Dec. 28, 1965 G. N. LA CASSE 3,225,849

TILTING SUSPENSION FOR CRAWLER FRAMES

Filed Feb. 21, 1964 2 Sheets-Sheet 1

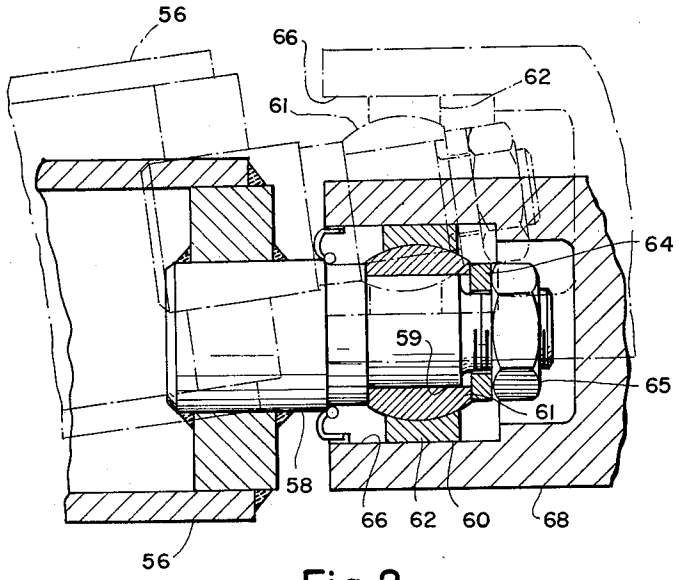

Fig. 2.

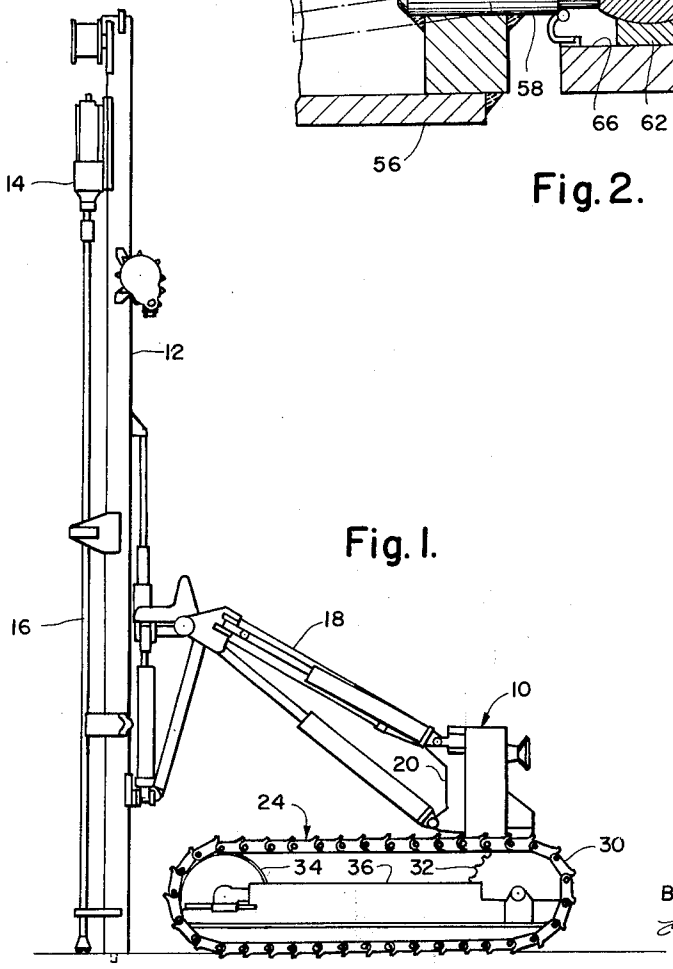

Fig. 1.

