

[54] PROTECTIVE CANOPY FOR A PORTABLE
DRILLING MACHINE

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173/43, 173/219
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[58] Field of Search 173/34, 37, 43, 44, 38,
173/23; 299/11; 175/219; 61/45 D

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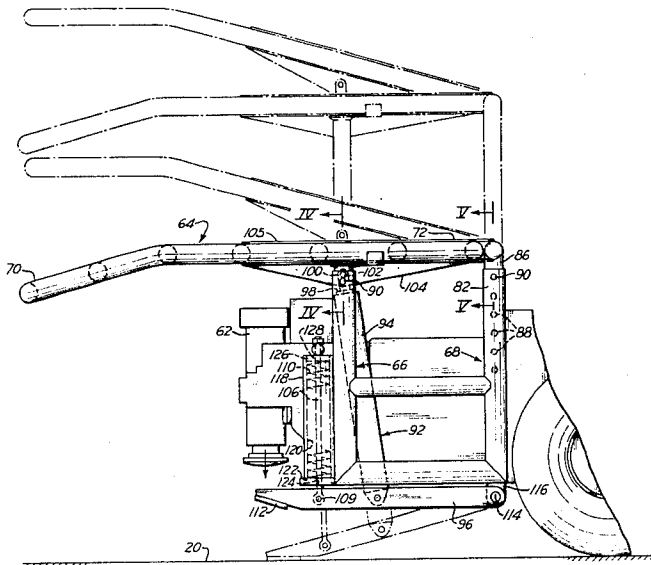
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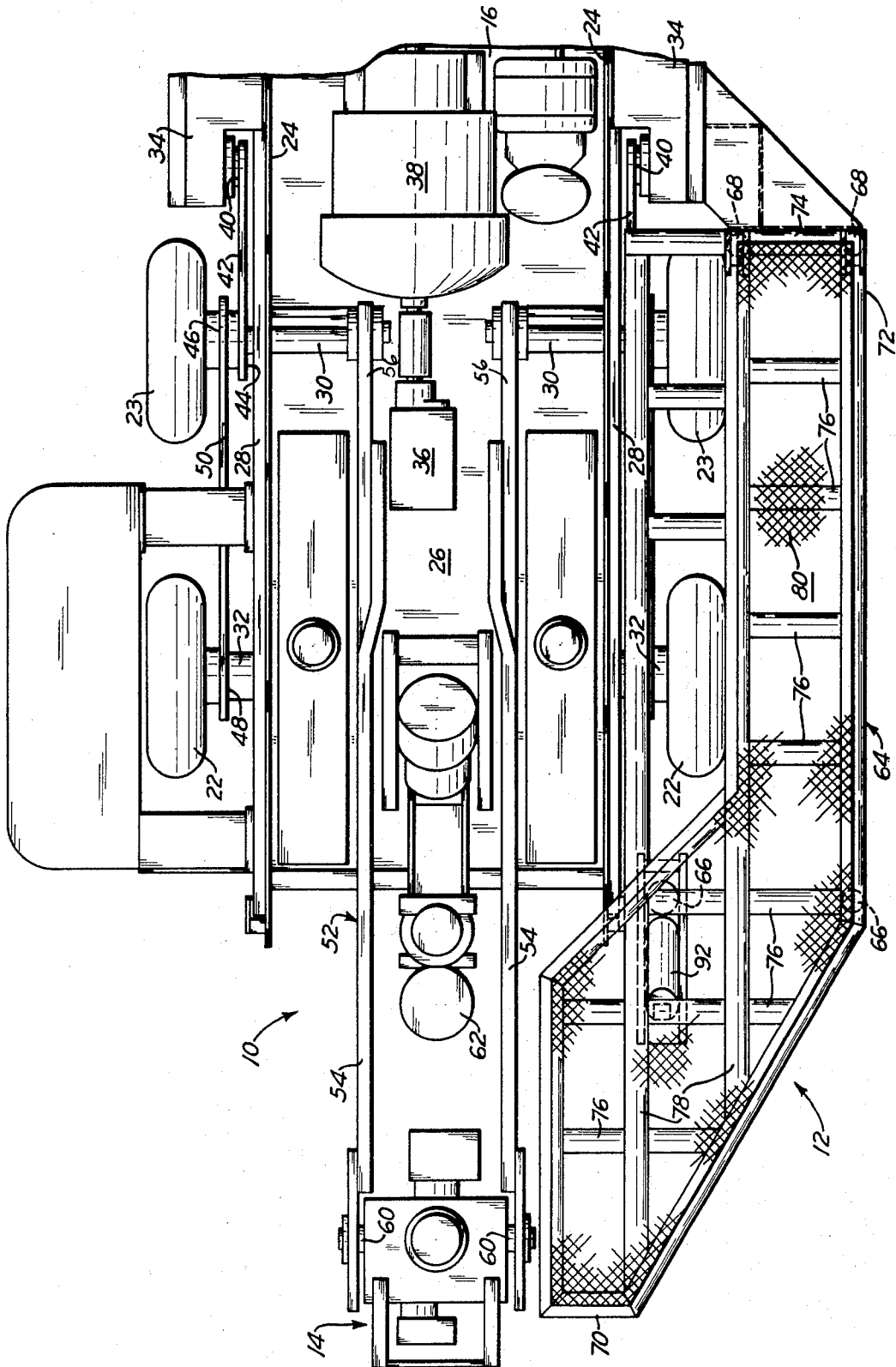
[57] ABSTRACT

A protective canopy framework having front and rear

end portions is positioned adjacent the drill boom of a portable drilling machine carried on a mobile body portion. An expanded metal screen covers substantially the entire surface area of the canopy framework. Pairs of front and rear vertical post members are secured at their lower end portions to an extension of the body portion. Elongated cylindrical members, arranged to extend outwardly from the top of each post member, support the canopy framework. The cylindrical members are operable by manual adjustment to raise the canopy framework in a vertical plane to a preselected height above the body portion and maintain the canopy framework immovable relative thereto. A hydraulic lift jack connected to a pair of arm members that are pivotally mounted to the body portion engages the mine floor and is operable upon actuation to pivot the canopy front end portion from a substantially horizontal position about the rear end portion into position adjacent the mine roof surface. In another embodiment, a pair of adjustable link plates connect the canopy rear end portion to the body portion. The link plates are arranged to selectively raise the rear end portion in a vertical plane above the body portion. The protective canopy framework positioned adjacent the mine roof surface protects the drill operator from the hazard of falling rock material and collapse of the mine roof during the drilling operations.

