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THROTTLE CONTROL MECHANISM

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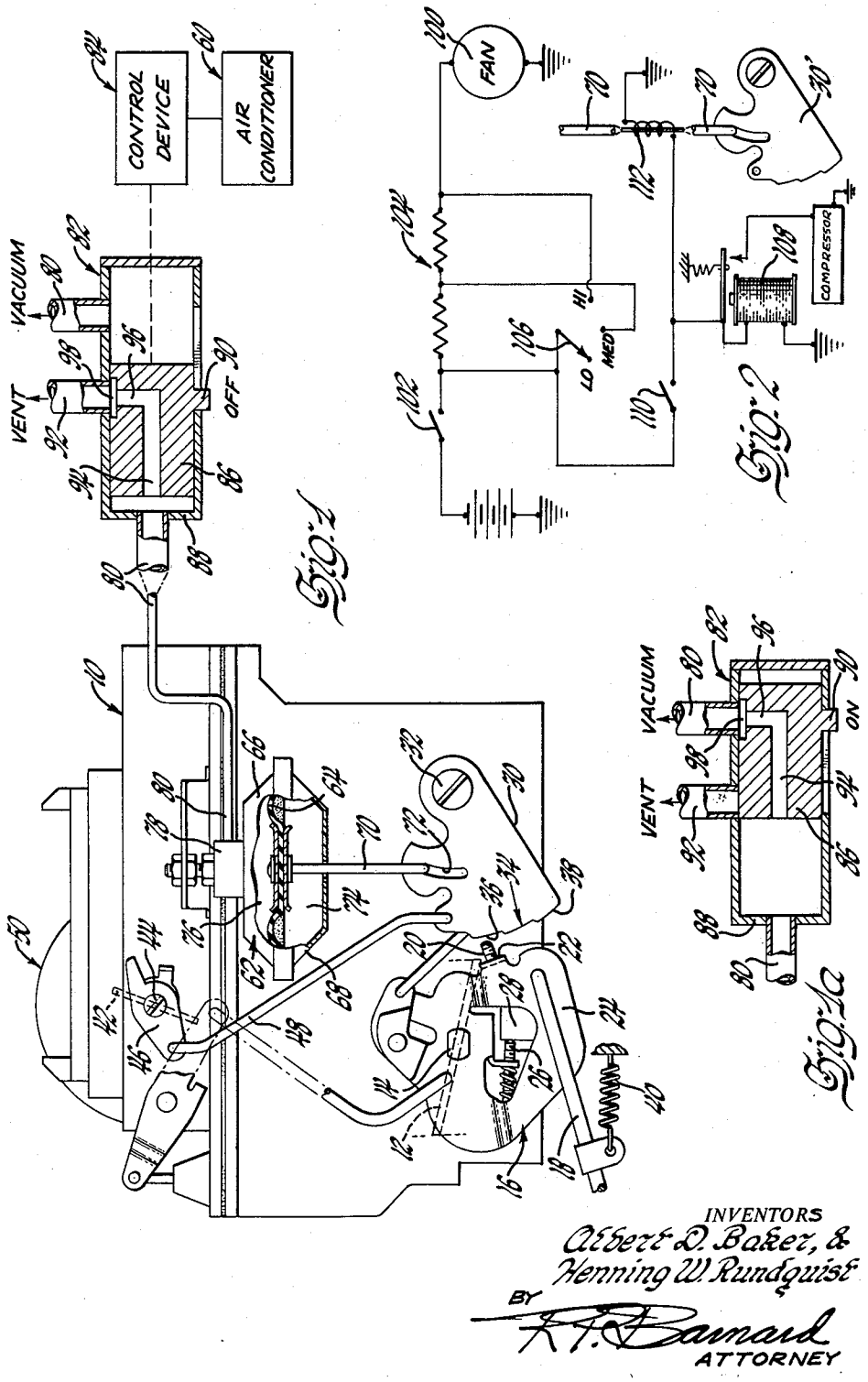


Fig. 1

Fig. 2

Fig. 3

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THROTTLE CONTROL MECHANISM

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The present invention relates to an apparatus for controlling the idling speed of an internal combustion engine. It has been found necessary in present day automobiles to provide means for automatically adjusting the idling speed of the engine to compensate for the additional load imposed thereon by certain of the larger accessories such as air conditioning units. Accordingly, the present invention relates to an improved engine idling control system in which the throttle idle setting is automatically adjusted when one of such major accessories is being driven by the engine in order that the engine idling speed may be maintained at a constant value or, if preferred, increased slightly.

