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Bumueller

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[54] **ARTICULATED VEHICLE**

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[52] **U.S. Cl.** **248/2,** 173/27, 173/28, 173/43

[51] **Int. Cl.** **F16m 3/00**

[58] **Field of Search** ..... 248/2, 16; 173/27, 28, 173/43; 180/51, 77 S

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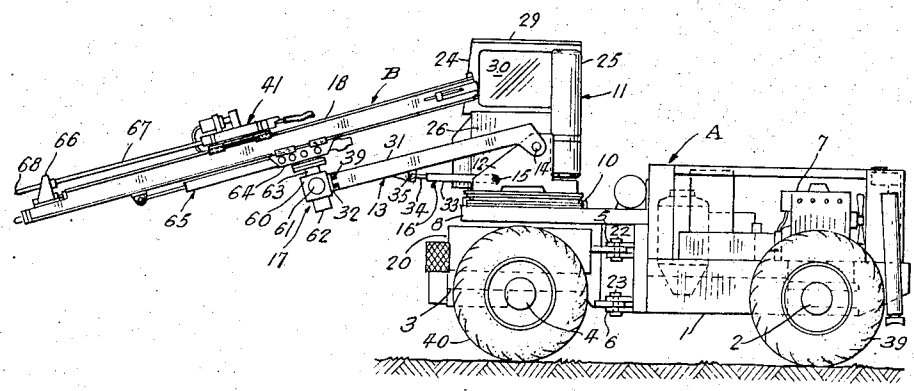
[57] **ABSTRACT**

An articulated vehicle for carrying a working assembly, e.g., a drilling assembly, includes first and second frames and a platform extending cantileverwise from the first frame over the second frame; the working parts are all mounted on the first frame and the platform, the parts mounted on the platform being mounted on a turntable unit adapted to rotate 360°, whereby a projecting working assembly can be made to overlie the first frame; the vehicle can thus adapt a compact arrangement for travelling and shows good manoeuverability; the turntable unit has a braking arrangement applied directly to it.