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TILTING SUSPENSION FOR CRAWLER FRAMES

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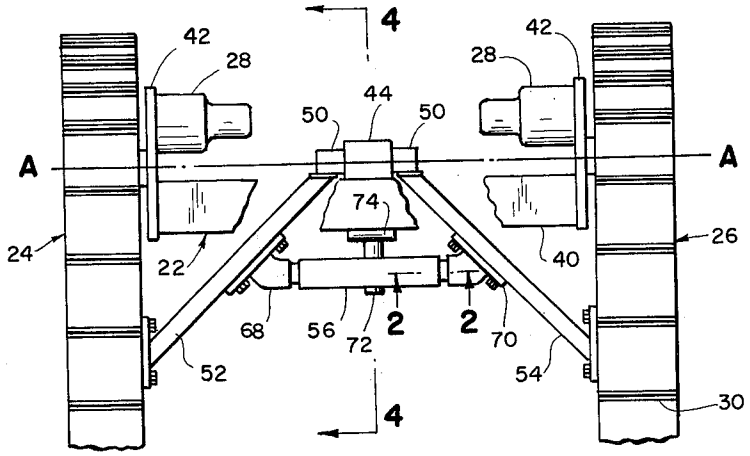

Fig. 3.

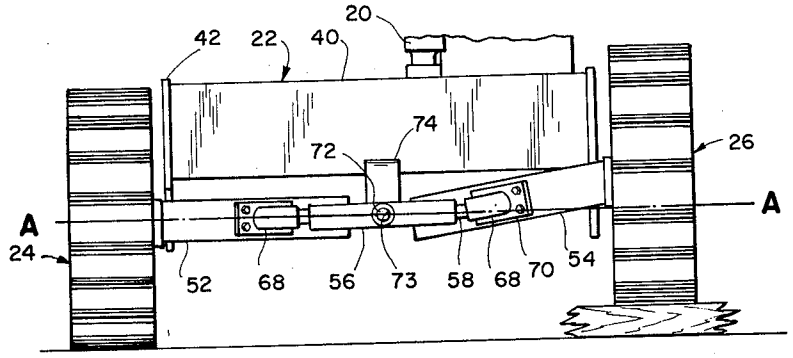

Fig. 5.

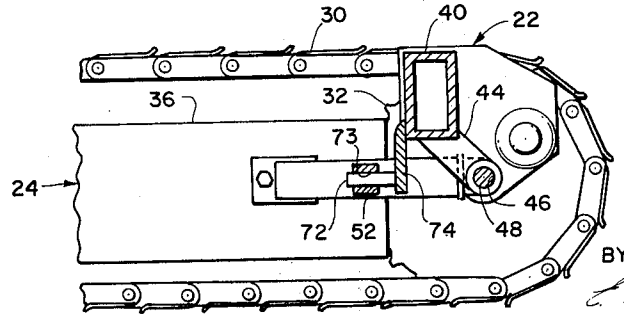

Fig. 4.

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3,225,849

Patented Dec. 28, 1965

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3,225,849

TILTING SUSPENSION FOR CRAWLER FRAMES

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Filed Feb. 21, 1964, Ser. No. 346,500
3 Claims. (Cl. 180—9.5)

This invention relates to a drilling device and more particularly to a crawler mounted mobile drill carriage having a novel frame suspension which provides for relative tilting movement of the crawlers with respect to each other when traveling over an irregular surface.

The drilling device of the present invention contemplates the use of a similar crossbar for supporting the drill support frame, which crossbar, by the use of spherical bearings eliminates the need for universally mounted links. The novel structure of this invention is stronger and more rigid than that of the prior art structures and can be constructed more economically since fewer pieces of material are necessary in the construction of the device of the present invention resulting in economy in manufacture and assembly.

It is therefore an object of this invention to provide a new and improved mobile drill carriage.

It is another object of this invention to provide a new and improved drill carriage for travelling over an irregular surface.

