Dec. 12, 1967 E. J. HLINSKY 3,357,746

THRUST REACTION SUPPORT FOR ROTARY BORING DEVICES OF CONTINUOUS MINING MACHINE

Filed Aug. 5, 1965 3 Sheets-Sheet 1

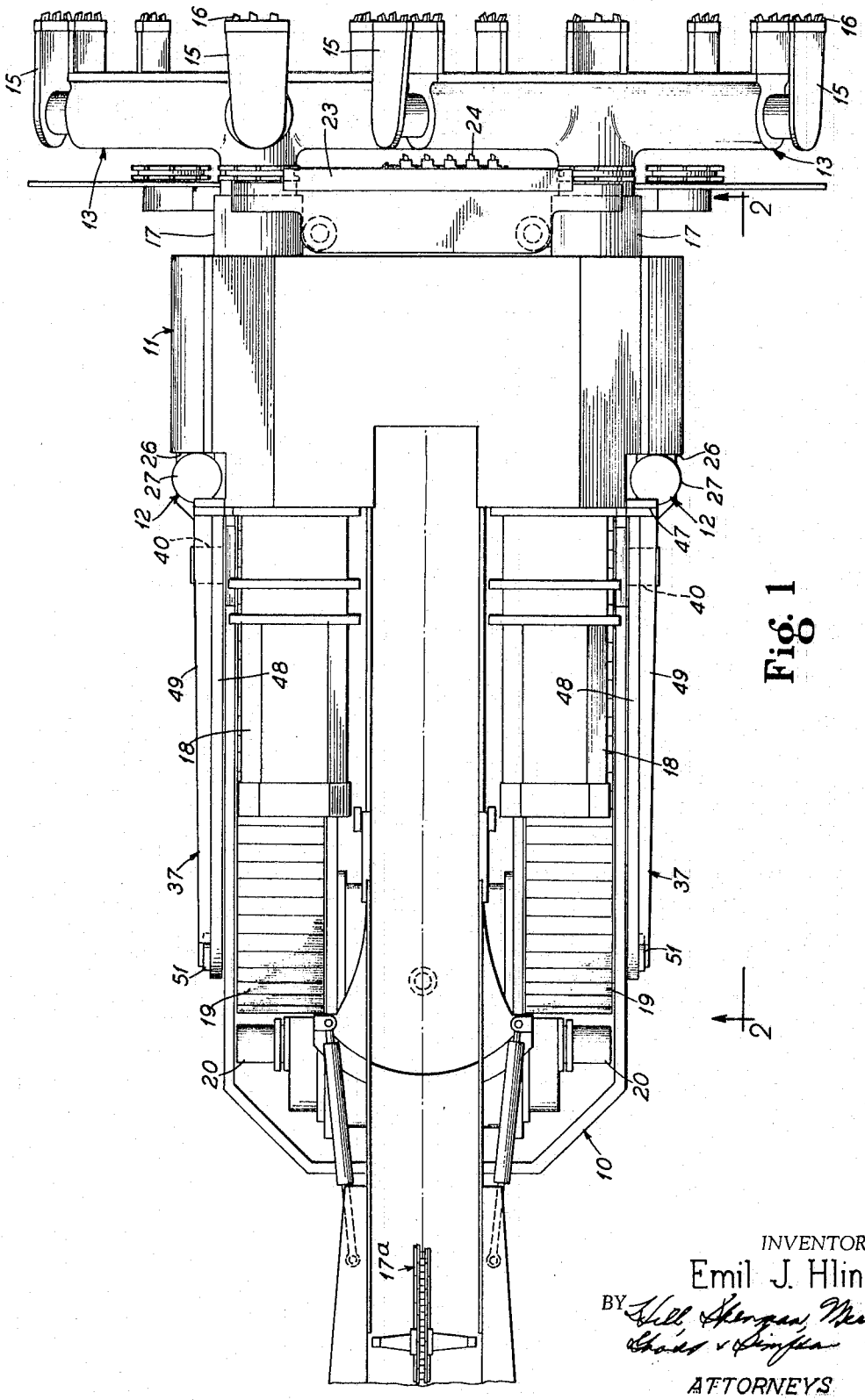


Fig. 1

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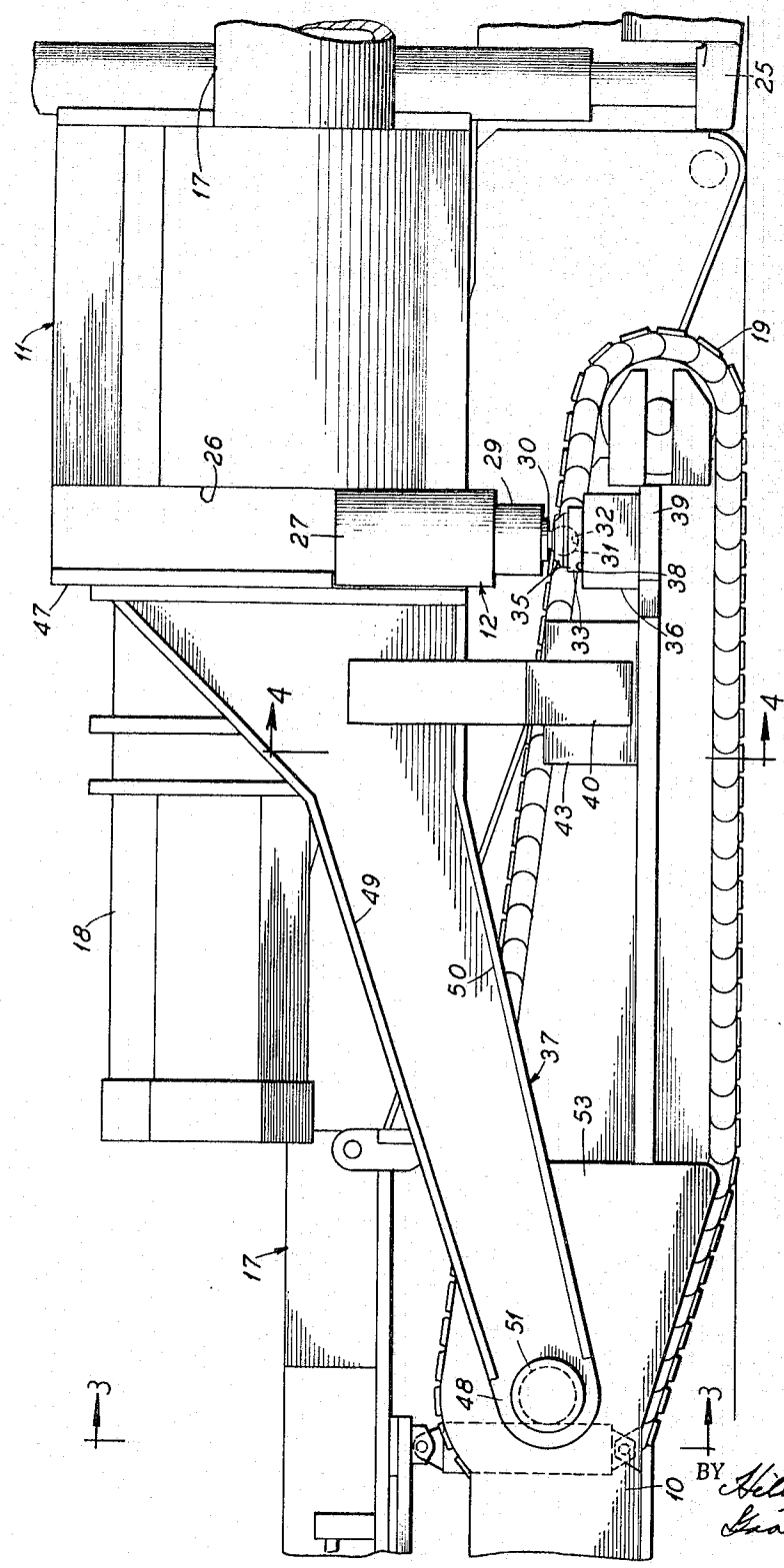


