

REGULATION 9

APPLICATION ACCEPTED AND AMENDMENTS  
ALLOWED 2.14.90

59 8262 FOR 1

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

APPLICATION FOR A STANDARD PATENT



We, BENDIX FRANCE, of 126, Rue De Stalingrad, 93700, Drancy, France, hereby apply for the grant of a Standard Patent for an invention entitled:-

"HYDRAULIC BOOSTER DEVICE"

which is described in the accompanying Complete Specification.

Details of basic application:-

Number: 86 07619

Country: France

Date: 28th May, 1986

Our address for service is:

SHELSTON WATERS

55 Clarence Street

SYDNEY, N.S.W. 2000.

DATED this 18th day of May, 1987

BENDIX FRANCE

by

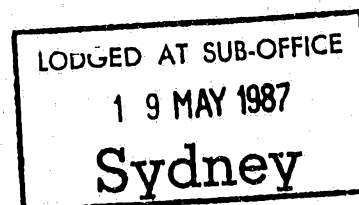
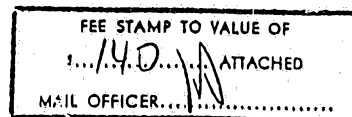
*Robert G. Shelston*

Fellow Institute of Patent Attorneys of Australia  
of SHELSTON WATERS

To: The Commissioner of Patents  
WODEN A.C.T. 2606

File: D.B.42I

Fee: \$140.00



(CONVENTION — Company)

FORM 8 — REGULATION 12 (2)

COMMONWEALTH OF AUSTRALIA PATENTS ACT, 1952-1973  
DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention Application No. .... made  
(a) Here Insert (in full) by <sup>(a)</sup> BENDIX France (société anonyme) .....  
Name of Company.

(hereinafter referred to as "Applicant") for a patent for an invention entitled:  
(b) Here Insert Title of <sup>(b)</sup> "HYDRAULIC BOOSTER DEVICE" .....  
Invention.

<sup>(c)</sup> Emmanuel POIDATZ .....  
(c) and (d) Here Insert Full Name and Address of Company Official authorised to make declaration, of <sup>(d)</sup> BENDIX France, 126, rue de Stalingrad .....  
93700 DRANCY - FRANCE

do solemnly and sincerely declare as follows:

1. I am authorised by Applicant to make this declaration on its behalf.

(e) Here Insert Basic Country or Countries followed by date or dates of Basic Application(s), in <sup>(e)</sup> FRANCE ..... on the 28th day of MAY ..... 19 86.  
..... on the ..... day of ..... 19 ..

(f) Here Insert Full Name(s) of Applicant(s) in Basic Country, by <sup>(f)</sup> BENDIX France .....

(g) Here Insert (in full) Name and Address of actual Inventor of <sup>(g)</sup> Roland LEVRAI - Pascal PICOT ..... Christian RIQUART .....  
Inventors, of 9bis Av. G. Monmousseau, of 1, Place J. Jaurès, of 33, rue Fessart .....

of 93240 STAINS ..... Apt 84  
94380 BONNEUIL/MARNE 75019 PARIS .....  
FRANCE ..... FRANCE ..... FRANCE ..... is/are

the actual Inventor(s) of the invention and the facts upon which Applicant is entitled to make the Application are as follows:

Applicant is the Assignee of the said Inventor(s).

4. The basic Application(s) referred to in paragraph 2 of this Declaration was/were the first Application(s) made in a Convention country in respect of the invention, the subject of the Application.

DECLARED at PARIS, FRANCE .....  
this ..... 16th ..... day of APRIL ..... 19 87.

(h) Personal Signature of Declarant (c) (no seal, witness or legalisation).

(h) .....  
(Signature of Declarant)

Emmanuel POIDATZ

To THE COMMISSIONER OF PATENTS, Chef du Service Brevets de la Société Anonyme dite : BENDIX France.

