PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: ROMEO ROMANINI

1,140,236

1,140,236

Date of Application and filing Complete Specification: 19 June, 1967.
No. 28208/67.
Application made in Italy (No. 14181) on 18 June, 1966,
(Patent of Addition to No. 1067306 dated 16 Feb., 1966.)
Complete Specification Published: 15 Jan., 1969.

Index at acceptance: —F2 F(1A1C1B, 1A1C4B, 1A2C, 1B6, 1BX, 1J2)
Int. Cl.: —B 60 t 7/20

COMPLETE SPECIFICATION

Vacuum Servo-Control for Operating the Brake on a Trailer Simultaneously with Operation of the Hydraulic Brake on the Tractor

We, LANCIA & C. FABBRICA AUTOMOBILI TORINO S.p.A. an Italian Joint Stock Company of 27 Via Vincenzo Lancia, Turin, Italy do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to improvements in pneumatic controls for operatng the brake on a trailer trailed by a tractor equipped with a hydraulic brake mechanism having a master cylinder operated from a brake pedal.

The parent patent specification discloses a pneumatic servo-control for operating the brake on a trailer simultaneously with operation of the hydraulic brake on the tractor, in which the part of the said control located on the said trailer comprises a pneumatic brake actuating cylinder having arranged therein an axially movable partition sub-dividing it into first and second fluid tight separated chambers, a stem extending through one of said chambers, fixed to the said partition and connected with trailer brake actuating means in order to apply or release the said brake upon displacement of the said partition, a reservoir connected to the first of said chambers and communicating through a valve with the part of the said servo-control located on the tractor on which is provided a vacuum source and a master cylinder actuated by a foot pedal lever and having at least one discharge port connected to the wheel brake cylinders of the tractor. The part of the said servo-control located on the tractor comprises in turn a distributer valve having a pneumatic section having a first port connected to the second of said chambers, a second port open to the atmosphere and a third port communicating by means of an intermediate conduit and a non return valve with the said vacuum source on the tractor; the said distributor valve being further connected with the discharge port of the master cylinder and being provided with means for connecting the said first port with said intermediate conduit and to shut-off the said second port when the tractor brake is released and for connecting said first port to the atmosphere through said second port and for interrupting the communication between the said first and third ports when the said master cylinder delivers pressure fluid to the said distributer valve during braking of the tractor.

A pneumatic servo-control having the above defined features will be referred to in the following description and claims as a "pneumatic servo-control of the type disclosed".

In the pneumatic servo-control of the type disclosed above, the valve connecting the reservoir on the trailer with the part of the said control located on the tractor is a spring loaded normally closed valve communicating directly with the vacuum source on the tractor, such as the suction or intake manifold of the engine. For this reason the intermediate conduit, interposed between the third port on the pneumatic section of the distributor valve and said vacuum source, is connected to a vacuum storing reservoir located on the tractor and serving to make up for any difference in vacuum arising in the chamber of the trailer brake actuating pneumatic cylinder by effect of the spring in the said valve connecting the reservoir on the trailer with the part of the control located on the tractor, and it is

[*Price* 4*s.* 6*d.*]

necessary to provide non-return valves in the couplings connecting the parts of the pneumatic servo-control located respectively on the trailer and on the tractor. This is a rather involved and expensive structure which suffers also from the drawback that in the case of damage to one of said valves the vacuum reservoir on the tractor and/or the intake manifold becomes suddenly connected to the atmosphere.

The object of the invention is to provide a pneumatic servo-control of the type disclosed which is simpler in structure and less expensive than the said servo-control and which is free from the drawbacks of the latter.

The above and further objects are fulfilled by a pneumatic servo-control of the type defined above which is characterized in that the said reservoir on the trailer is connected with a part of the said intermediate conduit situated between the third port of the said distributer valve and the said non-return valve, and that the said valve through which the said reservoir communicates with the part of the said servo-control located on the tractor, is normally open and closes when its spring-biassed valve member is impinged upon by the atmospheric pressure in the event the trailer is loosened from the tractor, and/or the joint connecting said valve with the part of the servo-control located on the tractor is released.

The invention will be described with reference to the accompanying drawings which show by way of example an embodiment thereof, and wherein:

Figure 1 is a diagrammatical plan view of a tractor and of a trailer, showing their hydraulic brake mechanisms and a pneumatic servo-control according to the invention connecting said mechanisms,

Figure 2 is a detail view of Figure 1 on an enlarged scale;

Figure 3 is a diagrammatical view of the trailer brake mechanism according to a modification.