14 Claims, 10 Drawing Figures





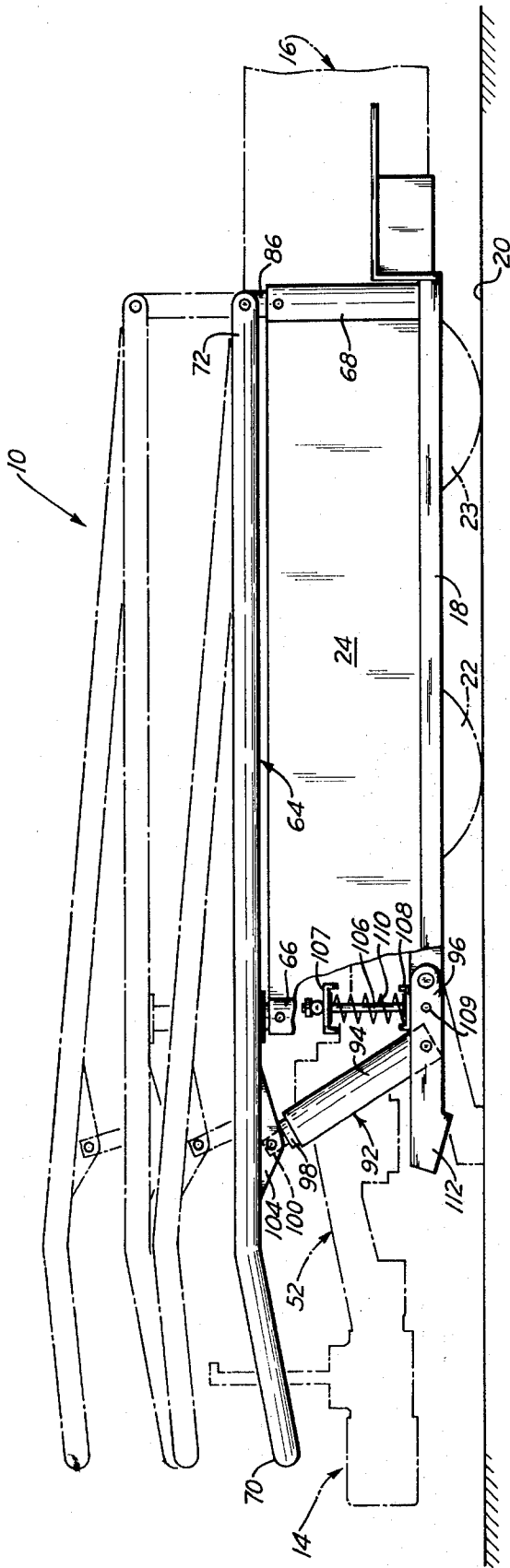


Fig. 2

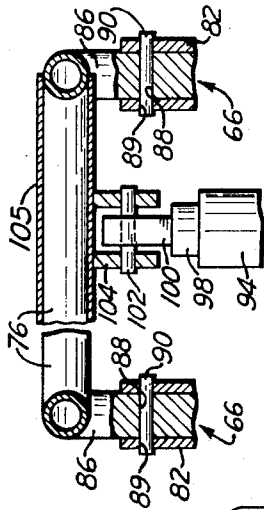


Fig. 4

