May 21, 1946. E. W. BARNHART 2,400,803

COMBINED BRAKE AND STABILIZER CONTROL

Filed Aug. 21, 1944 2 Sheets-Sheet 1

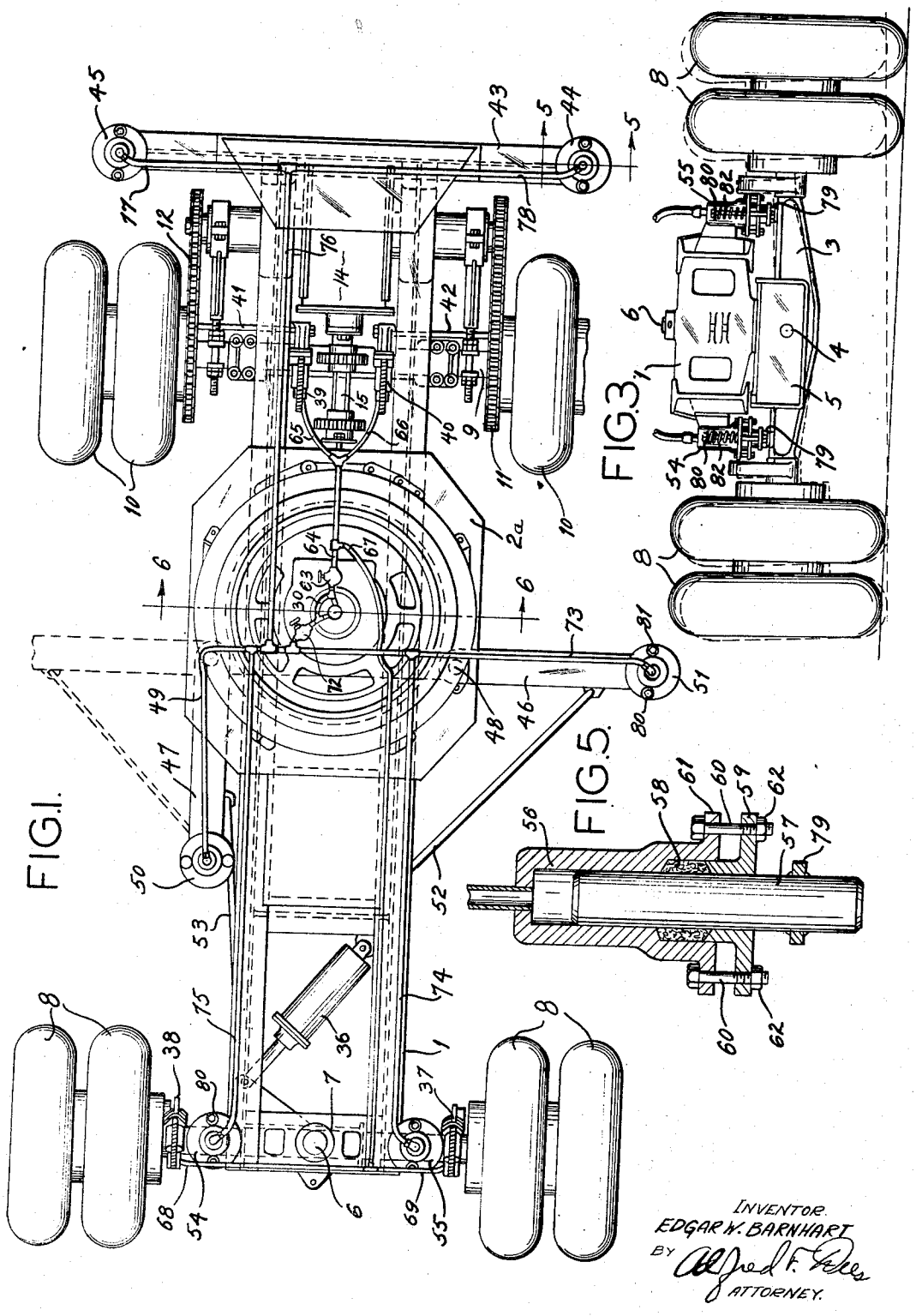


FIG. 1.

FIG. 3.

FIG. 5.

