Dec. 16, 1969 D. D. SIMPSON ET AL 3,484,084

CARBURETOR IDLE SPEED CONTROL

Filed July 7, 1967

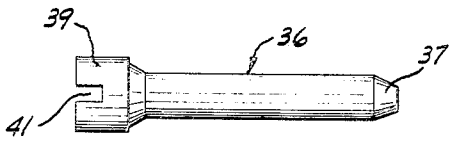

FIG. 3.

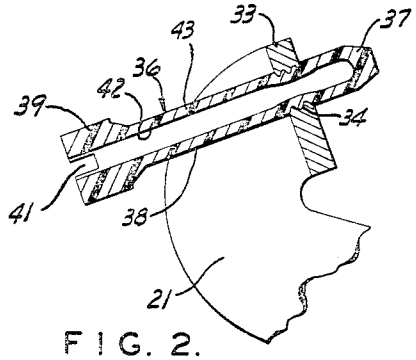

FIG. 2.

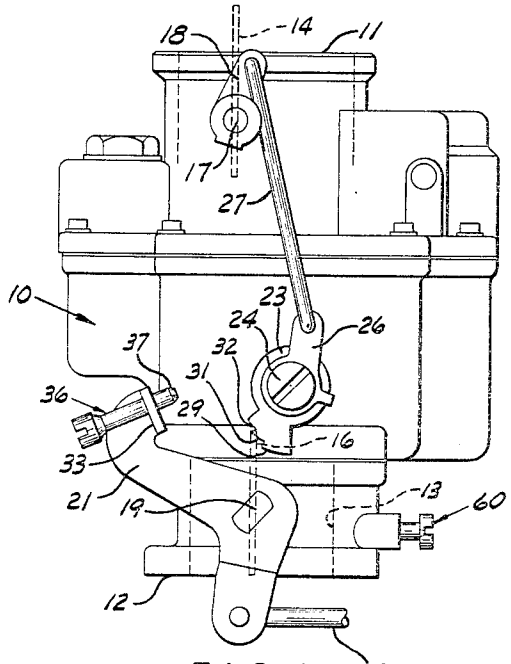

FIG. 1.

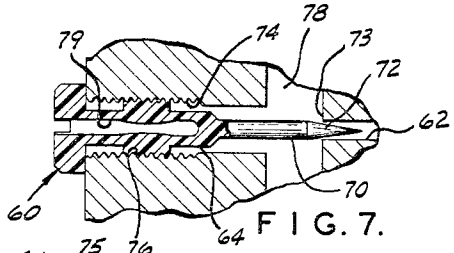

FIG. 7.

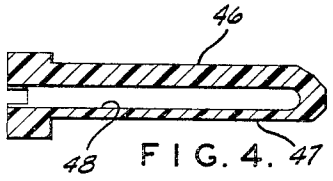

FIG. 4.

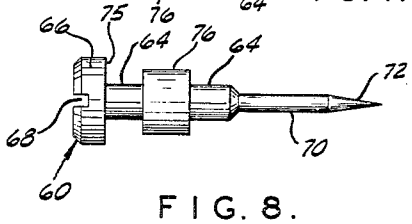

FIG. 8.

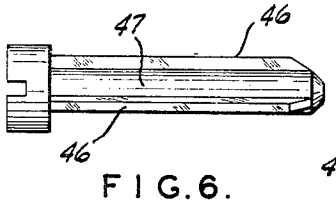

FIG. 6.

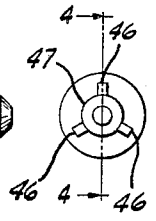

FIG. 5.

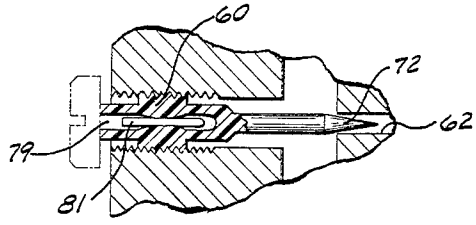

FIG. 9.

