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HINGE CONNECTION FOR PIVOTED FEED LEG TYPE ROCK DRILLS

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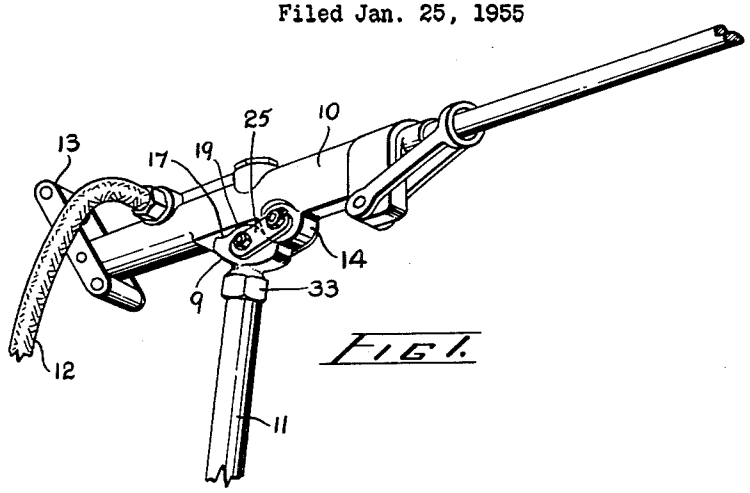


FIG 1.

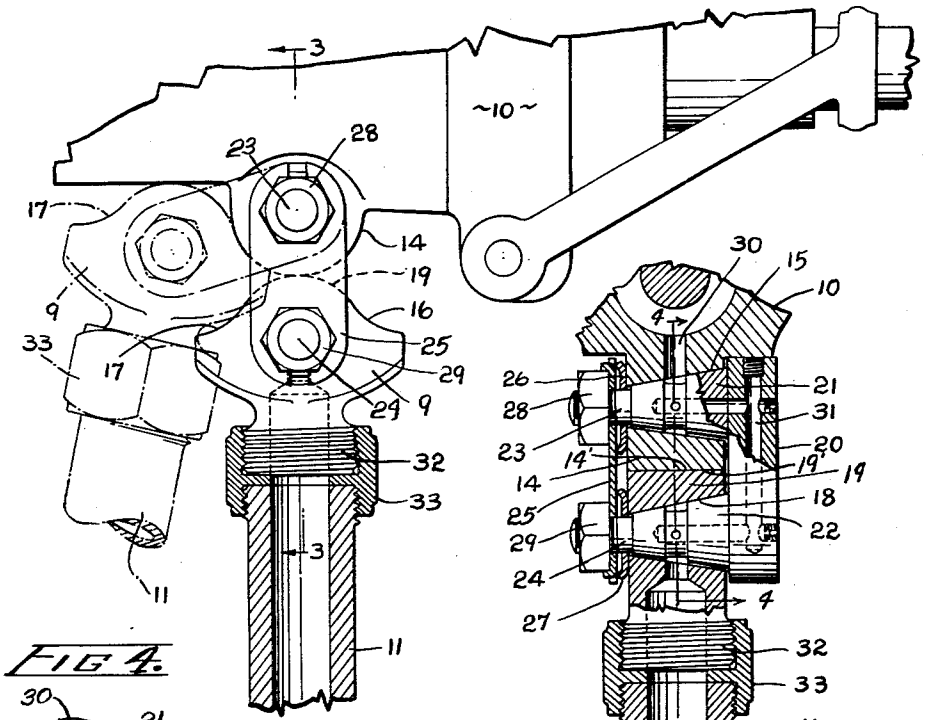
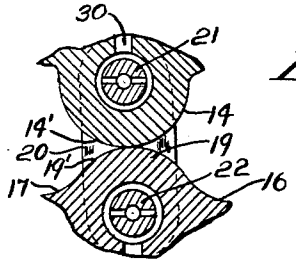


FIG 2.

FIG 3.

FIG 4.



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HINGE CONNECTION FOR PIVOTED FEED LEG TYPE ROCK DRILLS

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16 Claims. (Cl. 255—45)

This invention relates to a rock drill of the pneumatic, percussive type which is supported in part by an extensible feed leg of the pneumatic cylinder and piston type. In particular, the invention relates to the transverse hinge connection for pivotally connecting the rock drilling tool to the feed leg.