Referring to the drawings for more specific details of the invention, 1 represents a tractor and 2 a trailer coupled therewith, the outer contours of which are marked by dash lines.

The hydraulic brake mechanism on the tractor 1 comprises a master cylinder 3, a foot pedal lever for operating the braking system 60, two wheel brake cylinders 4 on the fore wheels and two wheel brake cylinders p on the rear wheels.

The cylinder 3 is provided with two discharge ports denoted by 8 and 9, respectively.

The fore wheel brake cylinders 4 are connected with each other and the output 8 by means of fluid pressure delivery pipes 6, 12, the rear wheel brake cylinders 5 being connected with each other and with the discharge port 9 by means of fluid pressure delivery pipes 7,13.

The trailer brake mechanism comprises a master cylinder 14 and two wheel brake cylinders 15 connected with each other and with the master cylinder by means of fluid pressure delivery pipes 16,17. A pneumatic brake actuating cylinder 18 is arranged on the trailer 2 and is subdivided into a first chamber 19 and a second chamber 20 by a piston 21 biased by a reaction spring 22.

The piston 21 is operatively connected with the piston 23 of the master cylinder 14 by means of a rod 24 extending through the second chamber 20 of the cylinder 18.

A distributer valve 27 on the tractor comprises a pneumatic and a hydraulic sections, as described in detail in the parent patent. The pneumatic portion of the valve 27 is formed with a first port 29, a second port 30 and a third port 31.

The first port 29 of the valve 27 is connected with the first chamber 19 in the pneumatic cylinder 18 on the trailer by means of a pipe 39, a tightly interfitting pipe joint 106 and a pipe 41.

The second port 30 is open to the atmosphere, the third port 31 is connected with the suction manifold 11 of the engine 10 by means of an intermediate conduit 33 formed in the body of the valve 27 and of a pipe 35. A unidirectional valve 61 is interposed between the conduit 33 and pipe 35, the said valve being normally held closed by the action of spring means and opening towards the manifold 11.

The hydraulic section of the valve 27 comprises a hydraulic cylinder 48 formed with two ports 51 and 52, the port 51 connecting with the port 8 of the master cylinder 3 by means of a pipe 54, the port 52 connecting with an intermediate point in the pipe 7 by means of a pipe 53.

According to the invention the second chamber 20 in the pneumatic cylinder 18 is pneumatically connected with an intermediate portion of the conduit 33 situated between the said third port 31 and the unidirectional valve 61.

The abovementioned connection comprises a pipe 100 connected at one end with the chamber 20 and at its other end with a reservoir 101 on the trailer 2.

A hand-operated cock 102 is interposed in the pipe 100 and is movable to two operative positions, in one of which the chamber 20 is connected with the reservoir 101, whereas in the other position the chamber 20 is cut off from the reservoir 101 and is connected to the outside through the opening 103 in the body of the cock.

The reservoir 101 is connected to the conduit 33 of the valve 27 by pipes 104 and 104a which can be coupled together by means of a joint 105. A normally open unidirectional

valve 107 is interposed between the conduit 104 and the reservoir 101.

As shown in Figures 1 and 2 the body 108 of the valve 107 is secured to the reservoir 101, the interior 109 of the body 108 communicating with the conduit 104 and reservoir 101 through openings 110,111, respectively.

A valve member 112 is slidably mounted in the hollow 109 and is held by a calibrated spring 113 spaced from its annular seat 114 surrounding the opening 111, whereby the valve 107 is normally open.

The valve 107 closes when the vacuum in the conduit 104 is lower than the vacuum in the reservoir 101, whereby the spring 113 is compressed and the valve member 112 abuts the seat 114 and closes the port 111.

The rating of the spring 113 should be such that the valve 107 closes when the vacuum in the reservoir 101 exceeds a predetermined value and when the conduit 104 is opened to the outside.

During operation when the trailer equipped with a hydraulic brake mechanism as shown in Figure 1, is loosened from the tractor, that is, when the joints 105 and 106 are released, the valve 107 closes, the vacuum being maintained in the reservoir 101 and chamber 20 in the pneumatic cylinder 18, whereas the chamber 19 is acted upon through pipe 41 by the atmospheric pressure which exerts a thrust on the piston 21 and brakes the trailer by the action of the stem 24 on the piston 23 of the master cylinder 14.