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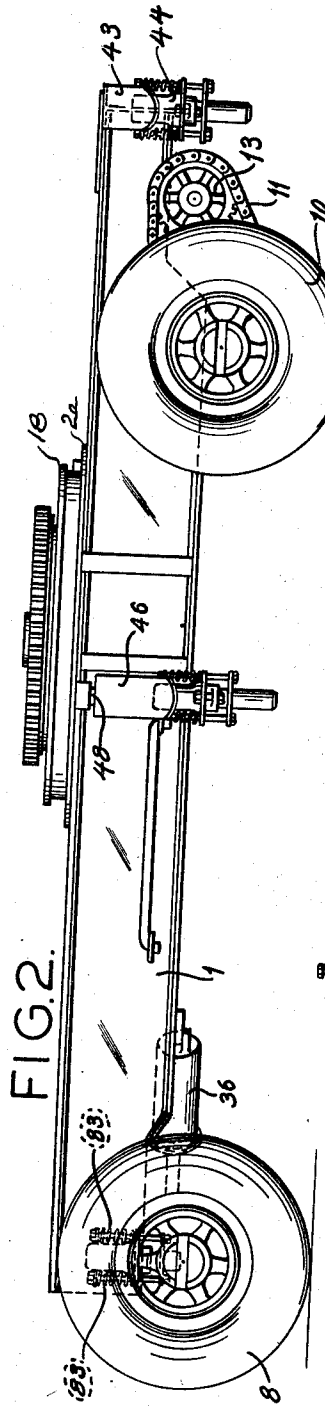


FIG. 2.

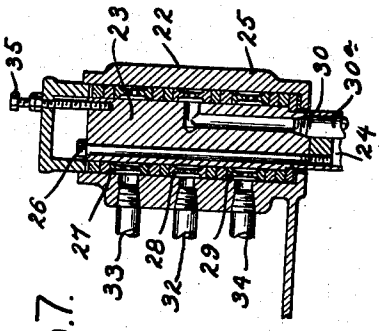


FIG. 7.

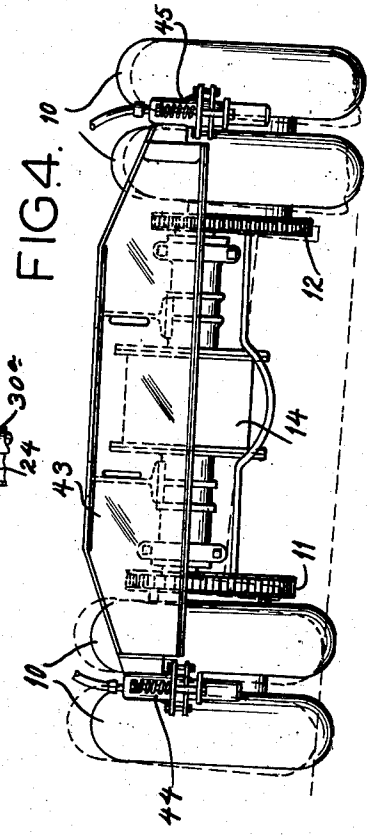


FIG. 4.

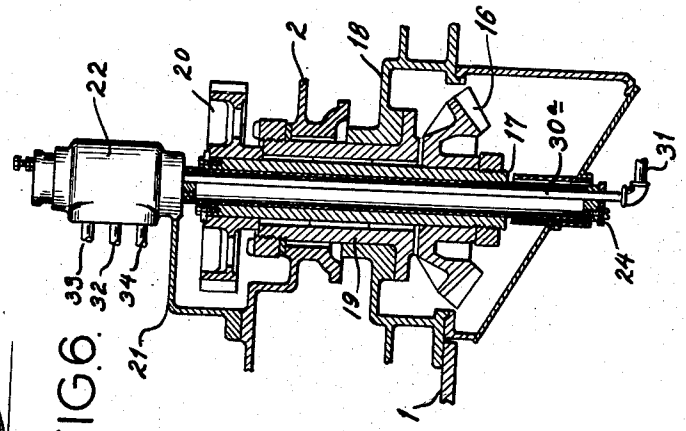


FIG. 6.

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COMBINED BRAKE AND STABILIZER CONTROL

Edgar W. Barnhart, Marion, Ohio, assignor to The General Excavator Company, Marion, Ohio, a corporation of Ohio

Application August 21, 1944, Serial No. 550,456

11 Claims. (Cl. 212—145)

This invention relates to portable self-propelled cranes, hoists or excavators and in its more specific aspects is directed to a device for stabilizing the chassis thereof during periods of operation.

