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Metaillier

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[54] **STABILIZING DEVICE FOR APPLIANCES FOR PUBLIC WORKS, FOR HANDLING AND FOR MAINTENANCE**

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[51] **Int. Cl.**.....**B60s 9/02**

[58] **Field of Search**.....280/150.5, 150 C

[56] **References Cited**

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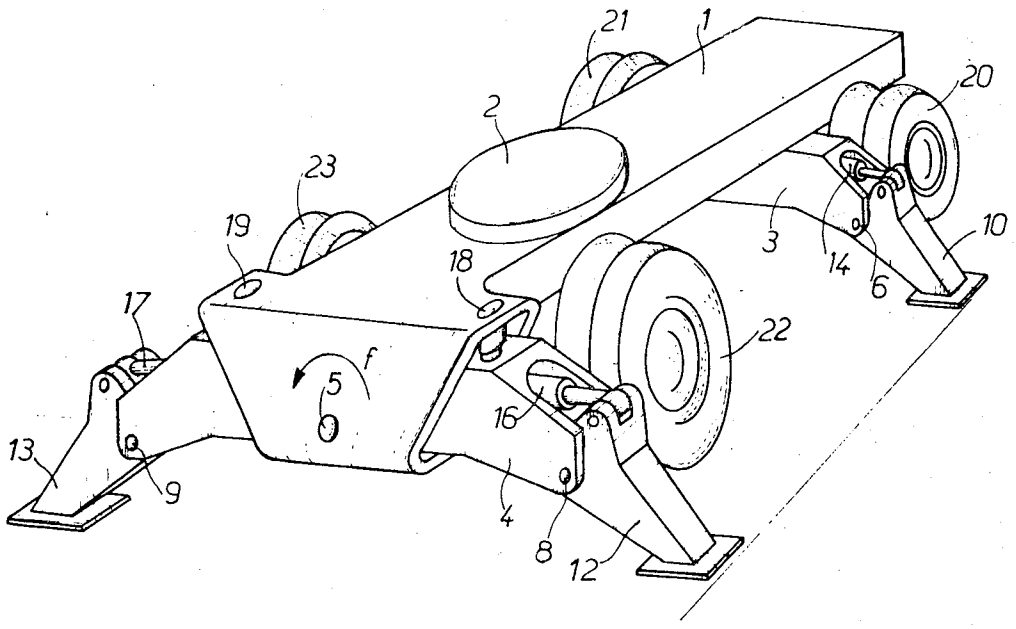
[57] **ABSTRACT**

The invention relates to the field of appliances for public works, for handling and for maintenance.

More specifically, the invention relates to a stabilizing device for such appliances which comprises two pairs of stabilizing legs driven by jacks and arranged at the front and at the rear, respectively, of the appliance. At least one of these pairs of legs is mounted on a traverse articulated, about an axis, to the chassis of the appliance which can be immobilized about its axis by suitable means, such as jacks, which also allow one to cause it to pivot about its axis.

This device is useful for re-establishing the bearing on the ground of one of the legs carried by the traverse in the event of cessation of this bearing.

