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Jacob et al.

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[54] **RECEIVERS IN PUBLIC WORKS MACHINES**

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[51] **Int. Cl.** **E02f 3/28**

[58] **Field of Search** 214/138, 140, 762, 771, 214/778; 60/486; 91/6

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[57] **ABSTRACT**

A public works machine includes a boom articulated to a frame and means for adjusting the relative position of the boom with respect to the frame. The adjusting means includes fluid supply means operatively connected between a source of fluid and a receiver or jack; said fluid supply means has a selectively positionable control or selection device which in the first position thereof controls the boom for precise handling of a load with a slow pivotal movement of the boom, and in a second position thereof controls the boom for rapid pivotal movement.

2 Claims, 3 Drawing Figures

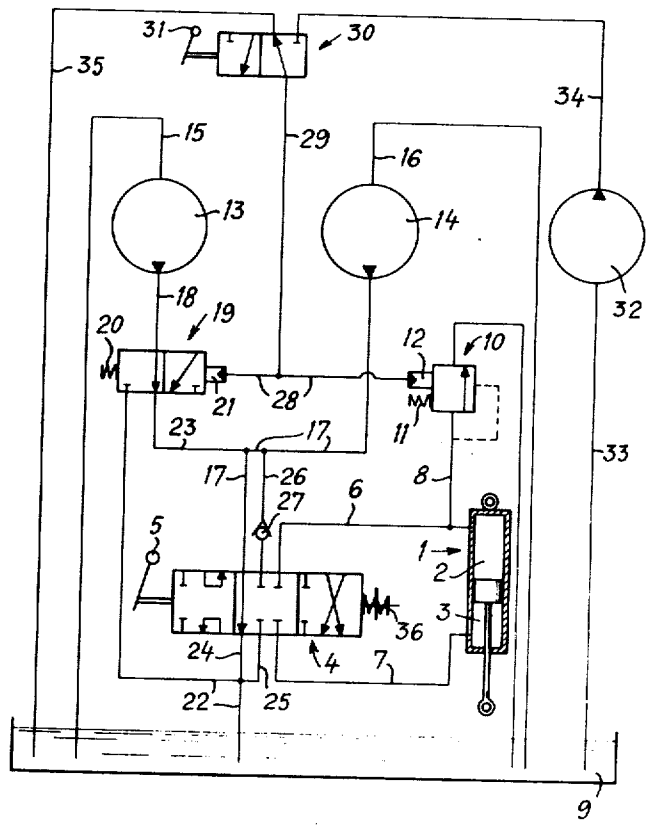
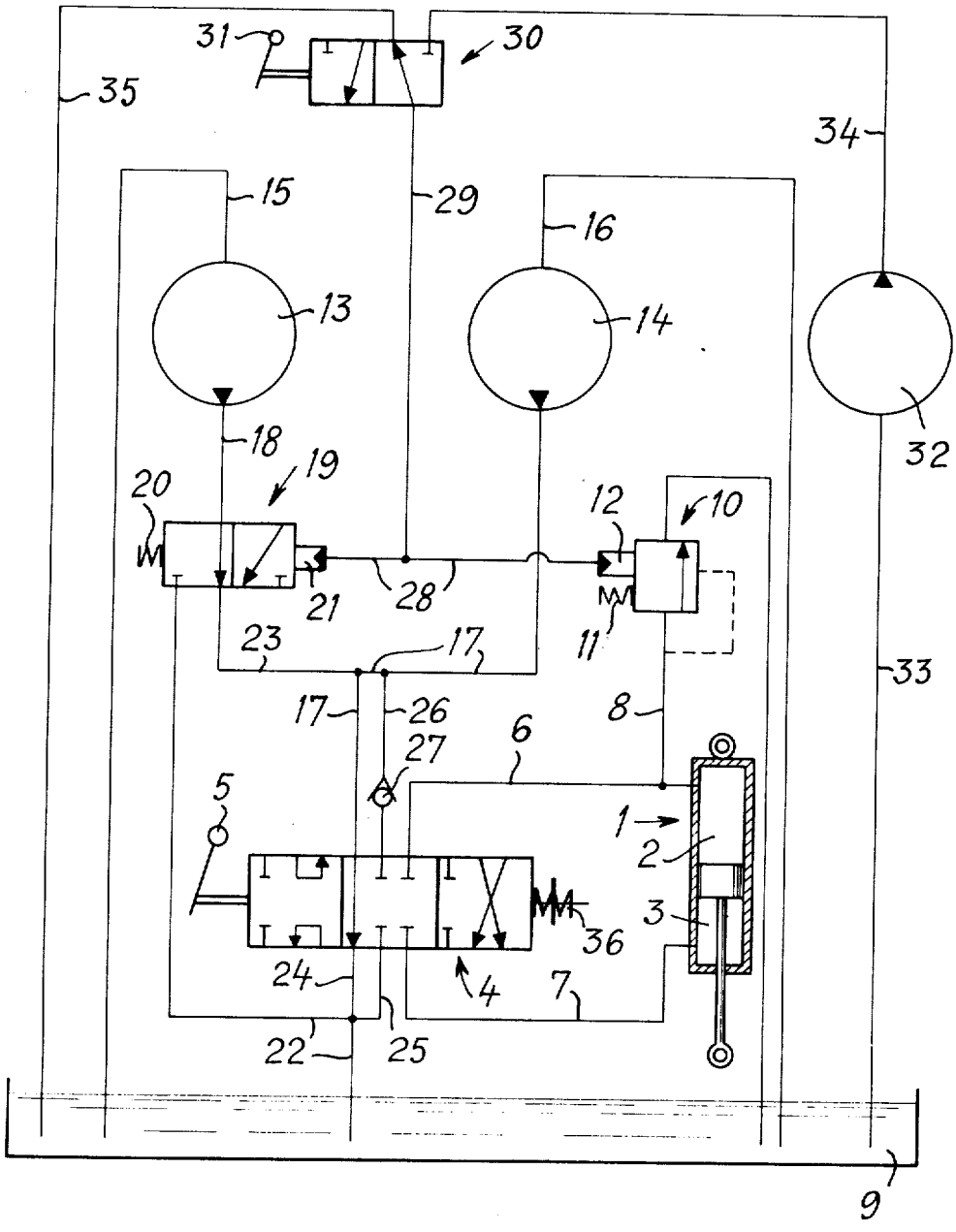