While in general engine idling control devices have been heretofore utilized for this general purpose, such devices have either been complicated, required the actuation of several control members or were not selectively controllable with the actuation of a particular accessory.

In the present invention means has been uniquely combined with a throttle fast idle cam in such a way as to make the carburetor throttle setting responsive both to engine temperature as well as the actuation of a major accessory and which arrangement uniquely insures that the engine will be operated at the proper idling speed under all heavy engine accessory load conditions. It is a further object of the present invention to provide an idling speed controlling device which is conjointly operated by a control device adapted to control the operation of a major engine accessory such as an air conditioning unit.

Other details and advantages of the present invention will be apparent from a perusal of the detailed description which follows.

In the drawings:

Figure 1 is a view of a carburetor embodying the subject invention;

Figure 1*a* shows the idle control valve in its on position; and

Figure 2 represents a modified type of idle speed control circuit.

A carburetor is shown generally at **10** and may be of any well known type such as that shown in Patent 2,771,282 Olson et al. Save insofar as the components will be hereinafter described, carburetor **10** does not, per se, constitute a part of the present invention.

Carburetor **10** includes a throttle valve **12** fixed for rotation upon a shaft **14**. A lever **16** is fixed to shaft **14** and is adapted to be suitably articulated through a rod **18** to the accelerator pedal, not shown, in order that the position of throttle **12** may, in general, be determined by the vehicle operator.

While the operator normally controls the position of the throttle **12**, it is necessary when the accelerator pedal is released, as during idling operation, to provide means whereby the engine will be idled at a speed sufficient to prevent stalling. Accordingly, a fast idle adjustment screw **20** is provided on a tab **22** on an offset portion **24** of lever **16**. In general when the engine is

warm and otherwise operating under normal loads, fast idle adjustment screw **20** will have no control over the position of the throttle valve **12**.

The normal idle adjustment for the throttle **12** will be determined by an adjusting screw **26** which is likewise mounted on lever **16** and is adapted to coact with a fixed stop **28** on the carburetor casing. If the normal idle adjusting screw were set to insure an adequate idling speed under all operating conditions of the engine, idling speed would be excessive during many conditions. Thus, the fast idle adjustment screw **20** is utilized to supplement the action of the normal idle adjustment screw under certain engine operating conditions as will now be considered.

A fast idle cam **30** is pivotally mounted upon a stud **32** fixed to the carburetor casing. Cam **30** is eccentrically mounted with respect to stud **32** in such a way that it tends to rotate in a counterclockwise direction about the stud due to the force of gravity acting thereon. Cam **30** includes a progression of low to high step surfaces **34** and which surfaces are disposed adjacent the fast idle adjustment screw **20**. A low cam surface is provided at **36** whereas a high cam surface is provided at **38**.

A spring member **40** is suitably fixed to the accelerator control rod **18** biasing the throttle valve lever **16** in a counterclockwise direction thereby urging the fast idle adjusting screw **20** toward the fast idle cam **30**.