INVENTORS
DONALD D. SIMPSON
RAYMOND G. HENNEMANN
BY
Robert B. Burns
ATTORNEY

United States Patent Office

3,484,084

Patented Dec. 16, 1969

3,484,084

CARBURETOR IDLE SPEED CONTROL

Donald D. Simpson and Raymond G. Hennemann, St. Louis, Mo., assignors to ACF Industries, Incorporated, New York, N.Y., a corporation of New Jersey

Filed July 7, 1967, Ser. No. 651,819

Int. Cl. F02m 11/10

U.S. Cl. 261—41 7 Claims

ABSTRACT OF THE DISCLOSURE

This invention relates a novel arrangement for use in a carburetor embodying an idle fuel system and having a choke valve as well as a throttle valve. One aspect of the device includes a linkage having a rotatable lever with a stepped contact surface, which lever functions as an intermediate member for coordinating the movement and position of the throttle with the choke valve at engine idle speeds. The linkage further includes a collapsible or deformable wall, adjustable element, forming a transitory member, the disposition of the latter being variable to alter the relative position of the throttle with respect to said rotatable lever thereby to achieve and regulate the engine at a preferred idle speed.

In a further aspect of the invention, a deformable wall plastic member is provided in conjunction with a valve body in the engine fuel system to regulate air/fuel flow from the carburetor under engine idle conditions.

BACKGROUND OF THE INVENTION

(1) The field of this invention encompasses carburetors and similar charge forming devices adapted to cooperate with and regulate the speed of internal combustion engines.

(2) The prior art related to carburetors is extensive, however with respect to control of engine idle speed it is more limited. The art has taught the use of a cooperative relationship between the carburetor throttle and a choke valve, such that an adjustable member may be utilized to translate movement through a linkage connecting the throttle and the choke. The adjustable member is familiar in the art normally as a metallic screw, threaded into an appropriate socket and being rotatably adjustable to set the idle optimum speed position of the throttle as determined by the position of the choke. The adjusting screw, in order to assure its maintaining a predesired stationary setting, is normally provided with locking means such as a lock nut, lock washer, and/or compression spring to avoid rotation of the adjustable member in spite of excessive engine speed and vibrations.

It is understandable that in the course of normal operation of an internal combustion engine, a certain amount of wear will result due to moving contacting parts. Further, the provision of a suitable adjusting screw and its accompanying locking device such as a spring, constitutes a relatively expensive combination which adds to the overall cost of the carburetor.

With respect to metering of idle fuel, it is generally known that a metallic needle valve member in the fuel system offers a satisfactory control expedient.

However with this form of valving, a needle element must be provided with means for maintaining a fluid tight relationship in spite of periodic adjustments. Thus, according to the invention, a deformable wall valve element is provided to rotatably engage a valve body for longitudinally positioning said element to provide a desired fuel flow and also to provide a self sealing valve element.

SUMMARY OF THE INVENTION

This invention relates in brief to a novel carburetor construction for regulating an air/fuel mixture, including a linkage for controlling the choke position, and a valve for controlling fuel flow.

The linkage comprises essentially an adjustable coupling including a first member formed of a relatively rigid material and having a constricted opening. A second, elongated member formed of a softer resilient material than the first member includes a smooth surfaced, generally cylindrical shank of a diameter normally slightly greater than the diameter of said constricted opening. Said second member is provided with an axially extending bore underlying said cylindrical surface. A head at one end of the bore may be adapted for urging said shank into said constricted opening. Thus, the resilient surface of said shank will be inwardly deformed thereby to frictionally position said first member with respect to said second member and to subsequently permit axial adjustment of said shank with respect to said constricted opening by the application of a torsional force to said second member.

A contact tip on one end of the adjusting member shank is adapted to engage a stepped cam surface on a rotatable lever which is in turn operably connected to the carburetor choke. Thus the throttle idle position will be determined by the limitation in movement imposed by the resilient stop.

