Jan. 10, 1956 J. W. F. HOLL 2,730,090

EXHAUST BACK PRESSURE BRAKING SYSTEM

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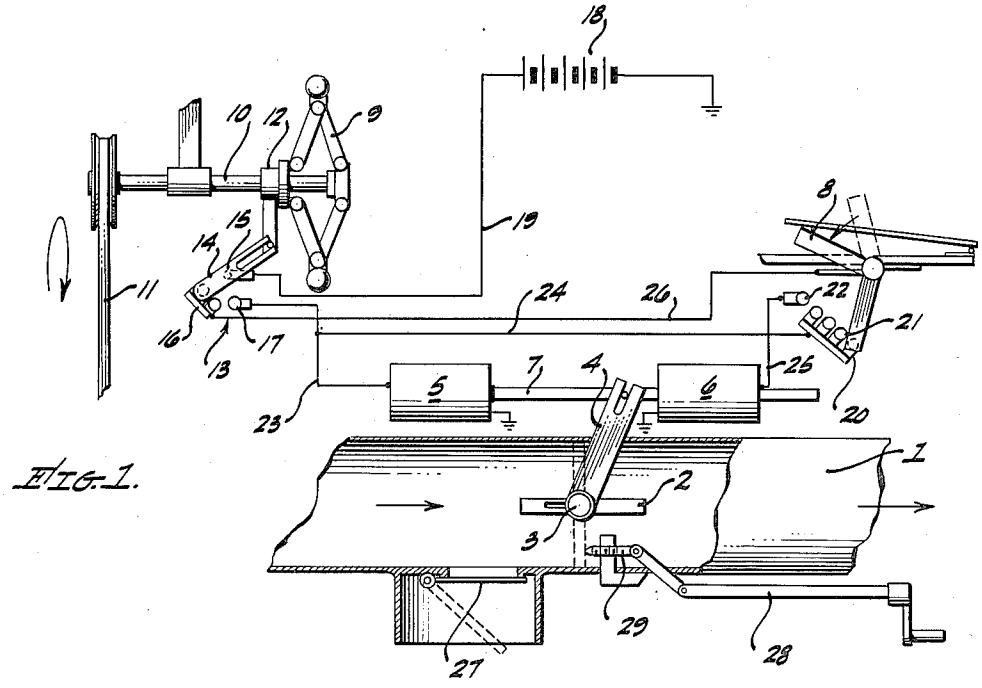


FIG. 1.