It is a further object of this invention to provide a new and improved drill carriage having a drill support frame supported by a crossbar, which crossbar is connected to a pair of crawler frames by simple ball joint connections.

It is still another object of this invention to provide a new and improved crawler mounted drill carriage having a novel frame suspension which provides for relative tilting movement of the crawlers with respect to each other when travelling over an irregular surface, which frame suspension comprises a minimum of moving parts.

These and other objects and advantages of this invention will more fully appear upon consideration of the following description and drawings in which:

FIGURE 1 is a side elevational view of a mobile drill mounted on a drill carriage constructed according to the principles of this invention;

FIGURE 2 is an enlarged, fragmentary, sectional view taken substantially on the line 2—2 of FIGURE 3;

FIGURE 3 is a top plan view of the mobile drill carriage shown in FIGURE 1;

FIGURE 4 is a sectional view taken on the line 4—4 of FIGURE 3; and

FIGURE 5 is a front elevational view of the mobile drill carriage shown in FIGURE 3.

Referring now to the drawings, there is shown in FIGURE 1 a drilling device 10 comprising an elongated drill frame 12 having mounted thereon and feedable therealong a drill motor 14 provided with an elongated drill rod and drill bit 16 for producing bores in rock strata in a manner well known in the art. The drill frame 12 is pivotably and longitudinally adjustably mounted on a suitable drill support boom 18 pivotably adjustably mounted on a support member 20 which is in turn mounted on and supported by a main frame 22 (see FIGURES 3 and 4) hereinafter more fully described.

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Two crawler mechanisms 24 and 26 of a well known type are held in laterally spaced parallelism by the main frame 22 and associated members as hereinafter more fully set forth. The crawlers 24 and 26 are suitably powered by suitable motors 28 suitably connected through control means to a device providing energy such as electrical current or compressed air for operation of the crawlers 24 and 26 in a well known manner.

Each of the crawlers 24 and 26 comprises an endless chain 30 trained about and driven by a drive sprocket 32 powered by one of the motors 28 and rotatable about a common centerline A—A (see FIG. 3) by suitable speed reduction gearing interposed between the motor 28 and the respective sprocket 32. An idler sprocket 34 (see FIG. 1) as well as the drive sprocket 32 is mounted on a crawler frame 36 for each of the crawlers 24 and 26 with each of the crawler frames 36 being provided with suitable guides and rollers for control of the orbiting of the chain 30 thereabout. For purposes of explanation the end of the machine shown to the left in FIGURES 1 and 4 will be hereinafter referred to as the forward end and the longitudianl dimension of the machine will be that taken along the line 4—4 of FIGURE 3 with the idler sprocket 34 at the forward end of the caterpillar 24 and the drive sprocket 32 at the rearward end of the crawler 24.

The main frame 22 comprises an elongated heavy walled steel tube of rectangular cross section extending transversely across the drilling device 10 and located forwardly and upwardly from the axis A—A of the drive sprockets 32. The ends of the tube 40 are rigidly secured to a pair of rearwardly extending bracket plates 42 pivotably mounted on the crawler frames 36 respectively for limited rotation about the axis A—A with the motors 28 suitably mounted thereon and located rearwardly of the axis A—A. From an intermediate portion of the tube 40 a central bracket 44 extends rearwardly and downwardly a sufficient distance to encompass a bore 46 coaxial with the axis A—A. An elongated cylindrical pin 48 is rigidly secured in the bore 46 and pivotably received in a journal end 50 of a support beam 52 which extends forwardly and transversely from the central bracket 44 to an intermediate portion of the crawler frame 36 of the righthand crawler 24. In like manner a lefthand support beam 54 having a journal end 50 pivotably receiving an end portion of the pin 48 extends obliquely forwardly from the central bracket 44 to a central portion of the crawler frame 36 of the lefthand crawler 26.