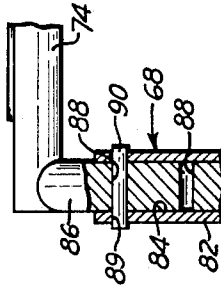


Fig. 5

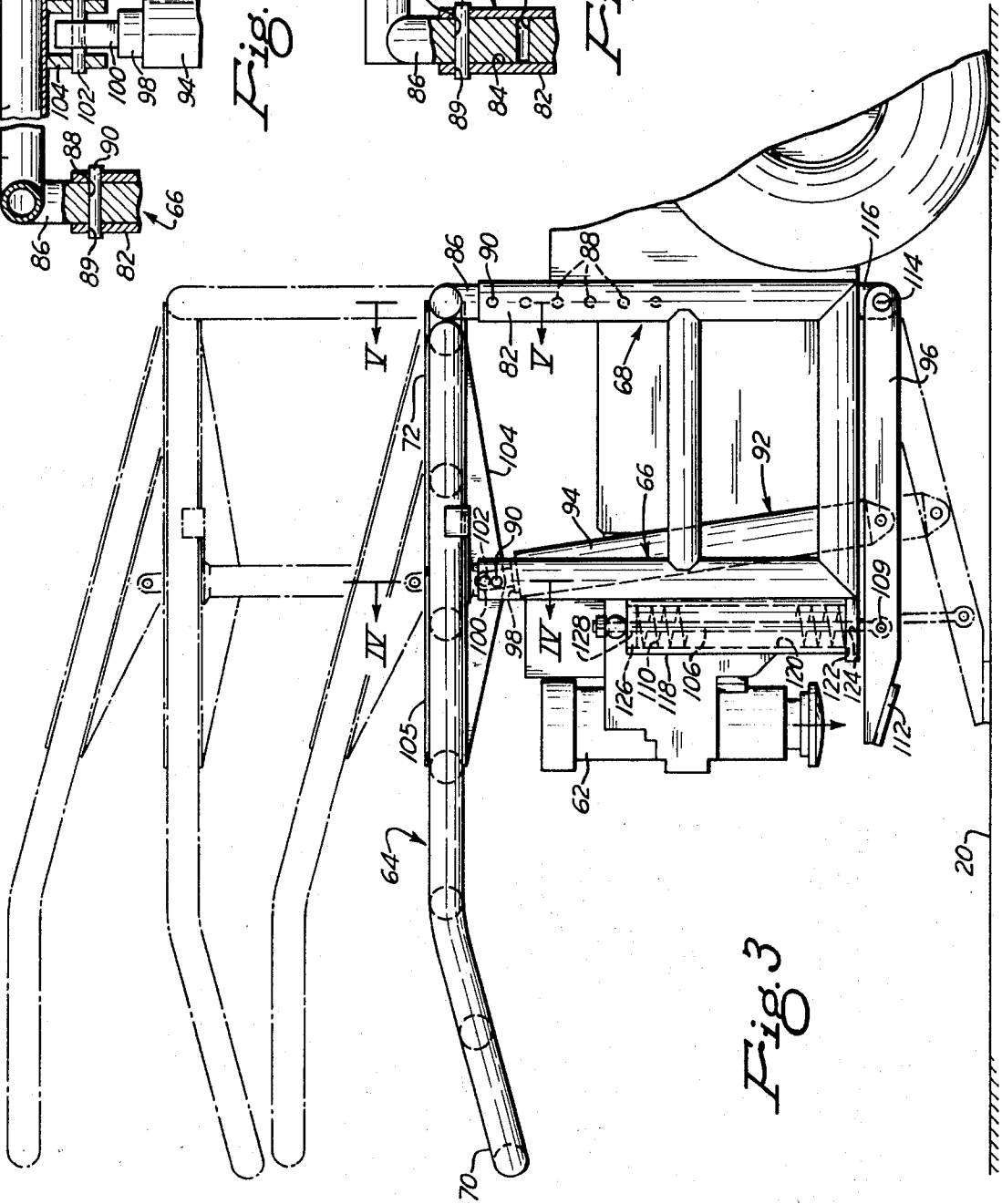
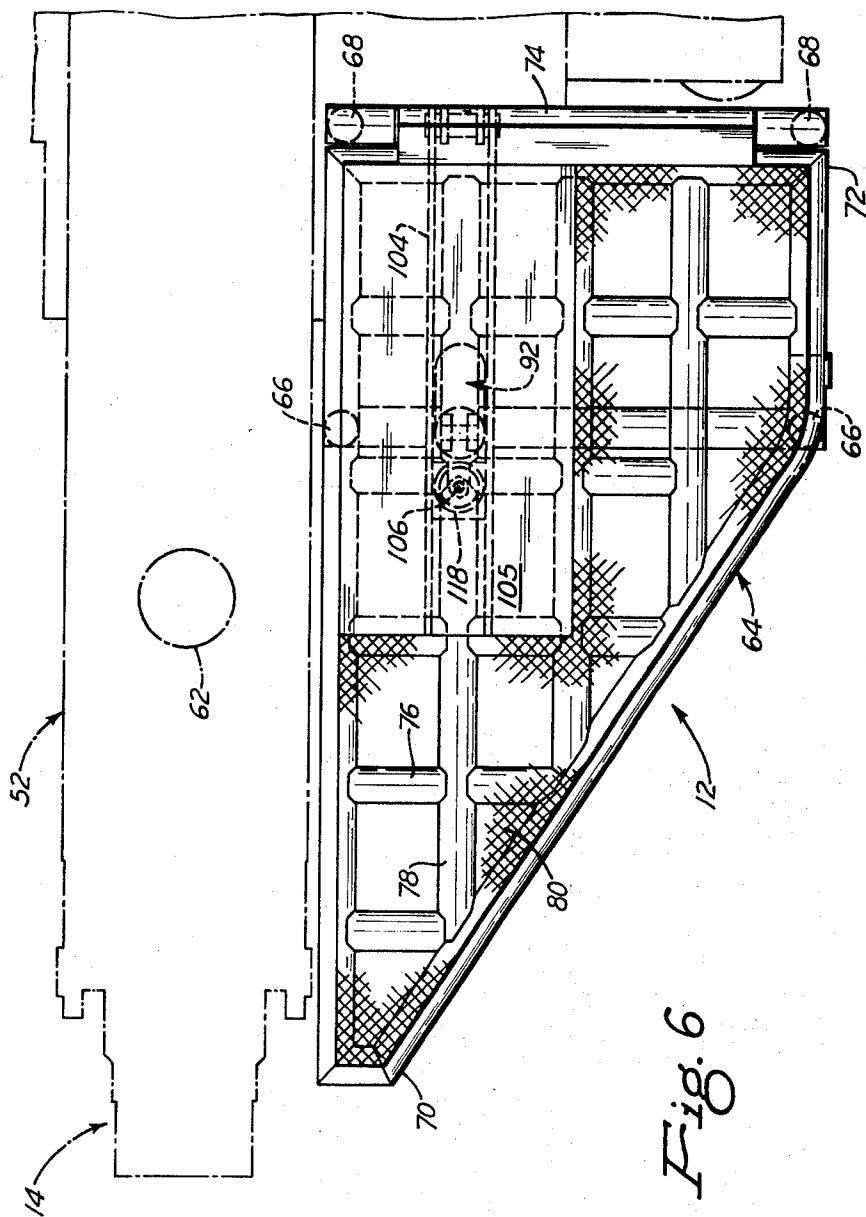
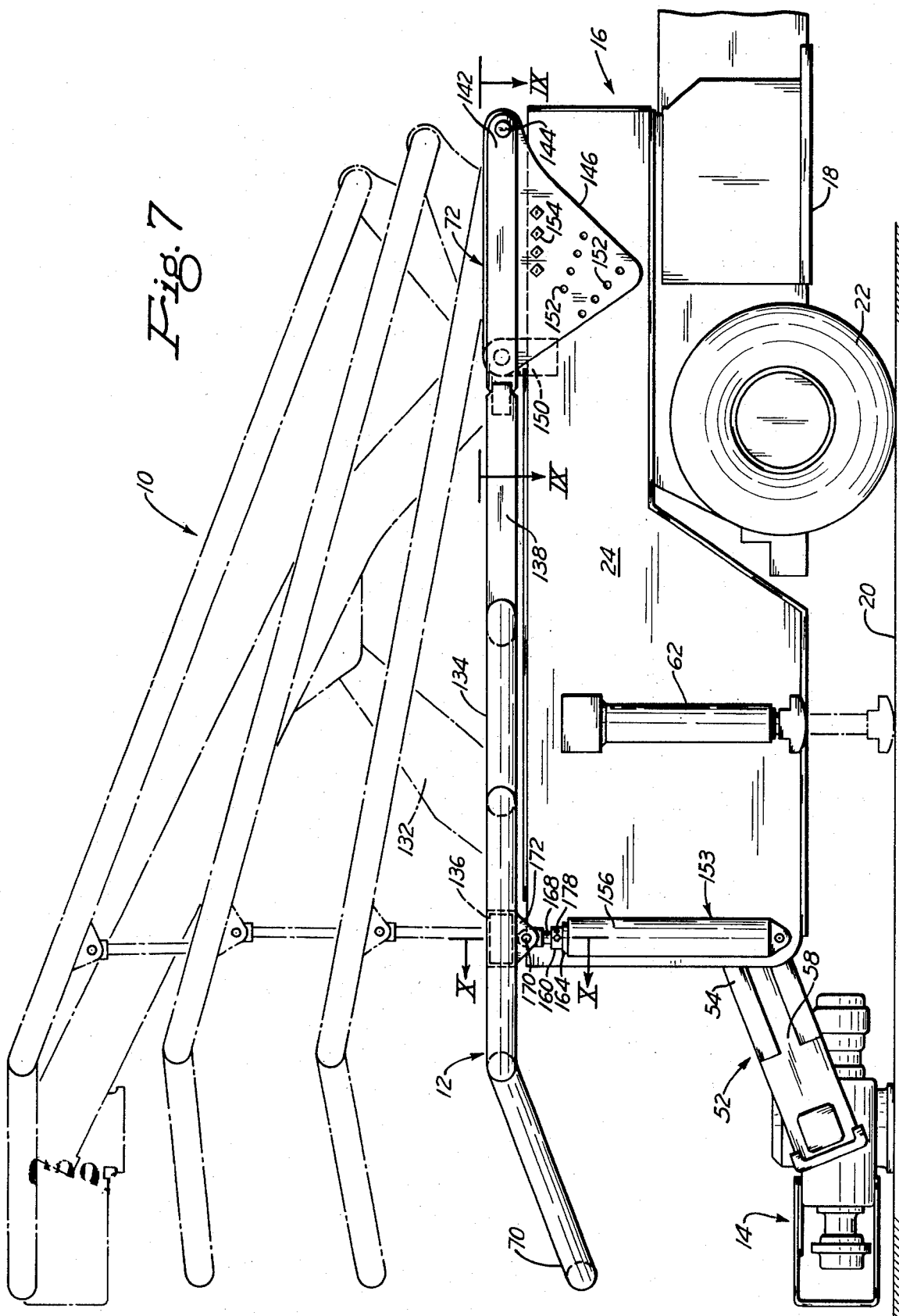