FIG-1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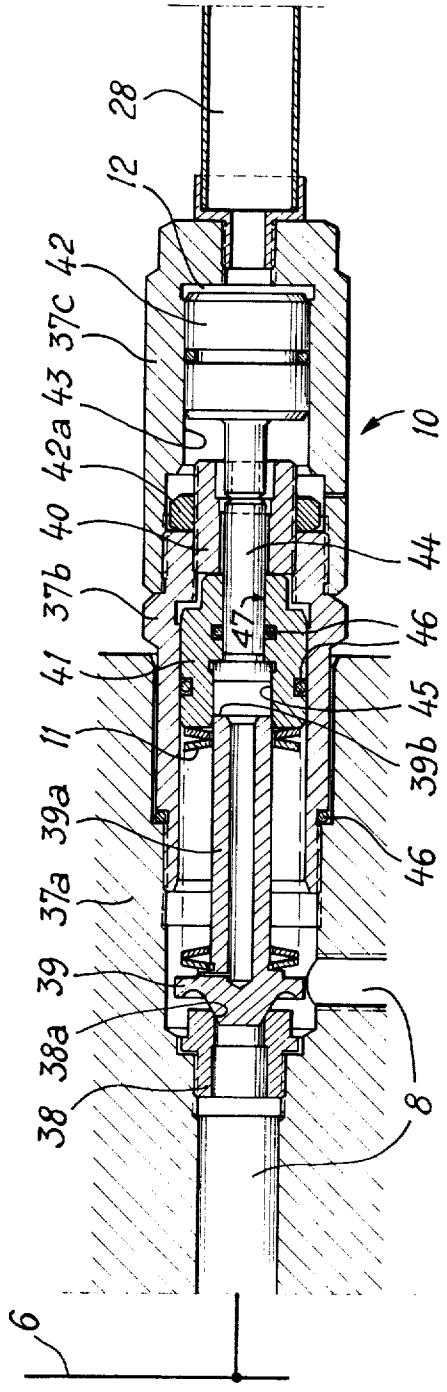
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FIG-2