Fig. 2

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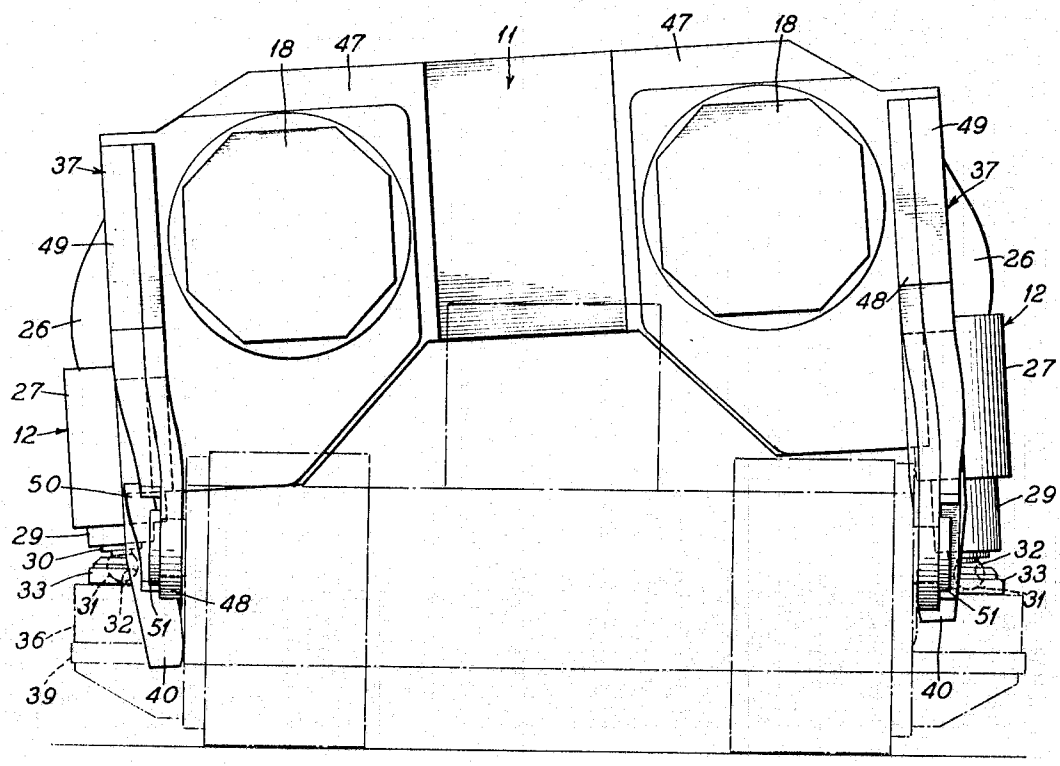


Fig. 3

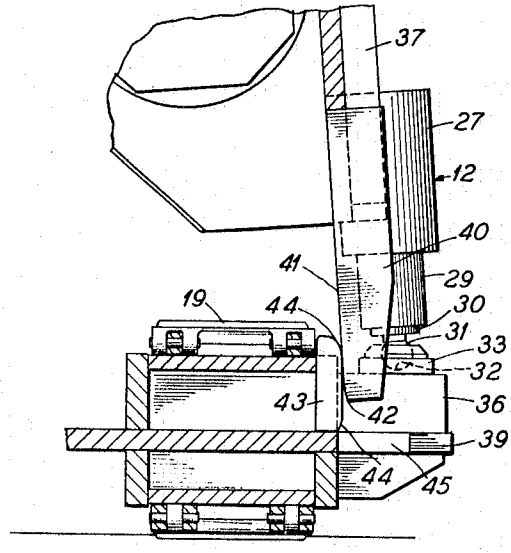


Fig. 4

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THRUST REACTION SUPPORT FOR ROTARY BORING DEVICES OF CONTINUOUS MINING MACHINE

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7 Claims. (Cl. 299—59)