Fig. 3





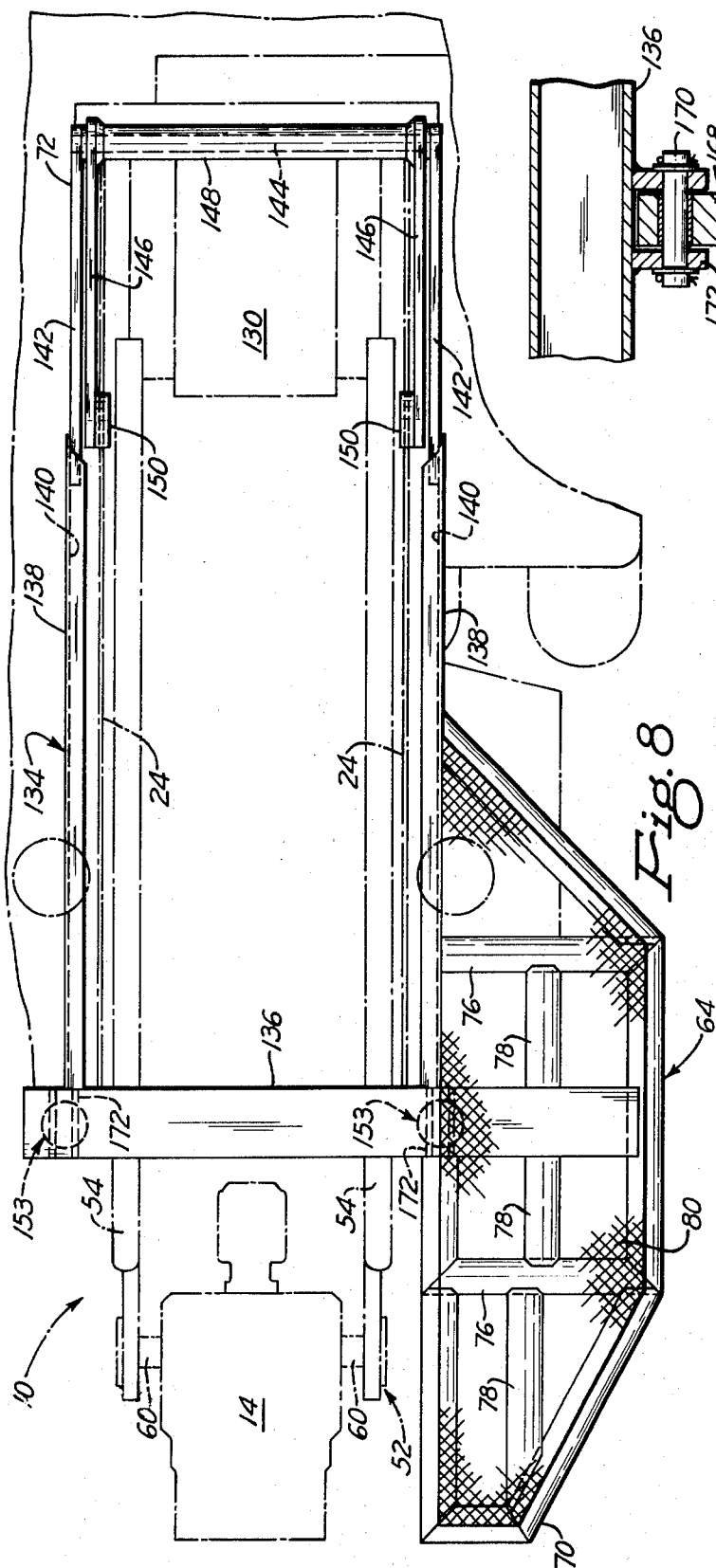


Fig. 8

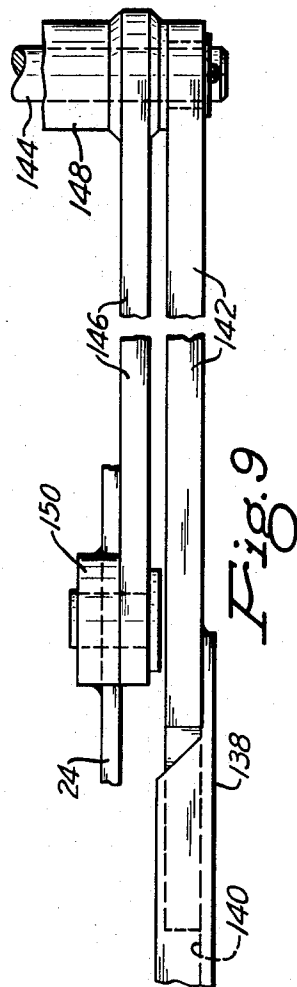


Fig. 9

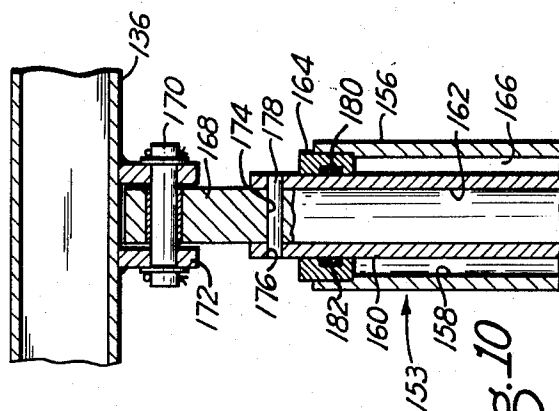


Fig. 10

PROTECTIVE CANOPY FOR A PORTABLE DRILLING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a protective canopy for use in combination with a portable drilling machine and more particularly to a protective canopy which is vertically movable into position adjacent a mine roof to protect the drill operator from collapse of the roof during drilling operations.

2. Description of the Prior Art

In underground drilling operations, a portable drill is commonly used to drill bolt holes in the mine roof. The portable drill, which may be of the rotary or rotary percussion type, is pivotally connected to a forwardly extending boom connected at its rear portion to the frame of a self-propelled car. Suitable linkage mechanisms raise and lower the boom about its pivotal connection to the car frame. The mobile car carrying the boom and portable drill is propelled along the mine floor to the desired location in the mine where the drilling operation is to be conducted. The drill operator raises the boom through the linkage mechanism to, in turn, raise the boom in a vertical plane above the car. In this manner, the boom raises the drill to the required elevation in the mine tunnel to accomplish drilling of the bolt holes.

The conventional drilling operation involves the drilling of several holes in a row transversely of an unsupported section of the mine roof. After periods of continual drilling, a section of the unsupported mine roof could be sufficiently weakened to the extent that it would collapse resulting in serious injury to operating personnel and damage to mining equipment. There is need to provide a protective device in combination with the portable drill that protects the drill operator from collapse of the mine roof during the drilling operation. In addition, the protective device must be vertically adjustable to provide protection at selected levels above the car frame for varying mine roof elevations.

SUMMARY OF THE INVENTION

In accordance with the present invention there is provided a combination drill boom and protective canopy which includes a wheeled body portion having a frame and a drill boom assembly positioned forwardly of the wheeled body portion. The drill boom assembly is arranged for movement in a vertical plane above the frame. A protective canopy is secured to the frame and is positioned adjacent the drill boom. The canopy includes front end and rear end portions arranged for vertical movement relative to the frame. A vertical adjusting mechanism is provided for selectively moving the canopy in a vertical plane relative to the frame. An extensible mechanism pivots the canopy frame front end portion about the canopy frame rear end portion. A support device retains the extensible mechanism fixed relative to the frame to thereby provide vertical movement of the canopy.

The canopy front end portion is positioned adjacent the drill boom assembly. An intermediate portion formed integral with the front end portion is linked to the extensible mechanism. The canopy rear end portion is pivotally connected to the vertical adjusting mechanism. An expandable metal screen covers substantially the entire top surface area of the front end

portion, the intermediate portion and the rear end portion of the protective canopy. The extensible mechanism is operable to move the front end portion and the intermediate portion angularly relative to the rear end portion.