One of the objects of the invention is to provide a more flexible and efficient construction for stabilizing the chassis of a portable self-propelled hoist or related device during its period of hoist operation.

A further object of the invention is to provide outrigger jacks with a control device operable from the operator's station.

Another object of the invention is to provide a hydraulic control for the outrigger jacks of a portable self-propelled hoist that are interlocked with the brakes of the hoist chassis.

Another and further object of the invention is the provision of means in the interconnected jacks and brake circuits whereby either the jacks or brakes may be selectively or jointly operated.

Another and still further object of the invention is to provide an interlocked outrigger jack and brake control on a portable self-propelled hoist in which the controls are arranged at and in proximity to the operator's station.

Other objects are to increase the flexibility of control, stability of the chassis during periods of hoist or crane operation, reduce the number of operating parts and the maintenance cost of the device.

Other and further objects of the invention will occur to those skilled in the arts to which this invention pertains as the description proceeds which, taken in connection with the accompanying drawings, sets forth a preferred embodiment of the invention but such disclosure is not to be construed as a limitation of the invention which is limited only by the appended claims and any and all modifications, alterations and variations of structure coming within the spirit and scope thereof are deemed to be included herein.

In the drawings:

Figure 1 shows a plan view of a chassis incorporating the invention.

Figure 2 shows a side elevational view thereof.

Figure 3 shows a front elevational view thereof.

Figure 4 shows a rear elevational view thereof.

Figure 5 shows a vertical sectional view of a hydraulic jack taken along the line 5—5 of Figure 1.

Figure 6 shows a vertical sectional view through the center shaft taken along the line 6—6 of Figure 1.

Figure 7 shows a vertical sectional view through the pressure fluid coupling.

Portable cranes and hoists have in the prior art been equipped with various stabilizing devices manually operated to prevent tipping or rocking of the chassis during periods when a heavy load is being handled by the boom or other load handling apparatus mounted in the upper body of the crane or hoist. These manual devices or screw jacks usually require considerable personal attention and are slow to function. These jacks are of the conventional screw variety carried on the chassis and are sometimes detachable. This invention seeks to reduce the length of time required to stabilize the chassis and render the jacks operable from any rotative position of the upper body with respect to the chassis. In order to increase the stability of the chassis and reduce the number of parts, the stabilizers are operable by the same source of power as the brakes and to still further increase the flexibility of control, the jacks and chassis brakes may be severally or jointly operated by the same source of power.

The above objects and advantages are achieved in a device in which 1 is the frame of a chassis on which a supporting plate 2a is fixed above which the deck or platform element 2 of the conventional upper body is rotatably mounted. This is conventional in the arts and, therefore, no detailed description is deemed necessary although a schematic illustration of the relationship of the parts is shown in Figure 6.

On the forward end of the chassis an axle 3 is pivotally mounted on a pin 4 secured in a housing 5 to which a vertical king pin 6 is secured extending through the chassis for the purpose of enabling the axle 3 to be twisted or turned about 6 as an axis to steer the same. A suitable retaining means 7 is provided to keep king pin 6 in operative relation with chassis 1. Axle 3 pivots about pin 4 in order that pneumatic wheels 8 may pivot in order to hold chassis 1 substantially level regardless of undulations in terrain as shown e. g. by the dotted line in Figure 3.

The rear end of the chassis 1 is supported on a rigid axle 9 having pneumatic or rubber tired wheels 10 thereon which are driven by chain devices 11 and 12 disposed around sprocket wheels, one of which is indicated at 13 in Figure 2. Sprocket wheels, such as 13, are secured to shafts extending from a transmission arranged within a housing 14. Power is supplied to the aforesaid transmission by way of power transmitting element 15 which is operatively associated with the gear 16 secured to center shaft 17. This shaft is

rotatably secured in a housing 18 by means of a sleeve element 19 and deck 2 of the upper body is rotatably mounted on the other end of sleeve element 19. Shaft 17 is suitably journaled in sleeve 19 and at its upper end has a gear 20 secured thereto which is connectable to a suitable prime mover (not shown) mounted on the deck 2. The wheel and axle assembly 9 and 10 is rigidly associated with the chassis frame 1, and pivoted axle 3 is intended to keep the chassis frame 1 substantially level when the wheels are resting on undulating terrain as shown in Figure 4.

