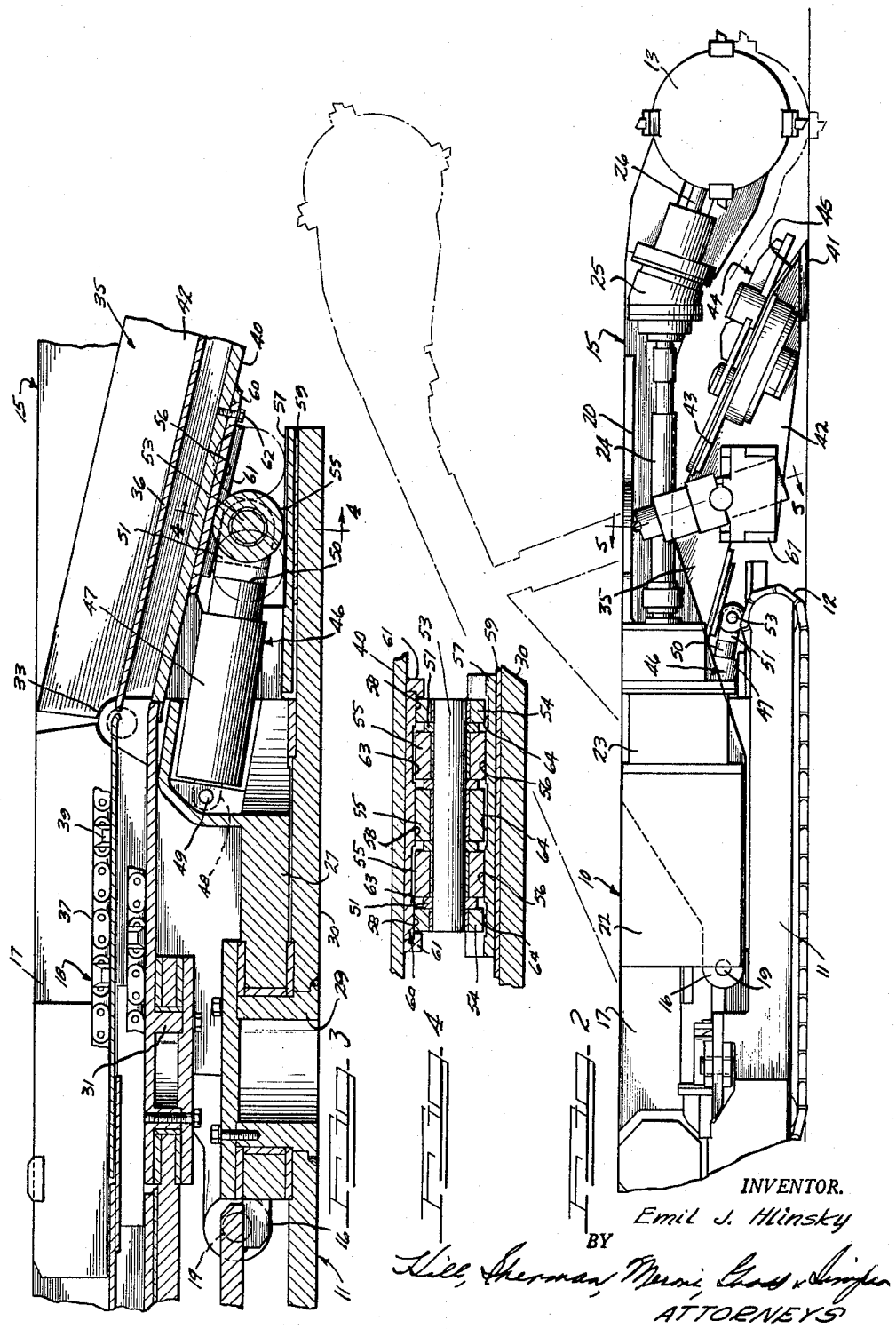
Fig. 1

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FIG. 5

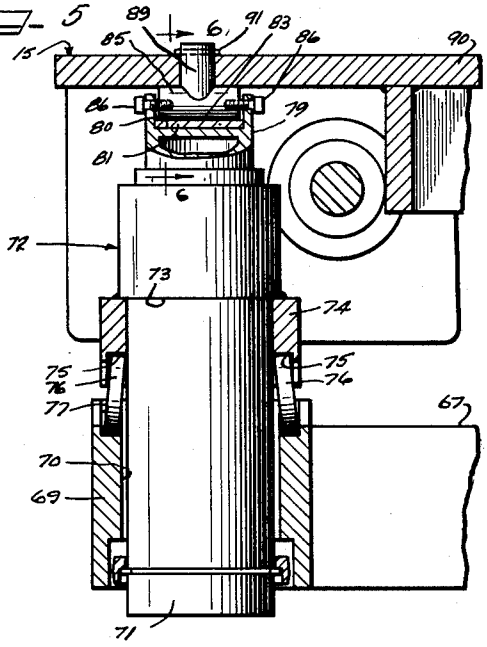
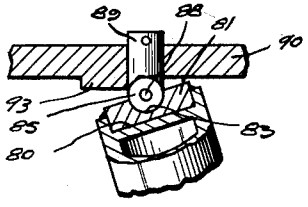


FIG. 6



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3 Claims. (Cl. 262—26)

This invention relates to improvements in mining machines of the continuous mining and loading type and more particularly relates to an improved form of ripper type miner.

In continuous mining machines of the ripper type, a rotary mining head is supported a substantial distance in advance of the main frame of the machine and extends transversely of the main frame of the machine. A boom arm forms a support and feeding means for the mining head and is pivoted to the main frame of the machine for movement about a horizontal axis extending transversely of the machine, supporting the mining head for sumping by bodily movement of the machine along the ground and feeding the mining head vertically to effect a mining operation. The boom arm is usually moved vertically by hydraulic jacks at the opposite sides of the boom arm and connected between the front end portion of the main frame of the machine and the boom arm.

With such an arrangement of mining head, boom arm and feeding means for the boom arm and mining head, the thrust reactions in cutting are taken on the front end portion of the main frame of the machine, tending to tilt the entire main frame about its front end.

A principal object of the present invention is to cure the foregoing difficulties and stabilize the main frame of the machine by transferring the cutting reactions on the mining head and boom arm from the main frame of the machine to the ground, a substantial distance in advance of the main frame of the machine.

A further object of the invention is to provide an improved form of continuous mining machine of the ripper type in which a rotary mining head is disposed in advance of the main frame of the machine and extends transversely of the main frame of the machine, and a boom arm, transversely pivoted to the main frame of the machine, is provided to support the rotary mining head and feed the rotary mining head vertically, wherein the vertical feeding means for the rotary mining head comprises a hydraulic jack pivotally connected to the boom arm intermediate its ends and transferring the cutting reactions to the ground in advance of the front end of the machine.