In rock drills of the pivoted feed leg type, as an example, a rock drill such as disclosed in my copending application Serial No. 279,014, filed March 28, 1952, now abandoned, a continuation of which Serial No. 676,701 was filed on August 5, 1957, the transverse hinge connection for pivotally connecting the rock drilling tool to the extensible feed leg has the feeding thrust of the feed leg transmitted therethrough and the pivot pin carries the impact of the machine and is thus subjected to considerable wear. Also, in the drill of the application, a separate external supply hose is required for delivering pressure fluid to the extensible leg. The present invention contemplates improvements over known types of drilling machines in that the foregoing and other disadvantages are substantially overcome. In the present invention there is provided an improved transverse hinge connection between the drilling tool and the feed leg wherein the thrust loads are carried directly by the housing of the drilling tool and leg and not by the pivotal connecting elements, as heretofore mentioned. Further, in the present invention, pressure fluid may be conducted from a connection on the drilling tool to the feed leg through elements of the hinge connection whereby the separate external hose connection heretofore employed is eliminated.

It is, therefore, an object of the present invention to provide a rock drill of the pivoted extensible feed leg type having an improved transverse hinge connection between the rock drilling tool and the feed leg. Another object is to provide an improved transverse hinge connection whereby the thrust and impact loads heretofore received by the hinge connection are transmitted directly to the drilling tool housing and feed leg wholly independently of the hinge connection. A further object is to provide an improved thrust transmitting means between the feed leg and the rock drill whereby the thrust loads are transmitted directly through abutting surfaces on the feed leg and drilling tool housing. Yet another object is to provide an improved fluid connection between the drilling tool and the feed leg whereby pressure fluid may be conducted through elements of the hinge connections. A still further object is to provide a fluid conduit through the hinge connection whereby the separate external hose connection heretofore employed is eliminated. These and other objects and advantages of the invention will, however, hereinafter more fully appear.

This application corresponds to my Canadian application Serial No. 675,802, filed on November 12, 1954.

In the accompanying drawing there is shown for purposes of illustration one form which the invention may assume in practice.

In this drawing:

Fig. 1 is a fragmentary perspective view showing the rock drill embodying the transverse hinge connection of the present invention.

Fig. 2 is a fragmentary view of the machine, on an enlarged scale, showing the hinge connection in broken lines in the position which it assumes during the drilling operation and, in full lines, in the position which it may assume during withdrawal of the drilling tool from the work.

Fig. 3 is a vertical section taken on line 3—3 of Fig. 2, with parts shown in full.

Fig. 4 is a vertical section taken on line 4—4 of Fig. 3, showing details of the hinge connection.

As the present invention is particularly adapted for use with rock drills used in mining operations and since in most mining operations, the rock drilling machinery and other machines are usually pneumatically operated, the invention will be described as employed in such operation. It is to be understood, however, that the present invention is useful for application to other machines and constructions and is therefore not limited to use in conjunction with pneumatically operated drilling tools.

The rock drilling tool is identified by the numeral 10 and is of the hammer type, for percussively actuating a conventional drill steel carryng a drill bit. The drilling tool, when in use, is supported, at least in part, by an extensible feed leg 11 which, in the present example, is of the pneumatically operated cylinder and piston type and this feed leg may impart a feeding thrust to the rock drill to aid in the feeding thereof during drilling. The rock drilling machine is provided with a fluid supply line 12, a transverse grasping handle 13, which may be of the type described in the above mentioned application Serial No. 279,014, and the usual control valves (not shown) for controlling the supply of air under pressure to operate the drilling tool and the feed leg.

The means for pivotally connecting the drilling tool to the reciprocable element of the feed leg comprises an enlargement in the form of a boss 14 integral with the underside of the housing of the drilling tool and this boss has its periphery arcuately curved at 14' (Fig. 4) so that the boss is substantially semi-cylindrical in shape, the center of the boss 14 desirably being located as close as possible to the center of gravity of the drilling tool. Formed centrally through the boss 14 is a tapered bore 15, as shown in Fig. 3, the bore 15 forming a bearing for one of the pivot pins to be hereinafter described. Mounted on the upper end of the feed leg 11 is a detachable coupling member 9 which has a centrally positioned crown 19 arcuately curved at 19' corresponding with the curvature of the surface of the boss 14. The curved surface of the crown 19 at each side of the base of the coupling member thereafter merges into oppositely disposed arcuately curved convace faces 16, 17 having the same radius as the arcuate periphery of the boss 14 so that the boss 14 fits into and may rest against one or the other of the concave faces, as hereinafter described. The axes of the pivot providing elements are aligned with the points from which the radii of the oppositely disposed arcuate surfaces are respectively struck, as shown in Fig. 2. The coupling member 9 is formed with a tapered bore 18 concentric with the center on which the crown is described. The coupling member is formed with a threaded shank 32 which, with the union

33, provides a simple means for detachably connecting the coupling member 9 to the leg.

