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INDUCTION SYSTEM FOR CARBURETED TWO-CYCLE ENGINES

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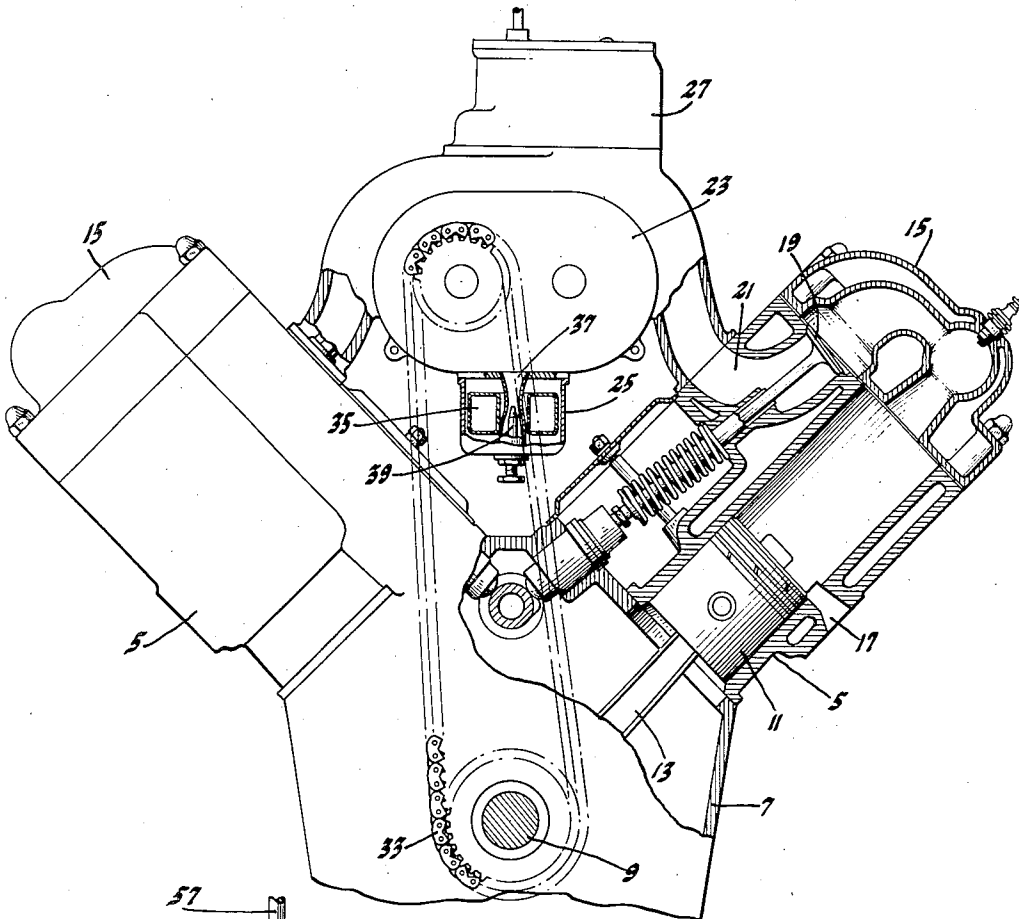


Fig. 1

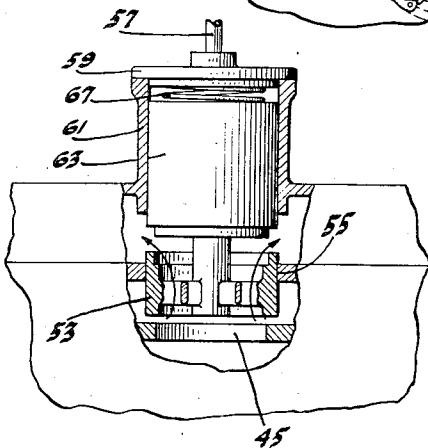


Fig. 4

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## UNITED STATES PATENT OFFICE

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INDUCTION SYSTEM FOR CARBURETED  
TWO-CYCLE ENGINES

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5 Claims. (Cl. 123—65)

This invention relates to internal combustion engines and particularly to engines operating on the two-cycle order. It is further concerned with an improvement in the mechanism for supplying and for controlling the supply of carbureted mixture to such an engine. Like other known engines, it makes use of a blower to receive the mixture from the carburetor and deliver it to the engine manifold, a manually operable throttle valve being used between the discharge of the blower and the engine cylinder or the manifold in the case of a multi-cylinder engine. The variation in the work to be done is accomplished, as in prior inventions, by varying the pressure within the manifold, and this is attained by the manipulation of the throttle valve located beyond the outlet of the blower.

