May 29, 1934. G. DEMONGE 1,960,481

REGULATION OF BRAKES

Filed June 26, 1930 2 Sheets-Sheet 1

fig. 1

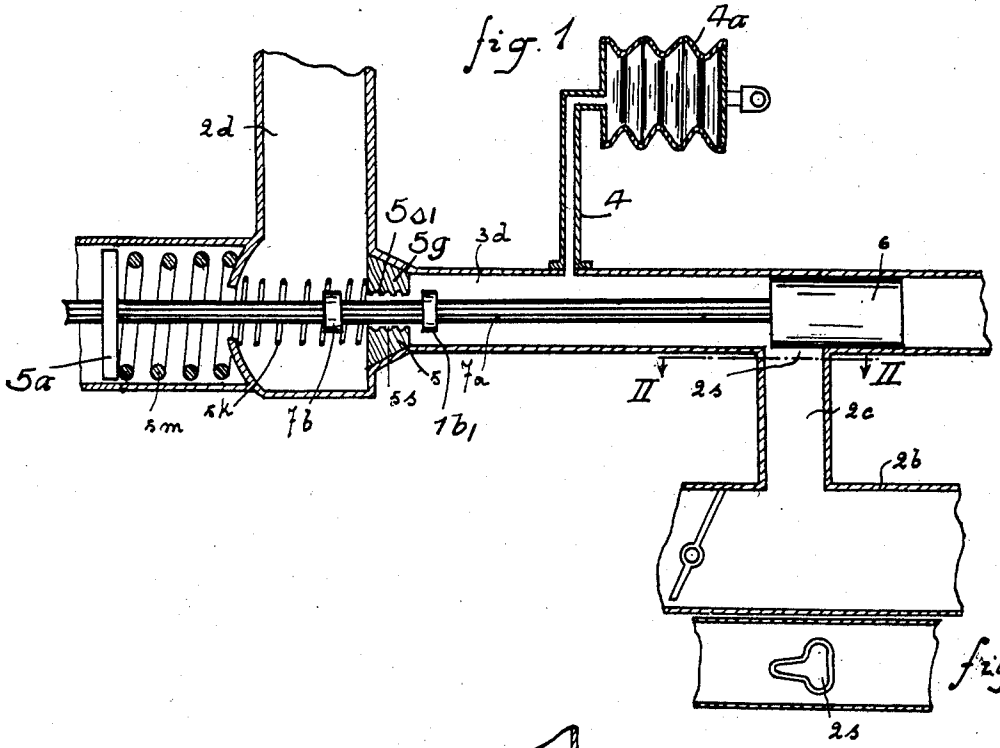


fig. 2.

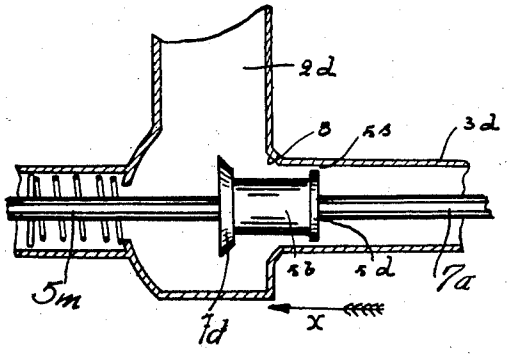


fig. 3

Inventor:-
Gerard de Monge
by
Lampua, Parry, Hard & Lampua
Attys.