17 Claims, 5 Drawing Figures



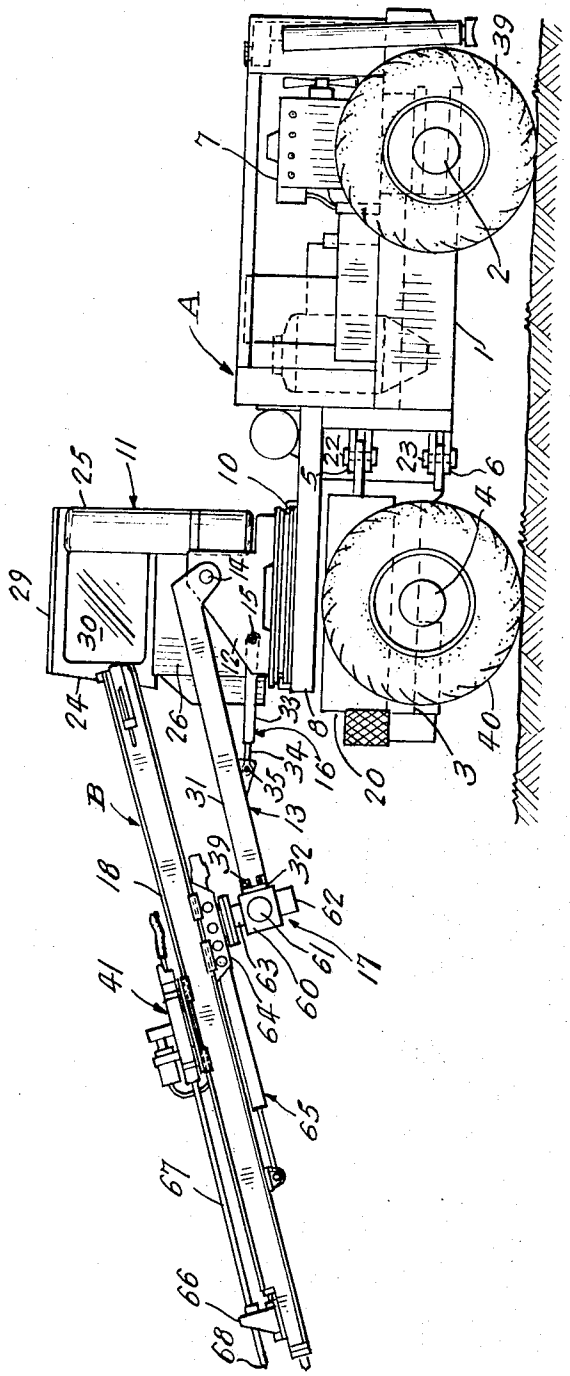

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FIG. 1

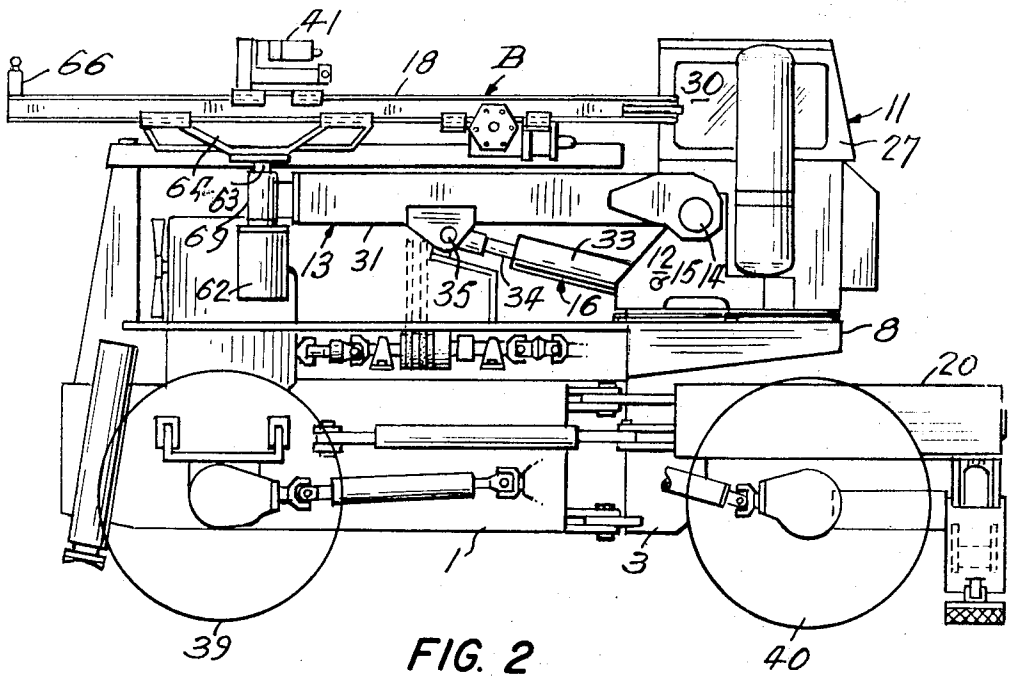
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FIG. 2

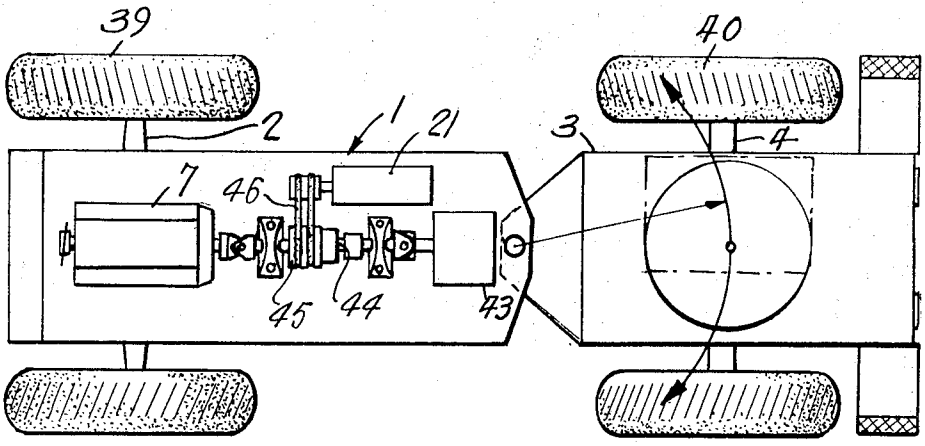
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FIG. 3

