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AUXILIARY AIR SUPPLY DEVICE FOR INTERNAL COMBUSTION ENGINES

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Fig. 1.

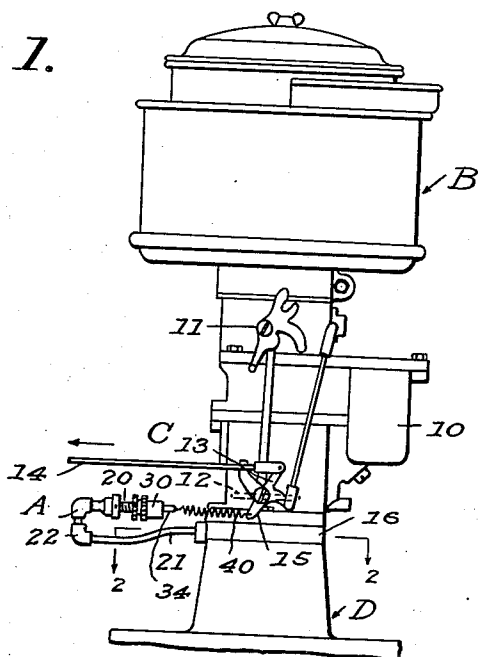


Fig. 2.

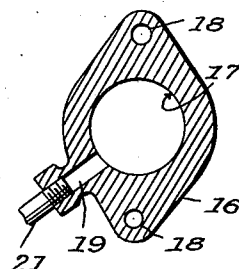


Fig. 3.

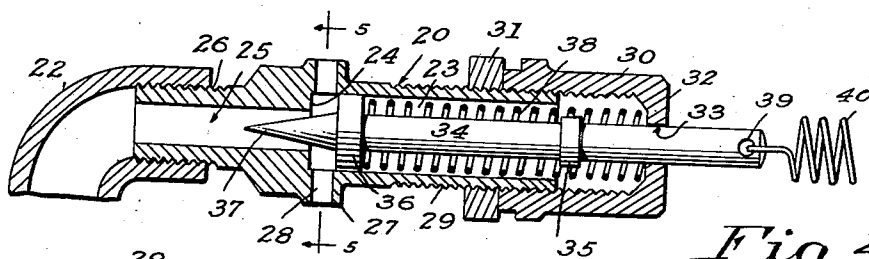
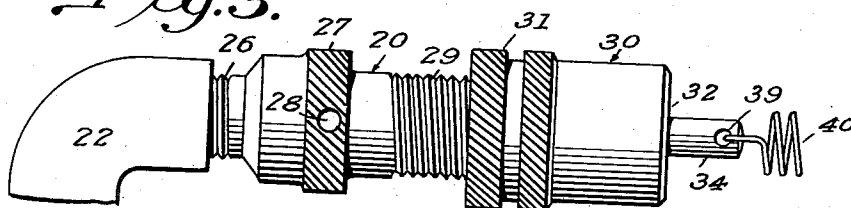


Fig. 4.

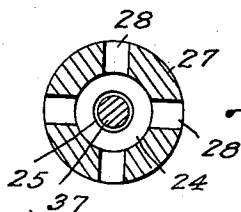


Fig. 5.

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AUXILIARY AIR SUPPLY DEVICE FOR
INTERNAL COMBUSTION ENGINES

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1 Claim. (Cl. 251-145)

My invention relates to a device for supplying auxiliary air into the carbureter system for internal combustion engines for automotive vehicles and more particularly to the automatic control means for varying the amount of air supplied at various throttle openings in the intake system.

It is desirable to furnish a rich mixture to the engine or starting and at low speeds of travel of the motor driven vehicle and then to vary the mixture as the speed of travel increases. An object of the present invention is to provide a control valve which accurately meters the amount of auxiliary air admitted to the air and fuel mixture with actuating means for varying the amount of air supplied having connections with the throttle or throttle control means so as to be variably operated therewith.

Another object of the invention in conjunction with the metering of the auxiliary air supplied to the fuel mixture is to provide adjusting means in the connection of the valve with the throttle operating means whereby the valve can be set to open at any given speed and the opening is thereafter variably increased as the speed is increased.

A further object of the invention is to provide such auxiliary air control apparatus in the form of attachments which are simple in construction and inexpensive to manufacture and which may be easily and quickly applied to automotive vehicle engines.

Further objects and details of the invention will appear as described in connection with a highly satisfactory embodiment thereof which is illustrated in the accompanying drawing and hereinafter set forth and claimed.

Referring to the drawing in which like characters of reference designate similar parts throughout the several views:

Figure 1 is a side elevation illustrating a downdraft air intake and carbureter for an internal combustion engine of an automotive vehicle with my invention applied thereto.