May 29, 1934. G. DEMONGE 1,960,481

REGULATION OF BRAKES

Filed June 26, 1930 2 Sheets-Sheet 2

fig. 4

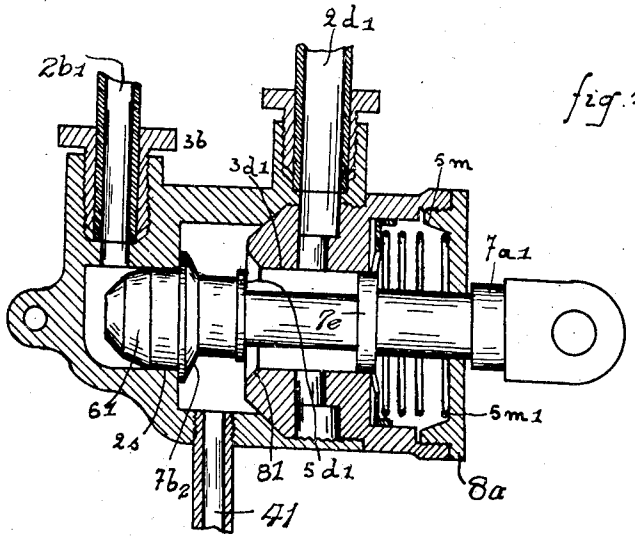
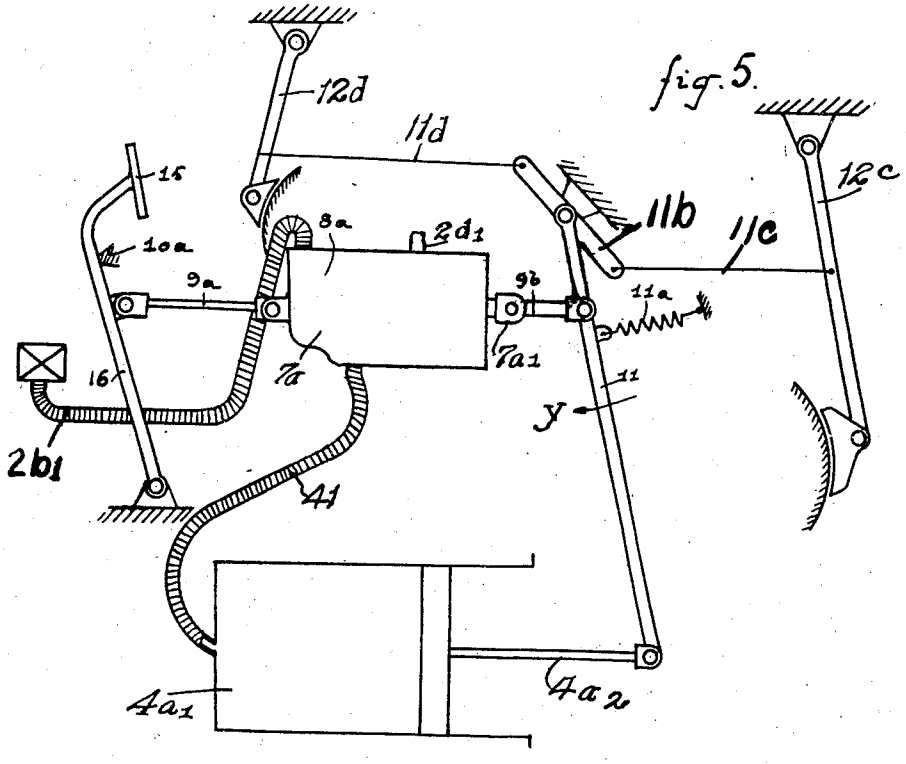


fig. 5.



Inventor:-
Gerard de Monge
by
Langner, Parry, Card & Langner
Attys.

Patented May 29, 1934

1,960,481

UNITED STATES PATENT OFFICE

1,969,481

REGULATION OF BRAKES

Gérard de Monge, Liege, Belgium, assignor to Fabrica Italiana Magneti Marelli, Societa Anonima, Milan, Italy

Application June 26, 1930, Serial No. 464,065
In Belgium March 1, 1930

4 Claims. (Cl. 121—41)

The invention relates to mechanism for regulating the degree of vacuum existing in a power chamber and created by the suction in the supply pipe of an internal combustion engine. Such vacuum is produced in a power chamber by controlling a gaseous medium passing through an intermediate chamber which communicates with the power chamber; and by means of suitable connections, the effect of this vacuum can be utilized to create an unbalanced force for setting the brakes of a vehicle in motion, to check or stop said vehicle.

An object of this invention is to provide apparatus which employs air as the power medium and provides means for conducting the air into the intermediate chamber through a passage of constant area, the regulation of the vacuum in the power chamber being determined solely by regulating the volume of the current of air in the intermediate chamber. In view of the fact that the invention obtains maximum braking by establishing communication between the intermediate chamber and the intake manifold of the motor, the size of the passage for the admission of the air to the intermediate chamber is necessarily very slight. This small inlet has the advantage of increasing the rapidity of establishing the vacuum in the power chamber and limiting the air current which passes through the intermediate chamber, so that the latter causes practically no changes in the condition of carburetion during the braking.