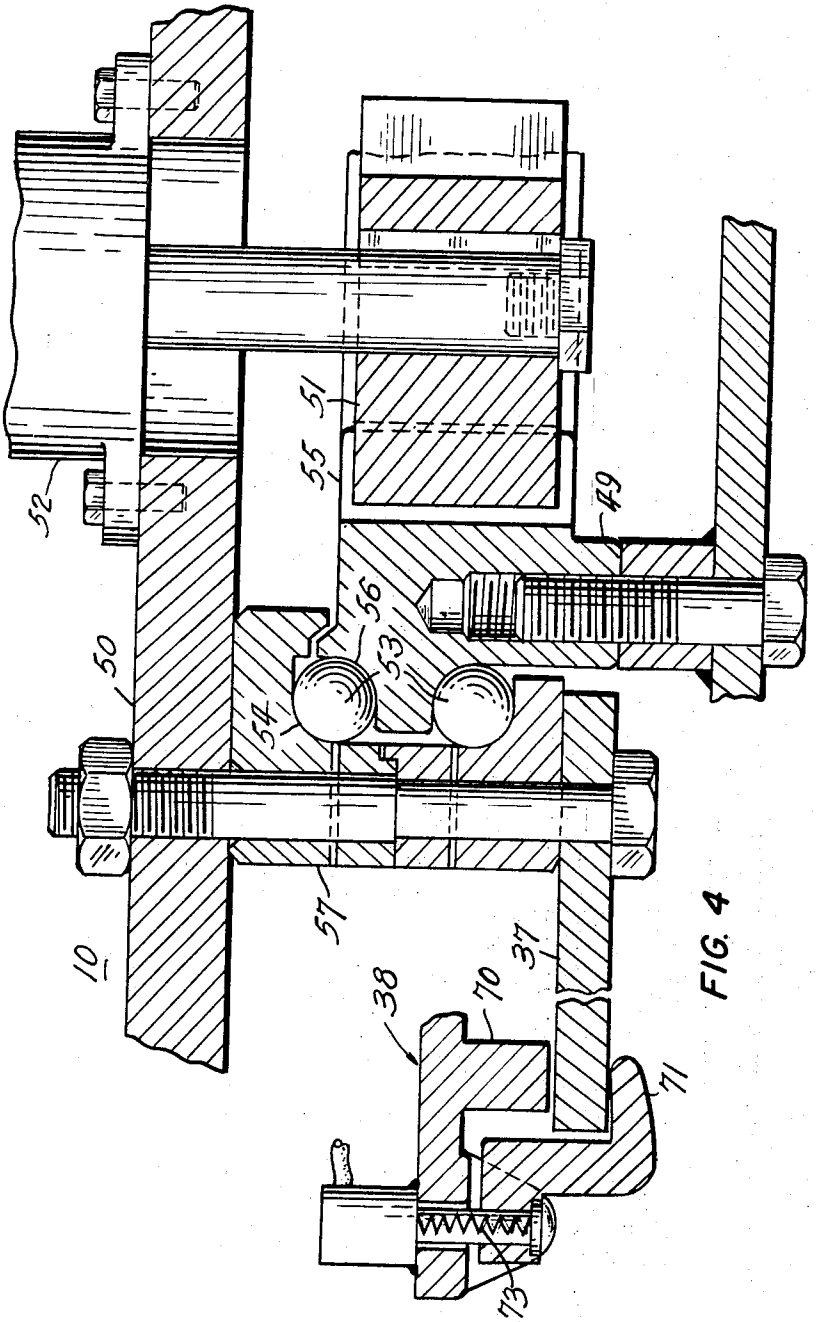

FIG. 4

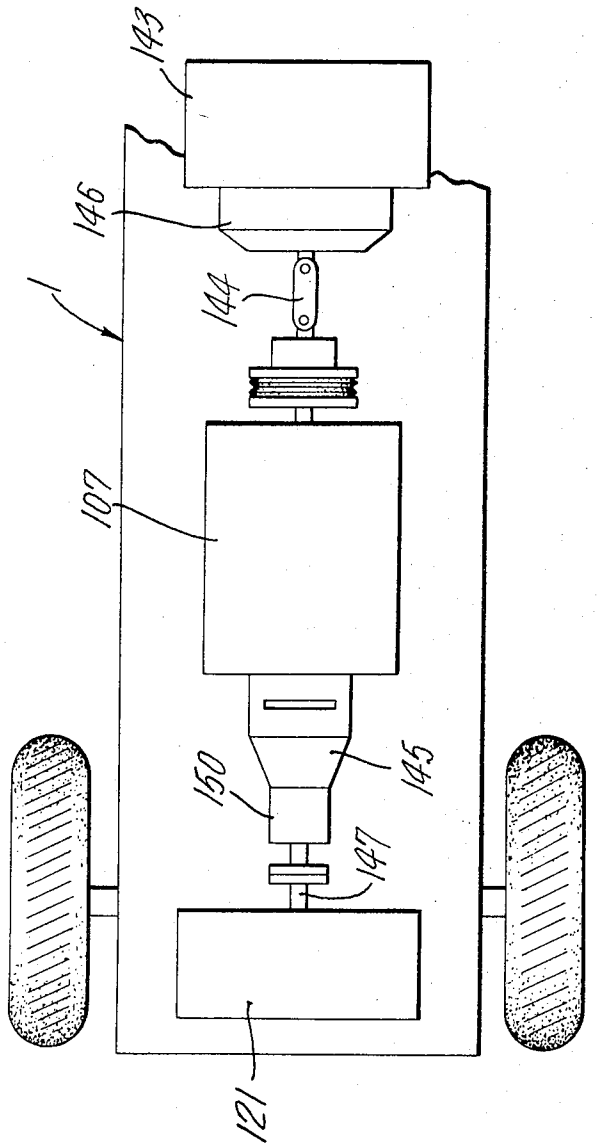

FIG. 5

ARTICULATED VEHICLE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an articulated vehicle, and more especially to an articulated vehicle having a turntable unit on which is mounted a drilling assembly.

2. Description of Prior Art

In order to carry out operations in outlying areas in which a varied terrain is encountered such as in mining and road making, working assemblies, for example, rock drilling assemblies, are mounted on a vehicle which must be capable of travelling over the varied terrain. Vehicles which will meet the arduous requirements in one respect have frequently failed in other respects. Generally, the vehicles which are used to mount working assemblies are of the track type being mounted on caterpillar tracks and are large in size and heavy in weight.

Such vehicles are, accordingly, slow in movement, and difficult to manoeuver in varied terrains particularly in turning corners in rocky terrain when on a journey to a working site. Such vehicles also have the disadvantage that movement from one working area to an adjacent working area outside the limits of manoeuverability of the working assembly requires considerable movement of the vehicle, which, owing to the large size of the vehicle and its poor manoeuverability, is time consuming with subsequent delays in the working operations. This lengthens the time required to complete the working operations and increases the costs.

Also, in confined spaces where a working site is closed by rock, for example, it is often necessary to employ the vehicle or other vehicles in clearing an entrance for the vehicle, so that it can reach the working area; a confined space may also mean that only one vehicle and working assembly can be used at a time owing to the size of the vehicle, whereas in the case where there are two different working areas, it might be desirable to use other equipment in the second working area, access to which is prevented by the presence of the large track vehicle.

The present invention provides a vehicle on which can be mounted a working assembly; the vehicle being generally compact and having good manoeuverability.

The present invention further provides an improved turntable unit adapted to carry the working assembly on the vehicle.