**SHELSTON WATERS**

PATENT ATTORNEYS

55 CLARENCE STREET, SYDNEY

AUSTRALIA

Cables: 'Valid' Sydney Telex: 24422

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(12) PATENT ABRIDGMENT      (11) Document No. AU-B-73202/87  
(19) AUSTRALIAN PATENT OFFICE      (10) Acceptance No. 598262

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(54) Title  
HYDRAULIC BOOSTER DEVICE

International Patent Classification(s)  
(51)<sup>4</sup> B60T 013/12

(21) Application No. : 73202/87

(22) Application Date : 19.05.87

(30) Priority Data

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(71) Applicant(s)  
BENDIX FRANCE

(72) Inventor(s)  
ROLAND LEVRAI; PASCAL PICOT; CHRISTIAN RIQUART

(74) Attorney or Agent  
SHELSTON WATERS

(56) Prior Art Documents  
US 4709550  
US 4671168

(57) Claim

1. Hydraulic booster device comprising a body having a first bore in which a first piston and a second piston are slideably mounted, the first piston being displaceable under the effect of the actuation of a third piston slideably mounted in said first bore, and the second piston being displaceable by means of a hydrostatic connection formed in a first working chamber defined between the first and second pistons, a second working chamber being defined between said second piston and a valve there being respectively associated with each piston a valve in a respective hydraulic circuit between a pressurized-fluid source and a respective brake circuit; and a third chamber defined in the first bore between the first piston and the third piston, and connected to a

(11) AU-B-73202/87  
(10) 598262

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reservoir of fluid under low pressure by means of a valve which closes at the end of a specific stroke of said third piston, characterized in that it has a second bore, in which is slideably mounted a pilot piston determining, together with a closed end of said second bore, a fourth chamber in hydraulic communication with said third chamber, the other end of said second bore being in hydraulic communication with the reservoir of fluid under low pressure by means of a valve controlled as a function of the pressure of the fluid of the pressurized fluid course, said pilot piston being displaceable under the effect of the pressure in said third chamber counter to a first spring.

COMMONWEALTH OF AUSTRALIA

59 8262

FORM 10

PATENTS ACT 1952

C O M P L E T E        S P E C I F I C A T I O N

FOR OFFICE USE:

Application Number: 73202/87  
Lodged:

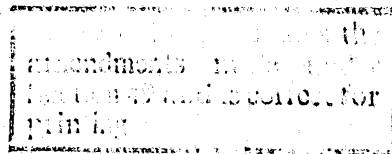
Class

Int.Class

Complete Specification Lodged:  
Accepted:  
Published:

Priority:

Related Art:



Name of Applicant: BENDIX FRANCE

Address of Applicant: 126, RUE DE STALINGRAD,  
93700, DRANCY, FRANCE

Actual Inventors: ROLAND LEVRAI; PASCAL PICOT;  
CHRISTIAN RIQUART

Address for Service: SHELSTON WATERS, 55 Clarence Street, Sydney

Complete Specification for the Invention entitled:

"HYDRAULIC BOOSTER DEVICE"

The following statement is a full description of this invention,  
including the best method of performing it known to me/us:-

HYDRAULIC BOOSTER DEVICE

The present invention relates to hydraulic brake booster devices and more particularly to such a device for a dual brake circuit of mixed hydrodynamic (known as "full power") and hydrostatic operation.

5           A so-called "full power" hydraulic booster device is known from French Patent Application No. 8,502,824, filed on 27 February 1985, which device comprises two piston means delimiting two master cylinder chambers and each having a return valve means to the tank. The device also comprises two high pressure valve means, a  
10       first incorporated in the first piston means and a second in an element closing the bore of the device. The device may function in the hydrodynamic mode and, in the event of failure of a high pressure circuit, in the hydrostatic mode as a conventional master cylinder.

15           Despite its advantages, this device has minor drawbacks in that the pedal travel perceived by the driver of the vehicle is too short. Modern vehicle manufacturers request that the pedal travel should be  
20       more progressive in order to improve driving comfort.

          A subject of the present invention is therefore to provide a hydraulic booster device of the mixed or so-called "full power" type which is nevertheless capable of operating as a conventional master cylinder in  
25       the event of failure of a high pressure circuit and having a more progressive pedal travel.

