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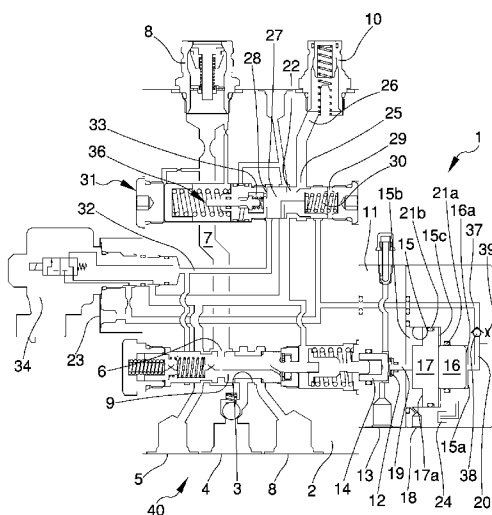


Fig. 1

(57) Abstract: An actuating device (1) of a valve (40) for the braking of a trailer comprises: at least a driving chamber (12) having at least a braking gap (13) connectable to the braking system of a towing vehicle and inside which is slidably accommodated at least one driving element (14) movable between a rest configuration and a driving configuration wherein it interacts with the distributor (9) to displace it from the rest position to the braking one; at least an actuating seat (15) inside which is accommodated sealingly sliding at least one piston (16, 17) delimiting at least a first chamber (15a), communicating with at least an additional gap (20) connectable to the secondary port (23) and acting on a first face (16a) of the piston itself, and at least a second chamber (15b), communicating with at least a driving gap (18) connectable to a control device of the parking and/or emergency brake of the towing vehicle and acting on a second face (17a) of the piston (16, 17) opposite the first face (16a); at least a connecting rod (19) placed between the piston (16, 17) and the driving element (14), the piston (16, 17) being able to push the driving element (14) from its rest configuration to the driving configuration by means of the rod (19) when the force acting on the first face (16a) is greater than that acting on the second face (17a).

ACTUATING DEVICE OF A VALVE FOR THE BRAKING OF A TRAILER

Technical Field

5 The present invention relates to an actuating device of a valve for the braking of a trailer.

Background Art

Some recently introduced standards establish that between a towing vehicle and its trailer must be placed a connecting device having a pair of male joints adapted to be inserted inside a pair of relative female joints.

10 In particular, the female joints are connectable to a control line adapted to supply the braking system of the trailer and to an additional line, respectively, adapted to disable the automatic and/or parking brake of the trailer itself.

As the technician skilled in the art knows, the braking phases of a vehicle are generally three, i.e. the service braking, which occurs under regular operating
15 conditions of the vehicle itself, the parking braking, i.e. when the vehicle is stationary in the same position, and the emergency braking.

These standards also establish that, for agricultural tractors with hydraulic braking of the trailer, during the emergency braking of the towing vehicle the trailer's service braking is also activated, so as to have a gradual braking of the
20 same and that the parking braking is activated following the operation of the parking brake of the towing vehicle.

It follows therefore, that when the operator actuates the brake pedal of the prime mover, he/she intervenes on the wheels of same and, by means of a braking valve (called brake-trailer valve), also on the trailer's braking system.

25 Generally, for towing vehicles capable of reaching speeds above 40 km/h, the operation of the automatic and/or parking brake of the trailer occurs by resetting the pressure along the additional line.

On towing vehicles traveling at a speed below 40 km/h the pressure can also be reset along the additional line following the operation of the emergency brake
30 of the towing vehicle.

In particular in the latter case, the towing vehicle and the trailer can be difficult to drive since the braking of the trailer turns out to be of the on-off type and,

therefore, too abrupt for the accuracy required under certain conditions.

Some of known towing vehicles envisage the use of a device for actuating the relative parking or emergency brake of the spring type, also called SAHR (Spring Apply Hydraulic Release). The devices of this type envisage one or
5 more springs for the actuation of the parking or emergency brake of the towing vehicle, in contrast to which one or more hydraulic or pneumatic cylinders are activated. As the technician skilled in the art knows, when these cylinders do not exert any force the action of the springs is maximum as well as the braking action, while when they exert a force greater than that of the springs, the brakes
10 are free and when they exert a modulated force in opposition to the springs, the brakes are actuated with a variable force according to the resultant forces.

Description of the Invention

The main aim of the present invention is to provide a device which allows to actuate the service braking of the trailer following the activation of the
15 emergency brake of the towing vehicle, and which at the same time allows, in parking condition, to maintain active the parking brake of the trailer itself, thus avoiding that the relative hydraulic circuit remains under pressure.