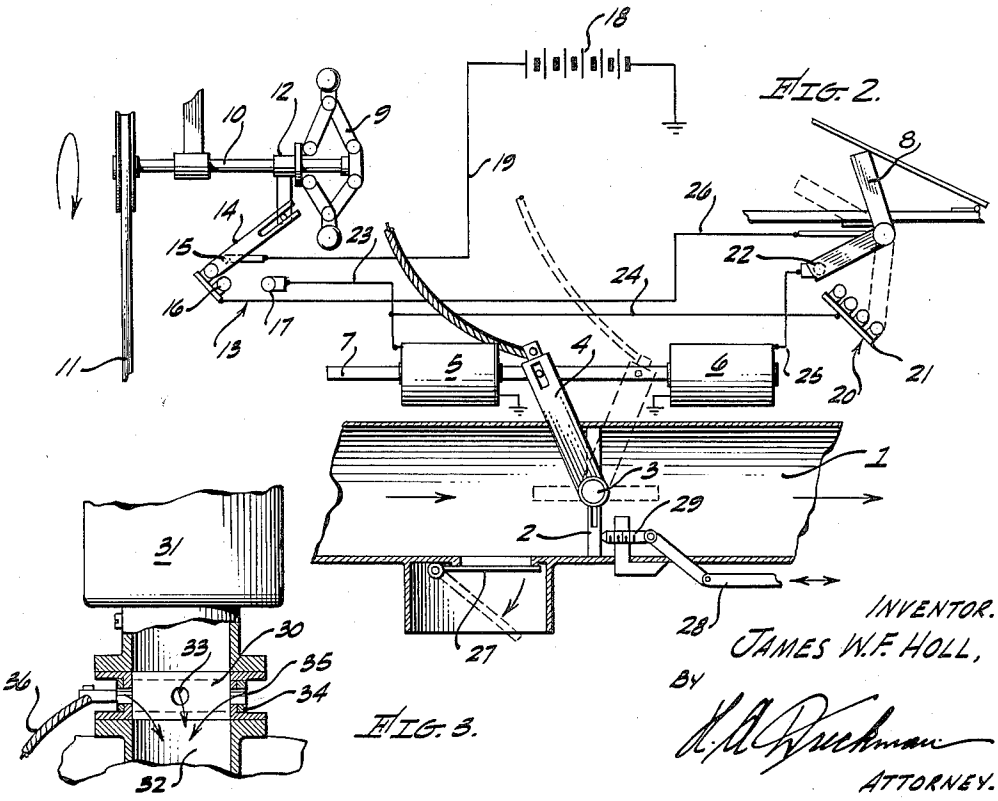


FIG. 2.

FIG. 3.

INVENTOR.
JAMES W.F. HOLL,
BY
ATTORNEY.

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FIG. 5.