          To achieve this, the invention relates to a hydraulic booster device comprising a body having a bore in which a first and a second piston means are mounted  
30       slideably, the first piston means being displaceable under the effect of the actuation of a third piston mounted slideably in the bore, and the second piston means being displaceable by means of a hydrostatic connection formed in a pressure chamber defined between the  
35       first and the second piston means, there being associated with each piston means a respective valve means in a

respective hydraulic circuit between a fluid source under pressure and a respective brake circuit, and a third chamber defined in the bore between the first piston means and the third piston, characterized in that the third chamber is partially delimited by a piston valve which is displaceable under the effect of the pressure in the third chamber as it meets a first spring means.

The present invention will now be described by way of example with reference to the accompanying drawings, in which:

figure 1 is a view in longitudinal section of a hydraulic booster device according to a first embodiment;

figure 2 is a curve representing the pedal travel as a function of the input force of the device of figure 1; and

figure 3 is a view in longitudinal section of a device according to a second embodiment.

As shown in figure 1, the hydraulic booster device, which in the example shown is a master cylinder for brake circuits, comprises a body 10 having a multi-stage bore 12 sealed at one end by a closing element 14. Mounted sealingly slideably in the bore 12 is a first piston 16 intended to be connected to a brake pedal (not shown). Mounted slideably in the first piston 16 is a flap element 18 which is stressed towards a position in which it comes up against a shoulder 20 by means of a spring 22. A second piston 24 is mounted sealingly slideably in the bore 12 and is coupled to the first piston 16 by a spring 26. The second piston 24 has an axial passage 28 which connects a first chamber 30, defined between the first and second pistons 16, 24, to an intermediate chamber 32.

The intermediate chamber 32 is delimited by a first piston means 34 which has a multi stage bore 36 in which a flap assembly 38 is slideably mounted. The flap assembly 38 has a passage 40 which is intended to be

closed by a seal 42 which comes up against the first piston means 34 when the flap assembly 38 moves in the bore 36. A push rod 43 is mounted slideably in a second axial bore 44 in the first piston means 34 and has, at one end, a ball 46 which is intended to interact with a seat 48 in the flap assembly 38. At its other end, the push rod 42 has an actuating rod 50 which is intended to free a ball 52 from its seat 53 thus opening a hydraulic passage between a fluid source 54 under pressure and the inside of the bore 36.

Moreover, the device comprises a second piston means 56 mounted slideably in the bore 12 and coupled to the first piston means 34 by a spring 58. A first working chamber 60 is formed between the first and second piston means 34, 56 and is connected to a first brake circuit 62. The second piston means 56 comprises a multi stage bore 64 in which a push rod 66 is mounted slideably with play, which push rod has at one end a ball 68 capable of closing a seat 70 in a passage 72 between the multi stage bore 64 and a low pressure tank 74. At its other end, the push rod 66 has an actuating rod 76 which is capable of freeing a ball 78 from its seat 80 in a passage 82 between a fluid source under pressure 84 and a second working chamber 86 which is connected to a second brake circuit 88.

According to the invention, the device comprises a multi stage bore 90 arranged beside the bore 12 and in which a piston valve 92 is mounted slideably, which piston valve defines a chamber 96 by means of a closing element 94. A flap means 98 is mounted sealingly slideably in the bore 90 and is connected to the piston valve 92 by means of a dual spring assembly 100 and 102 and a casing 104 mounted fixedly in the bore 90. One end 107 of the bore 90 is in hydraulic communication with the source 54 and the bore on the other side of the flap means 98 is in hydraulic communication with a low pressure tank 106 which is also connected to the bore 12 by a passage 108. The flap means 98 has a seal 110 which

is intended to close the hydraulic passage between the bore 90 and the tank 106 during a movement of the flap means 98. The chamber 96 is connected to the first chamber 30 by a passage 112.

5           The mode of operation of the device thus described is as follows. A force applied by the brake pedal on the piston 16 is transmitted by means of the spring 26 to the second piston 24 which moves to the left (looking at the drawings), causing the displacement of  
10 the flap assembly 38. The displacement of the flap assembly 38 causes the seat 48 to be closed by means of the ball 46. The first working chamber 60 is thus isolated from the tank 106, but the intermediate chamber 32 remains in communication with the tank 106 and the first  
15 chamber 30, the seal 42 remaining open. This position corresponds to the point W on the curve in figure 2. If the force on the pedal continues to increase, the rod 50 of the push rod 43 frees the ball 52 from its seat 53 (point X on the curve), allowing the fluid under pressure to pass through the first working chamber 60 to-  
20 wards the first brake circuit 62. The pressure increase in the first working chamber 60 leads to the displacement of the second piston means 56, causing the seat 70 to be closed by means of the ball 68 and the ball 78 to  
25 be opened by the rod 76. The hydraulic passage between the high pressure source 84 and the second brake circuit 88 is thus opened.