Figure 2 is a horizontal sectional view taken on line 2-2 showing the auxiliary air intake adapter for introducing the air into the air and fuel intake passageway beyond the carbureter.

Figure 3 is an enlarged side elevation of the control valve for the auxiliary air.

Figure 4 is a longitudinal sectional view of the same and

Figure 5 is a cross sectional view taken on line 5-5 of Figure 4.

In general Figure 1 illustrates the manner in

which auxiliary air control apparatus A in accordance with my invention may be connected with a conventional downdraft intake of an internal combustion engine. This intake as shown comprises an air filter B below which it is connected to a carbureter C which in turn is connected with the inlet passage D to the engine intake manifold (not shown). These parts of the engine downdraft intake are conventional having the usual air and fuel passages there-through and the carbureter is provided with the usual control members, reference to some of which will be made.

The carbureter is shown as having a forwardly extending fuel float chamber 10, choke means, generally designated 11 which is operated thermostatically or in any other approved manner and several other controls for illustrative purposes only. In applying my invention to such a downdraft intake it will be noted that the carbureter has, adjacent to its lower portion, a throttle or accelerator butterfly type of valve 12 illustrated in dotted lines in its closed position and on the exterior of the passage an operating lever arm 13 is connected to the shaft of this valve for rotating it which in turn is connected with the accelerator rod 14 which when moved in the direction of the arrow turns the lever in a counter clockwise direction to open the valve 12. This lever has a downwardly extending arm 15 which controls the auxiliary air intake. Other carbureter elements and their controls are not disclosed as they are not necessarily connected with the auxiliary air intake apparatus in accordance with the present invention and a complete understanding thereof.

In order to supply auxiliary air to the air and fuel mixture supplied to the engine I provide an adapter 16 which is bolted in the intake between the carbureter C and the inlet passage D. This adapter is relatively flat and as shown in the detail sectional view, Figure 2, it has a passageway 17 which is preferably as large as and corresponding in shape with the intake passageway at this point and holes 18 provided therein provide passages through which the carbureter securing bolts may extend in securing the members in place. The adapter is provided with a lateral inlet duct 19 with which a control valve 20 is connected or by means of a conducting pipe 21 and fittings 22 in order to place the valve in any desirable position with respect to the carbureter C and its controls as illustrated by way of example in Figure 1.

As illustrated in detail in Figures 3, 4 and 5

valve 20 consists of a hollow body member which is generally designated by the same reference numeral 20. This body member has extending inward from one end a large bore in the major portion thereof providing a valve chamber 23 having a substantially flat inner end 24 and extending therefrom is a reduced cylindrical bore 25 providing an air passageway through the other end of the body. This end of the body is preferably smaller in its exterior diameter threaded as shown at 26 for connection with adapter 16 or conductor leading thereto and in an intermediate position, around the flat end portion 24 of the chamber 23 and extending in a forward direction thereof is an enlarged collar 27, knurled to facilitate in making connections and also provided with a plurality of air passages 28 extending radially into chamber 23 slightly beyond the flat inner end 24. There are preferably four passages 28 as best shown in Figure 5 and these passages have a total cross-sectional area somewhat in excess of the cross-sectional area of passageway 25 whereby the air will be free to flow through these passages so as to insure sufficient air to be delivered through passage 25 in accordance with the operation of the valve control means in chamber 23.

The portion of body 20 surrounding valve chamber 23 is exteriorly threaded at 29 throughout the greater portion of its length for receiving a cylindrical cap nut 30 and a locking nut 31 each having internal threads which cooperate with threads 29 on body 20. Cap nut 30 provides an adjusting member for the control valve and is of a length such that it may substantially cover the threaded portion surrounding chamber 23 or may be adjusted outwardly thereon, increasing the length of chamber 23 from the inner flat end 24 to the end 32 of cap nut 30 which end is provided with a concentric bore 33.

Housed within chamber 23 between the inner end 24 thereof and end 32 of cap nut 30 is the valve mechanism comprising a longitudinal operating plunger 34 extending concentrically therein with its outer end extending through bore 33 of cap nut 30. This plunger is provided with a collar or stop member 35 which is engageable with the end 32 of cap nut 30 as a limit when the plunger is drawn outwardly and adjacent to the inner end of plunger 34 is a piston member 36 which slides along the cylindrical walls of chamber 23 with a loose fit permitting a limited flow of air therebetween. Extending inwardly from plunger 34 and piston 36 is a pin member 37 having a diameter, at the surface of the piston 36, slightly less than that of bore 25, and of gradually decreasing diameter as it extends away from the piston so as to provide a relatively long tapered metering pin. These elements, stop member 35, piston 36 and pin 37 may be made as a part of plunger 34 or joined therewith in any desired manner. Surrounding plunger 34 and stop member 35 is a compression spring 38 which has its inner and outer ends seated between the outer end surface of piston 36 and the inner surface of the cap nut end 32 and by adjustment of cap nut 30 on threads 29 the force of the spring acting on the plunger and the outer limit for stop member 35 may be varied. It will be noted that the inner end surface of piston 36 is relatively flat and in normal inoperative position of the engine or at low throttle openings spring 38 acts with sufficient force to seat this end surface of piston 36 into cooperation with the flat end wall 24 so as to substantially

cut off any flow of air to and through passage 25. In Figure 4, however, the plunger and valve are shown in an outer position so that the valve is at least partially open.