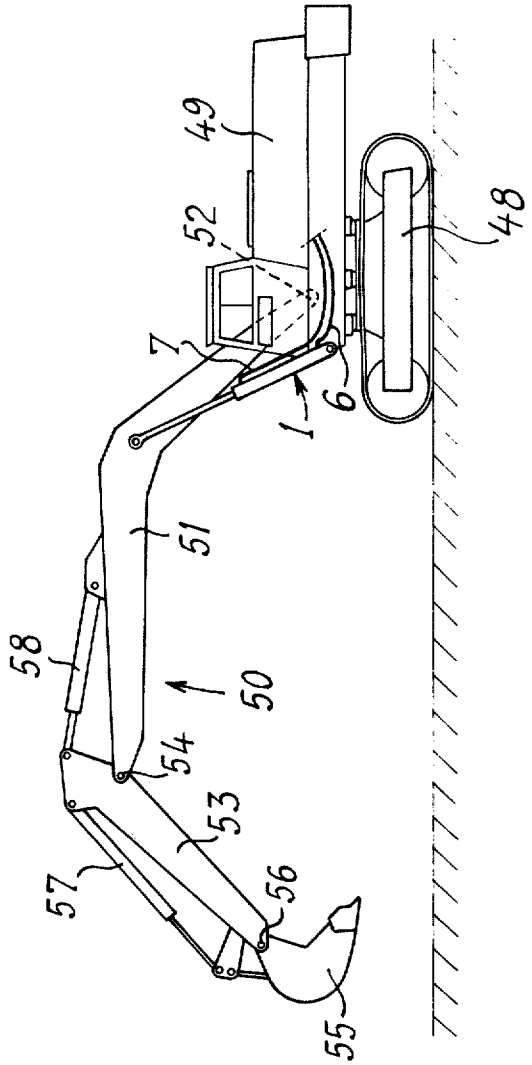

FIG-3

RECEIVERS IN PUBLIC WORKS MACHINES

The present invention relates to the general application to a device for supplying a receiver with pressurised fluid from a discharge valve having at least two pre-regulated adjustments. It is the search for an optimum yield in a supply device comprising at least two sources of pressurised fluid, but also the maintenance of operational safety which has led to the conception of this new application of a discharge valve having several adjustments.

A particular application of a supply device thus produced is indicated as likewise forming part of the invention.

The invention therefore has firstly as an object a device for supplying a receiver with pressurised fluid constituted by:

a fluid receiver,

at least two sources of pressurised fluid,

a selection device having at least two positions, which is interposed between at least one of the sources of fluid and the receiver and by means of which this receiver is connected, in a first position of the selection device, only to one of said fluid sources and, in a second position to at least two of these fluid sources,

and an adjusted discharge valve connected in shunt in the supply conduit of the receiver.

This discharge valve is provided with a device for regulating its adjustment in the course of operation having at least two pre-adjustments. In addition, the selection device and the adjustment regulating device are coupled to a common control device, with two positions, one of which corresponds to the communication of the receiver with only one of said fluid sources and to the selection of a determined pressure adjustment and the other of which corresponds to the communication of the receiver with at least two fluid sources and to the selection of another pressure of adjustment of value lower than that of the determined adjustment pressure.

The invention also has for an object a public works machine constituted by a boom articulated to the frame and by a member for adjusting the relative position of this boom on this frame, applying the above-mentioned supply device. The receiver of the supply device is then constituted by said adjusting member, whilst the first position of the selection device corresponds to the precise handling of a load by the boom and to a slow pivoting of said boom, and the second position of this selection device corresponds to a rapid pivoting of said boom.

The invention will be more readily understood on reading the following description with reference to the accompanying drawings, in which:

FIG. 1 shows a supply circuit according to the invention,

FIG. 2 is an axial section through the valve used in the circuit of FIG. 1,

FIG. 3 is a view of a hydraulic shovel using the supply device of FIG. 1.

Referring now to the drawings, FIG. 1 shows a receiver, constituted in the present case of a double-acting jack 1, which comprises two chambers 2 and 3 connected to a distributor valve 4 with manual control 5 by two conduits 6 and 7 respectively. A conduit 8 is connected in shunt to conduit 6 and is connected to a fluid tank 9. In conduit 8 is disposed an adjusted discharge valve 10 which comprises an elastic return

member 11 and the opening of which is controlled by the pressurised fluid contained in the part of the conduit 8 between the conduit 6 and said valve 10, and regulated by the pressurised fluid contained in the inlet chamber 12.