Extending transversely of the machine from an intermediate portion of the support beam 52 to an intermediate portion of the support beam 54 is an elongated crossbar member 56 having an axis parallel to the axis A—A and in a common horizontal plane therewith (see FIG. 3).

The crossbar member 56 as shown comprises an elongated main portion of rectangular cross section with a stepped cylindrical element 58 rigidly secured in each end thereof and extending longitudinally outwardly therefrom with the two end elements 58 being coaxial with each other and with the main portion of the crossbar 56 (see FIG. 2). A reduced diameter portion 59 of the cylindrical element 58 at each end of the crossbar 56 is fitted to the inner diameter of a spherical bearing 60 of a type well known in the art and characterized as a self-

aligning two-piece bearing having a partially spherical inner element 61 mounted in a cylindrical outer element 62 having a partially spherical inner surface mating with the outer surface of the inner element 61 so that the inner element 61 is universally pivotable within a limited range of angles within the outer element 62. The inner element 61 is secured on the reduced diameter portion 59 in any suitable manner as by a washer 64 and a nut 65 as shown. The outer element 62 is slidably mounted in an axial bore 66 of a generally cylindrical bearing bracket 68 provided with an integral oblique base 70 rigidly removably secured to an intermediate portion of one of the beams 54 or 52. Thus the crossbar 56 is universally pivotably connected between the intermediate sections of the beams 52 and 54 with the slidable relationship of the outer element 62 to the bore 66 providing for a change in length made necessary whenever the crawler 24 rotates about the axis A—A in relation to the crawler 26, which rotation takes place to a greater or less degree almost continually as the device 10 traverses irregular ground or other supporting surfaces.

A transverse bore 73 through the center of the crossbar 56 slidably receives an elongated cylindrical pin 72 having an axis coinciding with the centerline of the machine (line 4—4) in the horizontal plane containing the axis A—A when the machine is standing on a flat, level surface. The pin 72 is rigidly secured to the lower end of a bracket plate 74 rigidly secured to and downwardly depending from the lower front central portion of the tube 40. The bracket plate 74 and the pin 72 provide a third support point, in conjunction with the brackets 42, for the main frame 22 so that the frame 22 is rigidly supported on a three point suspension while the crawlers 24 and 26 are free to rotate with respect to each other about the axis A—A within limits imposed by the structural clearance between the frame 22 and the beams 52 and 54. When the drilling device 10 is operating upon an irregular surface the crawlers 24 and 26 will at times necessarily rotate about axis A—A in relation to each other as for example when the forward end of the crawler 26 is raised in relation to the position of the forward end of the crawler 24 as shown in FIGURE 5 the following actions will take place: the end of the crossbar 56, nearest the crawler 26, will rise causing the crossbar to extend obliquely from one bearing bracket 68 to the other necessitating a lengthening of the connection extending therebetween. With a given size of machine this lengthening amounts to approximately .22" for an angle of 7½° as measured between the horizontal plane and the centerline of the crossbar 56. This amount of lengthing is accomplished by movement of the outer elements 62 within the bores 66 a distance of .11" towards the centerline, as measured within each bore 66. While the above described action is taking place the pin 72 has been carried upwardly by an amount equal to one-half the rise of the bracket 68 associated with the crawler 26 and consequently the forward edge of the main frame 22 has also been carried upwardly by one-half the amount of the rise of the aforementioned bracket 68. Thus it is seen that the crawlers 24 and 26 are free to rotate about the axis A—A' with respect to each other but that rigid three point support of the main frame 22 remains in effect although a slight tipping of the main frame 22 does take place. It is to be realized that as the main frame 22 rotates about the axis A—A there is a slight change in the distance from the axis A—A to the center of cross bar 56 which change in distance is accommodated by the sliding fit of the pin 72 in the transverse bore of the crossbar 56 allowing the necessary variation in length to take place without interfering with the rigidity of the assembly.

