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3,529,680

ROCK DRILL WITH RING SUPPORT

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2 Sheets-Sheet 1

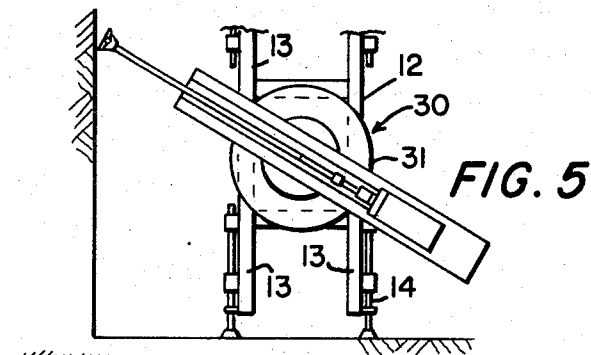
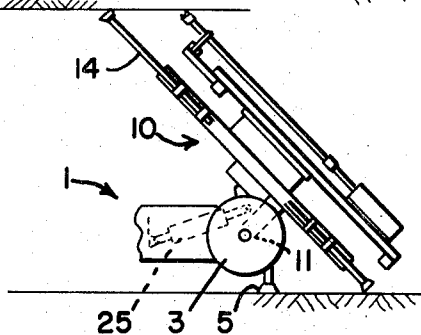