The vertical adjusting mechanism comprises a plurality of vertical tubular members each having an axial passageway therethrough and rigidly secured at the lower end portions thereof to the frame. Elongated cylindrical members are positioned for axial movement in the axial passageway of each of the tubular members. The cylindrical members are suitably connected at the top portion thereof to the protective canopy. Each tubular member is provided with a bore passing transversely therethrough and positioned adjacent the upper end portion of the tubular member. Each cylindrical member includes a plurality of vertically spaced bores passing transversely therethrough. The bore of the tubular member is selectively aligned with one of the cylindrical member bores, and a post pin is inserted through the aligned bores. The post pin retains the cylindrical member immovable relative to the tubular member. Thus, the protective canopy is maintained at a predetermined height above the frame.

The extensible mechanism includes a hydraulic lift jack that is pivotally mounted at the lower end portion thereof to the frame. An extension rod is arranged for slidable movement in the axial chamber of an intermediate cylinder which, in turn, is concentrically positioned within the lift jack. The rod is pivotally connected at the upper end portion thereof to the protective canopy. Actuation of the hydraulic lift jack extends the rod outwardly from the intermediate cylinder to thereby raise and lower the canopy front end portion relative to the canopy rear portion. Thus, the front portion may be moved angularly relative to the rear portion once the canopy, by operation of a vertical adjusting mechanism, has been raised to a desired vertical height above the frame adjacent the mine roof surface.

Accordingly, the principal object of this invention is to provide a protective canopy covered with an expanded metal screen for a portable drilling machine and operable to be raised in a vertical plane above the machine to a position adjacent the mine roof surface for protection of the drill operator during drilling operations.

Another object of this invention is to provide a protective canopy for a portable drilling machine which may be pivotally mounted on the machine frame and raised angularly in a vertical path to a position adjacent the mine roof surface for protection of the drill operator during drilling operations.

A further object of this invention is to provide a versatile protective canopy for a portable drilling machine which may be selectively raised to a predetermined height above the machine frame.

These and other advantages of this invention will be more completely disclosed and described in the following specification, the accompanying drawings and the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of the protective canopy mounted to a portable drilling machine adjacent the drill boom thereof according to the present invention.

FIG. 2 is a view in side elevation of the machine shown in FIG. 1, illustrating in phantom the canopy

frame movable vertically and pivotally relative to the portable drilling machine.

FIG. 3 is an enlarged fragmentary elevation partially in section, illustrating in phantom the range within which the canopy frame may be moved vertically above the portable drilling machine.

FIG. 4 is a fragmentary view partially in section taken along the line IV—IV of FIG. 3.

FIG. 5 is a fragmentary view partially in section taken along the line V—V of FIG. 3.

FIG. 6 is a top plan view of the enlarged fragmentary elevation shown in FIG. 3.

FIG. 7 is a view in side elevation of another embodiment of the present invention, illustrating the canopy frame arranged for pivotal movement in a vertical plane above the portable drilling machine.

FIG. 8 is a top plan view of the canopy frame and portable drilling machine shown in FIG. 7.

Fig. 9 is an enlarged fragmentary view taken along the line IX—IX of FIG. 7.

FIG. 10 is an enlarged fragmented sectional view taken along the line X—X of FIG. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the drawings and particularly FIGS. 1 and 2 there is illustrated a portable drilling machine generally designated by the numeral 10 and a protective canopy generally designated by the numeral 12 secured to the portable drilling machine 10 adjacent the drill unit 14. The portable drilling machine 10 includes a mobile body portion 16 and is propelled along the mine floor 20 on wheels 22 and 23. The body portion 16 includes a pair of parallel side plates 24 vertically supported to a horizontal platform 26.

The rear wheels 23 of the body portion 16 are rotatably mounted on the axle 30. The axle 30 is supported by the side plates 24 and passes transversely across the body portion 16. The front wheels 22 are mounted in side arms 28 on shafts 32 which are also carried by the side arms 28 and project outwardly therefrom.

The side arms 28 extend rearwardly beyond the rear wheels 23 and forwardly beyond the front wheels 22 and carry a speed reducer 34 outboard of the side arms 28 and a hydraulic motor (not shown). Fluid under pressure is supplied by a hydraulic pump 36, suitably mounted on the horizontal platform 26, through conduits (not shown) to the hydraulic motor. The hydraulic pump 36 is driven by the motor 38. Sprockets 40 on the speed reducer 34 carry chains 42 which drive sprockets 44 on the rear wheels 23. Additional sprockets 46 on the rear wheels 23 and sprockets 48 on the front wheels 22 are connected by chains 50 to carry the drive to the front wheels 22.

The portable drilling machine 10 carries a boom 52 which is positioned longitudinally of the body portion 16 at the front end thereof and projects forwardly therefrom to carry the drill unit 14. The boom 52 is suitably mounted intermediately of the body portion 16 for movement in a vertical plane thereabove. Vertical movement of the boom 52 directs the drill unit 14 in a straight vertical path above the body portion 16. The boom 52 consists of a pair of forwardly extending boom members 54 maintained in parallel relation by vertical support members 56 secured to the boom members 54 at the base of the boom 52 on the body portion 16.

The drill unit 14 which may be either a percussion or rotary drill is pivotally connected to the boom arms 54 by the trunnions 60 which project inwardly from the boom arms 54. A suitable linkage (not shown) is provided for leveling the drill unit 14 to maintain the axis of the drill shaft in vertical alignment as the boom 52 constantly changes its angular position as it moves upwardly through a vertical plane. The body portion 16 is equipped with one or more stabilizing jacks 62 mounted thereon. The jack 62 is fluid actuated and operable to contact the mine floor 20 and rigidly position the body portion 16 during the drilling operation.

Referring particularly to FIGS. 1 through 6, the protective canopy 12 includes an elongated horizontal canopy boom framework generally designated by the numeral 64 supported by a plurality of front and rear vertical post members 66 and 68 that are rigidly mounted on the support frame 18 extending laterally from the side arm 28. The canopy boom framework 64 includes a front end portion 70 positioned adjacent the drill unit 14 and a rear end portion 72 pivotally connected to a transverse bridge bar 74 that is supported for movement in a vertical plane by operation of the rear vertical post members 68 to be described hereinbelow.

The canopy boom framework 64 includes a plurality of transverse and longitudinal support members 76 and 78 which provide strength and rigidity for the framework. A continuous expanded metal screen 80 covers the transverse and longitudinal support members 76 and 78 of the canopy boom framework 64. The front and rear vertical post members 66 and 68 support the total mass of the canopy boom framework 64 and the screen 80 secured thereto and are operable to raise and lower the canopy boom framework in a vertical plane relative to support frame 18. The canopy boom framework 64 and screen 80 are structurally designed to withstand the impact forces applied thereto by collapse of a portion of the mine roof upon the framework and thus protect the drill operator working below.

Each of the vertical post members 66 and 68, as illustrated in FIG. 5, include a vertical tubular member 82 having an axial passageway 84 therethrough. An elongated cylindrical member 86 is axially positioned in the tubular member axial passageway 84. The cylindrical member 86 of each of the front and rear vertical post members 66 and 68 is suitably connected at the top portion thereof to the respective transverse support member 76 and the bridge bar 74 of the canopy boom framework 64. A plurality of vertically spaced bores 88 pass transversely through the cylindrical member 86. The vertical tubular member 82 is provided with a single bore 89 passing transversely through the upper end portion thereof. A post pin 90 is arranged to pass through the aligned bores 88 and 89. Thus, the cylindrical member 86 is maintained immovable within the axial passageway 84 by the post pin 90 retained in the bore 89 of the tubular member 82 and a selected bore 88 of the cylindrical member 86. With the above described arrangement, the cylindrical member 86 of the front and rear vertical post members 66 and 68 support the canopy boom framework 64 at a preselected height above the body portion 16 of the portable drilling machine 10. Adjustments in the height of the canopy boom framework 64 are made by removing the post pin 90 from the bore 89 aligned with one of the bores 88 of the cylindrical member 86 and accordingly raising or

lowering the cylindrical member 86 within the axial passageway 84 as desired. The canopy boom framework 64 then may be raised in a vertical plane to a desired elevation above the body 16 depending upon the height of the mine roof.