3 Claims, 2 Drawing Figures



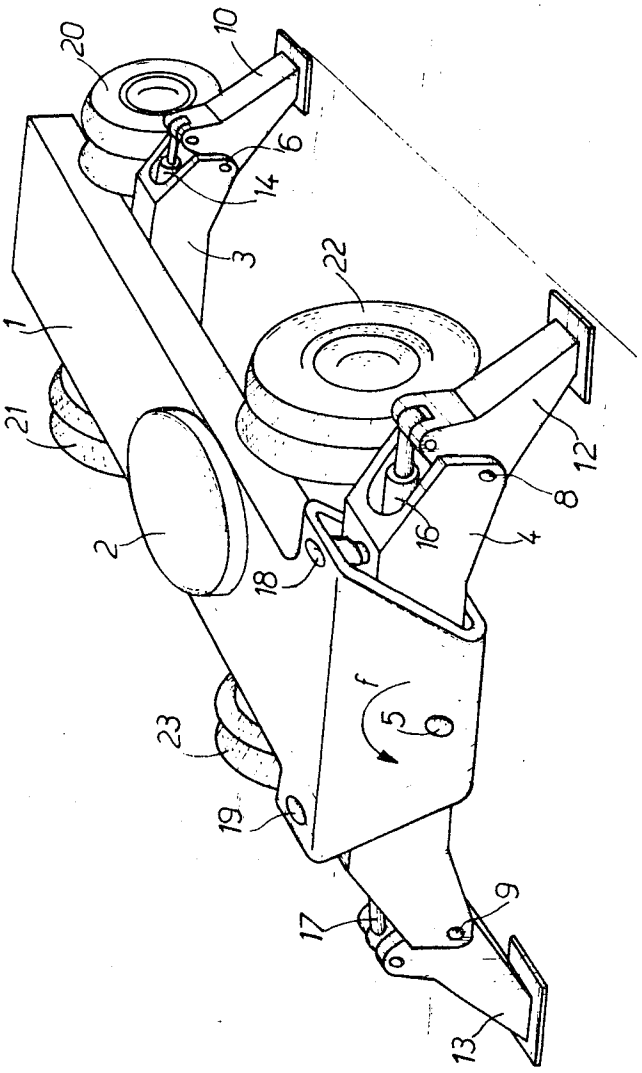


FIG. 1

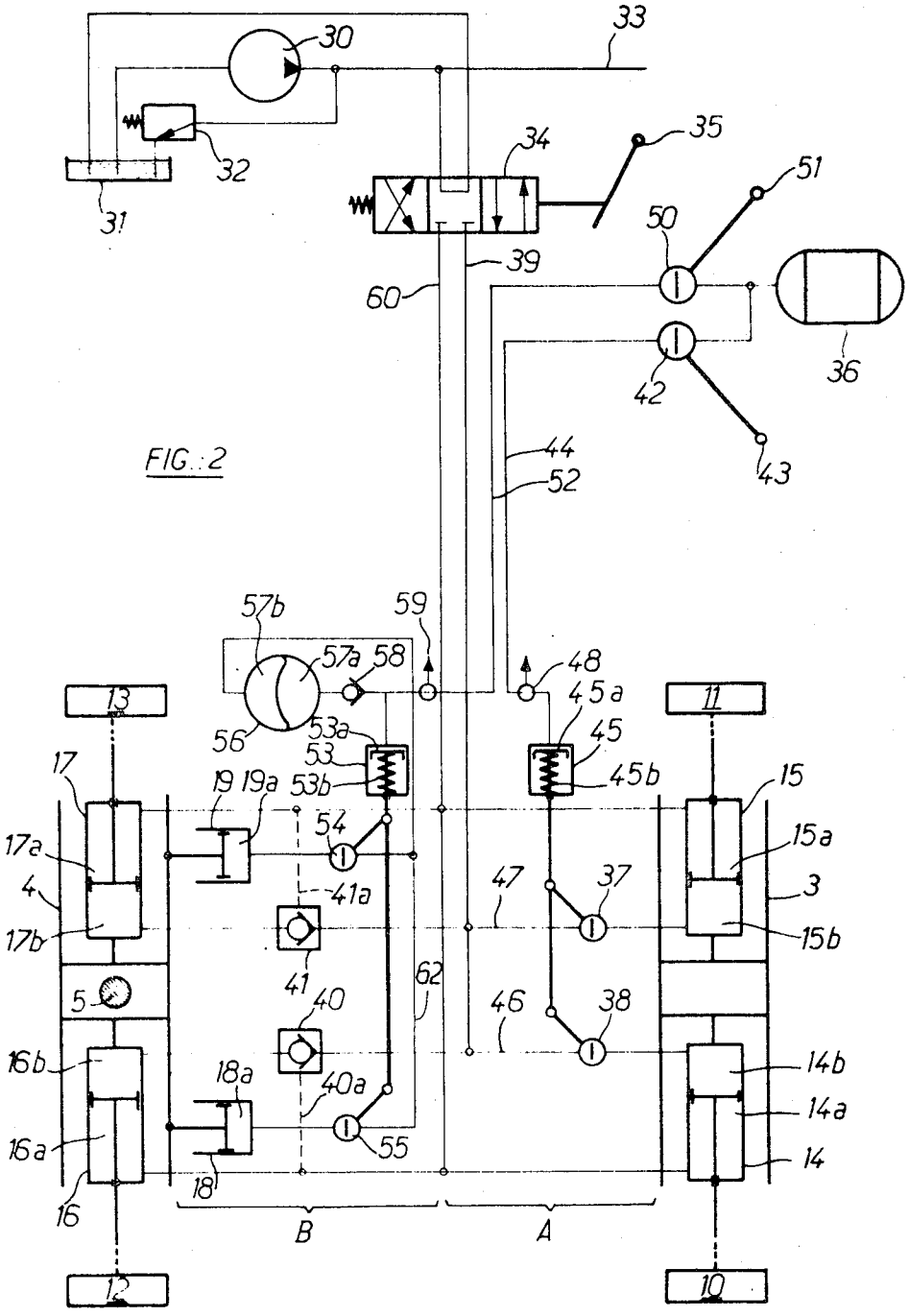

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FIG. 2

STABILIZING DEVICE FOR APPLIANCES FOR PUBLIC WORKS, FOR HANDLING AND FOR MAINTENANCE

Mobile appliances for public works intended to lift big and variable loads, or for carrying out earthwork works, such as cranes, mechanical shovels, excavators, etc., are known which are provided with mobile spades or stabilizing carrying legs which can be brought to bear on the ground in order to increase the surface of the support polygon of the appliance during work.

Until now, the stabilizing legs or spades were articulated directly on the chassis of the appliance, their movements being controlled by hydraulic jacks. Usually a single distributor is used to feed simultaneously all the jacks driving the stabilizing legs.

The disadvantage of this mode of drive is that the driver is not the master of the descending movements of the spades or legs, since the stresses exerted on each of the driving jacks of the stabilizing legs are usually not equal, so that the jacks which are the least loaded are the first to move.

On the other hand, it often happens that, during work, the stabilizing legs penetrate to a greater or lesser extent into the ground, so that the appliance finds itself in unstable equilibrium on only three supports, one of the four legs no longer being in bearing on the ground.