ABSTRACT OF THE DISCLOSURE

Mounting for the boring assembly of a continuous mining machine in which the main supporting housing for the boring heads is supported on the main frame of the machine on laterally spaced elevating jacks having universal bearing connection with the main frame. Laterally spaced thrust reaction arms are rigidly mounted at the back of the main supporting housing and extend rearwardly of said housing and are transversely pivoted to the main frame adjacent the rear end portion of the main frame for movement about coaxial transverse axes. The thrust reaction arms have sufficient compressive stability to transfer the thrust reactions of mining from the cutter frame structure to the rear end portion of the main frame. These arms also have sufficient torsional instability to twist upon angular adjustment of the main supporting housing about an axis extending longitudinally of the main frame, by operation of the elevating jacks.

Summary of invention and objects

This invention relates to improvements in thrust reaction mountings for the rotary boring devices of continuous mining machines.

A principal object of the present invention is a provide an improved support for the superstructure carrying the rotary boring assembly of a continuous mining machine arranged with a view toward simplicity in construction and operation and having sufficient ruggedness to transfer the thrusts of boring to the rear end of the machine.

A further object of the invention is to provide an improved mounting for the boring assembly of a continuous mining machine in which the support and adjustment of the boring assembly is materially simplified and ruggedness of the support is attained by providing direct pivotal controlling connections for the superstructure carrying the cutting assembly, transversely pivoted at the rear end of the main frame of the machine and sufficiently flexible to accommodate tilting of the superstructure about an axis extending longitudinally of the machine.

A still further object of the invention is to provide a simplified and improved form of continuous mining machine having a plurality of rotary boring heads supported on a superstructure adjustably movable relative to the main frame of the machine, and supported on the main frame at its front end by independently operable jacks, in which adjustments of the superstructure is controlled by thrust reaction arms extending from the superstructure towards the rear end of the machine and transversely pivoted thereto, in which the arms have sufficient compressive stability to transfer the thrusts of mining to the rear end of the machine and have sufficient torsional flexibility to twist upon adjustment of the superstructure about an axis extending longitudinally of the machine.

Still another object of the invention is to improve upon the thrust reaction supports of boring head types of continuous mining machine, by supporting the superstructure carrying the rotary boring heads at the front of the main frame of the machine on elevating and tilting jacks supported on the main frame of the machine for

slidable movement with respect thereto, and by stabilizing the superstructure by side loading means retaining the superstructure from lateral movement with respect to the machine, and by controlling elevating and tilting of the superstructure by thrust reaction arms extending from the superstructure toward the rear end of the machine and having direct pivotal connection with the main frame of the machine, in which the thrust reaction arms have sufficient rigidity to transfer the reactions of mining to the rear end of the main frame of the machine and still have sufficient torsional instability to accommodate adjustment of the superstructure about an axis extending longitudinally of the machine, to conform the boring heads to a sloping mine floor.

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 present invention, with the conveyor of the machine broken away;

FIGURE 2 is a fragmentary view in side elevation of the front end portion of the machine shown in FIGURE 1, with the boring heads broken away;

FIGURE 3 is a fragmentary rear end view of the machine, looking substantially along line 3–3 of FIGURE 2, with certain parts of the machine removed; and

FIGURE 4 is a fragmentary transverse sectional view taken substantially along line 4—4 of FIGURE 2.

In the embodiment of the invention illustrated in the drawings, I have shown in FIGURE 1 a continuous mining machine of the boring type having a mobile base or main frame **10**. A superstructure or cutter frame structure **11** is supported on and extends in advance of the main frame **10** and across the forward end of the main frame. The cutter frame structure **11** is vertically adjustable with respect to the main frame and angularly adjustable about an axis extending longitudinally of the main frame, by hydraulic jacks **12**, **12**, supporting said cutter frame structure at the forward end of the main frame, as will hereinafter more clearly appear as this specification proceeds.