A further object of this invention is to provide apparatus which includes means for forming an intermediate chamber having communication with the atmosphere and a connection to the supply pipe of an internal combustion engine and containing a valve and a passage cooperating therewith of such relative shape that the degree of vacuum in the intermediate chamber produced by the connection to the intake manifold of the engine is approximately proportional to the extent of movement of the valve.

Another object of the invention is to provide mechanism for regulating the vacuum in a power chamber and comprising means for forming an intermediate chamber having connections as above set forth and movably mounted in operative position.

The invention also provides that communication between the intermediate chamber and the suction manifold is established in such manner that the vacuum in the power chamber is proportional to the movement of the control member of the brake.

An embodiment of the invention is illustrated by way of example on the accompanying drawings in which:

Fig. 1 is a diagrammatic section of the mechanism according to this invention:

Fig. 2 is a partial section on the line II—II of Fig. 1,

Fig. 3 is a modification in section of a portion of the mechanism of Fig. 1,

Fig. 4 is a section of a further modification,

Fig. 5 shows diagrammatically a braking system utilizing the mechanism of Fig. 4.

In the apparatus shown on Fig. 1 the intermediate chamber $3d$ is adapted to be put into communication, on the one hand, with the open air through the port or passage $5s$ of constant area and the conduit $2d$; and, on the other hand, with the suction manifold $2b$ of an internal combustion engine through a port $2s$ and the conduit $2c$. This intermediate chamber is also in constant communication through a conduit 4 with a power chamber $4a$. The internal combustion engine whose suction is utilized is the motor of the vehicle to be braked by the apparatus.

The passage $5s$ is formed between a rod $7a$ and an aperture in a valve 5, subject to the action of a spring $5k$ which tends constantly to hold said valve on its seat $5g$. Grooves, such as $5s_1$, are provided on the inner face of the aperture in the valve 5, to give the effect of baffles or deflectors in the passage $5s$. The eddies created in the passage $5s$ by these grooves have an action equivalent to that of a reduction in the cross section of said passage. Arranged on the control rod $7a$ is a closure member 6, adapted to move opposite the port $2s$ and to more or less uncover the latter so as to regulate the area of the communication between the intermediate chamber $3d$ and the conduit $2c$.

The rod $7a$ is moved for actuation of the brakes by operating the brake pedal (not shown) of the vehicle and is done in opposition to the action of a spring $5m$. The spring $5m$ abuts against the outside of the atmospheric conduit $2d$ at one end and against the collar $5a$ on the rod $7a$ at the other. Thus the spring is compressed whenever the rod $7a$ moves the reciprocable valve 6 to open the port or passage $2s$.

Two collars $7b$ and $7b_1$ are also arranged on the rod $7a$. The distance which separates these collars is equal to the movement of rod $7a$ during operation of the brake, that is to say, from minimum braking (application of the brake bands to the brake drums) up to the practically maximum braking. The result of this arrange-

ment is that on maximum braking the collar 7*b* closes the passage 5*s* because it has then moved up close to the end of this passage; and the port 2*s* is now fully uncovered by the valve 6; and that on rapid release the collar $7b_1$ removes the valve 5 from its seat so as to produce free communication between the intermediate chamber 3*d* and the conduit 2*d* leading to the atmosphere. This result follows because the rod 7*a* now moves in the other direction bringing the collar $7b_1$ against the other side of the valve 5.

In practice (see Fig. 1) the outside air enters into the intermediate chamber through the passage 5*s* and discharges into the suction manifold 2*b* of the motor through the port 2*s* whose effective area is determined by the position of the closure member 6 and the rod 7*a*. The size of port 2*s* and passage 5*s* determines the extent of the vacuum in the intermediate chamber and hence in the brake power 4*a*.

The profile or outline of the above mentioned port 2*s* (see Fig. 2) is such that the vacuum in the intermediate chamber is proportional to the movement of the valve 6.

In case the rod 7*a* is connected to the brake pedal through a floating lever, which is joined directly to the vehicle brakes, it is to be noted that for complete or rapid braking the collar 7*b*, which at this moment is pressed against the valve 5, acts as a point of bearing for directly transmitting to the brakes the effort exerted by the driver on the brake pedal. If, for example, the total course or movement of the valve 6 is 10 mm., the first two of which permit the flow of air in the intermediate chamber between the conduits 2*d* and 2*c* and the last millimeter of which serves to actuate the collar 7*b*, there remain 7 mm. for progressive operation of the brakes.