          If the force on the pedal continues, the spring 26 bends, allowing a pedal travel shown in figure 2 between the points X and Y. The fluid in the first chamber 30 is forced back through the passages 28 and 40 to-  
30 wards the tank 106. At the end of this travel, the flap element 18 closes the passage 28, thereby isolating the first chamber 30 of the low pressure tank 106. This  
35 position corresponds to the point Y on the curve in figure 2. From this point, the fluid in the first chamber 30 passes through the passage 112 towards the chamber

96, causing the displacement of the piston valve 92 as it meets the spring 102. The pedal travel increases to the point Z on the curve, which corresponds to the point at which the first piston 16 comes up against the second piston 24 by means of the push rod 18.

In the event of a failure of the high pressure source 54, the flap means 98 moves to the left (looking at the drawings) under the effect of the spring 100 and the seal 110 closes the passage between the bore 90 and the tank 106. The piston valve 92 is thus immobilised. When the device is activated, the first piston 16 moves, causing the seat 48 to be closed by means of the ball 46 and freeing the ball 52 from its seat 53. As there is no high pressure obstructing the displacement of the flap assembly 38, the latter continues to slide until the seal 42 comes up against the first piston means 34, thereby closing the passage between the intermediate chamber 32 and the low pressure tank 106. As the fluid in the first chamber 30 is incompressible, the first piston 16 and the first piston means 34 move together, sending the fluid in the first working chamber 60 towards the first brake circuit 62 and displacing the second piston means 56.

In the second embodiment shown in figure 3, the elements which are identical or similar to those in figure 1 bear the same reference numerals.

The device in figure 3 differs from that in figure 1 in that the flap assembly 138 is not provided with a seal 42. The piston valve 92 is stressed towards its position in which it comes up against the closing element 94 by a dual spring assembly 140 and 142 and a casing 144 arranged directly in the bore 90. The bore 90 is connected to a chamber 120 by an opening 122. The chamber 120 communicates with the low pressure tank 106 by means of a passage 124. A flap means 98 is mounted sealingly slideably in a passage 126 in communication with the high pressure source 54, and has a seal 110 intended to close the passage 124 between the chamber 120

and the tank 106 under the effect of a spring 128.

When the device is activated, the piston 16 moves and the flap element 18 comes up against the second piston 24, isolating the first chamber 30 from the reservoir 106. The resulting displacement of the first piston 16 sends the fluid in the first chamber 30 through the passage 112 towards the chamber 96, causing the displacement of the piston valve 92. The displacement of the piston valve 92 initially compresses the two springs 140 and 142. As the spring 140 is weaker than the spring 142, the piston valve comes up against the casing 144. The displacement of the piston valve 92 beyond this position compresses the spring 142 only. This successive compression of the two springs 140 and 142 creates a broken slope which is substantially identical with that in figure 2.

In the event of a failure of the high pressure source 54, the flap means 98 closes under the effect of the spring 128, thereby isolating the chamber 120 and the bore 90 from the low pressure tank 106. The piston valve is thus rendered immobile.

It can therefore be stated that, in accordance with the subject of the invention, a progressive pedal travel is ensured.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. Hydraulic booster device comprising a body having a first bore in which a first piston and a second piston are slideably mounted, the first piston being displaceable under the effect of the actuation of a third piston slideably mounted in said first bore, and the second piston being displaceable by means of a hydrostatic connection formed in a first working chamber defined between the first and second pistons, a second working chamber being defined between said second piston and a valve there being respectively associated with each piston a valve in a respective hydraulic circuit between a pressurized-fluid source and a respective brake circuit; and a third chamber defined in the first bore between the first piston and the third piston, and connected to a reservoir of fluid under low pressure by means of a valve which closes at the end of a specific stroke of said third piston, characterized in that it has a second bore, in which is slideably mounted a pilot piston determining, together with a closed end of said second bore, a fourth chamber in hydraulic communication with said third chamber, the other end of said second bore being in hydraulic communication with the reservoir of fluid under low pressure by means of a valve controlled as a function of the pressure of the fluid of the pressurized fluid course, said pilot piston being displaceable under the effect of the pressure in said third chamber counter to a first spring.