FIG. 4

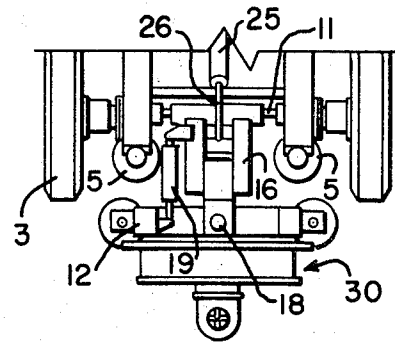


FIG. 3

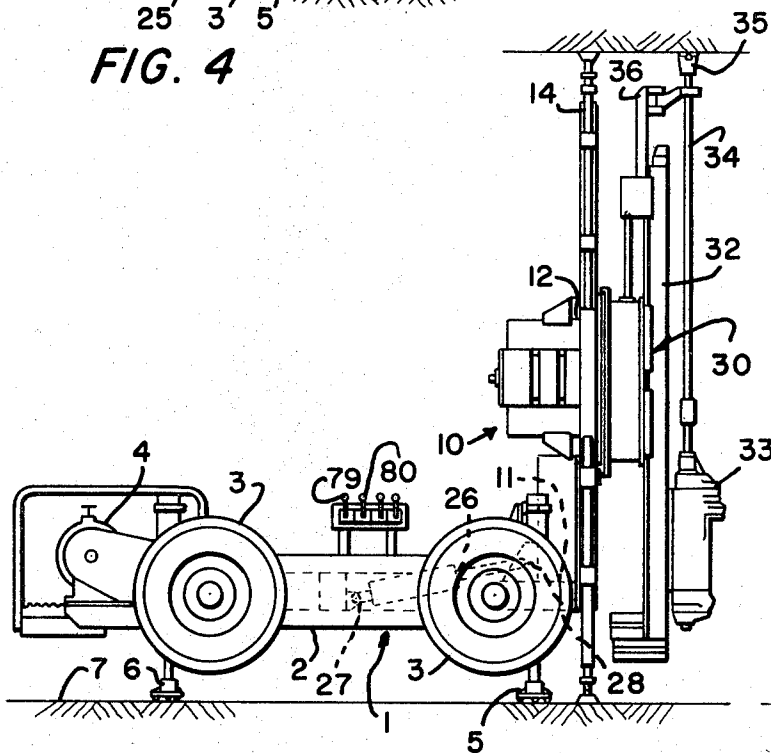


FIG. 1

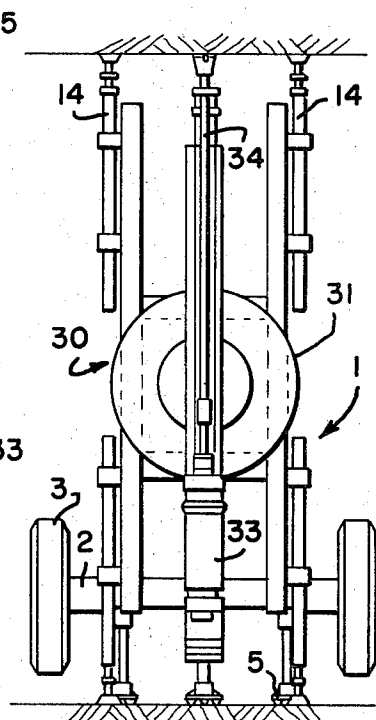


FIG. 2

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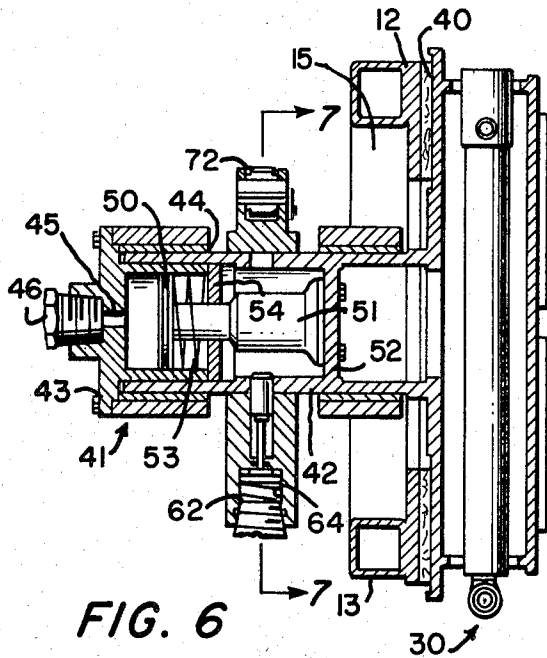
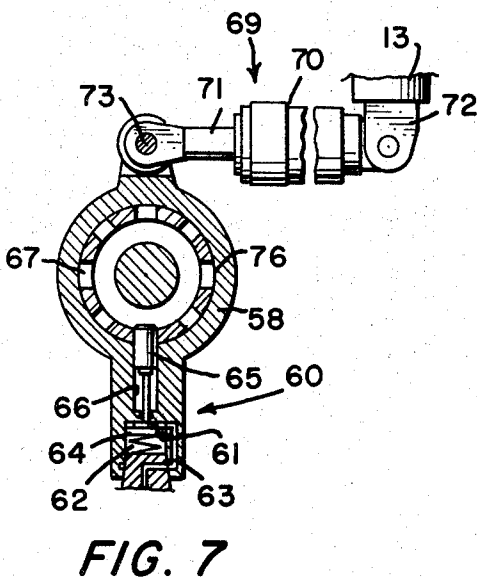
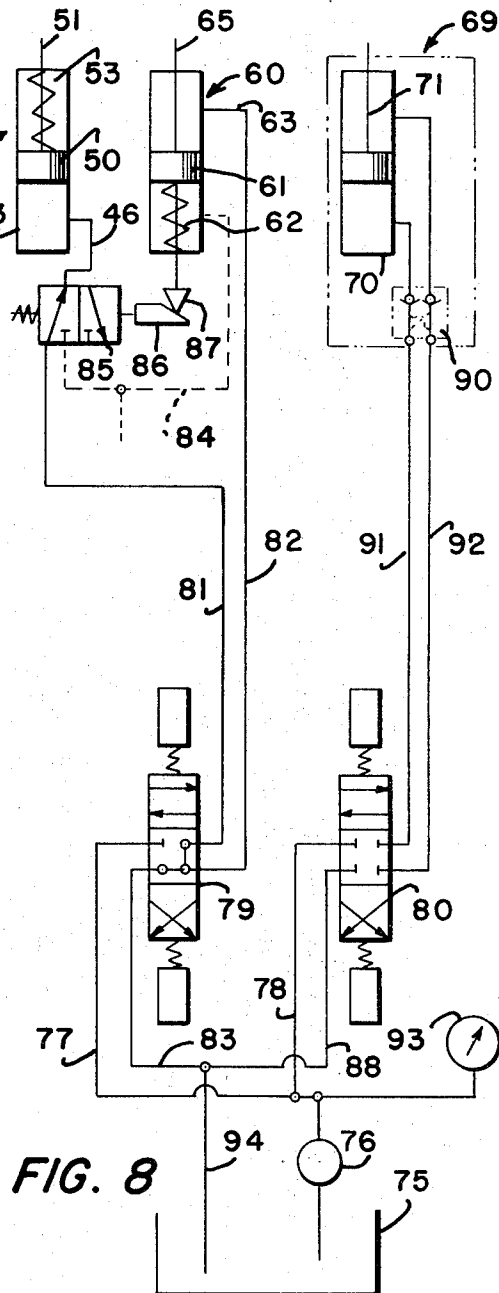
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1

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ROCK DRILL WITH RING SUPPORT

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15 Claims

ABSTRACT OF THE DISCLOSURE

A mobile rock drilling unit for use in drilling a fan of holes in underground mine workings such as a mining drift. The rock drill itself is mounted on a support and may be rotated 360°. The support may be tilted and slued relative to a mobile frame. A spring applied, fluid pressure released brake controls rotation of the drill. Clutch and safety arrangements aid in preventing inadvertent rotation of the drill.