With such an engine it has been found necessary to not only control the manifold pressure by the throttle valve, but to associate therewith automatic mechanism to similarly control the action of the blower in delivering mixture to the engine. It is preferred to use a blower, the operation of which consumes but a comparatively small part of the energy developed by the engine, and to work such a blower harder when delivering relatively greater charges and less hard when delivering lesser charges.

An object of my invention, then, is to provide a simple automatic control of the output of the blower to the engine whereby the blower shall operate at a pressure no greater than required for the given load and speed, as determined by the throttle. Specifically it is an object of the invention to provide a by-passage from the blower outlet to its inlet and to make use of a spring-loaded valve therein, the spring load being increased as the throttle valve is opened whereby with closed throttle the valve may more easily open to circulate a relatively large part of the mixture from the blower outlet to its inlet. Other objects and advantages will be understood from the following description.

In the drawings—

Fig. 1 is a view in elevation, partly in vertical section, of a V-type two-cycle engine with which my induction system has been associated.

Fig. 2 is a vertical section through the blower and showing the throttle and a bypass valve.

Fig. 3 is a vertical section at right angles to that of Fig. 2.

Fig. 4 is a view in elevation, partly broken away and in section, of the valve members, the valve members being shown in separated positions.

Referring by reference characters to the drawings, numeral 5 is used to designate one of the cylinders of a V-type two-cycle engine mounted on a crankcase 7. The crankshaft is designated by numeral 9. At 11 is one of the pistons connected to the crankshaft by the connecting rod 13. Each cylinder has a head 15 with a compression chamber and spark plugs as usual. At 17 is an outlet for exhaust gases. At 19 is a valve controlling the inlet of explosive mixture from passages 21 formed in the engine block. The valve is controlled by the usual camshaft and springs.

The novel induction unit comprises a casing 23, a carburetor 25 and a control member 27 carrying parts to be described. The casing 23 is formed with a main blower chamber 29 containing substantially conventional rotors 31 driven from the crankshaft by a chain 33 as shown in Fig. 1. The carburetor 25 includes a float 35 in the float bowl and a primary passage 37 for air which surrounds a fuel jet 39. The carbureted mixture enters the blower chamber 29 at 41 and the rotation of the rotors 31 forces the mixture from chamber 29 into passages 43 through a blower outlet 45. When the induction unit is mounted on the engine, the passages 43 communicate with the passages 21 in the cylinder block as clearly indicated by the drawings. It will be understood that the float bowl is to be supplied with fuel from any conveniently located source and the fuel from the float bowl supplies the jet 39. The casing 23 has passages 47 which may be located in a plane at right angles to passages 43. These passages 47 communicate at their lower ends with the bottom of chamber 29 above the inlet 41. They serve as bypass conduits to at times return some of the mixture from the blower outlet to its inlet. These passages have spaced openings 49 at the top of the casing 23.

The member 27, when positioned as in Fig. 1, covers an opening 51 in part 23 at the junction of the induction conduits 43. A throttle valve 53 of circular outline slides in an opening 55 formed in the member 27 which opening 55 is concentric with opening 45 from the chamber 29. It will be seen that the movements of the valve 53 vertically open or close the communication from the blower chamber to the passages 43. The valve 53 is guided in opening 55 and it carries a stem 57 which extends through and is guided by cover member 59. The extremity of stem 57 may be manually operated by any convenient means to open and close the throttle valve. The member 27

is further formed with a circular guiding wall 61 concentric with and of the same internal diameter as the opening 55. This wall guides the circular wall of a cup-shaped valve 63. At the junction of the wall of the valve and its base there is a reduced portion 65 which is received in a notched part of the throttle valve 53 as best shown in Fig. 2. An outer spring 67 in abutment with cap 59 is received within and engages the bottom of valve 63. An inner spring 69 also engages the bottom of valve 63 and at its upper end engages a disc 71 carried by the stem 57 at an intermediate point. The by-passes 47 communicate with a passage or space 73 in the member 27, which space is normally closed from communication with the blower outlet 45 by the valve 63. It will be seen that the lifting of the throttle valve is accompanied by a lifting of the bypass valve but without ordinarily opening said valve because of the movement of both valves together. It will also be observed that pressure within chamber 29 may raise the bypass valve away from the throttle valve 53 to permit the discharge of mixture through the by-passes to the entrance of the blower. Fig. 4 shows such a separation of the valves.