The drilling machine is connected to the feed leg by means of a pivoted strap or link 20 which carries two tapered pivot providing elements in the form of plugs or pins 21, 22 respectively, which fit into the tapered bores 15, 18 respectively, The plugs 21 and 22 are desirably welded or otherwise secured to the pivoted strap or link 20. As illustrated in Fig. 3, the tapered plugs or pins 21, 22 are provided with threaded extensions 23, 24 respectively on which is mounted a parallel link 25. Mounted on the extensions 23, 24 between the link 25 and the boss 14 and crown 19, are spring washers 26, 27. The plugs 21, 22 are fastened in position by hexagonal nuts 28, 29. These nuts are adjusted so that the upper nut 28 is somewhat tighter than the lower nut so as to increase its resistance to movement. Thus, the lower pivotal connection is free to turn until the arcuate face of the boss 14 fits into the face 16 during the drilling operation or may be swung to fit into the face 17 so that the drilling tool will assist in withdrawing the bit from the hole.

For supplying pressure fluid to the extensible feed leg 11, the casing or housing of the drilling tool is formed with a duct 30 which, through a suitable control valve, communicates with the fluid supply line 12 and with the feed leg 11 through the duct 31 which is formed through the tapered plug 21, the link 20 and tapered plug 22. Pressure fluid may flow from the duct in the tapered plug 22 to the bore of the hollow piston rod of the feed leg 11. Since the plugs 21, 22 do not carry any of the weight of the drilling tool or the thrust loads and percussive shocks set up by the drilling tool during the drilling operation, they are not subject to appreciable wear and thus maintain and retain a substantially fluid tight engagement in their respective tapered bores.

As a result of this invention, an improved rock drill of the pivoted feed leg type is provided for an improved hinge connection between the drilling tool and the feed leg whereby the thrust loads and impact forces are transmitted directly to abutting surfaces on the feed leg and drill housing wholly independently of the pivoted elements of the hinge connection. By the provision of the opposed arcuate abutting surfaces on the feed leg and drill housing, the parts are supported in direct contact irrespective of the relative angular positions of the drilling tool and feed leg. By associating the fluid conducting means with the hinge connection, pressure fluid may be supplied from the fluid supply line of the drilling tool to the feed leg thereby eliminating a separate external fluid supply hose. The cooperating parts of the improved hinge connection are not only simple in design but are also relatively rugged and durable, well adapted to withstand the demands of service. Other advantages of the invention will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a rock drill of the pivoted extensible pneumatic feed leg type, a drilling tool, a feed leg for supporting and feeding the tool, and a hinge connection extending transversely of the drill between the drilling tool and the feed leg whereby said tool and feed leg may be disposed in different angular positions at substantial angles at opposite sides of the longitudinal axial line of said feed leg, said hinge connection comprising pivot-providing-elements on said leg and tool respectively, and abutting surfaces on the feed leg and the drilling tool and formed for constant engagement in all relative angular positions of said tool and feed leg about the hinge pivot whereby the thrust loads transmitted between the tool and feed leg are received by said abutting surfaces independently of said pivot-providing-elements in all relative angular positions of said tool and feed leg.

2. A rock drill as set forth in claim 1 wherein said abutting surfaces are oppositely disposed and oppositely curved and one of said surfaces provides stops with which said other surface is engageable to limit the relative angular movement of said tool and feed leg at their extreme positions in either direction.