BACKGROUND OF THE INVENTION

This invention relates to mobile rock drilling units particularly adapted for use in drilling a fan of holes in mine workings such as a mining drift. More particularly it relates to the apparatus for tilting and rotating the drilling machine relative to the mobile supporting frame.

Apparatus which is used to drill a fan of holes in a mining drift or the like usually includes a support with a rock drill mounted on and rotatable relative to the support. The drill is rotated to a position to drill a hole in the desired location and locked in place. Prior to this invention, some apparatus employed hand cranks and the like to rotate the drill while others employed motor means such as fluid pressure operated piston-cylinder arrangements. In order to lock the drill in a particular position, such prior apparatus employ either hand operated locking devices or mere regulation of the motive power to the motor means.

The use of hand actuated locking arrangements present obvious disadvantages. Each time the drill is to be moved from one position to the next, the operator must unlock, rotate and relock the drill by hand. This is time consuming and often hazardous. The control of motive power to the motor means to provide the locking mechanism can also be dangerous. If fluid under pressure provides the motive power and the lines supplying fluid under pressure fail, the locking means will fail. Any failure of the locking means will permit the drill to rotate freely. Such free rotation can result in injury to personnel working in the vicinity of the drilling machine as well as damage to the machine.

Apparatus which is used for drilling a fan of holes in a mining drift usually requires that the machine be aligned so that it is parallel with the mining drift. With prior apparatus it was necessary to jockey the machine in order to achieve such parallel alignment. This is a time consuming operation and usually must be done each time the entire unit is moved from one location to the next.

SUMMARY

It is therefore the principal object of this invention to provide apparatus for drilling a fan of holes in a mining drift or the like which includes power rotation means for rotating the drilling machine and automatic locking means for preventing rotation of the drilling machine.

It is a further object of this invention to provide a safety arrangement which prevents undesired rotation of a drilling machine.

It is still a further object of this invention to provide

2

a drilling machine for drilling a fan of holes in a mining drift which permit easy alignment of the drilling machine in the mining drift.

In general, the foregoing and other objects will be carried out by providing: a rock drilling apparatus for drilling a fan of holes in a mining drift or the like comprising a frame, a support pivotally mounted on said frame; means for tilting said support about the pivotal connection between said support and said frame to a plurality of positions substantially all of which are substantially transverse to a mining drift; rock drill mounting means rotatably mounted on said support; means for rotating said rock drill mounting means; normally activated means for positively preventing rotation of said rock drill mounting means; and motor means for deactivating said rotation preventing means to thereby permit rotation of said rock drill mounting means.

DESCRIPTION OF THE DRAWINGS

The invention will be described in connection with and by reference to the annexed drawings wherein:

FIG. 1 is an elevation of a mobile rock drilling unit employing this invention;

FIG. 2 is a front view of the machine of FIG. 1;

FIG. 3 is a top plan view of a portion of the machine of FIG. 1;

FIG. 4 is a generally schematic view of the machine of FIG. 1 with the drilling machine in a different operative position;

FIG. 5 is a front view similar to FIG. 2 with the drilling machine in another operative position;

FIG. 6 is a sectional view of a portion of this invention; FIG. 7 is a sectional view taken on the line 7—7 of FIG. 6; and

FIG. 8 is a schematic diagram of the fluid pressure system of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 to 3, the rock drilling apparatus of this invention includes a vehicle generally indicated at 1. The vehicle includes a frame 2 supported on rubber tires 3 and has a drive motor 4 operatively connected to the tires 3. The vehicle is provided with conventional front and rear leveling jacks 5 and 6, respectively.

A support, generally indicated at 10, is pivotally mounted on the vehicle 1 at a pivotal connection 11. The support 10 includes a brake frame 12 preferably in the shape of a ring having an opening 15 therein. The brake frame 12 includes a pair of brace legs 13 secured thereto. Fluid pressure actuated jacks 14 are mounted on each end of the brace legs 13 which, during drilling operations, are extended to contact the walls of the mining drift 7 to insure adequate support for the machine.