In Fig. 3, the device which controls the communication between the intermediate chamber 3*d* and the conduit 2*d* terminating in the open air is formed by a cylindrical member 5*b* affixed to the drive rod 7*a* and provided with a circular flange 5*d* and a valve 7*d*. The circular shutter is formed so as to move in the intermediate chamber 3*d* during the entire period of braking so as to leave a passage of constant area 5*s* between the conduit 2*d* and said intermediate chamber. The valve 7*d* is intended to close said communication when it engages a seat 8 during complete braking. The distance separating the valve 7*d* from the seat 8 is equal to the length of movement of the rod 7*a* during the entire period of braking, so that on complete release (produced by moving rod 7*a* in the direction of the arrow X) the flange 5*d* passes out of the intermediate chamber and thus allows free entrance of air into the latter. The vacuum in the intermediate chamber is regulated in a manner similar to that of the case of Fig. 1, by actuation of the closure member 6.

The device shown in Figs. 1, 2 and 3 can advantageously be made out of tubing of the proper size joined together; or in any other manner. Thus the chamber 3*d* can be a piece of tubing joined at one end to a piece of tubing to provide the conduit 2*d* and at the other end to a smaller piece of tubing to provide the conduit 2*c*; and a pipe or tube of reduced size can be utilized to make the conduit 4 between the chamber 3*d* and one end of the power chamber 4*a*. This power chamber is shown as having the form of bellows and the other end is connected to the brake rods which are actuated when the bellows contracts.

In the construction shown in Figs. 3 and 4 the constant opening of small cross-section of the communication with the atmosphere is obtained by means of a circular shutter 5*d* or $5d_1$ sliding in a conduit 3*d* or $3d_1$ of slightly greater diameter, so as to leave for the air flow a reduced passage of constant cross-section independent of the movements of the shutter as well as of that of all the valves.

In the case of Fig. 5, the controller (an enlarged sectional view of which is shown on Fig. 4) has the form of a hollow casing 8*a* interposed directly between the brake pedal 15 and the lever 11 of the brake gear through the rods 9*a* and 9*b*. This lever 11 is connected rigidly to an arm 11*b*, connected by cables 11*c* and 11*d* to the brake organs proper. The brakes are shown as mounted upon arms or levers 12*c* and 12*d* connected to the cables or links 11*c* or 11*d* respectively; and while the arm 11*b* and lever 11 are rigid with respect to each other, there is a common pivot at their point of connection about which these parts turn in unison. Lever 11 is also subject to the action of a retractile spring 11*a* which tends to move it in a direction opposite that of the arrow Y toward the brake release position.

The intermediate chamber $3d_1$ in the casing 8*a* communicates with the power chamber $4a_1$ through the passage 41. It may also be put in communication with the atmosphere through the conduit $2d_1$, and with the motor intake through the conduit $2b_1$. A passage is formed by the annular space left between the flange $5d_1$ and the inner surface of the intermediate chamber. Control of communication between said intermediate chamber and conduit $2b_1$ is effected by means of a valve 61 having an approximately parabolic form. This parabolic form is selected so that the degree of vacuum in the intermediate chamber is approximately proportional to the movement of this valve.

To effect braking action, pressure is exerted on pedal lever 15 so as to transmit force to lever 11 through the spring $5m_1$ in the end of the casing 8*a*; the compression of this spring thus causes relative movement between the valve 61 and the casing 8*a* so as to produce communication between the intermediate chamber and passage $2b_1$. The degree of vacuum in this chamber increases with the effort exerted on the brake pedal.

The effect of the vacuum produced in the intermediate chamber is transmitted to the power chamber $4a_1$. The movable bar $4a_2$ of the latter acts to move lever 11 in the direction of the arrow Y.

During complete braking the valve $7b_2$ is pressed to its seat 81 and serves to directly transmit the force exerted on the pedal to the lever 11.