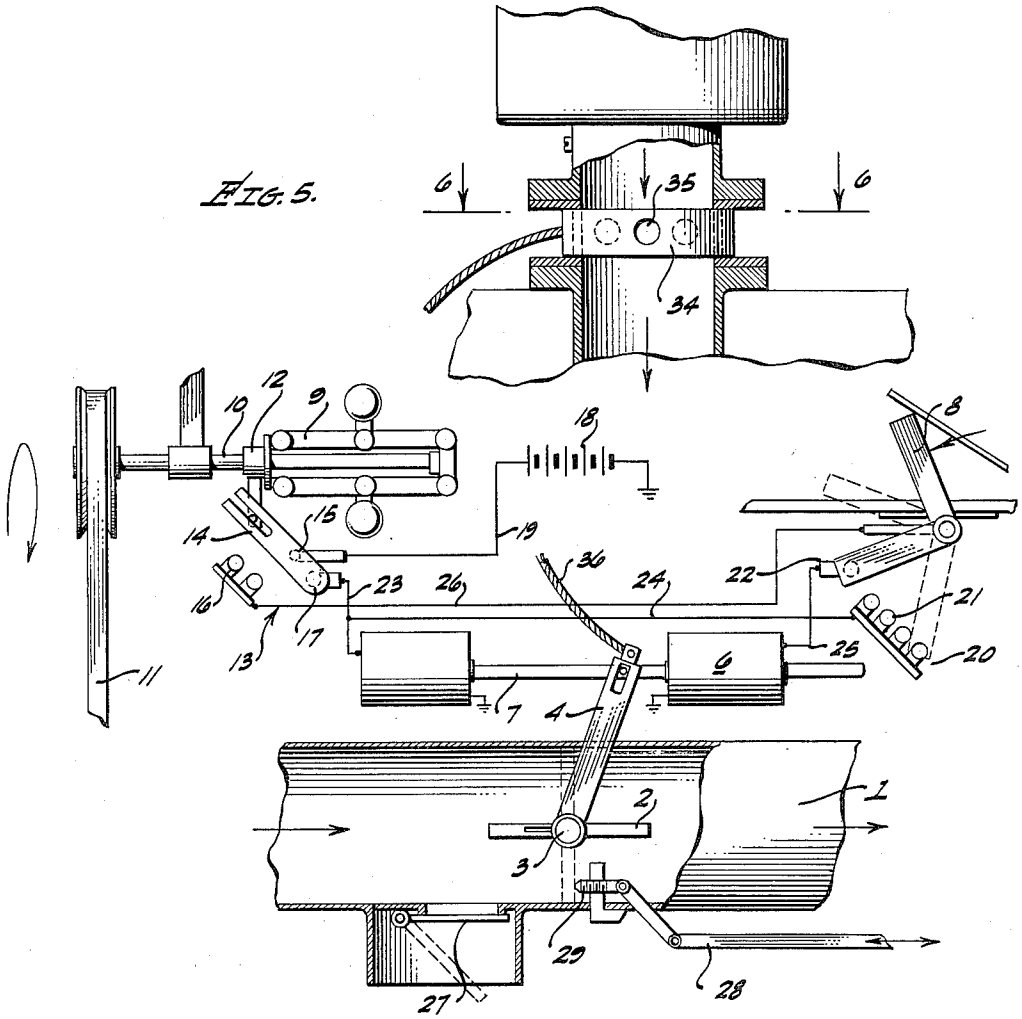


FIG. 4.

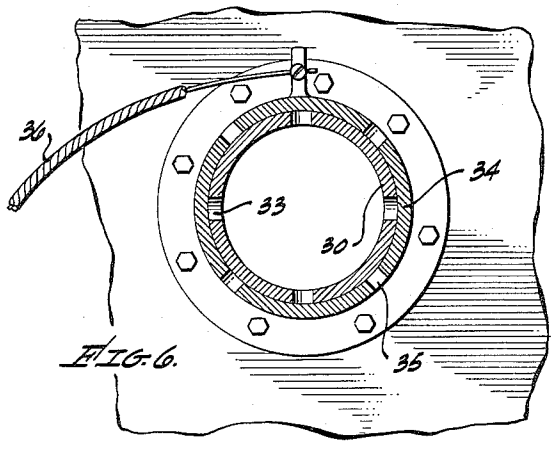


FIG. 6.

INVENTOR.
JAMES W. F. HOLL.
BY
ATTORNEY.

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EXHAUST BACK PRESSURE BRAKING SYSTEM

James W. F. Holl, Temple City, Calif.

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6 Claims. (Cl. 123—97)

This invention relates to an exhaust back pressure braking system whereby a valve in the exhaust pipe from the engine is caused to open or close, depending upon the R. P. M. of the engine which is being controlled.

An object of my invention is to provide a novel exhaust back pressure braking system in which a valve in the exhaust pipe is electrically controlled, and thereby moved to either open or closed position, the electrical means being controlled by switches.

Another object of my invention is to provide a novel exhaust back pressure braking system of the character stated, in which one electrical switch is controlled by the engine throttle, while another switch is controlled by a governor driven by the engine.

Still another object of my invention is to provide a novel exhaust back pressure braking system in which additional air may be introduced to the engine when the throttle is in closed or nearly closed position, and while the R. P. M. of the engine is still relatively high, as when a vehicle is traveling on a down grade.

A feature of my invention is to provide a novel braking system of the character stated in which the valve in the exhaust pipe is moved to open or closed position by means of solenoids, these solenoids being controlled by switches, one switch being operated by the engine throttle, while the other switch is operated by a speed governor driven by the engine.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawings:

Figure 1 is a diagrammatic view of my braking system under conditions of high R. P. M. of the engine with the accelerator open and with the exhaust pipe valve open.

Figure 2 is a view similar to Figure 1 but with the throttle in closed position and with the valve in the exhaust pipe in closed position.

Figure 3 is a fragmentary longitudinal sectional view of the carburetor and intake manifold of the engine and showing an auxiliary air intake for the engine.

Figure 4 is a diagrammatic view of my braking system showing the parts in the position where there is a low R. P. M. of the engine, or when the engine is just starting with the throttle in closed position and with the control valve in the exhaust pipe in open position.

Figure 5 is a view similar to Figure 3 but showing the ports closed which feed auxiliary air to the engine.

Figure 6 is a sectional view taken on line 6—6 of Figure 5.