In this case, and if the rods of the stabilizing jacks have not emerged to their maximum travel, the driver can put the appliance back onto four bearings by opening the distributor in order to re-feed the jacks with fluid under pressure. The jack in which the pressure has decreased (owing to the fact that the corresponding leg is no longer bearing on the ground) is thus re-fed, and its piston shifts until the corresponding leg bears once more against the ground.

On the other hand, if the rods of the jacks have already emerged to their maximum travel, it is no longer possible to put the appliance back on its four bearings, unless it is moved to seek another suitable bearing surface.

The present invention has the aim of supplying a new stabilizing device for appliances for public works, for handling or for maintenance, which allows the disadvantages described above to be obviated.

In accordance with the invention, this device which comprises two pairs of stabilizing legs driven by double-action hydraulic jacks and arranged at the front and at the rear, respectively, of the appliance that is to be stabilized, is characterized in that at least one of these pairs of stabilizing legs is mounted on a traverse articulated, about an axis perpendicular to this traverse and parallel to the mean plane of the chassis of the appliance, to the chassis of the said appliance, the said articulated traverse being able to be immobilized about its axis, in relation to the chassis, by suitable means also allowing one to cause the traverse to pivot about its articulation axis in the case of cessation of bearing on the ground of one of the legs carried by the articulated traverse, so as to re-establish this bearing.