2. Device according to Claim 1, characterized in that it also comprises a second spring arranged counter to the displacements of the third piston and of the pilot piston.

3. Device according to Claim 2, characterized in that the second spring is mounted in the first chamber.

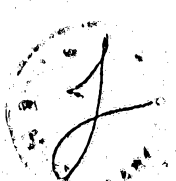
4. Device according to Claim 2, characterized in that the second spring is mounted in the said second bore.

5. Device according to Claim 4, characterized in that the second spring is arranged in such a way as to be rendered inactive after a predetermined displacement of the piston.

6. A hydraulic booster device substantially as herein described with reference to Figures 1 and 2 or Figure 3 of the accompanying drawings.

DATED this 22nd day of February, 1990.  
BENDIX FRANCE.

Attorney: WILLIAM S. LLOYD  
Fellow Institute of Patent Attorneys of Australia  
of SHELSTON WATERS

A handwritten signature, possibly 'J. S. Lloyd', is written over a circular stamp. The stamp contains some illegible text and a central emblem.

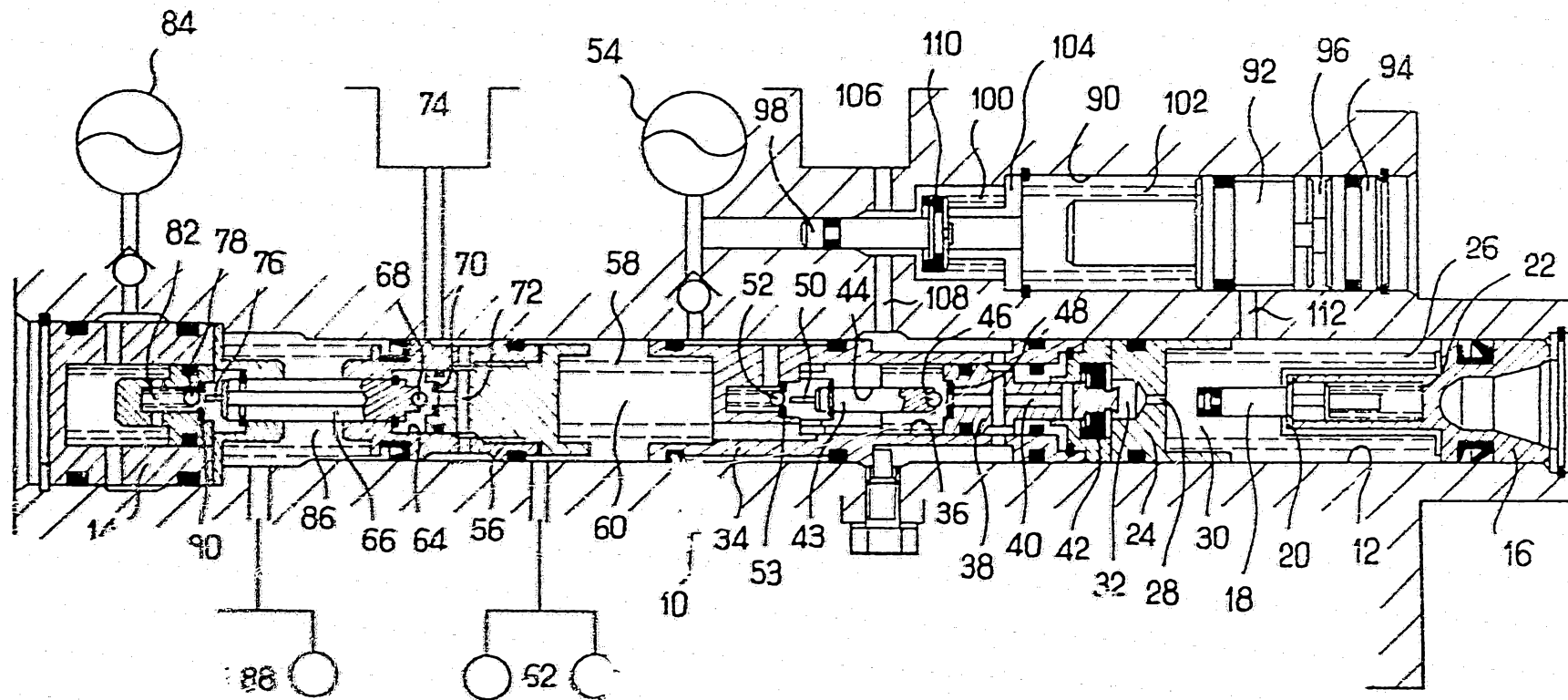


FIG. 1

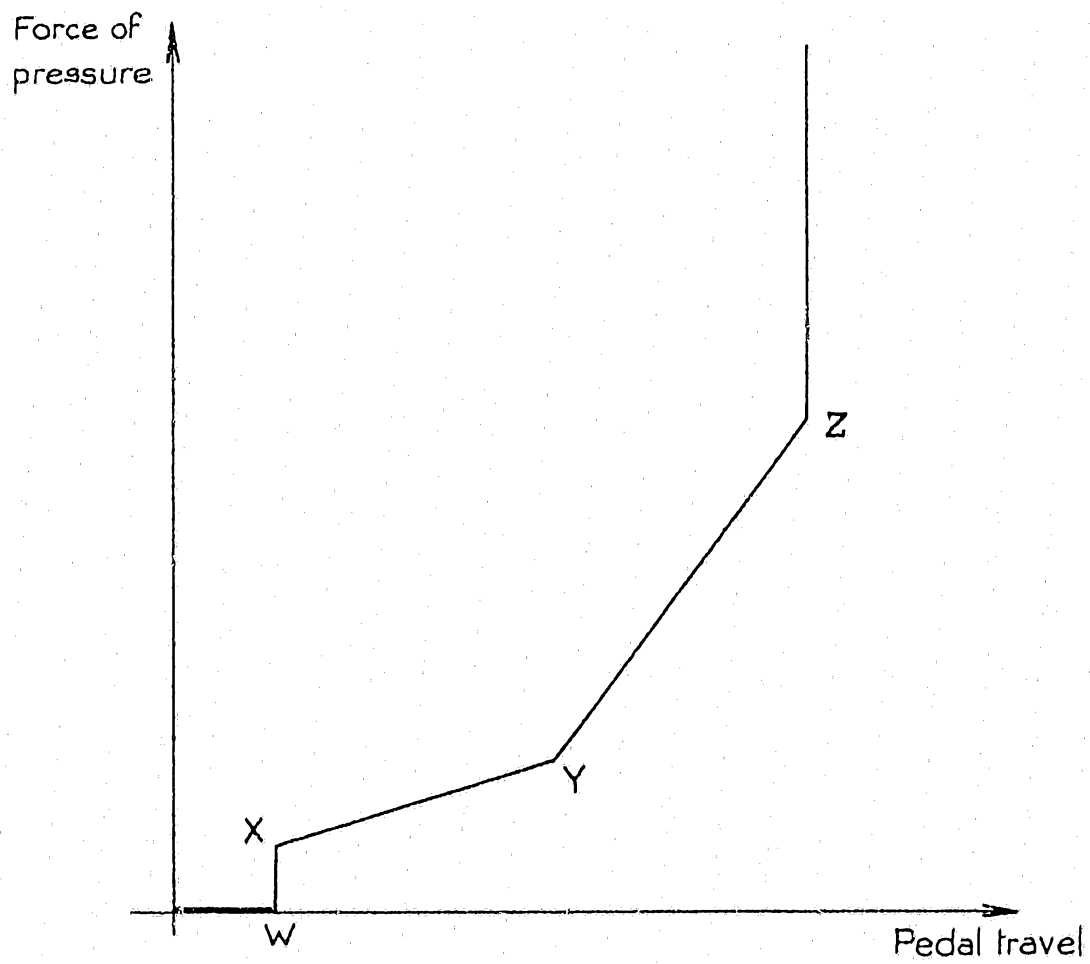


FIG. 2

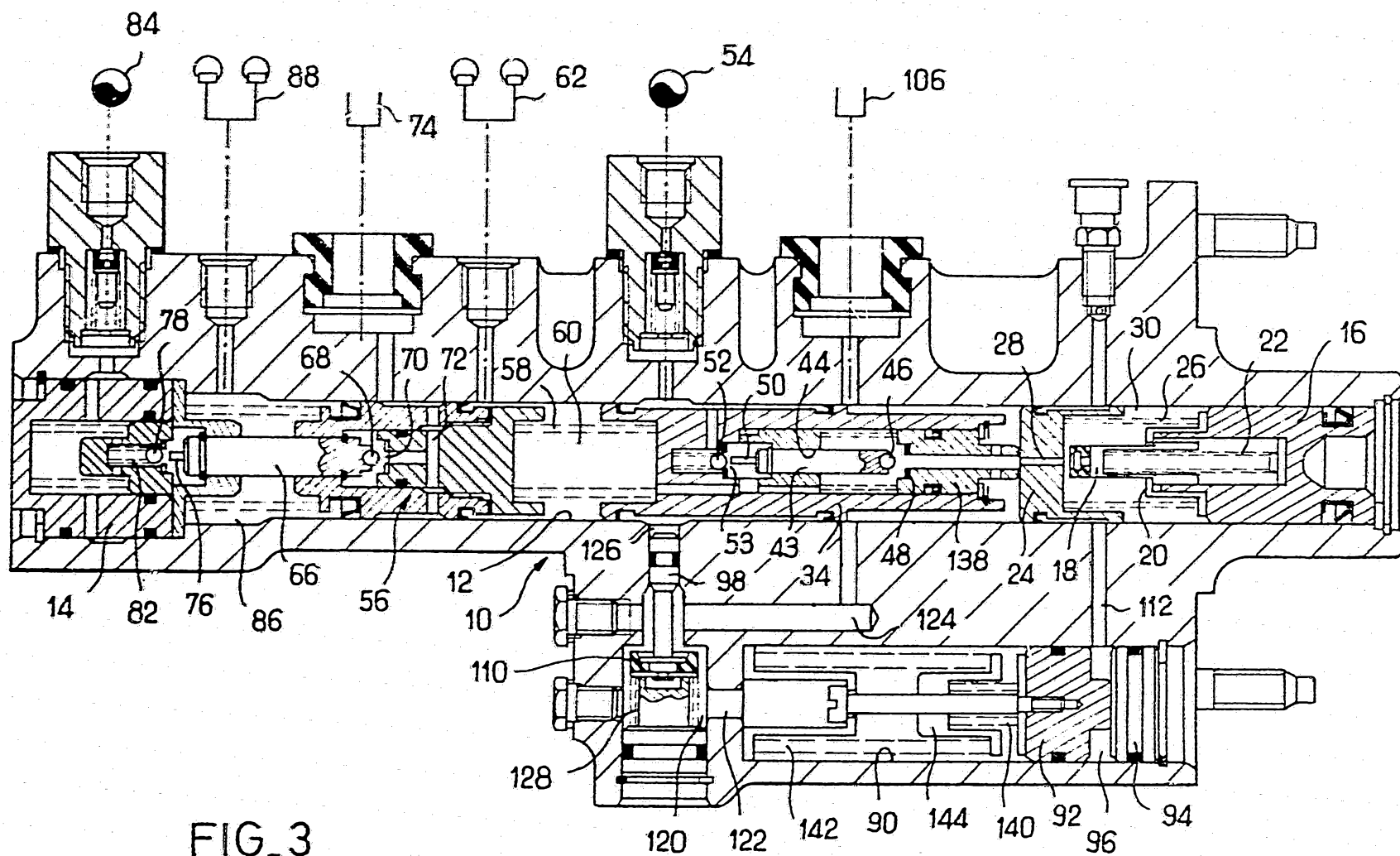


FIG. 3