Referring more particularly to the engine, the numeral 1 indicates the normal exhaust pipe of an engine through which the exhaust gases of an internal combustion engine pass. By closing off this exhaust pipe it will be evident that a back pressure can be exerted on the engine, the engine then acting as a compressor which will serve as a brake and will tend to reduce or retard the rotation of the crank shaft of the engine. A valve 2 is mounted within the exhaust pipe 1 on a shaft 3 extending transversely through the exhaust pipe and preferably journaled therein. An operating arm 4 is attached to the shaft 3 and reciprocation of the arm 4 will thus rotate the shaft 3, causing the valve 2 to move from open to closed position, as will be subsequently described. A pair of electrical operating means, such as the solenoids 5 and 6, are mounted adjacent the exhaust pipe 1, and the arm 4 is attached to the actuating rod 7 of the solenoids 5 and 6, which rod extends through both of the solenoids and is controlled by either of them, as will be further described.

An engine foot throttle 8 is diagrammatically shown and this throttle may be of the usual and well known type employed in modern vehicle engines and is usually foot operated. A governor 9 is mounted on a shaft 10 and this shaft is driven from the vehicle engine by suitable means, such as the belt 11, or a similar drive. The governor 9 is here shown as a fly ball type and includes a collar 12 which is caused to slide along the shaft 10 as the balls of the governor 9 move inwardly or outwardly. A switch 13 includes a switch arm 14, one end of which is connected to the collar 12, and movement of this collar causes the arm 14 to rotate around its pivot 15 to selectively engage the contacts 16 or 17. A battery 18 has a lead 19 extending to the arm 14, and the other side of the battery is grounded, as is usual in automotive electrical systems. A second switch 20 is actuated by the throttle 8 and includes contacts 21 and 22. A lead 23 extends from the contact 17 to one side of the solenoid 5. Another lead 24 extends from the lead 23 to the switch contacts 21. A lead 25 extends from the contact 22 to one side of the solenoid 6. A lead 26 extends from the throttle 8 to the contact 16.

In Figure 1 there is shown a normal driving position of the engine in which there is a high R. P. M. of the engine, and the foot throttle 8 is being held open by the foot of the operator. The governor 9 is extended as shown, and the switch arm 14 is engaging the contact 16. Current now flows from the battery 18 through the arm 14 to the contact 16 thence through the lead 26 to the throttle 8, thence to the contacts 21 and the leads 24 and 23 to actuate the solenoid 5. When the solenoid 5 is activated the arm 4 is in the position shown. The valve 2 is thus open and the exhaust gases flow freely out of the exhaust pipe 1.

In Figure 2 there is shown a position in which the engine speed is still high but the foot throttle 8 has been closed. In other words, the foot has been taken off of the throttle. The fly ball governor 9 is still extended, therefore current flows from the battery 18 to the switch arm 14 and thence to the contact 16, then through lead 26 to the throttle 8 which now is engaging contact 22. Current then flows through lead 25 to the solenoid 6 and actuates this solenoid. The arm 4 is now moved, as shown in Figure 2, and the valve 2 is closed. This causes a back pressure on the engine or a braking action on the engine.

In Figure 4 a position of the parts is shown where the engine is just starting, or where it has a very low R. P. M. The foot is off of the foot throttle 8 and the fly ball governor 9 is collapsed as shown. The switch arm 14 is now engaging the contact 17, as shown. Current flows from the battery 18 through the lead 19, thence to contact 17 and through lead 23 to the solenoid 5. This solenoid then moves the arm 4 to the position shown, and the valve 2 is held open. This prevents back pressure against the engine while it is being started. To prevent excessive pressure from being built up back of the valve 2, I provide a spring pressed relief valve 27 in the exhaust pipe 1, and this relief valve is on the engine side of the valve 2. If desired, a manual adjustment 28 can be provided for the stop 29 which is engaged by the valve 21 in its closed position. Thus, if desired, the

valve can be held slightly open and thus controlling the amount of back pressure or braking action on the engine.