At 75 is a disc valve held by a spring 77 to close a supplementary air inlet. The disc 75 has a stem 79 guided in an opening in a boss 81. The supplementary air inlet as shown communicates with the region 73, the passages 47, and the inlet to the blower.

The operation will be briefly described. The fuel from the gas jet and the primary air inlet is forced by the blower through the passages 43 to the engine cylinders when the throttle valve 53 is open. In the event that the engine is turning over at a rate such as to deliver a charge which a completely or partially closed throttle will not accommodate, the bypass valve 63 is lifted by the pressure developed in the blower and the mixture is returned to the blower inlet by way of passages 47. If the conditions are such as to open valve 75, the supplementary supply of air reaches the blower inlet through passages 73 and 47. The springs 67 and 69 jointly operate to hold the bypass valve on its seat on the throttle valve. As the throttle valve is lifted, the seat 71 of spring 69 is lifted with it—therefore the effort of spring 69 in holding valve 63 on its seat is constant regardless of the extent of opening of the throttle valve 53. The abutment of spring 67 is, however, fixed. Therefore the effort of this spring to hold the bypass valve seated varies with the opening of the throttle valve. Slight pulsations of the blower pressure may occur without causing opening or closing movements of the bypass valve owing to the extension of the bypass valve for a short distance into the end of the throttle valve. Since one spring operates with a changing pressure and the other with a constant pressure, the springs may be so chosen as to give a resistance to the passage of the mixture through the bypass which increases with throttle opening to any desired degree.

The spring 67 may be made slightly conical to secure a more rapid increase in the bypass pressure. When the throttle is partly open the air for the mixture passing to the engine is supplied to the inlet side of the blower, either through the primary air inlet 37 or the auxiliary air valve 75 and the passages 73 and 47 or from both sources. When the blower displacement volume exceeds the volume of mixture passing to the engine, the

excess returns to the blower inlet through the bypass as is obvious. At full throttle the entire blower outlet goes to the engine and the bypass valve is closed. The mixture entering the blower from the gas jet and the primary air inlet may be supplemented by air from the valve 75 and the by-passes 47 leading to the blower inlet, these sources being conveniently proportioned as by the selection of a spring 77 of predetermined strength to give the desired air and gas ratio in the mixture.

In certain prior constructions it has been proposed to make use of a conduit from the engine side of the throttle to the region of the bypass valve so that the pressure of the inlet manifold may be operable to variably influence the bypass valve. For example, when the throttle is opened the blower pressure tends to open the bypass valve but the conduit from the manifold carries the similar pressure of the manifold to oppositely influence and balance the direct pressure upon the bypass valve from the blower. As a result of these balanced pressures, the spring maintains the bypass valve closed at full throttle as it should. In accordance with my invention no such conduit is used but the pressure of the blower acting to open the bypass valve will so open it at closed throttle but cannot open it at full throttle because the spring load on the bypass valve automatically increases as the throttle opens. I am therefore able to accomplish substantially the results secured by the older arrangement without the provision of the conduit from the manifold to the bypass.

I claim:

1. For use with an engine, a blower, mechanism forming a passage to deliver gaseous mixture from the blower to the engine, a throttle valve in said passage, means affording a return passage from the outlet of the blower to the inlet thereof, a valve in said passage, yielding means operable to close said valve, said valves being operably connected whereby opening movement of the throttle valve increases the tension of said yielding means which functions to close the bypass valve.

2. For use with an engine, a blower, a conduit for delivering fuel from the blower to the engine, a throttle valve in said conduit, a bypass conduit leading from the outlet of the blower to the inlet thereof, a valve in said bypass, a plurality of springs positioned to close said valve, one of said springs having a fixed abutment, the other spring having an abutment movable with the throttle valve.

3. The invention defined by claim 2 together with an auxiliary air inlet having a spring-pressed valve, said auxiliary air inlet communicating with said bypass.

4. For use with an engine, a carburetor, a blower receiving fuel therefrom, a conduit for delivering fuel from the blower to the engine, a throttle valve therein, a bypass from the outlet of the blower to its inlet, a valve in said bypass, said valves being coaxial and movable together, springs engaging the bypass valve and operable to hold it in contact with the throttle valve, a fixed abutment for one spring, an abutment rigid with the throttle valve for the other spring.

5. The invention defined by claim 4, said valves having parts affording a limited sliding engagement prior to their separation to accommodate minor fluctuations of the pressure of the blower without an opening movement of the bypass valve.