Under these conditions, in order to release the brakes on the trailer the cock 102 is hand-operated in order to insulate the reservoir 101 and connect the chamber 20 with the atmosphere through the opening 103.

The embodiment shown in Figure 3 refers to the use of a brake mechanism according to the invention in connection with a trailer provided with mechanically-operated brakes. As is well known, such brakes comprise in association with each wheel brake shoes 200 controlled by a cam 201 fast with a lever 202. The levers 202 on all braked wheels are connected with an operating rod 203.

As shown in Figure 3 the rod 203 is directly connected with the stem 24 on the pneumatic cylinder mounted in a position other than described with reference to Figure 1.

The stem 24 of the piston 21 extends in this case through the first chamber 19 of the cylinder 18 so that, when the chamber 19 is connected with the atmosphere in the previously described manner, the stem 24 is drawn into the cylinder 18 and actuates the trailer brakes through the operating rod 203.

It will be understood that, the principle of the invention being left unaltered, embodiments and constructional details can be widely varied with respect to the description and drawings without departing from the scope of this invention defined in the following claims.

WHAT WE CLAIM IS:—

1. Pneumatic servo-control for operating the brake on a trailer simultaneously with operation of the hydraulic brake on the tractor, of the type disclosed, characterized in that the said reservoir on the trailer is connected with a part of the said intermediate conduit situated between the third port of the said distributer valve and the said non-return valve, and that the said valve through which the said reservoir communicates with the part of the said servo-control located on the tractor, is normally open and closes when a spring-biassed valve member therein is impinged upon by atmospheric pressure in the event the trailer is separated from the tractor, and/or the joint connecting said valve with the part of the servo-control located on the tractor is released.

2. Servo-control as claimed in claim 1, wherein the stem fixed to the partition movable in the trailer brake actuating pneumatic cylinder extends through the chamber of the latter connected to the said reservoir.

3. Servo-control as claimed in claim 1, wherein the stem fixed to the partition movable in the trailer brake actuating pneumatic cylinder extends through the chamber of the latter connected to the first port of the said distributer valve.

4. Servo-control as claimed in claim 2, characterized by the fact that when the chamber in the said pneumatic cylinder connected to the first port of the distributor valve is connected with the atmosphere, the said stem is acted upon by the thrust exerted on the said partition by the air pressure acting in such chamber in the pneumatic cylinder.

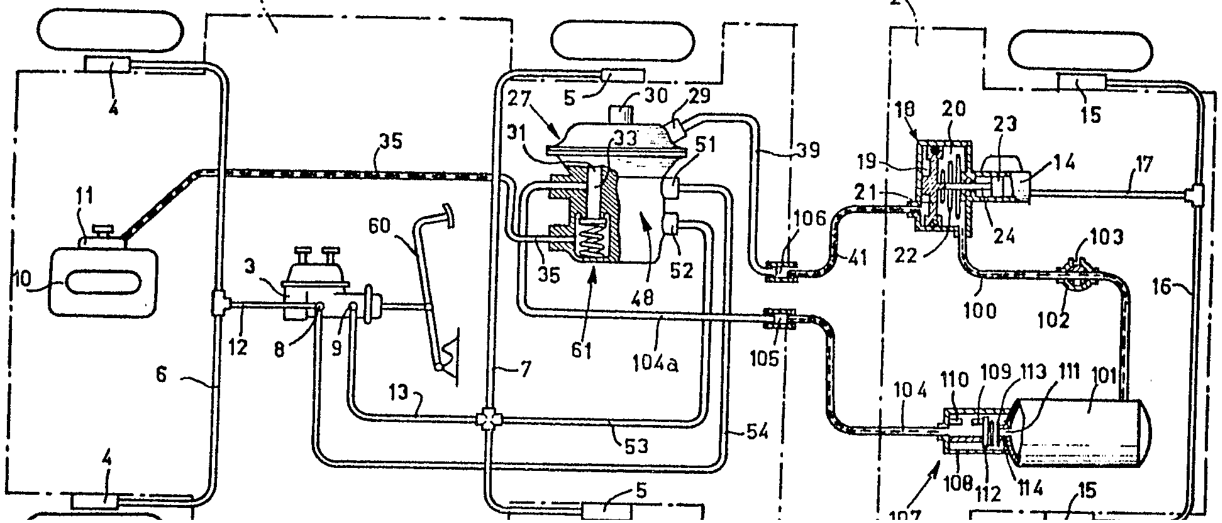
5. Servo-control as claimed in claim 3, characterized by the fact that when the said chamber connected to the first port of the distributor valve is connected with the atmosphere, the stem is drawn into the pneumatic cylinder.