Supported above center shaft 17 in a housing 21 on deck 2 is a pressure fluid coupling having a central core element 23 supported on a tubular element 24. Tubular element 24 is held in position vertically and against rotation relative to chassis frame 1 by being suitably secured at its lower end to the chassis frame. The external frame or casing 25 forms a part of and is rigidly associated with housing 21 and is, therefore, rotatable with respect to core 23. The core 23 is secured to tubular element 24 by bolts 26 and surrounding core 23 are a plurality of perforated channeled rings 27, 28 and 29 shown as three in number, each of which connects internally with its individual duct 30, only one of which is shown, formed in the core and which connects with a conduit 31 leading to some pressure fluid operated device. Each of conduits 32, 33, and 34 is connected to an appropriate source of pressure fluid supply mounted on the deck. Each of the rings 27, 28 and 29 is separated by appropriate packings to prevent leakage from one ring or duct to the other, it being understood that there are as many ducts 30 in core 23 as there are rings and each is connected by means of ducts 32, 33 and 34 to the source of pressure fluid supply. A screw means 35 is provided for the purpose of taking up slack caused by distortion and wear in the packing rings 27, 28 and 29.

Attention is invited to the fact that the foregoing illustrates a method by which different pressure fluid lines may be led from the rotatable deck to pressure fluid operable devices mounted on the chassis. One such device is the motor 36 used to steer the portable hoist or crane and the other is the pressure fluid brake actuating devices 37, 38, 39 and 40. As many devices as necessary may be provided, it being only necessary to provide the necessary number of ducts as for the individually operated devices. Suitable control valves (not shown) may be connected to ducts 32, 33 and 34. These are intended to be conventional structures and their particular organization is not of importance to the instant disclosure.

Brake actuating means, as indicated above, are provided for each of the wheels and in the instant case are pressure fluid actuated. Those for the forward wheels 8, 8 are disposed in proximity to the wheels. Those for the rear wheels are fixed to the frame 1 and by means of rods associated with the actuating devices operate the brakes disposed within the wheels 10, 10.

The means for stabilizing the frame 1 while a hoisting operation is being performed comprises a plurality of pressure fluid operated jacks distributed about the chassis of the hoist operable from the operator's station and in any rotative position of deck 2 relative to the frame 1. The frame 1 has fixed thereto at the rear a transverse member 43 whose length is considerably greater than the width of the frame to the ends of which pressure fluid jacks 44 and 45 are secured. Substantially midway of frame 1, and preferably though not necessarily, in proximity to the rotational axis of deck 2, two outrigger booms or arms 46 and 47 are pivotally mounted, one on each side of frame 1. The outriggers 46 and 47 are pivotally mounted on frame 1 by means of pivots 48 and 49. On the outer end of these outriggers, pressure fluid jacks 50 and 51 are mounted. During periods of non-use the outrigger booms 46 and 47 are reposing adjacent frame 1 as e. g. shown by the full line position of boom 47. In order that the booms 46 and 47 may be held in retracted or in extended condition, braces 52 and 53 provide the two positions which are illustrated in Figure 1.

The front end of the chassis is stabilized by mounting two pressure fluid jacks 54 and 55 on each side of the frame, the movable elements of which engage the axle 3 and keep the chassis frame 1 substantially horizontal. In order for the two forward jacks 54 and 55 to be operable it is necessary that the axle 3 be in a position such that it is at right angles to frame 1 or as particularly shown in Figure 1.

Each of the pressure fluid jacks comprises a cylinder 56 in which a piston or plunger 57 is reciprocably mounted. The cylinder 56 is counterbored to receive packing 58 which is held in place in the counterbore by closure element 59. The flange 61 on cylinder 56 is suitably apertured to receive a plurality of bolts 60 which extend through the flange portion of closure element 59. Nuts 62, 62 retain the closure element 59 in any adjusted position and serve to take up wear in packing 58 whenever necessary. Plunger or piston 57 has an arm or bracket 79 welded thereon which extends on opposite sides of the jack through which two bolts 80 and 81 extend. These bolts also extend through flange 61 on cylinder 56. Springs 82 and 83 (Figure 2) are arranged on bolts 80 and 81 and engage with the heads on bolts 80 and 81 and also engage the flange 61 on cylinder 56. The function of springs 82 and 83 is to retract plunger 57 when no pressure fluid is admitted to cylinder 56 of each of the respective pressure fluid operated jacks.