The disclosed adjusting member provides a positive throttle positioning means which avoids loosening in spite of the degree of engine vibration under running conditions. Further, the adjustable member is found to be a satisfactory replacement for a plurality of parts heretofore utilized to achieve the positioning function. Thus economically the herein described combination provides a more efficient, and less expensive carburetor, as well as one embodying a readily adjustable feature.

A deformable wall fuel metering valve element positioned in the carburetor includes basically a hollow member defining a thin outer wall. A portion of the member is smooth surfaced, and of a suitable diameter to be tightly received in a threaded opening. The fit between the formed threads and the valve element is adequate to assure a fluid and gas tight annular seal in spite of rotatable adjustment of said element within the valve body.

It is therefore a primary object of the hereinafter disclosed invention to provide an efficient yet inexpensive adjustable element for use in a carburetor construction.

It is a further object of the invention to provide a deformable wall valve element adapted to be self-sealing within a valve body solely by virtue of the deformability of said element.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates a side elevation view of a carburetor of the type in which the presently disclosed adjusting member is incorporated.

FIG. 2 is a segmentary view on an enlarged scale of a portion of the carburetor shown in FIG. 1, directed particularly to the lever connected to the carburetor throttle, which lever receives the idle adjust device and,

FIG. 3 is a side view of the idle adjust pin shown removed from its receiving aperture and in a undeflected condition.

FIG. 4 represent a side view in cross section of an alternate embodiment of the adjustable member.

FIG. 5 is an end view of the device shown in FIG. 4.

FIG. 6 is a side view of the member shown in FIGS. 4 and 5.

FIG. 7 is a side elevation in cross section taken along the longitudinal axis of a deformable wall valve element of the type contemplated.

FIG. 8 is a side elevation of the valve element shown removed from its threaded receptacle and

FIG. 9 is an embodiment of the disclosed insertable member including a locking element.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The novel adjusting pin or device, together with the valve element, are adapted for use on a number of carburetor types particularly those which utilize a choke as well as a throttle valve connected through an appropriate linkage. In that virtually all carburetors usually incorporate a fuel idle system, it is understandable that the arrangement of an idle adjusting valve and a linkage connecting the throttle and the choke will vary in accordance with the carburetor basic construction.

FIG. 1 of the drawings illustrates a typical carburetor of the type contemplated which includes an elongated body **10** comprising an inlet **11** for receiving an air filter, not presently shown. A discharge outlet **12** is adapted to connect to the intake manifold of an internal combustion engine. Body portion **10**, communicating inlet **11** and discharge outlet **12** comprises in general a mixture conduit **13** wherein incoming air is mixed with a predetermined amount of metered liquid fuel to form a combustible air/fuel mixture which is passed to the engine inlet manifold.

Following normal construction, the carburetor is provided with a choke valve **14** as well as a throttle valve **16**. Choke valve **14** is mounted at the upper portion of mixture conduit **13** adjacent inlet **11**, and is carried on a choke valve shaft **17** which protrudes from an external wall of the body. Shaft **17** is provided with an offset actuating lever **18** at the protruding end. The lower portion of the carburetor body is provided in the normal manner with throttle valve **16** connected to, or mounted to a throttle shaft **19** which, in a similar manner protrudes from a wall of the body, carrying a throttle control lever **21**. Said control lever **21** is connected in turn to a push rod **22** directly engageable with a control mechanism which might be either manually or pedally operated as in the instance of an automotive engine, to regulate engine speed.

An intermediate lever **23** is pivotally carried on a pin **24** depending from an external wall of body **10** intermediate the air inlet **11** and discharge **12**. Lever **23** includes a radially extending arm **26** having means for receiving a connecting rod **27** which is connected to lever **18** to coordinate movement of said lever **23** with the position of choke valve **14**.