SUMMARY OF THE INVENTION

According to one aspect of the invention, an articulated vehicle comprises a first frame mounted on a first axle and a second frame mounted on a second axle, the frames being articulated at a point between the axles: the first frame housing an engine and transmission unit for driving the vehicle, and mounted on said first frame a platform extending cantileverwise over the second frame, when the axles of the first and second frames are parallel, the platform having a turntable rotatably mounted thereon, said turntable being adapted to mount a working assembly.

In another aspect the invention comprises a turntable unit comprising a first member, a second member rotatably mounted on said first member, means to rotate said second member, and braking means mounted on one of said first and second members adapted to engage the other of said first and second members.

The controls and working parts are all mounted on the first frame of the vehicle and on the cantilevered platform extending from the first frame. This arrangement allows a large space on the second frame, which can be used to hold a fuel tank. It is thus possible to house on the second frame a large fuel tank, and the vehicle can thus travel for many days in outland regions with a large supply of fuel without being dependent on an external source of fuel.

The location of the working parts on a single frame enables the use of a single engine to provide power for both the vehicle and the working assembly whilst retaining manoeuverability through the articulated connection between the first and second frames.

As a further advantage the mounting of all the moving parts on one frame improves the carrying and travelling ability of the vehicle as compared with normal articulated vehicles, which have the moving parts distributed between the articulated frames. In normal articulated vehicles, there is a danger that parts mounted on one frame will interfere with parts mounted on the other frame, particularly when the vehicle turns a corner when a part mounted on and projecting from one frame may contact a part mounted on the other frame. This danger is largely eliminated by the present arrangement.

In the track type vehicles which have previously been used, two engines have been necessary, a first engine driving the track vehicle and a second engine driving the working assembly.

In a preferred embodiment, the working assembly is in the form of a boom arrangement with at least one drill assembly.

BRIEF DESCRIPTION OF DRAWINGS

Preferred embodiments of the invention are illustrated with reference to the accompanying drawings, in which:

FIG. 1 is a side elevation illustrating a vehicle in an operative position;

FIG. 2 is a side elevation illustrating the vehicle in its compact travelling position;

FIG. 3 is a plan schematically illustrating the rear section of a vehicle;

FIG. 4 is a fragmentary vertical cross section of a turntable unit;

FIG. 5 is a plan schematically illustrating the rear section of a vehicle in a different arrangement from that of FIG. 3.

DESCRIPTION OF PREFERRED EMBODIMENTS

With further reference to the drawings and particularly with reference to FIG. 1 a vehicle A having a drill assembly B is illustrated.

The vehicle A includes frames 1 and 3 mounted on axles 2 and 4 respectively, the frames 1 and 3 being articulated at articulation points 5 and 6 by means of articulation pins 22 and 23. Pairs of wheels 39 and 40 are rotatably mounted on axles 2 and 4 respectively. An engine 7 and transmission unit 43 are mounted on the frame 1, and are adapted to drive the vehicle A. A compressor 21 the use of which is described below is also mounted on frame 1, and is adapted to be driven by the engine 7.

The frame 3 has a large capacity fuel tank 20 mounted on it.

A platform 8 is mounted on and extends cantileverwise from the frame 1 over frame 3, and a turntable 10 is rotatably mounted on platform 8.

A cabin 11 for an operator is mounted on the turntable 10 and includes front and rear walls 24 and 25 respectively, side walls 26 and 27 and a roof 29. The front and rear walls 24 and 25 and side walls 26 and 27 have windows 30 to provide the operator with a clear, all-round view.

A pivot bracket 12 is mounted on the turntable 10 adjacent sidewall 26 of the cabin 11. The drill assembly B includes a telescopic boom 13 having boom sections 31 and 32. Boom section 31 is hingedly mounted to pivot pin 14 in the bracket 12. The boom section 32 slides within the boom section 31 on interchangeable bearing pads 39, preferably made from conventional brake lining material, for example, asbestos.

A hydraulic lift cylinder arrangement 16 is provided including a cylinder 33 hinged to the bracket 12 by means of hinge pin 15, and a piston 34 connected to the boom section 31 by means of hinge pin 35.