Hereinafter are indicated the modes of distribution of the fluid corresponding to the various positions of the distributors.

The three positions of the distributor 4 correspond as follows:

the first position, to the obturation, at the level of this distributor, of the conduits 17 and 24, and to the communication on the one hand of the conduit 26 with conduit 6 and on the other hand of conduit 7 with conduit 25;

the second position corresponds again to the obturation, at the level of the distributor 4, of conduits 17 and 24, and to the communication on the one hand of conduit 26 with conduit 7 and on the other hand, of conduit 25 with conduit 6;

the third position, which is intermediate between the first and second positions, corresponds to the communication of conduit 17 with conduit 24 and to the obturation, at the level of distributor 4, of conduits 6, 7, 25 and 26. It will be noted that a spring 36 is connected to the mobile member of the distributor 4 to ensure that it is maintained in its third position.

The two positions of distributor 30 correspond as follows:

the first position, to the communication of conduit 29 with conduit 35 and to the obturation at the level of this distributor of conduit 34;

the second position corresponds to the communication of conduit 34 with conduit 29 and to the obturation at the level of distributor 30, of conduit 35.

The two positions of the distributor 19 correspond as follows:

the first position, to the first position of distributor 30, the action of the elastic return member 20 being preponderant on that of the fluid contained in chamber 21, since, by conduits 28, 29 and 35, said chamber is in communication with the fluid tank 9. In this position, the distributor 19 communicates conduit 18 with conduit 23, and obturates at its level conduit 22;

the second position corresponds to the second position of the distributor 30, the action of the fluid contained in chamber 21 being preponderant, this time, on that of the elastic return member 20, since said chamber is placed in communication with the delivery of the auxiliary pump 32 by conduits 34, 29 and 28. In this position, the distributor 19 communicates the conduit 18 with conduit 22, and obturates at its level conduit 23.

It may be specified, as from now, that if a tank 9 has been provided for in the hydraulic embodiments of the type shown in FIG. 1, it is obvious that in pneumatic embodiments, the equivalent of the tank 9 is constituted by the atmosphere. In this case returns are generally made to atmosphere, in the same way as the suctions, no longer of pumps, but of compressors which constitute the equivalents of pumps 13, 14 or 32, are made in the atmosphere.

Furthermore, the auxiliary source of pressurised fluid constituted by the auxiliary pump 32 has of course various equivalents, such as for example a general conduit for the return of the fluid from the tank in which an adjusted discharge valve has been interposed in order to maintain a low but not a zero pressure, which is suffi-

cient to actuate the control jacks coupled to the distributor **19** and to the element for obturating the valve **10.** Another equivalent is constituted by an accumulator of pressurised fluid. Of course, the use of such equivalents, which are, moreover, well known per se, would not cause the device provided therewith to exceed the domain of the present invention.

FIG. 2 shows the details of the adjusted valve **10.** The body of the valve is constituted of three parts **37***a*, **37***b*, **37***c* screwed on one another in order to allow assembly of the elements disposed in said body. It will be noted that the conduit **8** is shown in the section of part **37***a*. Furthermore, a valve seating **38** has been screwed into the conduit **8** and possesses a bearing **38***a* on which the element **39** obturating the valve is in abutment. It is noted that the obturation element **39** comprises a guide rod **39***a* on which elastic washers **40** constituting the elastic return member **11** have been fitted. These washers abut on one another and, for one of the end washers, on the obturation element **39,** whilst the other end washer is in abutment on a stop **40** screwed in the part **37***b* of the valve body by means of an intermediate stop **41.** A counterscrew **42***a* blocks the stop **40** correctly screwed in part **37***b*. The guide rod **39***a* is mounted to slide in a bore **45** of the intermediate stop **41.**

Furthermore, a piston **42** is mounted to slide in abore **43** made in the part **37***c* of the valve body, and may abut on the end **39***b* of the rod **39***a* by means of a pusher **44** mounted to slide in a bore **47.**

It will be noted that gaskets **46** have been interposed between the parts **37***a* and **37***b* of the valve body, between the intermediate stop **41** and the body **32***b* and between the pusher member **44** and said intermediate stop **41,** so that the fluid contained in the cylinder defined by the bore **45** is isolated from piston **42.** This piston defines, with the bore **43,** the inlet chamber **12,** to which conduit **28** is connected.