In accordance with a particular embodiment, the articulated traverse can be immobilized in relation to the chassis by the means of two single-action jacks, pneumatic or hydraulic, arranged between the articulated traverse and the chassis on either side of the articulation axis of the traverse to the chassis, and the chambers of these jacks can be put into communication in order to bring about the pivoting of the traverse about its articulation axis when a pressure difference exists between the chambers of the two single-action jacks as a result of non-bearing on the ground of one of the stabilizing legs carried by the articulated traverse, so as to put the said leg into bearing on the ground once more.

The description which will follow with regard to the attached drawing, given by way of a non-restrictive example, will reveal how the invention can be realized, the special features which emerge both from the drawing and from the text forming, of course, part of the said invention.

FIG. 1 is a diagrammatic view in perspective showing an appliance chassis for public works, for handling or for maintenance, provided with a stabilizing device in accordance with the invention; and

FIG. 2 is a diagram of the control circuits of this stabilizing device.

Represented in FIG. 1 is the chassis of an appliance provided with a stabilizing device in accordance with the invention. On the chassis 1 of the appliance, which carries a jib or an arm orientable (not shown) by rotation about a pivot 2 having a vertical axis arranged on the said chassis, are fixed traverses 3 and 4. The traverse 3 is fixed rigidly to the front of the chassis whilst the traverse 4 is fixed in articulated manner, at the rear of the chassis, about an axis 5 perpendicular to the traverse 4 and parallel to the mean plane of the chassis. On the ends of the traverses 3 and 4 there are articulated at 6, 7, 8 and 9, respectively, stabilizing legs 10, 11, 12 and 13, these stabilizing legs being actuatable by associated double-action hydraulic jacks 14, 15, 16 and 17. Each of the jacks 14 to 17 has its body fixed to the traverse on which the leg which it actuates is mounted, and has its rod articulated at its end to the top of the stabilizing leg associated therewith. Moreover, the clearances of the traverse 4 about the axis 5 are controlled by means of a pair of single-action hydraulic jacks 18 and 19. These jacks 18, 19 are arranged between the chassis 1 and the traverse 4, on either side of the axis 5.

Also there are as shown the wheels 20–23 on which the appliance moves when it is desired to change the position of the appliance. These wheels are relieved of load partially or totally when the stabilizing device is put into action.

In FIG. 2 there are shown the control circuits of the stabilizing device of FIG. 1. These control circuits comprise a hydraulic circuit and a pneumatic circuit. The hydraulic circuit is fed from a service pump 30 supplying the necessary hydraulic pressure to the whole of the items of equipment of the appliance. This pump which takes the oil from a reservoir 31 is protected against excessive pressures by a piloted safety valve 32 and feeds, through the conduit 33, the work equipment (not shown) of the appliance and, through the distributor 34, the four jacks 14 to 17 actuating the stabilizing legs. The pneumatic circuit, which is fed from a compressed air source 36, allows, on the one hand, the gates 54 and 55 controlling the putting into communication of the chambers 18*a* and 19*a* of the hydraulic jacks 18 and 19 to be actuated, and the traverse 4 to be locked in position about the axis 5, and, on the other hand, allows actuation of the shut-off valves 37 and 38 controlling the feed in hydraulic fluid of the chambers of the jacks 14 and 15 carried by the traverse 3, corresponding to the placing in bearing on the ground of the legs 10 and 11.

It is necessary to note that the chambers **18***a* and **19***a* of the jacks **18** and **19**, the chamber **57***b* of the accumulator **56** and the conduit **62** are always filled with oil under pressure whose pressure depends on that prevailing in the chamber **57***a* of the accumulator **56**, the minimum value being that supplied by the compressed air source **36**.