On rapid release rod $7a_1$ moves to the position shown on Fig. 4. The rod $7a_1$ is rigid with respect to the valve 61, and this rod bears a collar or plunger 7*e* which has a close sliding fit with the inside of the chamber $3d_1$; and forms a movable partition between one end of this chamber and a recess in the end of the casing 8*a* receiving the spring $5m_1$. This recess has a closure 5*m* with an opening for the rod $7a_1$, and the collar 7*e* prevents leakage between the recess for the spring $5m_1$ and the chamber $3d_1$. Under the action of the air admitted into the power chamber $4a_1$ the lever 11 moves in the brake release direction, which produces a movement of the rod 9*b* con-

necting lever 11 to rod $7a_1$, to compress spring $5m_1$. It is to be noted that when the controller is inoperative, it rests against a stop $10a$ in such a manner as to leave a slight communication between the intermediate chamber and the intake manifold of the engine as by causing the flange $7b_2$ to engage its seat loosely at this time and to keep the flange $5d_1$ in said intermediate chamber, so that there exists in the latter and in the brake cylinder a slight vacuum to maintain the different elements of the brake gear under tension.

The casing $8a$ can be made in any suitable manner to provide the chamber $3d_1$ and the passages which enable this chamber to communicate with the conduits $2b_1$, $2d$, and 41; and may comprise several pieces or sections as shown in Fig. 4 suitably united together; or in one piece, if preferred; with couplings and openings to connect the conduits with the chamber $3d_1$.

What I claim is:

1. Controlling apparatus including means for forming a power motor, means for forming an intermediate chamber connected to the power motor, the intermediate chamber having a conduit for putting the same in communication with the intake manifold of an internal combustion engine, and a second conduit open to the atmosphere, a slidable rod in said intermediate chamber, said rod having at one end a tapering valve to control communication through the intermediate chamber between the power motor and the first-named conduit, said rod carrying a second valve having a flange to restrict communication between the intermediate chamber and the atmosphere and to cut off said communication, said valves and the interior of said intermediate chamber having such shape that the inflow of air to said intermediate chamber from the atmosphere is substantially constant when the valves are moved to open the first-named conduit and the amount of air withdrawn from said chamber thru the first-named conduit is proportional to the degree of movement of said valves.

2. Controlling apparatus including means for forming a power motor, movably mounted means for forming an intermediate chamber connected to the power motor, the intermediate chamber having a conduit for putting the same in communication with the intake manifold of an internal combustion engine, and a second conduit open to the atmosphere, the intermediate chamber also being connected to the power motor, a slidable rod in said intermediate chamber, said rod having at one end a tapering valve to control communication through the intermediate chamber between the power motor and the first-named conduit, said rod carrying a second valve having a flange to restrict communication between the intermediate chamber and the atmosphere and to cut off said communication, said valves and the interior of the intermediate chamber being of such shape that the inflow of air to the intermediate chamber is substantially constant when the second valve is open to establish communication through the first-named conduit with said manifold and the air withdrawn from said chamber through said first-named conduit is substantially proportional to the movement of the first-named valve, one end of said intermediate chamber being shaped to be connected with an actuating member, said rod protruding from the intermediate chamber at one end, a brake member to be actuated and connections from said member to the power motor to enable the latter to operate said member when the intermediate chamber is in communication with said manifold.

3. Regulating mechanism comprising means for forming a power motor, movably mounted means for forming an intermediate chamber connected to the power chamber, the intermediate chamber having a conduit for putting the same in communication with the intake manifold of an internal combustion engine, and a second conduit open to the atmosphere, a slidable rod in said intermediate chamber, said rod having at one end a tapering valve fixed thereon to control communication through the intermediate chamber between the power motor and the first-named conduit, said rod carrying a second valve fixed thereon having a flange to restrict communication between the intermediate chamber and the atmosphere and to cut off said communication, one end of said intermediate chamber being shaped to be connected with an actuating member, said rod protruding from the intermediate chamber at one end and being shaped for connection to a member to be actuated, and connections between said member and the power motor to enable the latter to operate said member when in communication with said manifold.

4. Controlling apparatus including means for forming a power motor, means for forming an intermediate chamber connected to the motor, said chamber having a conduit for establishing communication with the intake manifold of an internal combustion engine, and a second conduit open to the atmosphere, a reciprocable rod in said chamber, the rod having a valve fixed thereon at one end to control communication through the chamber between the motor and the first-named conduit, said rod also having a second valve fixed thereon including a flange or collar to control communication between the intermediate chamber and the atmosphere and to cut off said communication, the intermediate chamber having passages of such shape relative to the valves that the inflow of air to said chamber from said atmosphere is substantially constant when the valves are moved to open the first-named conduit, and the amount of air withdrawn from said chamber through the first-named conduit is proportional to the degree of movement of the first-named valve.

GÉRARD DE MONGE.