The structure of the present invention is very rigid in that the crossbar is not free to move forwardly and backwardly relative to the crawler frames but is only free to rotate about a fixed centerline since both ends of the crossbar although pivotable with relation to the support members and free to move transversely of the machine, cannot move forwardly or rearwardly with respect to the support members. The structure of the present invention employs only two relative large spherical bearings having an outside diameter of approximately two inches.

It is to be realized that although the crossbar has been described as being mounted in spherical self-aligning bearings, other types of ball and socket joints having the required degree of angular and longitudinal freedom with respect to the crossbar 56 can be employed in place of the spherical bearings 60.

It is to be realized that a preferred embodiment of this invention having been described, other embodiments of these principles are possible and envisioned as being within the scope of this invention. It is therefore respectfully requested that this invention be interpreted as broadly as possible and be limited only by the prior art.

I claim:

1. A mobile rock drill support comprising: two parallel crawler assemblies having a crawler frame within each of said assemblies; rearward portions of said assemblies having a common transverse axis, said assemblies being pivotable about said axis; a transverse frame pivotable about said axis and pivotably secured to said crawler frames; two elongated rigid support members, rigidly secured to and extending rearwardly and inwardly from intermediate portions of said crawler frames, respectively, said support members being pivotably secured to each other along said axis; spherical bearings transversely slidably mounted on intermediate portions of said support members, respectively; an elongated rigid cross-bar member extending between and universally pivotably secured by said spherical bearings; said crossbar member having a central transverse bore therethrough and being pivotably connected to said transverse frame through said bore, said bore having an axis normal to said transverse axis and said crossbar member being slidable along the axis of said bore to permit said crawler frames to rotate with respect to each other within the limits imposed by the clearance between said rigid frame and said support members.

2. A mobile rock drill support comprising: two parallel crawler assemblies; a crawler frame within each of said assemblies; rearward portions of said assemblies having a common transverse axis, said assemblies being pivotable about said axis; a transverse frame pivotable about said axis, pivotably secured to said crawler frames; two elongated rigid support members, rigidly secured to and extending rearwardly and inwardly from intermediate portions of said crawler frames, respectively, said support members being pivotably secured to each other; spherical bearings mounted on intermediate portions of said support members, respectively, said bearings being slidable transversely of said support members; an elongated rigid crossbar member extending between and universally pivotably secured to said spherical bearings; said crossbar member having a central transverse bore therethrogh; pivot means rigidly secured to said transverse frame, said bore and said pivot means having a common axis normal to said transverse axis and said bore slidably receiving said pivot means to permit said crawler frames to rotate with respect to each other within the limits imposed by the clearance between said rigid frame and said support members.

3. A mobile rock drill support comprising: two parallel crawler assemblies; a crawler frame within each of said assemblies; rearward portions of said assemblies having a common transverse axis, said assemblies being pivotable about said axis; a transverse frame pivotable about said axis, pivotably secured to said crawler frames; two elongated rigid support members, rigidly secured to and extending rearwardly and inwardly from intermediate portions of said crawler frames, respectively, said support members being pivotably secured to each

other; universally pivotable bearings mounted on intermediate portions of said support members, respectively, said bearings being slidable transversely of said support members; an elongated rigid crossbar member extending between and fixedly secured to said universal bearings; said crossbar member having a central transverse bore therethrough; pivot means rigidly secured to said transverse frame, said bore and said pivot means having a common axis normal to said transverse axis and said bore slidably receiving said pivot means to permit said crawler frames to rotate with respect to each other within the limits imposed by the clearance between said rigid frame and said support members.

References Cited by the Examiner

UNITED STATES PATENTS

2,065,509	12/1936	Bell et al.	287—87 X
2,828,137	3/1958	Wagner	180—9.5
2,936,841	5/1960	Mazzarins	180—9.54
2,988,159	6/1961	Webber	180—9.5

FOREIGN PATENTS

321,146	5/1920	Germany.

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