At the free end of the boom section 32, there is provided a universal joint indicated generally at 17, which includes a first fixed bracket 60 in a second bracket 69 rotatable relative to the fixed bracket 60. A hydraulic actuator 61 mounted to the fixed bracket 60 drives the second bracket relative thereto. A second hydraulic actuator 62 is mounted to the second bracket 69 and drives a shaft 63 journalled in the second bracket 69. A drill beam 18 including a mounting bracket 64 is fixedly mounted to the shaft 63 driven by the second hydraulic actuator 62. The drill beam 18 slides relative to the mounting bracket 64, and a piston and cylinder arrangement 65 connects at one end to the mounting bracket 64, and the other end to the drill beam 18. Finally a typical pneumatic drill motor 41 is adapted to slide on the drill beam 18 in the conventional manner. A drill rod holder 66 is provided at the end of the drill beam 18. In the drawings, a drill rod 67 and bit 68 is shown in an operative position. The drilling beam 18 further includes a roller chain, having a chain tensioner; the roller chain draws a feed cradle carrying drill rod 67.

When piston 34 is retracted, i.e. the lift cylinder arrangement 16 is in an unextended position, the telescopic boom 13 is in a lower working position, and is inclined at an angle of about 25° below the horizontal. When piston 34 is extended, the telescopic boom 13 is in its upper working position, and is inclined at an angle of about 30° above the horizontal. The telescopic boom 13 can occupy any position between these upper and lower positions.

The drill bit 68 can be turned through an angle of up to about 280° in any horizontal or vertical plane in which it is set by the starting position of the turntable 10 and telescopic boom 13 by means of the universal joint 17.

It will be apparent, since all the working parts of the vehicle A including the drill assembly B are supported by frame 1, that frame 3 will be readily movable about the articulation points 5 and 6 relative to frame 1. This would not be the case if the working parts were distributed between frame 1 and frame 3. Vehicle A thus possesses good manoeuverability because of its structural arrangement.

The interior of cabin 11 is arranged such that the controls for driving the vehicle A are located alongside rear wall 25, and the controls for operating the drill assembly B are located alongside front wall 24. The cabin 11 contains a swivel chair (not shown) located between front and rear walls 24 and 25. Thus when an operator is operating the drill assembly B he sits facing front wall 24 with the appropriate controls in front of him, at the same time, he has a clear view of the drill assembly B through the window 30 in front wall 24.

If the operator wants to drive the vehicle or to move it forwards or rearwards he turns his chair to the driving controls alongside rear wall 25; in this position he has a clear view in front of him through the windoe 30 in rear wall 25, and by means of suitably placed mirrors can see behind him.

The turntable 10 is mounted for rotary movement up to 360°. Thus when the drill assembly B is not in use, as for example, when the vehicle A is en route to a working site, the turntable 10 can be rotated, so that the drill assembly B overlies frame 1. This results in a compact arrangement which can be manoeuvered in areas in which manoeuvering of the vehicle A with the drill assembly B in the extended position would be difficult. The vehicle A thus has the advantage that it can adapt a compact form for travelling and has greater manoeuverability; this is more clearly illustrated in FIG. 2.

With reference to FIG. 3, the engine 7 drives a shaft 44 to a transmission unit 43. A cylindrical clutch device 45 is provided about the shaft 44; it includes a cylindrical pulley about which straps 46 pass. When the air compressor 21 is not required, the clutch device 45 is normally disengaged from the shaft 44. However, when it is required to increase the torque to slow the vehicle A, when coming to a stop, it is possible to engage the clutch device 45 thereby forcing the shaft 44 to drive the compressor 21, and thus increase the torque load on the shaft 44.

With reference to FIG. 4, a turntable 10 includes an annular support member 49 having an inwardly facing gear ring. A rotatable member 50, rotatable relative to the support 49 includes a downwardly extending annular skirt 57 forming the outer race 54 of a double ball bearing arrangement while the annular support member 49 forms the inner race of the ball bearing arrangement. The annular skirt 57 of the rotatable member includes an outwardly extending annular flange 37. A hydraulic motor 52 is mounted to extend through the rotatable member 50 and mounts a pinion gear 51, which engages the gear ring 55 in member 49.