While not presently shown, choke valve **14** may be controlled by, and is usually connected to a thermally responsive element such as a thermo coil or the like. This member functions to adjust the position of choke valve **14** in accordance with the temperature of the engine to facilitate both easy starting of the engine and economical operation after operating temperature has been achieved.

Intermediate lever **23** includes a peripheral contacting or cam surface having a plurality of progressively depressed steps **29**, **31** and **32** which permit the carburetor to idle at different speeds depending on engine temperature. Thus, after starting, as the engine achieves a satisfactory running temperature, the position of intermediate lever **23** will be rotated in response to expansion of the thermally responsive element. The latter has in turn positioned choke **14** normally in the wide open position to provide a minimum of choking action.

To coordinate the idle position of throttle **16** with the position of the choke valve **14**, control lever **21** is provided with an upstanding tab **33** disposed generally normal to the lever surface. Said lever is further provided with a constricted opening or receiving aperture **34**. Idle

adjusting pin **36** is received within constricted aperture **34** and includes a contact tip **37** disposed adjacent to one of the engaging steps **29**, **31** or **32**. Thus, with the engine operating under idle conditions, contacting tip **37** of the pin **36** will engage one of the stepped surfaces, thereby to properly position the throttle valve.

DESCRIPTION OF THE IDLE ADJUST PIN

Referring to FIGS. 2 and 3, idle adjust pin **36** includes an elongated shank **38** preferably of cylindrical construction having contact tip **37** at one extremity. The other extremity is provided with a head **39** extending coaxial of shank **38**, which head may be irregularly shaped on the outer surface to permit gripping for rotating the pin into receiving opening **34**. A transverse slot **41** formed in the head is adapted to accommodate the blade of a screwdriver or other suitable tool.

An elongated bore **42** extending axially of shank **38** forms a thin wall **43** of substantially uniform thickness. Bore **42** as seen in FIG. 2, extends from the end face of the head **39** and terminates adjacent contact tip **37**. Although the cavity defined by bore **42** presently disclosed is open at but one end, it may in the alternative be open at the tip end also to facilitate manufacture of the pin. For the present application, a closed tip is to be preferred since this portion of the pin is subjected to constant wear by repeated contact with lever **23**.

In accordance with the invention, adjusting pin **36** is formed preferably or at least partially, of a thermoplastic resinous material having the physical characteristic of being temperature stable, resilient, and resistant to the deleterious affect of aromatic fuels. For example it is found that materials such as nylon, and Delrin exhibit the necessary resistant qualities and still permit forming of a rigid yet yieldable thin wall.

In the instance of either of the above mentioned materials, wall **43** is so formed to be resiliently inwardly yieldable as the pin shank **38** is either rotated or urged into a constricted opening. The degree of constriction is of course contingent on the outside diameter of shank **38**. However, to achieve the necessary radial outward force, the shank may assume a non-circular cross section to permit the wall to be inwardly deformed at peripherally spaced apart points. It is essential in either instance that upon insertion of the tip and shank into a constricted opening, a sufficient torque or axial force will be required such that the pin wall will yieldably deform thereby establishing a frictional resistance to both further progress, or withdrawal of the pin.

In the instance of a rotatably insertable pin, opening **34** is provided with a smooth surfaced, preferably non-cutting thread as shown in FIG. 2 having root and crown diameters; thus, as the pin is rotatably driven into opening **43** it will be advanced to a desired position. As the shank emerges from the far side of the opening, the thin wall tends to resume its normal disposition so long as the wall material has not exceeded the limit of elastic deformation.

While not shown, the constricted aperture comparable to aperture **34** in FIG. 2, may be smooth walled thus permitting the pin to be forced directly into the opening by application of a longitudinal force. Such arrangement however must be non-rotatable and a greater reliance will thus be placed on the frictional force established between the contact surfaces of the mating elements rather than upon the reactive force formed by the smooth faced above mentioned thread.