The cutter frame structure **11** has a plurality of rotary boring heads **13** rotatably mounted on and projecting from the forward end thereof for cutting contiguous bores in the working face of a mine. The boring heads **13** are herein shown as having radially adjustable cutter supports **15** carrying the usual cutter bits **16** for making intersecting bores in a mine face and mining the face and progressing the cuttings for loading onto a conveyor **17**. As herein shown the boring heads **13** are rotatably supported on hubs **17**, **17** extending from the front face of the superstructure **11** and are driven from individual motors **18**, **18** secured to the rear face of said superstructure and extending rearwardly therefrom along opposite sides of a conveyor **17***a*. The motors **18**, **18** have geared driving connection with the boring heads **13**, **13**, to rotatably drive said boring heads in timed relation with respect to each other through conventional geared reduction trains housed within the superstructure **11**, and no part of the present invention so not herein shown or described further.

The main frame **10** is supported on laterally spaced continuous traction tread devices **19**, which serve to tram the machine from working place to working place and to feed the rotating boring heads **13**, **13** into a mine face. The continuous traction tread devices **19** may be of any well known form, driven from individual motors and speed reducers **20** in a manner well known to those skilled in the art, so not herein shown or described further.

The superstructure **11** also has an upper trimmer or cutter bar **23** extending across the forward end thereof

rearwardly of the boring heads **13** and having a trimmer chain **24** guided for movement therealong to cut out the unmined cusps depending from the mine roof between the boring heads **13**. **13**. The trimmer chain **24** is trained downwardly and angularly inwardly at opposite ends of the trimmer bar **23**, partially about the usual idler and drive sprockets (not shown) and outwardly therefrom to and along a lower trimmer bar **25** extending along the ground, and partially shown in FIGURE 2.

The elevating and tilting jacks **12**, **12** are mounted in vertically extending, rearwardly and outwardly opening recesses or notches **26** formed in the rear end portion of the superstructure **11** and extending vertically therealong. Each elevating and tilting jack includes a vertically extending cylinder **27** at the lower end portion of the recess **26** and depending from the bottom of the superstructure **11**. A piston **29** is extensible from the lower end of the cylinder **27**, upon the admission of hydraulic fluid under pressure to the head end of said cylinder. The piston **29** has a reduced diameter end portion **30** having a ball type support member **31** extending downwardly therefrom coaxial with the longitudinal axis thereof and mounted for universal movement in a socket **32** formed in a slide **33**. A cap **35** mounted on top of the slide **33** and completing the socket **32** is provided to retain the ball type support **31** to the socket **32**, and to accommodate tilting movement of the piston **29** and cylinder **27** about the slide **33** about axes extending transversely and longitudinally of the machine. The slide **33** is slidably mounted on a top surface **38** of a block **36** for lateral movement along the top surface of said block as the cutter frame structure **11** is tilted about axes extending transversely and longitudinally of the machine under the control of a pair of thrust reaction arms **37** extending rearwardly of the cutter frame structure **11** along opposite sides of the main frame **10** and transversely pivoted thereto adjacent the rear end of said main frame.

As shown in FIGURE 2 the blocks **36** are mounted on the outsides of the continuous traction tread devices **19** on laterally extending horizontal ledges **39** extending outwardly of the main frame **10** and traction tread devices **19** and between the upper and lower runs of said traction tread devices.

A pair of laterally spaced side loading posts **40**, provide lateral stability for the cutter frame structure **11**. As shown in FIGURES 2 and 4, the side loading posts **40** are each mounted on the outside of and depend vertically from a thrust reaction arm **37**. The side loading posts **40** are disposed adjacent but rearwardly of the rear end portion of superstructure **11** and have flat inner bearing faces **41** converging outwardly at their lower ends, as indicated by reference character **42** in FIGURE 4 and engaging the outer faces of bearing blocks **43** mounted on and extending upwardly of the ledge **39**. Each bearing block **43** has rounded upper and lower faces **44** accommodating tilting movement of the side loading posts **40** about said bearing blocks upon lateral tilting movement of the superstructure **11** (FIGURE 4). The ledge **39** is also provided with an opening **45**, for receiving the associated side loading post **40**, as the cutter frame structure **11** is lowered under the control of the jacks **12**.