The brake frame 12 is pivotally connected at 18 to the rear portion 16 of the support 10. Motor means in the form of a piston-cylinder arrangement 19 is interposed between the rear portion 16 of the support 10 and the brake frame 12. This piston-cylinder arrangement 19, when actuated, slues the brake frame with respect to the vehicle. By being able to slue this portion of the machine, it is not essential that the vehicle be parallel with the drift before drilling operations begin. If the vehicle is at a sight angle to the mining drift, the support 10 is slued until it is properly aligned. In order to tilt the support 10, a power cylinder 25 including a piston and piston rod 26 has been provided. The power cylinder 25 is connected to the vehicle frame 2 at 27 and the piston rod 26 is connected to the support 10 at 28. As the piston 26 is extended and retracted, the support 10 will pivot relative to the frame 2 about pivot point 11 between extreme posi-

tions of horizontal and vertical. An intermediate position is shown in FIG. 4. This permits the drilling of a fan of holes at a plurality of angles between these two extremes.

A rock drill mounting means 30 is provided on the forward end of the vehicle. The mounting means 30 includes a mounting ring 31 having a drill guide 32 secured thereto. A rock drilling machine 33 is slidably mounted on the drill guide 32 for movement relative thereto. A conventional drill rod 34 having a drill bit 35 mounted thereon is secured to the drilling machine 33 in the usual manner. A power operated centralizer 36 may be mounted on the mounting means 30 to insure that the hole being drilled is along the desired path.

In order to drill a fan of holes, it is necessary to provide some means for rotating the drilling machine relative to the vehicle in a plane which is transverse to the mining drift. During the actual drilling of a hole, it is necessary to hold the drilling machine in the desired position. By this invention, a spring applied, fluid pressure released brake arrangement has been provided to permit rotation when it is desired such as to reposition the drilling machine and to prevent rotation of the drilling machine during actual drilling of the hole.

A frictional material such as brake lining 40 is secured to the brake frame 12 so that it is interposed between the ring 31 and the brake frame 12. When the ring 31 is held firmly against the brake lining 40, the ring and hence the drilling machine 33 are prevented from rotating relative to the vehicle 1. When the ring 31 is released from the brake lining 40, the ring 31 and drill 33 may rotate relative to the vehicle.

Referring to FIG. 6, the spring applied, fluid pressure released brake for selectively preventing and permitting rotation of the drill includes a cylinder 43 suitably secured to the support 10. A sleeve 44 is interposed between cylinder 43 and a rearward extension 42 of the mounting means 30 to permit rotation of the extension 42 and hence the mounting means relative to the cylinder 43 and the vehicle 1. A passage 45 including a conduit 46 has been provided for conducting fluid under pressure from a source to the cylinder 43.

A piston 50 including a piston rod 51 is mounted for reciprocal movement within the cylinder 43 and the extension 42. A plate 52 is positioned in the rearward extension 42 and has fixed thereto the piston rod 51. A spring 53 is interposed between the piston 50 and the end wall 54 of the cylinder 43 to urge the piston 50 and hence, the rearward extension 42 and ring 31 rearwardly into engagement with the brake lining 40. Thus, in the absence of fluid under pressure sufficient to overcome the biasing force of the spring 53, the drill mounting means 30 is braked against the ring 12 and cannot rotate relative to the support 10. When fluid under pressure sufficient to overcome the biasing force of spring 53 is supplied through conduit 46 and passage 45 to the cylinder 43, the piston 50 moves to the right as viewed in FIG. 6 forcing the rock drill mounting means 30 to the right away from the brake lining 40. In this position, rotation of the drill mounting means is permitted.

In order to rotate the rock drill mounting means 30 and thus the drilling machine 33, we have provided a rotation arrangement best shown by reference to FIGS. 6 and 7. A collar 58 encircles the rearward extension 42. A clutch means 60 is provided to permit the collar 58 to be fixed to the extension 42 or free to rotate relative to the extension 42. This clutch is preferably a spring applied, fluid pressure released arrangement and includes a piston 61 mounted for reciprocal movement in the bore 64. A rod 65 is connected to the piston 61 and is adapted to reciprocate in a bore 66. A plurality of holes 67 are provided in the extension 42 and adapted to selectively receive the rod 65. A spring 62 biases the piston 61 and the rod 65 towards the extension 42. In order to move the rod 65 out of the holes 67 and thus disengage the clutch means 60, fluid under sufficient pressure to over-

come the biasing force of spring 62 is selectively conducted to the bore 64 through supply conduit 63.