Under certain operating conditions, especially with a closed throttle and with a high engine R. P. M. as when the vehicle is going down grade, it is desirable that additional air be fed to the engine so that sufficient volume of gas will be obtained to build up a back pressure in the exhaust pipe. I provide this additional air in the following manner: A ring **30** is positioned between the carburetor **31** and the intake manifold **32**. This ring is provided with air intake ports **33** through which auxiliary air is fed to the engine. A slip ring **34** surrounds the ring **30** and is provided with intake ports **35** which match with the ports **33** in one position of the slip ring **34**. The slip ring **34** is rotated by the arm **4** through an ahrens cable **36**, this cable being of the push pull type. Thus as the arm **4** is swung back and forth by the solenoids **5** and **6**, as previously described, it will rotate the slip ring **34**, causing the ports **33** to be opened or closed and permitting auxiliary air to be drawn into the engine when the parts are arranged as shown in Figure 2, that is, under conditions of high engine R. P. M. and with the foot throttle **8** closed.

Having described my invention, I claim:

1. An exhaust back pressure brake for vehicles having an engine, and an exhaust pipe extending from the engine, of a valve mounted in said exhaust pipe, an arm projecting from said valve, a pair of solenoids, an actuating rod extending through both of the solenoids, means attaching the arm to the actuating rod, an engine throttle, and electrical switch means operable by the throttle to control said solenoids.

2. An exhaust back pressure brake for vehicles having an engine, and an exhaust pipe extending from the engine, of a valve mounted in said exhaust pipe, an arm projecting from said valve, a pair of solenoids, an actuating rod extending through both of the solenoids, means attaching the arm to the actuating rod, and engine throttle, and electrical switch means operable by the throttle to control said solenoids, a governor driven by the engine, and electrical switch means operable by the governor to control said solenoids.

3. An exhaust back pressure brake for vehicles having an engine, and an exhaust pipe extending from the engine, of a valve mounted in said exhaust pipe, an arm projecting from said valve, a pair of solenoids, an actuating rod extending through both of the solenoids, means attaching the arm to the actuating rod, an engine throttle, and electrical switch means operable by the throttle to control said solenoids, said engine having auxiliary air intake ports therein, a slip ring surrounding said ports to

open and close the same, and means extending from said arm to the slip ring to actuate the slip ring as said arm is moved.

4. An exhaust back pressure brake for vehicles having an engine, and an exhaust pipe extending from the engine, of a valve mounted in said exhaust pipe, an arm projecting from said valve, a pair of solenoids, an actuating rod extending through both of the solenoids, means attaching the arm to the actuating rod, an engine throttle, and electrical switch means operable by the throttle to control said solenoids, said engine having auxiliary air intake ports therein, a slip ring surrounding said ports to open and close the same, and means extending from said arm to the slip ring to actuate the slip ring as said arm is moved, a governor driven by the engine, and electrical switch means operable by the governor to control said solenoids.

5. An exhaust back pressure brake for vehicles having an engine, and an exhaust pipe extending from the engine, of a valve in said exhaust pipe, an arm projecting from said valve, a pair of solenoids, an actuating rod extending through both of the solenoids, means operably connecting the actuating rod and said arm, an engine throttle, an electrical switch, operating means connecting the throttle and the switch, means electrically connecting said switch and said solenoids whereby movement of the throttle will actuate either of said solenoids.

6. An exhaust back pressure brake for vehicles having an engine, and an exhaust pipe extending from the engine, of a valve in said exhaust pipe, an arm projecting from said valve, a pair of solenoids, an actuating rod extending through both of the solenoids, means operably connecting the actuating rod and said arm, an engine throttle, an electrical switch, operating means connecting the throttle and the switch, means electrically connecting said switch and said solenoids whereby movement of the throttle will actuate either of said solenoids, a fly ball governor, drive means extending from the engine to the fly ball governor, an electrical switch, operating means extending from the governor to the last named switch, said last named switch being also connected to each of the solenoids to control the same.

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