A still further object of the invention is to provide an improved form of continuous mining machine of the ripper type having an inclined elevating conveyor tiltable up and down about a transverse axis disposed adjacent the forward end portion of the main frame of the machine and supported on the ground in advance of the forward end of the main frame of the machine on a shoe, and by connecting hydraulic jacks between the shoe and a boom arm supporting the mining head of the machine for vertically feeding the boom arm and mining head and transferring thrusts to the support shoe for the conveyor in advance of the main frame of the machine.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

FIGURE 1 is a top plan view of a continuous mining machine constructed in accordance with the principles of the invention, with certain parts broken away;

FIGURE 2 is a view in side elevation of the front end portion of the machine shown in FIGURE 1;

FIGURE 3 is an enlarged partial fragmentary longitudinal sectional view taken substantially along line 3—3 of FIGURE 1 and illustrating the means for elevating the front end portion of the elevating conveyor of the machine;

FIGURE 4 is a fragmentary sectional view taken substantially along line 4—4 of FIGURE 3, illustrating certain details of the elevating mechanism not shown in FIGURE 3;

FIGURE 5 is a fragmentary transverse sectional view taken substantially along line 5—5 of FIGURE 2;

FIGURE 6 is a fragmentary longitudinal sectional view taken substantially along line 6—6 of FIGURE 5.

In the embodiment of the invention illustrated in the drawings, a continuous mining machine 10 of the ripper type is shown as including a main frame 11 mounted on laterally spaced continuous traction devices 12, for propelling the machine along the ground from working place to working place and sumping a mining head in the form of a rotary cutter drum 13 into the working face of a mine, to thereafter be fed vertically along the working face to effect a mining and loading operation of the working place.