More specifically, in order to lower the stabilizing legs, one opens the distributor **34** by manipulating the control lever **35** so that the oil delivered by the pump **30** passes through the piping **39**. Since the shut-off valves **37** and **38** are normally closed, the oil penetrates first into the chambers **16***b* and **17***b* of the jacks **16** and **17** by traversing the controlled non-return valves **40** and **41**. The rear legs **12** and **13** are lowered, come into bearing against the ground and raise the rear portion of the appliance while relieving the rear wheels **22, 23**. The non-return valves **40** and **41** serve to guarantee the immobilization of the jacks **16** and **17** when the distributor **34** is in the closed neutral position. The branchings **40***a* and **41***a* serve for the controlling of the valves **40** and **41**, so as to allow the lifting of the legs **12** and **13**. Moreover, as the shut-off valves **54** and **55** which control the placing in communication of the hydraulic jacks **18** and **19** are closed, the traverse finds itself locked in position in relation to the chassis upon the lowering of the legs **12** and **13**.

If now it is desired to lower also the front pair of legs **10** and **11**, one opens the shutter **42** of the pneumatic circuit by actuating the lever **43** so that the compressed air supplied by the source **36** is sent, via the conduit **44**, into the cylinder **45** so as to actuate the piston **45***a* contrary to the return spring **45***b* and to bring about the opening of the shut-off valves **37** and **38**, thus allowing the oil of the conduit **39** to penetrate into the chambers **14***b* and **15***b* of the jacks **14** and **15**, via the conduits **46** and **47** respectively, which has the effect of lowering the legs **10** and **11**.

When the four stabilizing legs are correct in bearing on the ground and when the appliance is deemed perfectly stable, one then puts the distributor **34** into the closed neutral position at the same time as one closes the shut-off valve **42**. The closure of this latter brings about the return of the piston **45***a* into the position shown in FIG. **2**, under the action of the return spring **45***b*, and, therefore, the closure of the shut-off valves **37** and **38**. A free escape valve **48** is provided on the conduit **44** so that the compressed air stored there can escape.

It is to be noted that one could proceed, if desired, to the simultaneous putting into bearing of the four stabilizing legs, by opening the shut-off valve **42** at the same time as the distributor **34**, so as to feed simultaneously with hydraulic fluid the chambers **14***b*–**17***b* of the jacks **14**–**17**.

If, in the course of work, the appliance finds itself in unstable equilibrium on only three legs, for example, as a result of a consolidation or subsidence of the ground, it is possible to put it into stable equilibrium once more without having to shift the appliance.

Let it be supposed, for example, that the appliance finds itself in unstable equilibrium on the three legs **10**, **12** and **13**, the front leg **11** no longer being in bearing on the ground. In this case, the fluid pressure in the chamber **15***b* of the jack **15** decreases whereas that in the chamber **14***b* of the jack **14** increases, the leg **10** supporting the entire weight of the front portion of the appliance. If the jack **15** has not run out to its maximum travel, one can put the leg **11** into bearing on the ground once more by opening momentarily the shut-off valve **42** in order to bring about the opening of the shut-off valves **37** and **38** and, in this way, the putting into communication of the chambers **14***b* and **15***b*. Fluid under pressure of the chamber **14***b* than passes into the chamber **15***b* and increases the travel of the jack **15** until the leg **11** returns into bearing on the ground.

It can be seen that the control disposition of the jacks **14** and **15**, designated by the general reference A, allows one to re-establish the bearing of the front legs without having recourse to the pump **30** which can thus continue to feed, without disturbance, the hydraulic work equipment of the appliance.