3. In a rock drill of the pivoted extensible pneumatic feed leg type, a drilling tool, a feed leg for supporting and feeding the tool, and a hinge connection extending transversely of the drill between the drilling tool and feed leg whereby said tool and said leg may be disposed in different angularly related positions including positions at substantial angles at opposite sides of the longitudinal axial line of said feed leg, said hinge connection comprising cooperating pivot-providing-elements supported on parts of said tool and leg, and oppositely curved abutting surfaces on the feed leg and the drilling tool and formed for constant engagement in all relative angular positions of said tool and feed leg about the hinge pivot whereby the thrust loads transmitted between the tool and the feed leg are received by said abutting surfaces wholly independently of the pivot-providing-elements of said hinge connection in all relative angular positions of said tool and feed leg.

4. A rock drill as set forth in claim 3 wherein said pivot-providing-elements are parallel and are respectively aligned with the points from which the radii of said oppositely disposed arcuate abutting surfaces are struck and one of said surfaces being formed to provide stops at its opposite ends with which said other surface cooperates for limiting the opposite relative angular movements of said feed leg and tool.

5. A rock drill as set forth in claim 3 wherein said drilling tool is pressure fluid actuated and pressure fluid conducting means is provided for conducting pressure fluid from the drilling tool to the feed leg comprising passage means having ducts formed in said pivot-providing-elements.

6. In a rock drill, a drilling tool, an extensible supporting leg therefor, and a coupling for pivotally mounting the drilling tool on said extensible supporting leg to tilt about a transverse axis into different angular positions relative thereto, said coupling comprising a member formed on the underside of the tool, said member having an arcuately shaped bearing surface, a coupling member mounted on the top end of said leg, said coupling member having an arcuate crown of substantially the same radius as the bearing surface and a concave bearing face on each side of the crown, the radius of each face being substantially the same as the radius of the crown, a connecting link, means for pivotally connecting one end of said link to the first member and the other end to said coupling member, said link maintaining said first mentioned bearing surface in abutting contact with said arcuate crown, the pivotal connections being concentric with the bearing surface and said crown respectively whereby said bearing surface and crown remain in abutting contact in all angular positions of said tool about said pivotal coupling relative to said leg so that the thrust loads are received directly by the tool and said leg independently of said pivotal coupling in all relative angular positions of the tool and feed leg.

7. In a rock drill of the manually supported type having a drilling tool, an extensible supporting leg for said tool, and means for pivotally mounting the drilling tool on said extensible supporting leg, comprising a boss on the underside of the tool, said boss having an arcuate periphery and a bore formed centrally therethrough, a coupling member mounted on the top end of said leg, said member having an arcuate crown of the same radius

as the arcuate periphery and a bore formed centrally therethrough, a concave face on each side of the crown, each face being described on the same length of radius as the arcuate crown, said concave faces blending smoothly into the periphery of the crown whereby the circular periphery of the boss fits into the concave faces of said member, and a link having a pair of spaced apart pivot-providing-pins, one of said pins being received and secured in the first mentioned bore and the other received and secured in the second mentioned bore, the spacing between said pins being such that said link maintains the arcuate periphery of said boss in load-carrying engagement either with said arcuate crown or one or the other of said concave faces.

8. A rock drill according to claim 7 in which the drilling tool is pressure fluid actuated and has valve controlled fluid conduits and said link-and-pivot-providing pins are formed with fluid passages communicating with said leg and with said fluid conduits of the drilling tool.

9. In a rock drill of the manually supported type having a drilling tool, an extensible supporting leg for the tool, and a coupling for pivotally mounting the drilling tool on said extensible supporting leg comprising a member formed on the underside of the tool, said member having an arcuately shaped bearing surface, a bore formed centrally through said member, a coupling member mounted on the top end of said leg, said coupling member having an arcuate crown of substantially the same radius as the bearing surface and a concave bearing face on each side of the crown, the radius of each face being substantially the same as the radius of the crown, a bore formed centrally through said crown, a link having one end pivotally connected to the first member and the other end pivotally connected to said coupling member, the pivotal connections being concentric with said bearing surface and said crown respectively, and pivot-providing pin received in said bores to provide pivotal connections for said ends of said link, said link maintaining said first mentioned bearing surface in abutting contact either with said crown or one or the other of said bearing faces.

10. A rock drill according to claim 9 in which the drilling tool is pressure fluid actuated and has valve controlled fluid conduits and said link has pivot-providing-pins, said link and pivot-providing-pins being formed with fluid conducting passages communicating with said leg and said fluid conduits of said tool.