6. Pneumatic servo-control substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

FORRESTER, KETLEY & CO.,
Chartered Patent Agents,
Jessel Chambers, 88—90 Chancery Lane,
London, W.C.2.
and
Rutland House, 148 Edmund Street,
Birmingham 3.
Agents for the Applicants.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1969.
Published by the Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

Fig_1


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
27
29
30
31
33
35
39
41
48
51
52
53
54
60
61
100
101
102
103
104
104a
105
106
108
109
110
111
112
113
114

1140236 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheets 1 & 2

Fig. 2

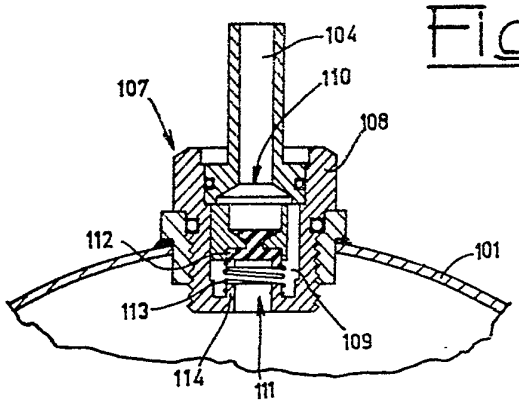
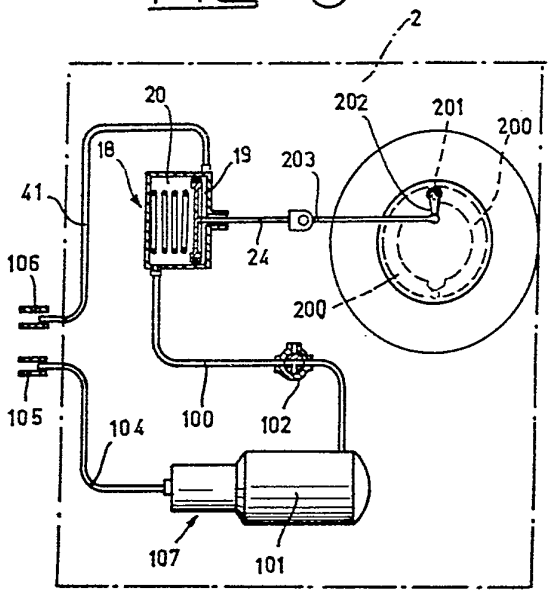


Fig. 3



1140236 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

Fig. 1

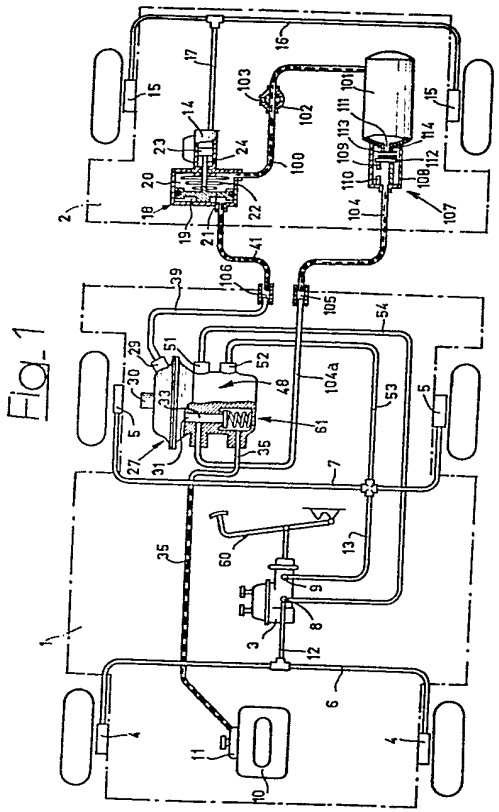


Fig. 2

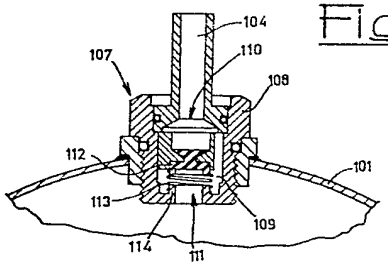


Fig. 3