Finally, with reference to FIG. **3,** a hydraulic shovel on endless tracks comprises a chassis **48** on which a turret **49** is pivotally mounted. A working equipment **50** equips the shovel and is constituted by a boom **51,** articulated on the turret **49** about an axis **52,** then an arm **53** articulated on the boom **51** about an axis **54** and by a bucket **55** articulated on the arm **53** about an axis **56.** Jacks are coupled between these various elements: jack **57** between bucket **55** and arm **53,** jack **58** between arm **53** and boom **51,** and jack **1** of FIG. **1,** which is coupled between boom **51** and turret **49.**

The advantages procured by the invention will be seen on reading the description of the operation of the supply device described therein.

The functioning of the adjusted valve **10** will be firstly examined.

It is firstly assumed that the pressure of the fluid contained in the conduit **28** is zero. Under these conditions, the stress exerted by this fluid on the piston **42** is also zero, in the same way as the stress transmitted by the pusher **44** to the guide rod **39***a*. Consequently, the obturator element **39** is capable of abutting on the bearing **38***a* of the seat **38** only under the sole return stress of the elastic washers **11,** which abut, to this end, on the part **37***b* of the valve body by means of the stop **40** and the intermediate stop **41.** Thus, a first adjustment of the valve **10** is obtained which is such that the obturator element **39** is repelled out of abutment of the bearing **38***a*, when the effect of the pressure of the fluid contained in the part of the conduit **8** connected to conduit **6** becomes greater than the return stress of the washers **11.** In this configuration, the valve communicates the two parts of conduit **8,** so that the pressure in the conduit **6** drops to become again lower than the pressure corresponding to the return stress of the washers **11,** known as first adjustment pressure.

When, on the contrary, the pressure in the conduit **28** has a given value which is not zero, the stress exerted on the piston **42** is also not zero and equal to the product of the pressure given by the section of said piston. The piston **42** then pushes pusher **44** and diposes the end thereof in abutment on the end **39***b* of the guide rod **39***a*. A supplementary stress equal to the stress exerted on the piston **42** is thus added to that already exerted by the elastic washers **11** to maintain the obturator element **39** in abutment on the bearing **38***a*. Obviously, under these conditions, the pressure of the fluid contained in the part of the conduit **8** connected to the conduit **6** necessary for removing the obturator element **39** from abutment on the bearing **38***a*, will be greater than the first adjustment pressure mentioned hereinabove, and will have to be at least equal to a given threshold, which constitutes a second adjustment pressure. In summary, in this configuration, the maximum pressure in the conduit **6** will be greater than the maximum pressure in the same conduit, corresponding to the absence of pressure in conduit **28.**

An adjusted valve has therefore been made which comprises two adjustments. According to the uses provided, it will either be considered that the normal adjustment is that which corresponds to the lowest adjustment pressure and it will be said that the other adjustment constitutes an "over adjustment" of the valve **10,** or that on the contrary the normal adjustment is that corresponding to the highest adjustment pressure, and it will then be said that the other adjustment constitutes an "under adjustment" of said valve **10.**

The application of the valve **10** has been shown in FIG. **1.** It is assumed that distributor **4** is placed in its first position and the functioning obtained by placing the distributor **30** in its first, then in its second position is successively studied.

The distributor **30** being in its first position, the distributor **19** is also disposed in its first position, as has been seen previously. The fluid delivered in conduits **17** and **23** by pumps **13** and **14** is conveyed, through conduits **26** and **6,** into chamber **2** of jack **1.** On the contrary, the fluid contained in chamber **3** is delivered out of said chamber and returns to tank **9** via conduits **7, 25** and **22.** If it happens that the external stress acting between the axes of articulation of the cylinder and the piston rod of the jack **1** becomes greater than a given limiting value, the pressure in the chamber **2** will increase until it reaches the value of the adjustment pressure of the valve **10** and will have for its effect momentarily to open said valve to allow the return of the fluid contained in chamber **2** to tank **9.** It will be noted that the pressure of the fluid is zero in conduit **28,** and consequently likewise in chamber **12,** so that the adjustment pressure of the valve **10** is equal to the first adjustment pressure mentioned above. On the other hand, the supply of the chamber **2** of the jack **1** has been effected by placing the outputs of the two pumps **13** and **14** in parallel.