11. In a rock drill of the manually supported type, having a drilling tool, an extensible supporting leg for the tool, and a coupling for pivotally mounting the drilling tool on said extensible supporting leg whereby the tool may tilt about a transverse axis into different angular positions relative to said leg, said pivotal coupling comprising a boss on the underside of the tool, said boss having an arcuate periphery, a coupling member mounted on the top end of said leg, said member having an arcuate crown of the same length of radius as the arcuate periphery and a concave face on each side of the crown forming seats for said boss, a connecting link, means for pivotally connecting one end of said link to said boss and the other end to said crown, the pivotal connections of said link-ends being so located that said link maintains the boss in load carrying engagement with said seats and to permit said boss to move from one seat to the other while the arcuate periphery thereon remains in abutting contact either with said crown or one or the other of said faces so that the thrust loads are received directly by the tool and leg independently of said pivotal coupling in all relative angular positions of the tool and leg.

12. A rock drill according to claim 11 in which the drilling tool is pressure fluid actuated and passage means is provided for conducting pressure fluid from the drilling tool to said leg including valve controlled fluid conduits in said tool and fluid passages in said link communicating with said leg and said conduits.

13. In a rock drill of the manually supported type having a drilling tool, an extensible supporting leg for the tool, and a coupling for pivotally mounting the drilling tool on said extensible supporting leg comprising a member formed on the underside of the tool, said member having an arcuately shaped bearing surface, a tapered bore formed centrally through said member, a coupling member mounted on the top end of said leg, said coupling member having an arcuate crown and a concave bearing face on each side of the crown forming seats for said tool-member, a tapered bore formed centrally through said crown, and a link having a pair of spaced apart tapered pivot providing pins, one of said pins being received and secured in the first mentioned bore and the other received and secured in the second mentioned bore, the spacing between said pins being such that said link maintains the bearing surface in load carrying engagement either with said crown or said seat forming faces and during movement of said bearing surface from one seat forming face to the other.

14. A rock drill according to claim 11 in which the drilling tool is pressure fluid actuated and has valve controlled fluid conduits and said link has pivot-providing pins, said link and said pins being formed with fluid passages communicating with said leg and with said conduits of said drilling tool.

15. In a rock drill of the pivoted extensible pneumatic feed leg type, a pressure fluid operated drilling tool, a pressure fluid operated feed leg for supporting and feeding the tool, a hinge connection extending transversely of the drill between the drilling tool and the feed leg whereby said tool and said leg may be disposed in different angular positions at substantial angles at opposite sides of the longitudinal axial line of said feed leg, said hinge connection comprising pivot-providing-elements on said leg and tool respectively, and abutting surfaces on the feed leg and the drilling tool and formed for constant engagement in all relative angular positions of said tool and feed leg about the hinge pivot whereby the thrust loads transmitted between the tool and feed leg are received by said abutting surfaces independently of said pivot-providing-elements in all relative angular positions of said tool and feed leg, and pressure fluid conducting means for conducting fluid from the drilling tool to the feed leg, said fluid conducting means including fluid conducting ducts formed in said elements of said hinge connection.

16. In a rock drill of the pivoted extensible pneumatic feed leg type, a pressure fluid operated drilling tool, a pressure fluid operated feed leg for supporting and feeding the tool, a hinge connection extending transversely of the drill between the drilling tool and feed leg whereby said tool and said leg may be disposed in different angularly related positions, said hinge connection comprising parallel pivot-providing-elements respectively supported on parts of said tool and leg, and oppositely curved abutting surfaces on the feed leg and the drilling tool and formed for constant engagement in all relative angular positions of said tool and feed leg about the hinge pivot whereby the thrust loads transmitted between the tool and feed leg are received by said abutting surfaces wholly independently of the pivot-providing-elements of said hinge connection in all relative angular positions of said tool and feed leg, said pivot-providing-elements being respectively aligned with points from which the radii of said arcuately disposed arcuate abutting surfaces are struck, said pivot-providing-elements being in the form of tapered plugs and tapered orifices which are formed in the parts respectively supporting said abutting surfaces and in which orifices said tapered plugs are respectively received, said drilling tool having a fluid supply connection thereon, said hinge connection including a link to which said tapered plugs are secured, and passage means for con-

ducting pressure fluid from said supply connection of the drilling tool to the feed leg including communicating fluid conducting ducts formed in said plugs and link.

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