If, on the other hand, it is one of the rear legs, for example the leg **13**, which is no longer bearing upon the ground, one can re-feed the chamber **17***b* with fluid under pressure by opening the distributor **34**, on condition that the rod of the jack **17** has not already emerged to its maximum travel. As a variant or if the rods of the jacks have already emerged to their maximum travel, one can proceed as follows: one opens the shut-off valve **50** of the pneumatic circuit by manipulating the lever **51** so that compressed air emanating from the source **36** passes through the conduit **52**, penetrates into the cylinder **53** and displaces the piston **53***a* contrary to its return spring **53***b*, which brings about the opening of the shut-off valves **54** and **55**. It is fitting to recall that these two shut-off valves remain normally closed in order to immobilize the traverse **4** in relation to the chassis **1**. The shut-off valves **54** and **55** being open, the chambers **18***a* and **19***a* are thus in communication, and oil under pressure of the chamber **18***a* passes into the chamber **19***a* in which the pressure has decreased owing to the fact that the leg **13** was no longer in bearing on the ground. This brings about the pivoting of the traverse **4** about the axis **5**, in the direction of the arrow *f* (FIG. **1**). This pivoting is continued until the leg **13** returns to bearing upon the ground and the pressures in the chambers **18***a* and **19***a* are equalized.

The accumulator **56** whose chamber **57***a* is put into communication, via the non-return valve **58**, with the source **36** upon the opening of the shut-off valve **50**, allows one to maintain a suitable pressure in the chambers **18***a* and **19***a*, thanks to the fluid under pressure contained in the chamber **57***b* which is separated from the chamber **57***a* by a membrane (compensation of the leakages and of differences in volumes).

When the appliance is once more suitably in bearing on its four stabilizing legs, one re-closes the shut-off valve **50**, which brings about the return of the piston **53***a* under the action of the return spring **53***b* and the closure of the shut-off valves **54** and **55**. The traverse is thus immobilized in the position which it has assumed. A valve **59** is provided in the conduit **52** so that the compressed air stored can escape when one re-closes the shut-off valve **50**.

Thus, the control arrangement of the jacks **12** and **13**, designated by the general reference B, allows one to re-establish the bearing of one of the rear legs in all cases.

When it is desired to raise the legs **10**–**13**, it is sufficient to set the distributor **34** to the open position which puts the pump **30** into communication with the

conduit 60 and the reservoir 31 with the conduit 39, and to open at the same time the shut-off valve 42 in order to bring about the opening of the shut-off valves 37 and 38, so as to feed with oil under pressure the chambers 14*a*–17*a* of the jacks 14–17.

It goes without saying that the embodiments described are only examples and that it would be possible to modify them, more especially by substitution of technical equivalents without, for all that, departing from the scope of the invention.

In particular, the embodiment illustrated by FIGS. 1 and 2 would be capable of receiving various modifications. Thus, the traverse 3 could also be articulated to the chassis and immobilized by two jacks, like the traverse 4, instead of being fixed rigidly to the chassis. Also the pairs of front and rear jacks could be driven each by an arrangement A or an arrangement B instead of being driven, respectively, by an arrangement A and an arrangement B. Finally, it would also be possible to combine the arrangements A and B in order to drive each pair of jacks.

I claim:

1. A stabilizing device for a machine having a chassis, comprising two pairs of stabilizing legs arranged at the front and rear, respectively, of said chassis, said legs being pivotably connected with said chassis, two pairs of fluid-actuated jacks connected with said chassis and each articulated to one said leg for pivoting the same, a traverse pivotally mounted on said chassis for angular movement about an axis extending longitudinally of said chassis, a pair of fluid-actuated jacks connecting said chassis and said traverse on opposite sides of said axis, one of said first mentioned pairs of jacks being connected with said chassis by being mounted on said traverse, one on each side of said axis, and means for selectively actuating said jacks.

2. A device according to claim 1, said jacks connecting said chassis and said traverse being of the single action type each having a fluid-pressure chamber, and said device including means for interconnecting the fluid-pressure chambers of said last-mentioned jacks.

3. A device according to claim 1, which further comprises means for connecting the fluid chambers of the jacks actuating the legs of at least one of said first mentioned pairs.

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