Within this aim, one object of the present invention is to provide a device which allows to control the braking of the trailer according to the SAHR pressure
20 applied to the relative towing vehicle and to the pressure that supplies the additional line of the trailer.

Another object of the present invention is to provide an actuating device of a valve for the braking of a trailer which allows to overcome the mentioned drawbacks of the prior art within the ambit of a simple, rational, easy, effective
25 to use and affordable solution.

The above mentioned objects are achieved by this actuating device of a valve for the braking of a trailer according to claim 1.

Brief Description of the Drawings

Other characteristics and advantages of the present invention will become better
30 evident from the description of a preferred, but not exclusive, embodiment of an actuating device of a valve for the braking of a trailer, illustrated by way of an indicative, but non-limiting, example in the accompanying drawings in which:

Figure 1 is a sectional view of a device according to the invention applied to a valve for the braking of a trailer.

Embodiments of the Invention

With particular reference to such illustrations, globally indicated with reference
5 number 1 is an actuating device of a valve 40 for the braking of a trailer.

The valve 40 comprises at least a base body 2 having at least a main seat 3
communicating with at least a main port 4 and a secondary port 23 connectable
to a source of a work fluid at a first and at a second pressure value respectively,
with a discharge port 5 connectable to a discharge tank, with a control port 6
10 communicating with a control line 7 connectable to a first male joint 8 of the
towing vehicle and with an additional port 25 communicating with an additional
line 26 connectable to a second male joint 10 of the towing vehicle. The first
and the second male joint 8 and 10 are in turn connectable to the braking system
of the trailer and to the automatic and/or parking brake of the same,
15 respectively.

In a particular embodiment, the secondary port 23 can be defined internally to
the valve 40; in other words, the valve 40 has just one port communicating with
the outside, i.e. the main port 4, from which a branch line extends having a
constriction downstream of which the secondary port 23 is defined.

20 Inside the main seat 3 is slidably accommodated at least one distributor 9
movable between a rest position and a braking position.

In the embodiment represented in the figure, inside the base body 2 is formed,
in addition to the main seat 3, also an auxiliary seat 22.

In particular, the main seat 3 is communicating with the main port 4, with the
25 discharge port 5 and with the control port 6 and the auxiliary seat 22 is
communicating with the secondary port 23, with the discharge port 5 and with
the additional port 25.

The distributor 9 accommodated inside the main seat 3 is movable between at
least a rest position, wherein the control port 6 is placed in communication with
30 the discharge port 5, and at least a braking position, wherein the main port 4 is
placed in communication with the control port 6.

Inside the auxiliary seat 22 is instead accommodated sliding at least an auxiliary

distributor 27 movable between a regular operation position, wherein the additional port 25 is placed in communication with the secondary port 23, and an emergency position, wherein the additional port 25 is placed in communication with the discharge port 5.

- 5 The valve 40 then comprises command means 31 for the displacement of the auxiliary distributor 27 from the regular operation position to the emergency position.

On the auxiliary distributor 27 act, on opposite sides, a thrust chamber 28 and a contrast chamber 29, where inside the latter are accommodated elastic means 30
10 adapted to push the second distributor element itself towards the emergency position.

The command means 31 comprise at least one command channel 32, 33 communicating with the thrust chamber 28, connectable to the secondary port 23 and to the discharge port 5, and valve means 34, 36, 9 operable at least to
15 place in communication the command channel 32, 33 with the discharge port 5 so as to permit the displacement of the auxiliary distributor 27 to the emergency position.

For a detailed description of the valve 40 reference is made to the content of patent MO2015A000046, contained herein by reference, filed by the same
20 applicant.

The application of the device 1 to different brake-trailer valves with respect to that described above cannot however be ruled out.

According to the invention, the device comprises at least one driving body 11 in which are defined at least a driving chamber 12 having at least a braking gap
25 13, connectable to the braking system of the towing vehicle, and inside which is slidably accommodated at least one driving element 14.

The driving element 14 is movable between a rest configuration, wherein it does not interact with the distributor 9, and a driving configuration, wherein it interacts with the distributor 9 to displace it from the relative rest position to a
30 braking position.

In particular, as a result of its displacement from the rest configuration to the driving configuration, e.g. by effect of the increase in pressure inside the driving

chamber 12, the driving element 14 contacts the distributor 9 to push it from the rest position towards a braking position.