The cutter drum 13 is rotatably supported a substantial distance in advance of the main frame on a boom arm 15 transversely pivoted to said main frame. The boom arm 15 has a bifurcated rear end arm structure 16 extending along opposite side walls 17 of a conveyor 18, and pivotally connected to the main frame on transversely extending pivot pins 19 suitably mounted on a laterally swingable frame structure 27. The boom arm 15 also has parallel spaced forwardly extending arm portions 20 forming bearing supports for the cutter drum 13 in a conventional manner, which is no part of the present invention so need not herein be shown or described further.

The furcations of the bifurcated portion 16 of the boom arm 15 have motors 22 extending along the outer sides thereof having speed reducer housings 23 extending forwardly of the ends of the casings for said motors, and containing suitable reduction gearing therein (not shown) driving drive shafts 24. The drive shafts 24 have driving connections with the cutter drum 13 through an angle drive (not shown) contained within a housing indicated generally by reference character 25, and a shaft 26 driven by the angle drive within said housing. The shaft 26 extends forwardly of the housing 25 and has drive connection with the cutter drum 13 for rotatably driving said cutter drum to mine upwardly from the floor of the mine.

The laterally swingable frame structure 27 is pivotally mounted on a sleeve 29 mounted in and extending upwardly from a base plate 30 of the main frame 11. The vertical axis of the sleeve 29 is also coaxial with a pivot 31, forming a vertical pivot for the conveyor 18. The swingable frame 27 has laterally spaced vertically extending ears 33 extending upwardly of its forward end portion and forming a pivotal support for a vertically movable inclined elevating frame section 35 of the conveyor 18. The inclined elevating frame section of the conveyor 18 has a material carrying plate 36 along which a center strand chain 37 and flights 39 move, to carry the mined material from in advance of the main frame 11 adjacent the ground along said main frame, and beyond the rear end thereof.

The frame section 35 also has a bottom plate 40 supporting the return run of the chain 37. Side plates 42 extend along opposite sides of the bottom plate 40 and material carrying plate 36 and are connected together at their forward end portions by a ground engaging shoe 41, supporting the trough section 35 on the ground for movement therealong.

An inclined apron 43 extends across the front of the

inclined elevating frame section 35 and upwardly along opposite sides thereof (FIGURE 1). The apron 43 forms a support for conventional gathering devices 44 at opposite sides of the receiving end of the conveyor 18, for picking up the mined material and loading the material onto said conveyor. The ground engaging shoe 41 extends for the width of the apron 43 and is connected with the lower forward end portion thereof at its forward end. The gathering devices 44 include orbitally travelling gathering arms 45 moving to positions along the ground in advance of the apron 43 and then inwardly and backwardly toward the conveyor for gathering the material onto the conveyor in a manner well known to those skilled in the art and no part of the present invention so not herein shown or described further.

A hydraulic jack 46 is provided to raise the inclined elevating section 35 above the ground to accommodate tramming of the machine from working place to working place. As shown in FIGURES 2 and 3, the hydraulic jack 46 includes a cylinder 47 having an ear 48 extending from its head end and pivotally connected to the swingable frame 27 on a transverse pivot pin 49. The cylinder 47 has a piston rod 50 extensible from its piston rod end toward the forward end of the main frame 11. The piston rod 50 has a yoke 51 at its forward end forming a support for a transverse shaft 53. The transverse pivot pin 53, as shown in FIGURE 4, has two rollers 54 journalled on the outer ends thereof on the outside of the yoke 51 and a plurality of rollers 55 journalled thereon inside of the rollers 54. The two rollers 55 inwardly of the rollers 54 ride along ribs or ridges 56 extending along a forwardly extending bottom plate 57 of the swingable frame 27. The bottom plate 57 is mounted for movement with the swingable frame 27 transversely of the base plate 30 about the axis of the sleeve 29 on a bearing plate 59, interposed between the bottom of said bottom plate and the top surface of the base plate 30. The rollers 54 on the opposite ends of the shaft 53 and the extreme inner roller 55 ride along parallel ridges 58 extending longitudinally along a plate 60. The plate 60 extends along the undersurface of the bottom plate 40 and is retained thereto by gibs 61 extending along opposite sides of the plate 60 and along the opposite edges thereof. Machine screws 62 are provided to hold the plate 60 in position along the gibs 61. The plate 60 has recessed portions 63 extending therealong and registering with the outer rollers 55 to clear said rollers. In a like manner, the plate 57 has recessed portions 64 extending therealong and registering with outer rollers 54 and the inner roller 55, to clear said rollers.