As shown in FIGURE 2, each thrust reaction arm **37** extends rearwardly of a rear face **47** of the cutter frame structure **11**, adjacent the outer side thereof, and also extends vertically therealong for substantially the height thereof. The thrust reaction arm **37** is shown as being in the form of a plate **48** having a widened forward end portion extending vertically along the rear face **47** of the cutter frame structure **11** and having flanges **49** and **50** extending along the respective upper and lower sides thereof to provide sufficient compressive stability in the plate **48** to retain the plate from collapsing by the transfer of the cutting loads to the rear end of the main frame **10**, and to retain sufficient torsional flexibility or instability in the arm to allow the arm to twist by the torsional loads placed thereon as the superstructure **11** is tilted in one direction or another about the longitudinal axis of the machine. Pivot pins **51** are provided to pivotally mount the rear end portions of the arms **37** on a support plate structure **53**, of the main frame **10**. The support plate structure **53** is rigidly connected to the main frame **10** and extends along the outer side of an associated traction tread device **19** and forms a rugged mounting for the pivot pin **51**, retaining said pin solidly in position to transfer the thrust reactions of mining from the cutter frame structure **11** to the main frame **10**, at the rear ends of the paths of travel of the continuous traction tread devices **19**.

It may be seen from FIGURES 3 and 4, that when it is desired to tilt the superstructure **11** laterally to conform the boring heads **13** and lower trimmer bar **25** to a mine floor, one side of the cutter frame structure is elevated by its jack **12** and the opposite side of the cutter frame structure is lowered under the control of the associated jack **12**. The thrust reaction arms **37**, being pivotally mounted to the rear end portion of the main frame a substantial distance rearwardly of the jacks **12** on the rigid pivot pins **51**, have sufficient torsional instability to accommodate the lateral angular adjustment of the cutter frame structure **11** under the control of the side loading posts **40**, **40** retaining the superstructure in generally longitudinal alignment with the main frame of the machine.

The thrust reaction arms **37**, **37** and pivot pins **51**, **51** and mountings therefor, are thus sufficiently rugged to transfer the thrusts of mining from the cutter frame sturcture **11** to the rear end portion of the main frame **10** and have sufficient torsional instability or flexibility to twist along their longitudinal axes and accommodate lateral tilting adjustment of the superstructure **11** about the longitudinal axis of the machine.

While I have herein shown and described one form in which the invention may be embodied, it may be understood that various variations and modifications in the invention may be attained without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. In a continuous mining machine,

a mobile main frame,

a cutter frame structure at the front of said main frame and extending thereacross and in advance of the forward end thereof,

a boring assembly rotatably mounted at the forward end of said cutter frame srtucture and capable of cutting clearance for said main frame and cutter frame structure,

means supporting and adjusting said cutter frame structure with respect to said main frame at varying angles and elevations comprising,

two laterally spaced elevating jacks on opposite sides of said main frame,

universal bearing connection between said jacks and main frame at the front end of said main frame,

means adjacent said cutter frame structure for retaining said cutter frame structure from sidewise movement with respect to said main frame, and spaced arms rigidly mounted at the back of said cutter frame structure and extending rearwardly therefrom along opposite sides of said main frame and transversely pivoted to said main frame adjacent the rear end thereof for movement about coaxial horizontal axes,

said arms having sufficient compressive stability to transfer the thrust reactions of mining from said cutter frame structure to the rear end portion of said main frame,

and having sufficient torsional instability to accommodate angular adjustment of said cutter frame structure about an axis extending longitudinally of said main frame by operation of said elevating jacks.

2. A continuous mining machine in accordance with claim 1 wherein said elevating jacks are carried by said cutter frame structure on opposite sides thereof and depend therefrom, and wherein sliding shoes horizontally slidable along said main frame form mountings for the universal bearing connections between said jacks and main frame.