An indexing means, generally designated at 69, is provided to rotate the collar 58. This indexing means 69 includes an indexing cylinder 70 having a piston 71 mounted for reciprocal movement therein. The cylinder 70 is connected at 72 to one of the brace legs 13 and the piston 71 is connected at 73 to the collar 58. Fluid under pressure is supplied to the cylinder 70 to extend or retract the piston 71 and rotate the collar 58. When the clutch means 60 is engaged so that the rod 65 is positioned in a hole 67, extension or retraction of the piston 71 will result in rotation of the extension 42 and thus the mounting means 30 and drill 33. Such rotation is best illustrated by comparing FIGS. 2 and 6. When the clutch is disengaged, i.e., the rod 65 is retracted from a hole 67, extension or retraction of the piston 71 will rotate the collar 58 relative to the extension 42. Full extension of the piston 71 will result in the rotation of the mounting means 30 a fraction of a full circle. This is preferably, but not necessarily 45°. The amount of rotation depends on the length of travel of the piston 71. If the mounting means 30 has been rotated the full extent of the indexing means 69 and it is desired to rotate the drill mounting means 30 an additional amount, the clutch means 60 is disengaged so that the collar 58 will rotate relative to the mounting means 30. Fluid under pressure is supplied to the indexing means to retract the piston 71. The clutch 60 is then reengaged and fluid under pressure is again supplied to the piston 71 to advance the drill mounting means 30 the additional desired amount.

The fluid pressure arrangement for operating the apparatus of this invention is shown in FIG. 8. From a source of fluid under pressure such as a reservoir 75, a pump 76 supplies fluid under pressure through conduits 77 and 78 to control valves 79 and 80, respectively. These control valves are mounted on a suitable control panel on the frame 2 of the vehicle 1. From the control valve 79 fluid under pressure is supplied selectively to either conduit 81 or 82 depending upon the direction of actuation of the control valve 79. When fluid under pressure is supplied to conduit 81, it is directed through a safety valve 85 to passage 46 and to the cylinder 43. This fluid under pressure overcomes the biasing forces of spring 53 and hence releases the brake to permit rotation of the mounting means 30. At the same time, the control valve 80 is actuated to permit fluid under pressure to be supplied from the reservoir 75 through the conduit 78 to either conduit 91 or 92 to either advance or retract the indexing means 69 depending upon the direction of rotation of the drill desired. Since the clutch means 60 is spring applied, and hence engaged, the collar 58 is normally fixed to the extension 42, movement of the piston 71 of the indexing means will result in rotation of the mounting means 30.

When the drill has been rotated the desired amount, the valve 80 is set to neutral position to stop flow of fluid to the indexing means 69. The valve 79 is then set to neutral to stop the flow of fluid to brake cylinder 43. In this position, the cylinder 43 is dumped to the reservoir 75 through conduits 81 and 83. Spring 53 then braces piston 50 and mounting means 30 into engagement with brake lining 40 to prevent rotation of the mounting means 30 and drill 33. A safety valve 90 prevents rotation of the mounting means 30 between the time fluid flows to the indexing means has stopped and the time the brake is applied by preventing fluid flow into or out of the indexing means 69. In order to disengage the clutch to retract the indexing means 69 without rotating the mounting means 30, the valve 79 is moved up so that fluid under pressure is supplied through conduit 82 to conduit 63 and cylinder 65. The lower half of cylinder 65 is vented at 84.

As a safety arrangement when the clutch 60 is disengaged to permit rotation of the collar 58 relative to the mounting means 30, the brake is automatically ap-

5

plied to prevent rotation of the mounting means 30, and hence the drill 33, relative to the support 10. A safety valve 85 is interposed in the conduit 81 to control supply of fluid to the cylinder 43. When the clutch is engaged, the safety valve permits fluid under pressure to reach the cylinder 43 and release the brake. When the clutch 60 is disengaged, the safety valve is actuated to dump cylinder 43 to atmosphere so that the spring 53 takes over to brake the mounting means 30 against the support 10. In order to operate the safety valve 85, an actuator 87 is connected to the piston 61 of the clutch 60. The actuator 87 contacts an actuator 86 of the valve 85. The actuator 86 includes a camming surface so that slight movement of the piston 61 in an outward direction moves safety valve 85 to the left in FIG. 8 to prevent fluid under pressure from reaching the cylinder 43.