Referring to FIGS. 2 and 3 illustrating a preferred usage of the adjusting pin, the latter is rotatably urged into opening **34** to contact the stepped edge of the lever **23**. Thus with carburetor choke **14** set to a fully closed position, and with throttle **16** positioned to give a desired engine speed, adjusting pin **36** is rotated until tip **37** engages the lower most step **29** of lever **23** thus establishing the throttle position for the particular choke position.

Following normal carburetor operation, as choke **14** is adjusted to open in response to raising engine temperature, lever **23** is rotated to align the tip **37** with the low idle steps **31** and **32** thereby allowing throttle **16** to further close and limit the engine idle speed.

The outside diameter of shank **38** is preferably not so oversized as to be permanently marred or damaged while being urged through the constricted locking aperture **34**. The provision of sharp cutting edges on the aperture, although assuring a firm grip, would tend to gouge out a groove in the soft shank surface as the pin is rotated and is therefore not recommended. Such a groove however is not entirely undesirable, it is understandable though that it would reduce effective holding ability when the pin is rotated to a withdrawn position.

FIGS. 4 and 5 illustrate an alternate embodiment of the novel adjusting pin characterized in that the elongated surface of shank **47** is provided with a plurality of upstanding flutes **46** which extend the length of the shank. With respect to locking this embodiment of the adjusting pin in place, the peripherally spaced flutes **46** slideably engage a corresponding constricted opening. As the flutes bear inwardly against the thin wall defined by shank **46** and bore **48**, the thin wall will deflect inwardly thus establishing a reactive frictional force to resist further free movement of the pin within the constricted opening.

DESCRIPTION OF THE NEEDLE VALVE ELEMENT

FIGS. 7 and 8 illustrate a preferred embodiment of the invention in which the adjustable needle valve member **60** is carried in a threaded opening in the carburetor wall in such a position as to regulate fuel flow through passage **62** connected with the carburetor mixture conduit. The valve element comprises basically an elongated body **64** having a head **66** at one end provided with a transverse slot **68** to accommodate an adjusting tool.

The body other end is provided with a shank **70** having a conical tip **72** disposed in registry with seat **73** in passage **62**. Shank **70** may be formed of a suitable metal and fastened into the body **64**. However, depending on design requirements, shank **70** may also be molded into and become an integral part of the shank.

Cavity **79** extends axially through the body, opening at head **60** to define a thin resilient wall. As shown in FIGS. 7 and 8, an enlarged portion **76** is provided to form an engaging surface with the threads in threaded opening **74**.

In the instance of a valve member **60** rotatably received in opening **74**, a dual effect will be achieved. First, the outer surface of enlarged portion **76** will provide an annular seal against leakage of air through passage **74** thus providing uniformity. Secondly, said member **60** will be rotated to properly position tip **72** within passage **62** thereby defining an annular opening at seat **73** of a sufficient cross section to insure the proper amount of fuel to the engine under idle conditions.

As seen particularly in FIG. 7, with the valve member in position, the wall of said member **60** will be collapsed inwardly thereby exerting a restraining force against free movement of the valve member which would otherwise alter the valve setting in seat **73**.

It is contemplated that the present valve element and cooperating parts may be formed with a sufficient degree of accuracy to minimize the need to adjust the valve. Thus, annular shoulder **75** at the underside of head **66** will be brought into tight engagement with the body wall thereby to form a seal. Under such circumstances, tip **72** and its mating seat **73** are so designed to form a sufficiently large opening to pass the necessary amount of fuel under engine idle conditions.

In the instance of an application wherein it is desirable to fixedly position the adjustable element such as a tamper-proof device, means may be provided in conjunction with the resilient walled element to lock the same. As shown in FIG. 9, the carburetor idle adjust valve is similar to that shown in FIGS. 7 and 8 with the additional element of an expanding pin **81** which is frictionally held within cavity **79**. Said pin may be of a non-yielding material such as metal. However, it may also be formed of a resilient plastic material. In either instance the pin is adapted to fully enter the shank axial bore. Further insertion of the pin into the bore will provide a tight fit of the pin in the constricted portion of the bore, thus locking the adjustable member into place.