The admission of fluid under pressure to the head end of the cylinder 47 will thus move the two rollers 55 inwardly of the rollers 54 along the ridges 56 and will also move the outer rollers 54 and the extreme inner roller 55 along the ridge 58 and elevate the front inclined elevating section 35 of the conveyor and thereby raise the shoe 41 off the ground in an obvious manner. Upon the admission of fluid under pressure in the piston rod end of the cylinder 50, the rollers 54 and 55 will be moved inwardly along the plates 57 and 60 to accommodate the shoe 41 to come into engagement with the ground by gravity.

Referring now in particular to the means for raising the boom arm 15 about the coaxial axes of the pivot pins 19, from the floor to roof of the working place, to feed the cutter drum 13 upwardly to effect a mining operation of the working face, the side plates 42 of the inclined elevating section 35 of the conveyor 18 have a cross beam 67 extending across the bottoms thereof intermediate the ends thereof and suitably secured to said side plates (FIGURES 2 and 5). The cross beam 67 has support housings 69 secured thereto and extending forwardly thereof along the outer sides of the side plates 42 for a portion of the length thereof and suitably secured thereto. The support housings 69 each having a central open

portion 70 (FIGURE 5) for receiving a cylinder 71 of a hydraulic jack 72.

Each cylinder 71 is shown as having a stepped outer wall in which a shoulder 73 is formed at the junction of the smaller diameter portion of the cylinder wall to the larger diameter portion thereof. The shoulder 73 faces the support housing 69 and is abutted by a sleeve 74 welded or otherwise secured to the outer cylinder wall. The sleeve 74 has diametrically opposed downwardly facing arcuate recessed portions 75 formed therein, adapted to be engaged by the peripheral faces of disks 76, supporting the sleeve 74 and jacks 72 in the support housing 69. The faces of the disks 76 are generally spherical and are supported in upwardly facing recessed portions 77 formed in the support housing 69 at diametrically opposed sides thereof, and form pivotal supports for the jacks 72 in the support housings 69 and accommodate said jacks to pivot about axes extending transversely of the inclined elevating section 35 of the conveyor.

It will be seen from FIGURE 5 that the disks 76 are toed inwardly from their lower to their upper ends. The angles of the respective bottom and top surfaces of the arcuate recessed portions 77 and 75 conform to the faces of the disks 76 and the general angles of inclination of said disks 76 with respect to the cylinder 71 and support said disks to form in effect spherical pivotal supports for the jacks 72, to accommodate limited lateral movement of said cylinders and to allow for lateral shifting movement of the boom arm 15 with respect to the support housings 69.

Each cylinder 71 has a piston rod 79 extensible therefrom having a recessed upper end portion 80 forming a support for a bearing block 81 (FIGURES 5 and 6). The bearing block 81 has a transversely extending circumferential recess 83 formed therein, having bearing engagement with the cylindrical surface of a transverse pivot pin 85. Machine screws 86 extending through the wall of the piston rod 79 into the recessed portion 80 thereof extend within drilled end portions of the pivot pin 85, to retain said pivot pin into arcuate bearing engagement with the circumferential recessed portion 83 of the bearing block 81. The transverse pin 85 is shown in FIGURES 5 and 6 as having a retainer pin 89 extending upwardly therefrom intermediate the ends thereof, through a plate 90 of the boom arm 15 and as being retained thereto, as by a cotter key 91. An abutment plate 93 is welded or otherwise secured to the undersurface of the plate 90 into abutting engagement with the rear end portion of the pins 85 and 89, to form an abutment therefor and to aid in taking the stresses from the pin 89 during elevating and lowering the boom arm 15.