The external end of plunger 34 is preferably apertured at 39 to provide suitable means for connecting a valve operating spring 40 therewith, and as shown, in Figure 1 the other end of this operating spring is connected with arm 15 so as to be drawn thereby when the accelerator rod 14 is actuated to open valve 12. The tension of spring 40 is sufficient to overcome spring 38 when the accelerator rod 14 is operated to open valve 12 and the coaction of the two springs is controllable by varying the adjustment of cap nut 30 inwardly or outwardly along threads 29 on body 20. It will thus be seen that the point of opening of the valve may be adjusted with respect to the engine throttle opening and while driving the vehicle its adjustment is such as to effect the opening at and above a predetermined speed. By this adjustment means also variations in the increase of the amount of auxiliary air supplied as the throttle is opened greater amounts may be had, the tapered pin 37 in its cooperation with cylindrical passage 25 affords an accurate means for metering the amount of air supplied, whereby the amount of auxiliary air supplied for all throttle openings and corresponding speeds of the engine may be accurately determined.

When the engine is operated the valve which is in closed position when the engine throttle 12 is closed, is drawn in an opening direction after the valve 12 has been opened a predetermined amount and then is increasingly opened as the throttle opening is increased, as referred to above. It will be noted from a closed position, the flat surface of piston 36 in engagement with surface 24, the piston first unseats and permits a small amount of air to flow from openings 28 over the periphery of the piston at its inner edge and thence between said flat end walls and into passage 25 around tapered pin 37. As the piston moves outwardly it uncovers air passages 28 to a greater and greater extent until they are entirely open, thus effecting a metering of the air flow through these openings for an initial portion of the outward opening movement of the plunger and piston. At the same time, as the piston is being moved outwardly, however, tapered pin 37 is also moved outwardly from passage 25 increasing the passage opening and definitely metering or controlling the amount of auxiliary air supplied in accordance with the position of the piston in chamber 23 and pin 37 in passageway 25. Pin 37 is also operative to continuously increase the amount after piston 36 has passed passages 28 until the end of pin 37 is entirely withdrawn from passage 25 or stop member 35 engages end 32 of cap nut 30, depending upon the adjustment thereof. Cap nut 30 when positioned outwardly on body 20 permits a greater flow of auxiliary air through the valve than when in an inner position and by positioning it inward the amount may be materially limited. The correct amount of air supplied is thus controlled and while the selection of springs 38 and 40 with respect to each other has a decided influence upon the operation of the valve it is not critical since variations of the springs may be compensated for by adjustment of the cap nut 30.

From the foregoing, numerous advantages of my auxiliary air control apparatus will be readily apparent to those skilled in the art.

Having set forth a highly satisfactory em-

bodiment of my invention I do not wish to limit myself to any of the specific constructions or modes of operation described above in this specification for purposes of giving an example or illustration of employment of the invention, for it will be obvious that wide departure from the above may be made without departing from the spirit and scope of my invention, which is as set forth in the following claim.

10 I claim:

Auxiliary air supply apparatus for internal combustion engines including a valve member having a cylindrical passageway therethrough, a plunger having a tapered pin extending into said passageway, said valve member having a housing beyond said cylindrical passageway through which housing the plunger extends, said housing having an inwardly and outwardly adjustable outer end member, locking means for said adjustable outer end member, a spring within said housing engaging the outer end member thereof and urging the tapered pin into the cylindrical passageway of the valve member, a piston element on said plunger beyond which the tapered pin extends, said piston

to be engaged on one side by said spring and its other side adapted to engage the valve member at the end of the passageway to close the same when the plunger is in its innermost position, said housing having a plurality of radial apertures extending therethrough, said apertures adapted to be uncovered by the piston as the piston moves outwardly in the housing, the tapered pin movable with the piston to variably control the cylindrical passageway as the piston moves to variably uncover the apertures, a stop collar on the plunger outward from the piston adjacent to and engageable with the outer end member of the housing to limit the extent of outward movement of the plunger and tapered pin from the cylindrical passageway of the valve member, and a spring for connecting the outer end of the plunger with a valve operator, said springs cooperating in the operation of the tapered pin on the plunger and adjustable with respect to each other by inward or outward adjustment of the outer end member of the housing.

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