If the functioning corresponding to the placing of distributor **30** into its second position is now studied, it is noted that, the distributor **19** having itself been con-

comitantly placed in its second position, the conduit **18** is placed in communication with the tank **9** by conduit **22**; pump **13** now delivers to tank **9**. Consequently, the pump **14** is now the only one connected to chamber **2** of jack **1**, by conduits **17, 26** and **6**. It will further be noted that the pressure in the conduit **28** is now equal to that of the fluid contained in conduits **29** and **34**. The fluid contained in the chamber **12** is therefore at a non-zero pressure which adds a complementary adjustment to the adjustment of the valve **10** due to the elastic washers **11**. This effect results in the overall adjustment of the valve **10** now corresponding to the second adjustment pressure mentioned above. It is in this way that the maximum pressure of the fluid contained in the chamber **2** will be greater than what it was when the distributor **30** was in its first position. It will be noted that it has been possible to tolerate an increase in the maximum pressure in the chamber **2** only when the supply output is limited to the value of the delivery output of one of the two pumps **13** and **14**, that of pump **14** in the present case. Consequently, the possibility of developping a stress between the axes of articulation of the jack is therefore obtained when the supply output is limited to a given value, which is greater than the maximum stress admissible relative to a supply under an output greater than said given value.

Of course, the second position of the distributor **4** corresponds to a telescoping movement of the jack **1**, which is the reverse of that relative to the first position of said distributor. This movement is known per se and does not necessitate any particular explanation.

It will further be indicated that although the second adjustment, corresponding to the pressurisation of the chamber **12**, has conveniently been obtained hydraulically, it is still possible to obtain it mechanically for example by putting into or out of service a second spring which would or would not add its effect to that of the elastic washers **11**.

Similarly, it would also be possible to cause the pressure of a pressurised fluid to act on a second piston distinct from piston **42**, by replacing said washers **11**.

The application shown with regard to FIG. **3** is self-explicit. It should simply be noted that the limitation of the output to the delivery of the single pump **14** corresponds to the execution of precise works, made at relatively low speed by the bucket, whilst the supply of jack **1** by the two pumps **13** and **14** corresponds to a rapid phase of the operation, such as for example, the raising of boom **51**. In this case, the maintenance of a satisfactory safety makes it obligatory to limit the maximum pressure in the supply circuit to a value lower than that corresponding to the work at low speed. This is in fact what happens, the fluid of the jack **12** (overadjustment) returning to tank **9** via conduits **28, 29** and **35**.

The supply device of FIG. **1** may therefore also be applied to a crane, instead of the bucket of FIG. **3**. The same search for precision and safety of functioning could find the solution in the above-described disposition.

What I claim is:

1. A device for supplying a receiver with pressurised fluid, constituted by: a fluid receiver, at least two sources of pressurised fluid, a selector device having at least two positions, which is interposed between at least one of the fluid sources and the receiver and by means of which this receiver is connected, in a first position of the selection device, only to one of said fluid sources, and in a second position, to at least two of these fluid sources, and an adjusted discharge valve connected in shunt to the supply conduit of the receiver, wherein this discharge valve is provided with a device for regulating its adjustment in the course of operation having at least two pre-adjustments, and the selection device and adjustment regulating device are coupled to a common control device with two positions one of which corresponds to the communication of the receiver with only one of said fluid sources and to the selection of a determined adjustment pressure, and the other to the communication of the receiver with at least two fluid sources and to the selection of another adjustment pressure of value lower than that of the determined adjustment pressure.

2. Public works machine constituted by a boom articulated on the frame and by a member for adjusting the relative position of this boom on the frame, making use of the supply device according to claim **1**, wherein the receiver of the supply device is constituted by said adjusting member and the first position of the selection device corresponds to the precise handling of a load by the boom and to a slow pivoting of the boom, whilst the second position of this selection device corresponds to a rapid pivoting of the boom.

* * * * *