It may be seen from the foregoing that the cross beam 67 and supports 69, are in effect mounted on the shoe 41 forming a ground engaging support for said inclined elevating section 35 of the conveyor a substantial distance in advance of the forward end of the main frame 11. Thus, as fluid under pressure is admitted to the head ends of the cylinders 71 to elevate the boom arm 15 and cutter drum 13 about the transverse pivot pins 19, the loads of cutting, as the cutter drum 13 is fed vertically to mine out a working place, are transmitted from the boom arm 15 to the ground on the shoe 41, a substantial distance in advance of the main frame 11. The tendency for the main frame to tilt about its forward end portion is thus obviated and a more stable support for the cutter drum 13 is provided for vertically feeding the cutter drum upwardly along the working face, to mine out a portion of the working face of the width of said cutter drum.

While one form in which the invention may be embodied is herein shown and described, it should be understood that various modifications and variations in the invention may be attained without departing from the spirit and scope of the novel concepts thereof as defined by the claims appended hereto.

I claim as my invention:

1. In a continuous mining machine, a main frame, laterally spaced traction devices supporting said main frame on the ground and propelling said main frame along the ground, a boom arm transversely pivoted to said main frame adjacent the rear end portion of said traction devices and extending a substantial distance in advance of said main frame, a support frame mounted on said main frame for movement about a vertical axis intermediate the ends of said main frame and forming a transverse pivotal support for said boom arm, means moving said support frame and boom arm about said vertical axis, a rotary mining head extending transversely of said main frame and journalled on said boom arm adjacent the forward end thereof, a conveyor extending along said main frame and having an inclined forward end portion pivotally mounted on said laterally swingable support frame, for vertical movement with respect thereto about a transverse axis, a ground engaging shoe at the forward end of said conveyor supporting the forward end portion of said conveyor on the ground, gathering devices on opposite sides of the inclined forward end portion of said conveyor for gathering the mined material and progressing it onto said conveyor, hydraulic jack means extending along opposite sides of said inclined elevating portion of said conveyor and pivotally connected between said shoe and boom arm and transmitting the stresses of mining from said boom arm to said shoe during elevation of said boom arm and mining head to mine a working place from the floor to the roof of a mine.

2. In a continuous mining machine, a main frame, a boom arm transversely pivoted to said main frame and extending in advance of said main frame, a rotary mining head rotatably mounted at the forward end of said boom arm and extending transversely of said main frame, a conveyor extending along said main frame beneath said boom arm and having an inclined forward end portion pivotally mounted on said main frame for vertical movement with respect thereto about a horizontal transverse axis and extending in advance of the forward end of said main frame into engagement with the ground, a ground engaging shoe at the forward end of said conveyor, supporting the forward end portion of said conveyor on the ground, hydraulic jack means extending along opposite sides of said inclined forward end portion of said conveyor for elevating said boom

arm and feeding said mining head vertically, and mounting means for said hydraulic jack means comprising a beam extending transversely of said inclined forward end portion of said conveyor beneath the material carrying portion of the conveyor and having hollow support housings at opposite sides thereof having said hydraulic jack means extending therethrough, supporting connections between said support housing and said hydraulic jack means comprising diametrically spaced disks having generally spherical peripheries, support shoulders within said housings supporting said disks in inwardly toed relation with respect to said housings, support shoulders on said hydraulic jacks, supporting said hydraulic jacks on said disks, and pivotal connections between said hydraulic jacks and said boom arm, said disks forming universal supports for said hydraulic jacks on said support housings and accommodating limited lateral shifting movement of the boom arm during the mining operation.

3. In a vertical feeding means for the transversely pivoted booms of continuous mining machines and the like, a transverse support reacting against the ground, a hollow housing at each end of said support, a hydraulic cylinder movably mounted in each housing, pistons extensible from said cylinders and having transverse pivotal supporting connections with the boom, and means movably mounting said cylinders within said supports and accommodating lateral shifting movement of said boom during the operation of mining comprising diametrically spaced vertically extending disks supporting said cylinders on said supports and having generally spherical faces, shoulders within said housings having arcuate faces generally conforming to the faces of said disks, supporting said disks in inwardly toed relation with respect to said housings, and shoulders on said cylinders supported on said disks and having arcuate faces generally conforming to the faces of said disks.

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