Pressure fluid for operating jacks 44, 45, 50, 51, 54, and 55, as well as brake elements 37, 38, 39, and 40 originates in a pressure fluid supply (not shown) mounted on deck 2 and after passing an appropriate control valve enters conduit 32 which transmits it through perforated ring 28 into duct 30 through conduit 30a connected thereto and thence into conduit 31. Conduit 31 terminates in a valve 63 to which conduit 64 is connected that branches into conduits 65 and 66 terminating in brake devices 39 and 40, each of which has a suitable operating motor (not shown) associated therewith. Another conduit 67 branches off from conduit 64 which branches into conduits 68 and 69 terminating in motors (not shown) associated with the brake elements 37 and 38.

Branching off from conduit 31 is another conduit having a valve 72 therein that is connected to a conduit 73 which terminates in pressure fluid jacks 50 and 51. This conduit may have flexible portions therein or may be made entirely of flexible material to accommodate pivoted outrigger booms or arms 46 and 47. Conduits 74 and 75 take off from conduit 73 and terminate at the forward pressure fluid jacks 54 and 55 and conduit 76 branches into conduits 77 and 78, each of which terminates in pressure fluid jacks 44 and 45.

The operation of the jacks and brakes on the disclosed device is possible in any rotative posi-

tion of deck 2 relative to frame 1 by reason of coupling 22. Pressure fluid for operating them is admitted into conduit 32 and then is led to the lower conduit 31 through ring 28, duct 30 and passageway 30a. From conduit 31 it is distributed to the several brakes 37, 38, 39 and 40 through conduits 64, 65, 66, 67, 68 and 69. Pressure fluid is also distributed to the several jacks 44, 45, 50, 51, 54 and 55 through conduits 71, 73, 74, 75, 76, 77 and 78. Valves 63 and 72 determine whether the jacks and brakes will be operated jointly or severally from the pressure fluid supply on deck 2. In the event the plunger of the jacks on outrigger booms 46 and 47 and on member 43 fail to reach ground or any surface, suitable blocking is inserted thereunder. It is, therefore, evident that the jacks may be simultaneously operated with the brakes or either one alone and that they can be controlled by the crane operator requiring a smaller number of attendants and enabling a higher degree of mobility. The pressure fluid jacks can be quickly operated and the hoist or crane stabilized in only a fraction of the time ordinarily taken. The joint or several actuation of brakes and jacks enables the operator to secure any degree of stability desired ranging from the use of brakes alone to the joint use of brakes and jacks. As previously pointed out, the normal operative position of outrigger booms or arms 46 and 47 is at right angles to the longitudinal axis of frame 1.

That which is regarded novel and useful and which is sought to be protected by Letters Patent of the United States is as follows:

1. In a portable crane or hoist; a chassis; a deck rotatably mounted on said chassis; a set of brakes for said chassis; a set of stabilizing jacks for said chassis; arm means on said chassis supporting some of said jacks constructed and arranged to position them at varying distances from said chassis; means on said deck to enable pressure fluid to be delivered to said jacks and to said brakes; and valve means to selectively apply pressure fluid to said jacks and brakes or to either brakes or jacks to thereby stabilize said chassis.

2. In a portable crane or hoist; a chassis; a deck rotatably mounted on said chassis; a set of pressure fluid operated brakes for said chassis; a set of pressure fluid operated jacks for said chassis; arm means on said chassis supporting some of said jacks constructed and arranged to position them at varying distances from said chassis; means to transmit pressure fluid to said jacks and brakes from any rotative position of said deck relative to said chassis; and valve means to cause joint or several operation of said jacks and brakes to stabilize said chassis.

3. In a portable material handling device; a chassis; a deck rotatably supported on said chassis; pivoted outrigger arms on said chassis; a set of pressure fluid operated brakes for said chassis; a set of pressure fluid operated jacks on said chassis, at least two of which are mounted on said pivoted outrigger arms; means to supply pressure fluid to said brakes and jacks; and valve means to jointly or severally apply pressure fluid to said jacks and said brakes to stabilize said chassis.