The device 1 comprises, therefore, at least an actuating seat 15 inside which is accommodated sealingly sliding at least one piston 16, 17 delimiting, inside the
5 actuating seat itself, at least a first and a second chamber 15a and 15b.

The first chamber 15a is communicating with at least an additional gap 20 connectable to the secondary port 23 and acts on a first face 16a of the piston itself, while the second chamber 15b is communicating with at least a driving gap 18 connectable to a control device of the parking and/or emergency brake
10 of the towing vehicle (not shown in the figures) and acts on a second face 17a of the piston 16, 17 opposite the first face 16a.

More in detail, inside the driving body 11 a channel 37 is formed communicating with the additional gap 20 and connectable with the secondary port 23, along which is arranged a one-way valve 38 adapted to allow the
15 passage of the work fluid only towards the first chamber 15a, and a constriction 39, arranged parallel to the one-way valve 38 and adapted to slow down the outflow of the work fluid at output from the first chamber 15a.

In particular, the control device of the parking or emergency brake of the towing vehicle is of the spring type (SAHR).

20 Between the piston 16, 17 and the driving element 14 is placed at least a rod 19 adapted to transmit the displacement of the piston 16, 17 to the driving element itself. The piston 16, 17 is therefore adapted to push the driving element 14 from its rest position to the driving position by means of the rod 19 when the force acting on the first face 16a is greater than that acting on the second face
25 17a.

In a particular embodiment, not represented in the figures, the rod 19 is linked together, e.g. by means of an interlocking connection, to the piston 16, 17.

Advantageously, the second chamber 15b is placed between the first chamber 15a and the driving chamber 12 and the rod 19 is placed between the second
30 face 17a and the driving element 14.

Preferably, the first face 16a has an area different to the second face 17a. More in particular, the areas of the faces 16a and 17a are dimensioned depending on

the pressures present at the additional gap 20 and the driving gap 18, i.e. on the pressure present in the secondary port 23 and on that characterizing the control device of the parking or emergency brake of the towing vehicle.

In the embodiment represented in Figure 1 the first face 16a has a larger area
5 than the second face 17a.

In an alternative embodiment, not represented in the figures, the device 1 comprises elastic return means acting on the second face 17a and adapted to push the piston 16, 17 away from the driving element 14. More particularly, the elastic return means, e.g. of the type of a spring, are adapted to push the piston
10 16,17 in contrast to the force acting on the first face 16a. More particularly, in this embodiment, the first face 16a has substantially the same area of the second face 17a.

The piston 16,17 is movable between a stationary configuration, wherein the pressures acting on the first and on the second face 16a and 17a are
15 substantially null, a regular operation configuration, wherein the force acting on the second face 17a is greater than that acting on the first face 16a and the piston itself moves away from the rod 19 with respect to the stationary configuration, and an emergency configuration, wherein the force acting on the first face 16a is greater than that acting on the second face 17a and the piston
20 itself pushes the driving element 14 to a driving position by means of the rod 19.

The parking configuration corresponds to the condition in which the parking or emergency brake of the towing vehicle and the automatic and/or parking brake of the trailer are activated, and in which the pressure in the driving gap 18 and
25 in the additional gap 20 are substantially null. Under this operation condition, in fact, the pressure exerted by the control device of the parking or emergency brake of the towing vehicle to counteract the action of the springs is substantially equal to zero, as well as the pressure present in the additional line of the trailer.

30 The regular operation configuration, on the other hand, corresponds to the condition in which both the towing vehicle and the trailer are in motion and in which, therefore, both the driving gap 18 and the additional gap 20 are

pressurized. In this condition, in fact, both the control device of the parking or emergency brake of the towing vehicle and the additional line 26 of the trailer are pressurized to maintain the respective brakes deactivated. The diameter of the rod 19 is selected in such a way that the force acting on it is of no consequence and, in any case, counteractable with an appropriately stiff spring. The emergency configuration corresponds to the operation condition wherein the parking or emergency brake of the towing vehicle is activated, as a result of which the pressure in the driving gap 18 decreases since the counteracting action decreases to the springs that activate the brake itself, with respect to the regular operation configuration, and the piston 16, 17 moves towards the driving element 14 by pushing it through the rod 19 towards a driving configuration. The trailer braking pressure controlled by the distributor 9 will be greater the smaller the pressure in the driving gap 18.

In the aforementioned embodiment, wherein elastic return means are provided, the position taken by the piston 16, 17 in the stationary configuration substantially corresponds to that taken by the piston itself in the regular operation configuration.