The canopy front end portion 70 is pivoted about the canopy rear end portion 72 by operation of a hydraulic lift jack generally designated by the numeral 92 to raise the framework 64 and provide working space for the drill operator beneath the canopy screen 80. Referring to FIGS. 2, 3 and 4 of the drawings, the canopy boom lift jack 92 includes a cylinder 94 suitably secured at the lower end portion thereof to a horizontal arm member 96 which is pivotally connected at its rear portion by a pin 114 to ears 116 depending downwardly from the support frame 18. A hollow piston 98 is concentrically positioned within the cylinder 94 and is provided with an extension rod 100 positioned for axial movement in and out of cylinder 94. The rod 100 is pivotally connected by pin 102 passing through aligned bores in the rod 100 and clevis 104. The clevis 104 is welded to a transverse support member 76 of the canopy boom framework 64. With this arrangement, actuation of the lift jack 92 to extend the rod 100 outwardly from the cylinder 94 raises the canopy front portion 70 vertically relative to the canopy rear portion 72.

A rectangular plate member 105 is positioned on the top surface of the canopy screen 80 and is secured to the transverse and longitudinal support members 76 and 78 of a portion of the canopy boom framework 64. The plate member 105 overlies the lift jack 92 to provide protection against falling rock material dislodged from the mine roof.

Referring to FIGS. 2 and 3, a vertical rod 106 extends at its upper end portion through an opening in a bracket 107 positioned adjacent the lift jack 92. The lower end portion of the vertical rod 106 extends through an opening in a bracket 108 secured to the frame support 18 and is connected thereto by pin 109 to the rear portion of the horizontal arm 96. The openings in the brackets 107 and 108 are axially aligned to maintain vertical placement of the rod 106. A helical compression spring 110 is concentrically positioned around the rod 106 with the end portions of the spring retained in abutting contact with the brackets 107 and 108. The downward movement of the rod 106, together with the bracket 107, compresses the spring 110 between the brackets 107 and 108.

As the rod 106 moves downwardly through the opening in the lower bracket 108, the horizontal arm 96 connected to the rod 106 pivots downwardly about its connection to support frame 18 until the foot 112 provided on the front end portions of the arms 96 engages the mine floor 20. By operation of the lift jack 92, the canopy front portion 70 is urged into abutting contact with the mine roof to provide a downwardly directed force upon the foot 112 and thereby position the foot immovable on the mine floor 20. Suitable mechanical means are provided to maintain the rod 106 in a lowered position and to resist the upward forces exerted by the spring 110 upon the upper bracket 107. With the foot 112 firmly planted on the mine floor 20, the cylinder 94 of the hydraulic lift jack 92 is maintained immovable relative to the car frame 18.

Actuation of the lift jack 92 to extend the rod 100 from the cylinder 94 raises the front portion 70 of the canopy boom framework 64 from a substantially hori-

zontal position. As shown by the phantom lines in FIG. 2, the front end portion 70 is maintained at a greater height above the body portion 16 than the rear end portion 72 which remains fixed at the minimum height provided by the arrangement of the cylindrical member 86 in the tubular member 82 for each of the rear vertical post members 68. The canopy boom framework 64 is selectively raised and lowered to a desired height within a range determined by the vertical adjustments of the cylindrical member 86 in the tubular member 82 and the angular adjustments of the front end portion 70 relative to the rear end portion 72 by operation of the lift jack 92. Thus, for a given mine roof height within the limits of operation, the canopy boom framework 64 and metal screen 80 protect the drill operator from material dislodging from the mine roof during the drilling operation. Furthermore, the front end portion 70 may be positioned in abutting relation with a portion of the mine roof surface to thereby support the roof during the drilling operation and provide additional protection for the drill operator against roof collapse.

A cylindrical member 118, illustrated in FIG. 3, having a chamber 120 therein is suitably mounted to the support frame 18 above the horizontal arm 96. The cylindrical member 118 includes a sealed bottom portion 122 having a central bore 124 provided therethrough. The upper portion of the chamber 120 is closed by a cylindrical disc 126 positioned for vertical movement therein. The disc 126 has a central bore 128 provided therethrough and is aligned with the bore 124 provided in the sealed bottom portion 122. The vertical rod 106 is arranged to pass through the bores 124 and 128 of the sealed bottom portion 122 and the disc 126. Suitable mechanical means (not shown) is provided to move the rod 106 together with the disc 126 axially upwardly and downwardly in the chamber 120.

The lower end portion of the rod 106 is arranged to pass freely through the bore 124 of the sealed bottom portion 122. Also as described hereinabove, the lower end portion of the rod 106 is secured by the pin 109 to the horizontal arm member 96. Thus, the downward movement of the rod 106 and the disc 126 pivots the arm member 96 about its connection to the ears 116 to thereby urge the arm member 96 downwardly into engagement with the mine floor 20.

The helical compression spring 110 is retained in the chamber 120 of the cylindrical member 118 with the upper portion thereof maintained in abutting contact with the disc 126 and the lower end portion thereof maintained in abutting contact with the sealed bottom portion 122. In this manner, the helical compression spring 110 is concentrically positioned around the rod 106. Once the foot 112 is firmly positioned on the mine floor 20, the rod 106 and the disc 126 are maintained immovable in the chamber 120 to thereby compress the spring 110 in the chamber 120.

The force exerted downwardly by the foot 112 is resisted by the mine floor 20 which, in turn, applies an oppositely directed force upwardly against the foot 112. The upward force exerted by the mine floor 20 upon the foot 112 is transmitted through the arm members 96 to the hydraulic lift jack 92. Actuation of the hydraulic lift jack 92 to position the canopy front portion 70 in abutting contact with the mine roof exerts a downwardly directed force upon the arm member 96. This downwardly directed force is resisted by the force exerted upwardly by the mine floor 20 upon the arm

member 96. Thus, the hydraulic lift jack 92 is maintained immovable for drilling operations.

As shown by the solid lines in FIG. 3, the canopy boom framework 64 is arranged at its lowermost position. Actuation of the hydraulic lift jack 92 to extend the rod 100 raises the front end portion 70 in a vertical plane while the rear end portion 72 pivots about its connection to the rear vertical post members 68. When the rod 106 and the disc 126 are released from their lowered position in the chamber 120, the spring 110 returns to its original unstressed length in the chamber 120. In this manner, the rod 106 and the disc 126 assume their initial position in the chamber 120. The upward displacement of the rod 106 removes the arm members 96 from contact with the mine floor 20 and returns them to a substantially horizontal position above the floor 20.

For operation of the portable drilling machine 10 in mines of height which exceed the minimum height of the canopy boom framework 64 supported by the front and rear vertical post members 66 and 68, the post pins 90 are removed from the aligned bores of the tubular members 82 and cylindrical members 86. The cylindrical members 86 are then manually extended from the axial passageway 84 of each of the tubular members 82. In this manner, the cylindrical members 86 may be manually extended upwardly in a vertical plane adjacent the mine roof.