Sets of spring loaded disc brakes 38 connected to a hydraulic cylinder (not shown) are mounted around turntable 10 on platform 8. Brake members 70 and 71 under the action of the springs engage the flange 37 of member 50, and thus lock the turntable 10 in the desired position. When it is desired to rotate the turntable 10, the pressure of the springs 73 is opposed by hydraulic pressure from the hydraulic cylinder, and the brakes are released, thus enabling the turntable 10 to be rotated.

This braking system has advantages over conventional breaking systems in which the braking action is controlled through the gears, since the possibility of free play or slack, which may occur when the braking action is through the gears can be avoided; on the other

hand, a larger braking torque is needed, but this is compensated for by the saving in the gears.

The braking system has the further advantage that it stabilizes the location of the drill assembly B and the vibrations developed, for example, in the operation of the drill assembly B have only a limited effect on the direction and accuracy of the drilling.

With reference to FIG. **5** the parts on frame **1** are shown in a different arrangement from that in FIG. **3.** In this embodiment, an air compressor **121,** an engine **107** and a transmission unit **143** are located in a straight line. This arrangement has spatial advantages over the embodiment illustrated in FIG. **3,** and also has the advantage of supplying direct drive from the engine **107** to the compressor **121** as compared with the indirect belt drive illustrated in FIG. **3.** In this arrangement, the air compressor **121** is always running, and when not in use will be run at no-load. As in the arrangement illustrated in FIG. **3,** this arrangement can be used to increase the torque load on the shaft **147** by operation of the compressor **121,** thereby retarding the engine **107.**

In the arrangement illustrated in FIG. **5,** a gearbox **150** is shown about the shaft **147** between the engine **107** and compressor **121**; this is to change the direction of the shaft in the case in which the torque converter on the transmission unit can only be turned in one direction. Where a torque converter is used, which can rotate in both directions, the gearbox is not necessary.

In a particular embodiment a vehicle A, according to the invention, having a drill assembly B has a GM-6V-71 diesel engine **7** and a 600 c.f.m. Atlas Copco DT4 two stage air cooled compressor **21.** The telescopic boom **13** has a retracted boom length of about 9 feet, and an extended boom length of about 14 feet.

The overall length of vehicle A was of the order of 18 ft., 9 ins., the overall width about 8 ft., 6 ins. and the overall height with cabin **11** of the order of 11 ft., the ground clearance was about 1 ft., 7 ins., and the wheel base was about 11 ft., 6 ins.

The wheels **39, 40** had 18.00 to 26 inch, 10 ply tube type sure grip Grader-2tires for maximum two-way, non-skid traction.

The weight of the vehicle was of the order of 32,000 lbs.

These dimensions illustrate the relative compactness of the vehicle as compared with those typically used in drilling and related operations.

The drilling beam **18** had a total length of about 18 ft., 6 ins., and the extension cylinder provided an extension of 3 ft.

The drill bit **68** was of the Atlas Copco Rock Drill Model BBE 37, and the chain feed was a Standard Atlas Copco BBM36K258. Air consumption for operation of the drill bit **68** is generally about 630 cu. ft./min.

The fuel tank **20** had a capacity of about 290 U.S. gallons, which can thus hold enough fuel for about one week based on an 8 hour working day, and avoids the necessity for separate fuel carrying trailers.

In operation the drill bit **68** can be located initially at the required working area by rotating the turntable **10** and locking the turntable **10** by means of brakes **38** when the drill bit **68** is pointing approximately in the direction of the working area. The telescopic boom **13** is then adjusted to an appropriate angle by the lift cylinder arrangement **16,** and the telescopic boom **13** extended towards the working area as necessary A range of working areas can then be recched by adjustment of the universal joint **17** without the necessity of further adjustments to the turntable **10** or the position of the telescopic boom **13.**

In another embodiment a second drilling assembly B could be mounted on platform **8** adjacent side wall **27** of the cabin **11**; this would enable two drilling operations to be carried out at the same time.