In the preferred embodiment shown in the figures, the piston 16, 17 comprises at least a first piston 16 defining the first face 16a and at least a second piston 17 defining the second face 17a, where the first and the second piston 16 and 17 are distinct and arranged resting the one against the other.

More in particular, between the pistons 16 and 17 and the driving body 11 are placed at least a first and a second sealing element 21a and 21b, respectively, adapted to isolate in a fluid-operated manner the respective chambers 15a and 15b from one another.

Conveniently, between the first and the second chamber 15a and 15b is placed at least a further chamber 15c communicating with a discharge tank 24.

It has in practice been observed that the described invention achieves the intended objects and in particular the fact is stressed that the device to which the present invention relates, allows to adjust the service braking of the trailer depending on the pressure present in the additional line of the trailer itself and on the SAHR pressure and, at the same time, it allows to maintain active the

parking brake of the trailer thus avoiding the relative hydraulic system remains pressurized.

CLAIMS

- 1) Actuating device (1) of a valve (40) for the braking of a trailer of the type comprising a base body (2) having at least a main seat (3) communicating with at least a main port (4) and a secondary port (23) connectable to a source of a work fluid at a first and at a second pressure signal respectively; a discharge port (5) connectable to a discharge tank; a control port (6) communicating with a control line (7) connectable to the braking system of the towing vehicle; an additional port (25) communicating with an additional line (26) connectable to the automatic and/or parking brake of the trailer; inside said main seat (3) being slidably accommodated at least one distributor (9) movable between at least a rest position and at least a braking position; characterized in that it comprises at least a driving body (11) in which are defined:
- at least a driving chamber (12) having at least a braking gap (13) connectable to the braking system of a towing vehicle and inside which is slidably accommodated at least one driving element (14) movable between a rest configuration and a driving configuration wherein it interacts with said distributor (9) to displace it from the rest position to the braking one;
 - at least an actuating seat (15) inside which is accommodated sealingly sliding at least one piston (16, 17) delimiting at least a first chamber (15a), communicating with at least an additional gap (20) connectable to said secondary port (23) and acting on a first face (16a) of the piston itself, and at least a second chamber (15b), communicating with at least a driving gap (18) connectable to a control device of the parking and/or emergency brake of the towing vehicle and acting on a second face (17a) of said piston (16, 17) opposite said first face (16a);
- and in that it comprises at least a connecting rod (19) placed between said piston (16, 17) and said driving element (14), said piston (16, 17) being able to push said driving element (14) from its rest configuration to the driving configuration by means of said rod (19) when the force acting on said first face (16a) is greater than that acting on said second face (17a).
- 2) Device (1) according to claim 1, characterized in that said at least one piston (16, 17) is movable between a stationary configuration, wherein the pressures

acting on said first and second face (16a, 17a) are substantially null, a regular operation configuration, wherein the force acting on said second face (17a) is greater than that acting on said first face (16a) and the piston itself moves away from said rod (19) with respect to the stationary configuration, and an
5 emergency configuration, wherein the force acting on said first face (16a) is greater than that acting on said second face (17a) and the piston itself pushes said driving element (14) to a driving position by means of said rod (19).

3) Device (1) according to claim 1 or 2, characterized in that said second chamber (15b) is placed between said first chamber (15a) and said driving
10 chamber (12) and that said rod (19) is placed between said second face (17a) and said driving element (14).

4) Device (1) according to one or more of the preceding claims, characterized in that said first face (16a) has an area different to said second face (17a).

5) Device (1) according to one or more of the preceding claims, characterized in
15 that it comprises elastic return means acting on said second face (17a) and able to push said piston (16, 17) away from said rod (19).

6) Device (1) according to one or more of claims 1 to 3 and claim 5, characterized in that the area of said first face (16a) substantially corresponds to the area of said second face (17a).

20 7) Device (1) according to claim 6, characterized in that the position taken by said piston (16, 17) in said stationary configuration substantially corresponds to that taken in said regular operation configuration.

8) Device (1) according to one or more of the preceding claims, characterized in that said rod (19) is linked together with said piston (16, 17).

25 9) Device (1) according to one or more of the preceding claims, characterized in that said at least one piston (16, 17) comprises at least a first piston (16) defining said first face (16a) and at least a second piston (17) defining said second face (17a), said first and second piston (16, 17) being distinct and arranged resting the one against the other.

30 10) Device (1) according to claim 5, characterized in that it comprises at least a further chamber (15c), placed between said first and said second chamber (15a, 15b) and communicating with a discharge tank (24).