3. In a continuous mining machine,

a mobile main frame,

a cutter frame structure at the front of said main frame and extending thereacross and in advance of the forward end thereof,

a boring assembly at the forward end of said cutter frame structure capable of cutting clearance for said main frame and said cutter frame structure,

means supporting and adjusting said cutter frame structure with respect to said main frame at various angles and heights comprising two laterally spaced elevating jacks carried by said cutter frame structure at opposite sides thereof and depending therefrom,

universal bearing connections between said jacks and main frame at the front end of said main frame,

a pair of parallel spaced thrust reaction arms rigidly mounted at the rear end of said cutter frame structure at opposite sides thereof and extending rearwardly of said cutter frame structure along opposite sides of said main frame,

rigid transverse pivot means pivotally connecting said arms to said main frame at the rear end portion of said main frame,

side loading posts depending from said arms adjacent said cutter frame structure and having slidable engagement with opposite sides of said main frame, for retaining said cutter frame structure in longitudinal alignment with said main frame during an operation of mining and accommodating said cutter frame structure to be adjusted about axes extending longitudinally of said main frame,

said thrust reaction arms having sufficient compressive stability and the pivotal mountings for said arms on said main frame being sufficiently rugged to transfer the thrust reactions of mining to the rear end of said main frame, and said arms having sufficient torsional instability to twist about their longitudinal axes and thereby accommodate adjustment of said cutter frame structure angularly about an axis extending generally longitudinally of said main frame.

4. A continuous mining machine in accordance with claim 3 wherein the universal bearing connections between said jacks and main frame include sliding shoes slidably engageable with said main frame.

5. A continuous mining machine in accordance with claim 3 wherein the universal bearing connections between said jacks and main frame include sliding shoes slidably engageable with opposite sides of said main frame adjacent the forward end thereof,

and wherein the upper and lower sides of said thrust reaction arms have flanges extending therealong for substantially the length thereof accommodating twisting of said arms upon adjustable movement of said cutter frame structure about axes extending longitudinally of said main frame and retaining said arms from collapse by the compressive forces of mining thereon.

6. A continuous mining machine comprising,

a main frame,

a cutter frame structure spaced above said main frame at the front thereof and extending across and in advance of the forward end of said main frame,

a boring assembly at the forward end of said cutter frame structure and extending in advance thereof and capable of cutting clearance for said cutter frame structure and said main frame,

laterally spaced continuous traction tread devices supporting and tramming said main frame and feeding said boring assembly into a working face,

two laterally spaced elevating jacks mounted at the rear end of said cutter frame structure at opposite sides thereof and depending therefrom along the outsides of said continuous traction tread devices,

universal bearing connections between said elevating jacks and said main frame at the forward end of said main frame and outside of said continuous traction tread devices,

a pair of thrust reaction arms extending along opposite sides of the rear end portion of said cutter frame structure and rearwardly therefrom along the outsides of said continuous traction tread devices to positions adjacent the rear end of said main frame,

mounting plates mounted on said main frame and extending along the outsides of said continuous traction tread devices at the rear end portions of the paths of travel thereof,

transverse coaxial pivot pins rigidly mounted on said mounting plates and pivotally mounting said thrust reaction arms on said main frame,

a pair of side loading posts depending from said arms along the outsides thereof,

vertically extending bearing blocks mounted on said main frame and slidably engaged by said side loading posts and having rounded upper and lower end portions, accommodating angular movement of said posts about said bearing blocks,

said thrust reaction arms being in the form of plates having flanges extending along the upper and lower sides of said arms and giving said plates sufficient compressive stability to transfer the thrust reactions of mining to said main frame at the rear end thereof, and allowing said arms to have sufficient torsional instability to accommodate twisting thereof about the longitudinal axes thereof upon transverse angular adjustment of said cutter frame structure about an axis extending generally longitudinally of the machine.

7. A continuous mining machine in accordance with claim 6 wherein the universal bearing connections between said jacks and said main frame include shoes supported for limited slidable movement along the forward end of said main frame and having universal bearing sockets therein.

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