We claim:

1. An adjustable coupling device comprising:

(a) a first member formed of a relatively rigid material and having a threaded constricted opening.

(b) a second elongated member of relatively softer, resilient and elastic material than said first member,

(c) said second member including a shank portion providing a smooth outer generally cylindrical surface having a diameter greater than the diameter of said constricted opening, said shank portion having an axially extending bore underlying said generally cylindrical surface,

(d) and a head portion adapted to receive a tool for urging said second member into the constricted opening in said first member whereby:

when said shank portion of said second member is forced into said constricted opening of said first member, said cylindrical surface of said shank portion is elastically and resiliently deformed and conformed to the shape of the said constricted opening without cutting said surface, by displacement of the material underlying said generally cylindrical surface into said bore;

whereby, said second member may be infinitely adjusted axially relative to said opening by application of torsional force to said head portion and said second member will be held in an axially adjusted position relative to said constricted opening by the inherent elasticity and resiliency of the material of said second member and including a locking member carried in said second elongated member and including a pin having a locking portion characterized by a diameter less than the diameter of said axially extending bore, and greater than the cross-sectional area of the opening formed by said bore when the outer surface of said shank is deformed inwardly toward said bore whereby the locking portion of said pin will be tightly received in the constricted portion of said bore.

2. In an adjustable coupling as defined in claim **1** wherein said adjusting pin is formed of a substantially unyielding material.

3. In an adjustable coupling as defined in claim **1** wherein said adjusting pin is formed of a relatively yieldable elastic material.

4. In a carburetor including a body defining a mixture conduit communicating with a supply of air for forming an air/fuel combustible mixture;

(a) a valve means in said body to regulate the fuel flow to the mixture conduit and including,

(b) a threaded valve passage connected to a supply of fuel and having a port opening into said mixture conduit,

(c) a valve operator rotatably received in said threaded passage and including,

(1) a metering portion disposed in registry with said port to form an annular fuel channel,

(2) an elongated resilient shank having an enlarged portion adapted to engage the threads in said valve passage and to form an annular seal therewith,

(3) a bore extending axially of said shank to define a relatively thin wall,

(4) said shank enlarged portion being radially inwardly deflected into said bore thereby to fric-

tionally position said valve operator with respect to said valve passage and to form an annular liquid tight seal.

5. In a carburetor as defined in claim 4 wherein said valve metering portion depends axially from one end of said resilient shank, and a head depends from the other end thereof for rotatably adjusting said operator in said threaded passage.

6. In a carburetor as defined in claim 4 wherein said threaded passage in said carburetor is defined by a substantially smooth walled portion to avoid cutting of said shank portion when the latter is rotatably inserted into said threaded passage.

7. In a carburetor as defined in claim 4 including a locking pin adapted for insertion into said bore, a portion thereof having a diameter greater than the diameter of the cross-sectional area of the opening formed by the said wall in said bore whereby said locking pin when disposed in said constricted bore inwardly of said constricted wall, the latter will be wedged into position.

References Cited

UNITED STATES PATENTS

33,487	10/1861	Marsh	156—7
2,318,415	5/1943	Patzschke et al.	151—7 X
2,407,160	9/1946	Kahn.	
2,810,560	10/1957	Olson et al.	
2,852,056	9/1958	Rapata	151—7
2,859,779	11/1958	Parks	151—7 X
3,151,189	9/1964	McSeveny	261—52
3,202,194	8/1965	Jones	151—7
3,235,236	2/1966	Kalert.	
3,306,153	2/1967	Brown	151—7 X
3,330,545	7/1967	Donovan.	

TIM R. MILES, Primary Examiner

U.S. Cl. X.R.

85—8.3; 151—7, 14; 251—215; 261—52, 71