I claim:

1. An articulated vehicle comprising a first frame mounted on a first axle, and a second frame mounted on a second axle; the frames being articulated at a point between the axles,

the first frame housing an engine and transmission unit for driving the vehicle and mounted on said first frame a platform extending cantileverwise over the second frame when said first and second axles are parallel, the platform having a turntable rotatably mounted thereon, said turntable being adapted to mount a working assembly.

2. A vehicle according to claim **1** wherein the second frame has a large capacity fuel tank mounted thereon.

3. A vehicle according to claim **1** wherein said engine is adapted to povide power to operate the working assembly.

4. A vehicle according to claim **1** having independent spring loaded brakes mounted on the first frame and adapted to operably contact said turntable, said spring loaded brakes being connected to a means adapted to release the brakes.

5. A vehicle according to claim **1** wherein said working assembly is a drill assembly pivotally mounted on said platform.

6. A vehicle according to claim **5** wherein said drill assembly comprises means adapted to support and elevate drill means, said means comprising a boom pivotally mounted on said platform about a pivot and lift cylinder means including a cylinder hinged on said platform about a hinge and a piston hingedly connected to said boom, said pivot being spaced vertically from said hinge.

7. A vehicle according to claim **6** wherein said boom comprises hydraulically actuated inner and outer telescopic sections.

8. A vehicle according to claim **7** wherein said inner and outer telescopic sections of said boom have bearing pads of a low wear brake lining material located therebetween adapted to guide said inner section in said outer section.

9. A vehicle according to claim **1** wherein said turntable is adapted to rotate through 360°, whereby the working assembly can be located over the first frame to produce a compact arrangement.

10. A vehicle according to claim **1** including an air compressor mounted on said first frame and wherein a clutch means is provided about a drive shaft between the engine and transmission unit, said clutch means including a pulley means connected by continuous belt means to a shaft on said air compressor, so constructed and arranged that to increase the torque to slow the vehicle the clutch means can be engaged forcing the drive shaft to drive the compressor, thus increasing the torque load on the shaft whereby the vehicle can be slowed down.

11. A vehicle according to claim 1 wherein said turntable comprises a member rotatably mounted on said platform, means to rotate said member and braking means mounted on one of said platform and said member adapted to engage the other of said platform and said member.

12. An articulated vehicle comprising first and second frames mounted on first and second spaced apart axles, said frames being articulated at a point between the axles,

the first frame housing an engine and transmission unit for driving the vehicle,

a platform mounted on said first frame and extending cantileverwise over the second frame when said first and second axles are parallel,

said platform having a turntable mounted thereon adapted to rotate through 360°,

a pivot bracket mounted on said platform, and

a drill assembly mounted on said pivot bracket, said drill assembly comprising drill means rotatably mounted in two perpendicular planes on a telescopic unit, said telescopic unit comprising a telescopic boom pivotally mounted on said bracket about a pivot and lift cylinder means including a cylinder hinged on said bracket about a hinge and a piston hinged on said boom, said pivot being spaced vertically from said hinge.

13. A vehicle according to claim 12 wherein said telescopic boom comprises inner and outer telescopic sections having bearing pads of a low wear brake lining material located therebetween adapted to guide said inner sections in said outer section.

14. A vehicle according to claim 12 wherein the second frame has a large capacity fuel tank mounted thereon.

15. A vehicle according to claim 12 wherein said turntable comprises a member rotatably mounted on said platform, means to rotate said member and braking means mounted on one of said platform and said member adapted to engage the other of said platform and said member.

16. A vehicle according to claim 15 wherein said braking means comprise independent spring loaded brakes connected to a hydraulic pump adapted to oppose the spring action, and releast the brakes said hydraulic pump being mounted on said first frame.

17. A vehicle according to claim 1 including an air compressor mounted on said first frame in line with said engine and said transmission unit, said engine being located between said compressor and said transmission unit, so constructed and arranged that operation of the compressor can be used to increase the torque on a drive shaft between the transmission unit and the engine, whereby the engine can be retarded and the vehicle slowed down.

* * * * *