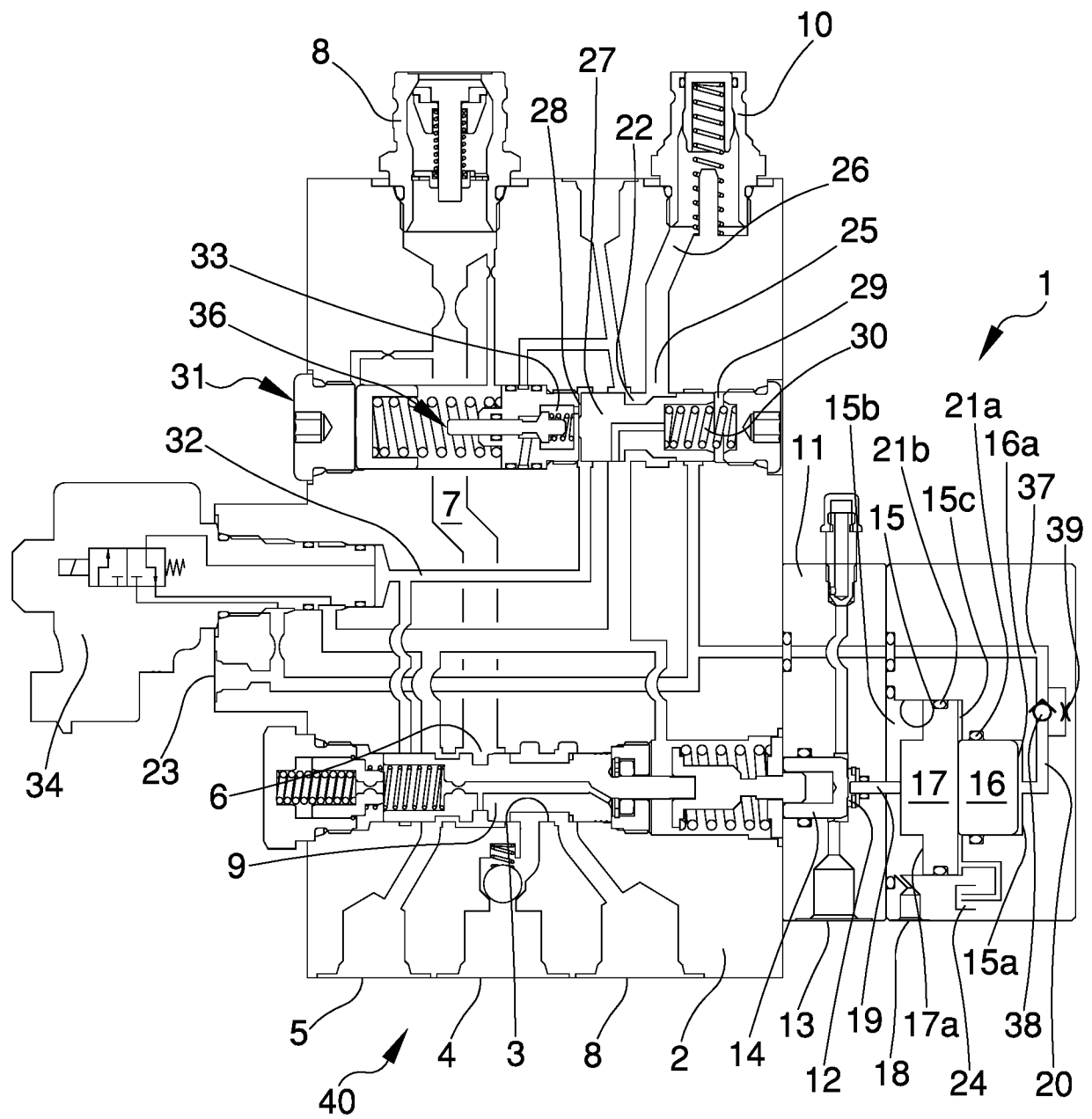


Fig. 1

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2016/054106

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60T11/10 B60T15/04 B60T13/22
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60T

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 876 009 A1 (STUDIO TECNICO 6M SRL [IT]) 27 May 2015 (2015-05-27) the whole document -----	1-10
A	CN 201 980 221 U (YTO GROUP CORP) 21 September 2011 (2011-09-21) figure 2 -----	1-10
A	CN 201 685 807 U (YTO GROUP CORP) 29 December 2010 (2010-12-29) figures 1-3 -----	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 2876009	A1	27-05-2015	NONE	

CN 201980221	U	21-09-2011	NONE	

CN 201685807	U	29-12-2010	NONE	