4. In a portable material handling device; a chassis; a deck rotatably mounted on said chassis; a pivoted outrigger arm mounted on each side of said chassis substantially midway thereof; pressure fluid operated jacks mounted on the ends of said chassis and on the end of each of said outrigger arms; pressure fluid operated brakes for said chassis; means to transmit pressure fluid to said jacks and brakes in any rotative position of said deck relative to said chassis; and valve means controlled by the operator to jointly or severally apply pressure fluid to said brakes and jacks to stabilize said chassis.

5. In a portable material handling device; a chassis; means to rotatably mount a deck on said chassis; a pair of pressure fluid jacks mounted on the front end of said chassis whose plungers are engageable with the front axle of said chassis; an outrigger arm mounted on each side of said chassis having a pressure fluid jack mounted on the ends thereof; a member mounted on the rear end of said chassis having hydraulic jacks mounted on the ends thereof; pressure fluid operated brakes on said chassis; a hydraulic coupling on said deck to transmit pressure fluid to said jacks and brakes in any rotative position of said deck relative to said chassis; a conduit connected to said coupling for transmitting pressure fluid therefrom to said brakes and jacks; and valves operable by the operator to enable the joint or several operation of said brakes and jacks to stabilize said chassis.

6. In a portable material handling device; a chassis; means to rotatably support a deck on said chassis; and means to stabilize said chassis during hoisting operations of the device which includes a set of pressure fluid operated brakes for said chassis, a set of hydraulic jacks for said chassis; arm means on said chassis supporting some of said jacks constructed and arranged to position them at varying distances from said chassis; and means to selectively jointly or severally apply pressure fluid to said brakes and jacks.

7. In a portable self-propelled material handling device; a chassis; a deck; means to rotatably mount said deck on said chassis; a set of pressure fluid operated brakes for said chassis; a plurality of pressure fluid operated jacks distributed about said chassis some of which engage other parts of said chassis and some of which are engageable with the supporting surface of the device; arm means on said chassis supporting some of said jacks constructed and arranged to position them at varying distances from said chassis; a common pressure fluid supply line for said brakes and jacks which includes a coupling adapted to supply pressure fluid to said brakes and jacks in any rotative position of said deck relative to said chassis; and valve means to selectively jointly or severally apply pressure fluid to said jacks and brakes to stabilize said device.

8. In a portable self-propelled material handling device; a chassis; a deck; journal means to rotatably support said deck on said chassis; pressure fluid operated brakes for said chassis; a plurality of pressure fluid operated jacks for said chassis; arm means on said chassis supporting some of said jacks constructed and arranged to position them at varying distances from said chassis; a pressure fluid coupling fixed concentrically with respect to said journal means adapted to transmit pressure fluid in any rotative position of said deck relative to said chassis; a first conduit disposed concentrically of said journal means; a second conduit having branches that connect said brakes and said jacks as separate units; and valve means associated with said branches to selectively jointly or severally apply pressure fluid to said jacks and brakes to thereby stabilize said device while handling material.

9. In a wheel mounted material handling device; a chassis; a deck rotatably supported thereon; an outrigger arm mounted on each side of

said chassis; a set of pressure fluid operated brakes for said chassis; a set of pressure fluid operated jacks on said chassis, at least two of which are mounted on said outrigger arms; means to position the jacks on said arm at varying distances from said chassis; means to supply pressure fluid to said brakes; means to supply pressure fluid to said jacks; and valve means to jointly or severally apply pressure fluid to said jacks and said brakes to stabilize said chassis.

10. In a wheeled material handling device; a chassis; a deck rotatably mounted on said chassis; an outrigger arm on each side of said chassis; pressure fluid jacks on said chassis, at least two of which are on said arms; means to position said arm mounted jacks at varying distances from said chassis; a set of pressure fluid operated brakes for said chassis; and means to jointly or severally apply pressure fluid to said jacks and said brakes to stabilize said chassis.

11. In a wheeled material handling device; a chassis; a deck rotatably mounted on said chassis; an outrigger arm on each side of said chassis; a plurality of pressure fluid jacks on said chassis in which some of said jacks are mounted on said arms; means to position said arm supported jacks at varying distances from said chassis; pressure fluid operated brakes for said chassis; means to transmit pressure fluid to said jacks and said brakes in any rotative position of said deck relative to said chassis; and valve means to jointly or severally apply pressure fluid to said brakes and said jacks to stabilize said chassis.

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