Each of the cylindrical members 86 is maintained immovable within the axial passageway 84 of the front and rear vertical post members 66 and 68 by passing the post pin 90 through the aligned bores in the vertical tubular member 82 and the cylindrical member 86. Actuation of the lift jack 92 extends the vertical rod 100 outwardly from the cylinder 92 to thereby pivot the canopy front end portion 70 about the canopy rear end portion 72 and urge the front portion 70 into position adjacent the mine roof. The stabilizing jack 62 is also lowered to brace the body portion 16. As illustrated by the phantom lines in FIG. 3, the canopy boom framework 64 may be selectively raised to contact the mine roof and thereby support the roof to protect the operator from roof collapse during drilling operations for a wide range of mine roof elevations.

Referring to FIGS. 7 through 10, there is illustrated another embodiment of the present invention in which a substantial number of parts are identical to those provided for the drill boom and protective canopy combination illustrated in FIGS. 1 through 6, and similar numerals will be used to designate similar parts. The drill boom 52 of the portable drilling machine 10 includes a pair of forwardly projecting boom arms 54. The boom arms 54, in turn, support the drill unit 14 on the trunnions 60 extending through the boom arms 54. The forwardly projecting boom members 54 are held in spaced, parallel relation at their rear portions by a connecting web 130. The boom members 54 are carried by an elevating link 132, illustrated in FIG. 3, that is pivotally mounted on the swing frame 16. Suitable mountings (not shown) are provided to permit vertical swinging movement of the elevating link 132 to thereby raise and lower the boom 52.

As illustrated in FIG. 8, the canopy boom framework 64 includes a front end portion 70 supported by transverse and lateral support members 76 and 78 which are covered by the expanded metal screen 80. An intermediate portion generally designated by the numeral 134

is connected to the front end portion 70 by a beam 136 that extends transversely thereacross. Intermediate portion 134 includes a pair of side rails 138 which are secured at their forward end portion to the beam 136.

The side rails 138 having channels 140 extend rearwardly from the beam 136, as illustrated in FIG. 9. A pair of rearwardly extending side arms 142 are positioned at their front end portion within the channels 140 and are held in spaced parallel relation by a transverse shaft 144 for pivotal movement thereon. A pair of link plates 146, positioned between the side plates 24 and the side arms 142, are also arranged for pivotal movement on the transverse shaft 144. A tubular sleeve member 148 surrounds the shaft 144 and retains the link plates 146 in spaced relation on the transverse shaft 144.

The link plates 146 are pivotally connected at their front end portion to the vertical ears 150 which are welded to the side plates 24, as illustrated in FIG. 7. Each of the link plates 146 includes a plurality of rows of bolt receiving openings 152 which are provided at suitable intervals across the width of the link plate. Bolts 154 extend through the bolt receiving openings 152 into aligned bores of the side plates 24 to thereby secure the link plates 146 to the side plates 24 of the swing frame 16. With this arrangement, the link plates 146 may be selectively raised and lowered relative to the side plates 24 by engaging the bolts 154 in the bolt receiving openings 152 of the desired row. As indicated in phantom lines in FIG. 7, the link plates 146 are arranged to pivot at their front end portions about the vertical ears 150 and move at their rear end portions in a vertical plane above the swing frame 16 to thereby raise the canopy boom rear end portion 72.

Referring to FIGS. 8 and 10, a pair of hydraulic lift jacks generally designated by the numeral 153 are secured in spaced relation at their upper end portions to the beam 136 adjacent the side rails 138 and at their lower end portions to the swing frame 16. The lift jacks 153 include a hollow outer cylinder 156 having a chamber 158 therein. An intermediate cylinder 160 having an axial chamber 162 is concentrically positioned within the chamber 158 of the outer cylinder 156. The intermediate cylinder 160 has an upper end portion extending above the hollow outer cylinder 156 upper end portion. An annular sleeve member 164 having an axial opening therethrough is positioned in annular passageway 166 formed between the outer cylinder 156 and the intermediate cylinder 160.

An extension rod 168 projects outwardly from the intermediate cylinder 160 and is pivotally connected to the beam 136 by a pin 170 that passes through the aligned bores in the upper end portion of the rod 168 and a clevis 172 welded to the beam 136. The extension rod 168 is operable to extend and retract from the intermediate cylinder 160 within the axial chamber 162 and thereby raise and lower the front end portion 70 about the rear end portion 72 supported at a selected height above the frame 16 by the link plates 146.

The extension rod 168 is provided with a transverse bore 174 that extends through the upper end portion thereof. The intermediate cylinder 160 is provided with a transverse bore 176 that passes through the upper end portion thereof and is aligned with the bore 174. A locking pin 178 is arranged to pass through the aligned bores 174 and 176 to thereby maintain the ex-

tension rod 168 immovable within the axial chamber 162 of the intermediate cylinder 160.

The annular sleeve member 164 positioned in the annular passageway 166 includes an annular recessed portion 180. A pair of O-rings 182 are positioned in the annular recessed portion 180 and surround the portion of the intermediate cylinder 160 the projects above the hollow outer cylinder 156. The O-rings 182 are arranged to permit extension and retraction of the extension rod 168 in the axial chamber 162 and provide a fluid and pressure tight seal between the outer cylinder 156 and the intermediate cylinder 160 in the annular passageway 166.

Once the stabilizing jack 62 is rigidly positioned in contact with the mine floor 20 to brace the frame 16 during the drilling operations, the lift jacks 153 are actuated to extend the rod 168 out of the outer cylinder 156. Extension of the rod 168 raises the canopy boom framework 64 in a vertical plane above the frame 16. The rod 168 is extended a preselected distance from the cylinder 156 until the front end portion 70 is positioned adjacent the mine roof. With the front end portion in this position, the expanded metal screen 80 protects the operator from the hazard of a roof fall as he operates the drill unit 14. Furthermore, the front end portion 70 may be positioned in abutting relation with the mine roof surface to support the portion of the mine roof being drilled.

With the extension rod 168 positioned at the desired height above the swing frame 16, the rear end portion 72 is elevated in a vertical plane relative to the swing frame 16 by disengaging the bolts 154 from one of the rows of bolt receiving openings 152 in the link plates 146. The link plates 146 are then raised upwardly on the side plates 24 and secured thereto by passing the bolts 154 through a row of bolt receiving openings 152 that are provided at a lower position on the side plates 24 than the row in which the bolts 154 previously had been positioned. Thus, the front end portion 70 may be raised in a vertical path relative to the swing frame 16 and at the same time pivotally moved in an arcuate path about the rear end portion 72.

According to the provisions of the patent statutes, I have explained the principle, preferred construction and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiments. However, I desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

1. The combination of a drill boom and a protective canopy comprising,
a wheeled body portion having a frame,
drill means,
said drill boom positioned forwardly of said wheeled body portion and operable to move said drill means in a vertical plane relative to said frame,
said protective canopy secured to said frame and positioned adjacent said drill boom, said protective canopy having front end and rear end portions arranged for vertical movement relative to said frame and a metal covering positioned on the top surface of said protective canopy,
vertical adjusting means for selectively moving said canopy in a vertical plane relative to said frame,

extensible means for pivoting said canopy front end portion about said canopy rear end portion, and support means for retaining said extensible means fixed relative to said frame to thereby provide vertical movement of said canopy.