A pressure gauge 93 is provided in the system to inform the operator that adequate pressure is available. Return conduit 94 is connected to conduits 83 and 88 to return fluid to the reservoir 75 from the indexing means 69 and clutch means 60.

From the foregoing it should be apparent that the objects of this invention have been carried out. The drilling machine 33 can be tilted and rotated relative to the frame 2 so that holes can be drilled in the mining drift in any direction between horizontal and vertical. The drill cannot be accidentally rotated due to the spring applied, pressure released braking arrangement. Various safety arrangements such as valves 85 and 90 reduce the likelihood of accidents. A sluing arrangement is provided in order to reduce the difficulty normally encountered in aligning the unit.

It is intended that the foregoing be merely a description of a preferred embodiment. It is intended that the invention be limited solely by that which is within the scope of the appended claims.

We claim:

1. A rock drilling apparatus for drilling a fan of holes in a mining drift or the like comprising:

- a frame;
- a support pivotally mounted on said frame;
- means for tilting said support about the pivotal connection between said support and said frame to a plurality of positions substantially all of which are substantially transverse to a mining drift;
- rock drill mounting means rotatably mounted on said support;
- means for rotating said rock drill mounting means;
- normally activated means for positively preventing rotation of said rock drill mounting means; and
- motor means for deactivating said rotation preventing means to thereby permit rotation of said rock drill mounting means.

2. The rock drilling apparatus of claim 1 wherein said means for preventing rotation of said rock drill mounting means includes a normally applied brake mounted on said support.

3. The rock drilling apparatus of claim 1 wherein means for preventing rotation of said drill mounting means is a normally applied brake mounted on said support and said motor means for deactivating said rotation preventing means includes fluid pressure operated piston means.

4. The rock drilling apparatus of claim 3 further comprising means for sluing said support relative to said frame.

5. The rock drilling apparatus of claim 1 further comprising clutch means for operatively connecting and disconnecting said means for rotating said rock drill mounting means to said rock drill mounting means.

6

6. The rock drilling apparatus of claim 5 wherein said means for preventing rotation of said drill mounting means is a normally applied brake mounted on said support and said motor means includes fluid pressure operated piston means which is adapted to be rendered ineffective when said clutch means is disconnected.

7. The rock drilling apparatus of claim 6 wherein said clutch means is fluid pressure operated and said apparatus further comprises a source of fluid under pressure; first conduit means for conducting fluid under pressure from said source to said motor means for deactivating said rotation preventing means and second conduit means for conducting fluid under pressure from said source to said clutch means.

8. The rock drilling apparatus of claim 7 further comprising valve means adapted to be acted on by said clutch means for rendering said motor means ineffective when said clutch means is disconnected.

9. The rock drilling apparatus of claim 8 further comprising means for sluing said support relative to said frame.

10. The rock drilling apparatus of claim 9 wherein said means for rotating said rock drill mounting means includes a fluid pressure actuated piston means and conduit means for conducting fluid under pressure from said source to said piston means.

11. A rock drilling apparatus for drilling a fan of holes in a mining drift or the like comprising:

- a frame;
- a support pivotally mounted on said frame and adapted to be tilted relative to said support between extreme positions which are parallel with and perpendicular to the longitudinal axis of a mining drift;
- means for tilting said support;
- rock drill mounting means rotatably mounted on said support;
- means for rotating said rock drill mounting means;
- spring applied, fluid pressure released brake means for selectively permitting rotation of said rock drill mounting means.

12. The rock drilling apparatus of claim 11 further comprising clutch means for selectively connecting and disconnecting said means for rotating said rock drill mounting means to said rock drill mounting means.

13. The rock drilling apparatus of claim 12 further comprising means for coordinating said clutch means and said brake means so that when said clutch means disconnects said rotating means and said mounting means, said brake means is applied.

14. The rock drilling apparatus of claim 13 wherein said clutch means is fluid pressure actuated and said drilling apparatus further comprises a source of fluid under pressure, first conduit means for conducting fluid under pressure from said source to said brake means and second conduit means for conducting fluid under pressure from said source to said clutch means.

15. The rock drilling apparatus of claim 14 further comprising means for sluing said support relative to said frame.

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U.S. Cl. X.R.

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