2. The combination of a drill boom and a protective canopy as set forth in claim 1 in which each said vertical adjusting means includes,

a vertical post member having an axial passageway therethrough, said vertical post member rigidly secured at the lower end thereof to said frame,
an elongated cylindrical member, said cylindrical member positioned for axial movement in said axial passageway,
said cylindrical member suitably connected at the top end portion thereof to said canopy, and
adjustable means for retaining said cylindrical member supporting said protective canopy at a preselected height above said frame immovable within said axial passageway.

3. The combination of a drill boom and a protective canopy as set forth in claim 2 in which each of said adjustable means includes,

said vertical tubular member provided with a bore passing transversely therethrough, said bore positioned adjacent the upper end portion of said tubular member,
said cylindrical member provided with a plurality of vertically spaced bores passing transversely therethrough, and
a post pin arranged to pass through said bore of said tubular member aligned with a selected bore of said cylindrical member to retain said cylindrical member immovable relative to said tubular members so that said protective canopy is maintained at a predetermined height above said frame.

4. The combination of a drill boom and a protective canopy as set forth in claim 1 in which said extensible means includes,

a hollow outer cylinder pivotally mounted at the lower end portion thereof to said frame, said outer cylinder having an open upper end portion,
an intermediate cylinder positioned concentrically within said hollow outer cylinder, said intermediate cylinder having an axial chamber therethrough and an upper end portion extending above said outer cylinder open upper end portion,
an annular passageway provided between said outer cylinder and said intermediate cylinder,
an annular sleeve member having a bore therethrough, said annular sleeve member securely positioned in said annular passageway to sealingly close said outer cylinder open upper end portion, and
a rod member arranged for slidable movement within said intermediate cylinder axial chamber extends outwardly from said intermediate cylinder, said rod member pivotally connected at the upper end portion thereof to said protective canopy,
said rod member operable to extend and retract from said intermediate cylinder and thereby raise and lower said canopy front end portion relative to said canopy rear end portion.

5. The combination of a drill boom and a protective canopy as set forth in claim 4 which includes,
said rod member having a transverse bore passing through the upper end portion thereof,

said intermediate cylinder having a transverse bore passing through said upper end portion thereof, and

a locking pin arranged to pass through the aligned bores of said intermediate cylinder and said solid rod to thereby maintain said solid rod immovable within said intermediate cylinder longitudinal chamber.

6. The combination of a drill boom and a protective canopy as set forth in claim 4 in which said annular sleeve member includes,

an annular recessed portion,
sealing means positioned in said annular recessed portion and surrounding said intermediate cylinder extending through said hollow outer cylinder, and said sealing means arranged to permit extension and retraction of said rod member in said intermediate cylinder axial chamber and thereby provide a fluid and pressure-tight seal between said outer cylinder and said intermediate cylinder in said annular passageway.

7. The combination of a drill boom and a protective canopy as set forth in claim 1 in which said support means includes,

a cylindrical member suitably mounted to said frame, said cylindrical member having a chamber therein, a rod member positioned axially in said chamber and arranged for axial movement therein, said rod member having a bottom tip portion, a pair of arm members having rear portions pivotally connected to said frame and front portions pinned to said rod member bottom tip portion, means for moving said elongated rod axially downwardly in said chamber so that said arm members pivot about said rear portions with said front portions contacting the mine floor to thereby rigidly brace said frame, and means for urging said elongated rod upwardly in said chamber to thereby release said front portions of said arm members from contact with the mine floor.

8. The combination of a drill boom and a protective canopy as set forth in claim 7 which includes,

said cylindrical member having an open top portion and a sealed bottom portion, said sealed bottom portion having an opening therein,

a cylindrical disc positioned in said open top portion for axial movement in said chamber, said cylindrical disc having a central bore therethrough aligned with said opening in said sealed bottom portion, and

said rod member arranged to pass through said disc central bore and said cylindrical member opening.

9. The combination of a drill boom and a protective canopy as set forth in claim 8 which includes,

a helical compression spring positioned in said chamber concentrically around said rod member, said helical compression spring having a top portion maintained in abutting contact with said cylindrical disc and a bottom portion maintained in contact with said cylindrical member sealed bottom portion,

said helical compression spring compressed by said cylindrical disc moving downwardly through said chamber with said rod member, and

said helical compression spring operable to extend to the original uncompressed length thereof and

thereby urge said cylindrical disc together with said rod member upwardly through said chamber.

10. The combination of a drill boom and a protective canopy as set forth in claim 1 in which said protective canopy includes,

a forwardly extending portion positioned adjacent said drill boom assembly,
an intermediate portion formed integral with said forwardly extending portion, said intermediate portion suitably linked to said extensible means,
a rearwardly extending portion pivotally connected to said vertical adjusting means,
said extensible means operable to move said forwardly extending portion and said intermediate portion angularly relative to said rearwardly extending portion, and
an expanded metal screen covering substantially the entire top surface area of said forwardly extending portion, said intermediate portion and said rearwardly extending portion.

11. The combination of a drill boom and a protective canopy as set forth in claim 10 which includes,

said intermediate portion having a pair of parallel spaced side rails,
a transverse beam member connecting said side rails to said forwardly extending member, and
said extensible means pivotally connected to said transverse beam member, said extensible means operable to vertically move said transverse beam member together with said forwardly extending member and said side rails.

12. The combination of a drill boom and a protective canopy as set forth in claim 4 wherein,

said rearwardly extending portion includes a pair of parallel spaced arm members, said spaced arm members suitably connected at one end portion thereof to said pair of spaced side rails,
a transverse shaft connecting said arm members at the other end thereof for pivotal movement, and
adjustable link means for raising said rearwardly extending portion in a vertical plane relative said frame, said adjustable link means arranged to connect said spaced arm member to said frame.

13. The combination of a drill boom and a protective canopy as set forth in claim 12 in which said adjustable link means includes,

a pair of laterally spaced plate members, each positioned adjacent one of said spaced arm members, bolt means for securing said plate members to said frame,

said bolt means adjustable on said frame to selectively position said plate member rear portion vertically above said frame,

said plate members pivotally connected at the front portion thereof to the front portion of said spaced arm members,

said plate members provided with aligned bores passing through the rear portion thereof,

said transverse shaft arranged to pass through said aligned bores of said plate members,

a tubular sleeve member having a longitudinal bore therethrough, and

said sleeve member concentrically supported by said transverse shaft and passing through said longitudinal bore for maintaining said plate members in spaced relation.

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14. The combination of a drill boom and a protective canopy as set forth in claim 13 in which, said spaced arm members pivot about said transverse shaft as said extensible means vertically raise said transverse beam together with said forwardly extending portion, 5

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said spaced arm members arranged to pivot on said transverse shaft with each of said plate members rear portions suitably positioned vertically above said frame.

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UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 3,865,197

DATED : February 11, 1975

INVENTOR(S) : Thomas W. McCormick

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 7, Line 17

After "above the" delete 'flooe'
and insert --floor--

Column 12, Line 34,
Claim 12

After "claim" delete '4' and
insert --11--

Signed and Sealed this

Thirteenth Day of February 1979

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

DONALD W. BANNER
Commissioner of Patents and Trademarks