A choke valve is indicated generally at **42** and is fixed for rotation with a shaft **44**. A lever **46** is also fixed to shaft **44** and has one end of a rod **48** suitably articulated thereto. The other end of rod **48** is articulated to the fast idle cam **30**. An automatic choke controlling mechanism is indicated generally at **50** and is of the type shown and described in Patent 2,705,484 Jorgensen. The choke controlling mechanism **50** is adapted to oppose the opening of the choke valve with a force which is inversely proportional to engine temperature. As the engine warms the air flow through the carburetor is adapted to cause the choke valve **42** to move in a counterclockwise direction opening the choke valve and permitting gravity to position the lever **46**, rod **48** and fast idle cam **30** in the positions shown in Figure 1. Thus with a warmed up engine, the fast idle adjustment screw **20** will not engage any of the surfaces **34** on the cam **30** and the throttle valve idle position will be controlled by the normal idle adjustment screw **26**. When the engine is cold, on the other hand, the choke valve lever **46** will move the rod **48** upwardly lifting the fast idle cam **30** and positioning the high step **38** thereof adjacent the fast idle adjustment screw **20** preventing the normal closing of the throttle **12** and thereby increasing the idling speed of the engine. As the engine temperature warms the fast idle cam **30** will be progressively permitted to move under the influence of gravity in a counterclockwise direction bringing progressively lower step cam surfaces into engagement with the fast idle adjustment screw and gradually permitting a reduction in the engine idling speed consonant with warmer engine operations.

In addition to providing means for increasing the engine idling speed when the engine temperatures are low, it has been found necessary to provide additional means for increasing the throttle idle position to either increase or maintain constant the engine idling speed when accessory loads are imposed on the engine. This has been found to be particularly necessary when a major accessory such as an air conditioning unit indicated generally at **60** is provided. Inasmuch as the load imposed by the air conditioning unit **60** is high during idling conditions relative to the power output of the engine, it is necessary either to adjust the normal idle adjustment screw **26** to accommodate idling operation with the air conditioning unit in operation, supra, or in the alternative

to provide means whereby the engine idling speed may be controlled automatically when the unit is in operation. It is apparent that the latter alternative is economically and operationally more desirable inasmuch as adjusting the normal idle adjustment screw will cause an excessively high idling engine speed when the air conditioning unit is not in operation as already noted.

Accordingly, a unique idle speed controlling mechanism has been developed and combines with the temperature controlled fast idle system as well as with the air conditioning actuating mechanism to provide means for controlling the engine idling speed in accordance with accessory loads.

A servo mechanism is indicated generally at **62** and includes a diaphragm member **64** peripherally clamped between a pair of casing members **66** and **68**. A rod member **70** is centrally fixed to the diaphragm **64** for movement therewith. The other end of rod **70** is connected to the fast idle cam **30** through a lost motion slot **72**. The lost motion connection between the servo device **62** and the fast idle cam **30** insures that the engine temperature control of the cam may take place regardless of the servo mechanism except as will be hereinafter described.

Servo **62** includes chamber **74** which is open to the atmosphere and chamber **76** which communicates through a boss **78** with a conduit **80** the latter being in turn connected to a power source, such as the intake manifold, not shown. The control of servo **62** is achieved through a valve mechanism **82** which is actually a part of the air conditioning unit control device **84**. Device **84** is adapted to be controlled by the movement of member **86** and among other things would contain suitable switch means for actuating air conditioner **60**.

Valve mechanism **82** includes a member **86** slidably disposed in a casing **88** and which may, for instance, be a part of the temperature control lever **90** for the air conditioning unit **60**. Casing **88** communicates with conduit **80** intermediate servo **62** and the manifold and with the atmosphere through a port **92**. The movable valve member **86** includes a longitudinal passage **94** formed therein which communicates with a radial passage **96** and a peripherally relieved portion **98**.

When the air conditioning unit is off, as indicated in Figure 1, the diaphragm chamber **76** is vented to the atmosphere. When the air conditioning unit is operative member **86** is moved to the right by a control lever **90** in which position the relieved portion **98** and passages **96** and **94** communicate engine vacuum with chamber **76** moving the diaphragm upwardly. The upward movements of diaphragm **64** imparts a similar movement to the control rod **70** causing the fast idle cam **30** to be moved upwardly until the high step **38** of the cam is adjacent the fast idle adjustment screw **20**. In this condition, the degree of idle throttle opening of the throttle valve **12** will be increased. In this way the idling speed of the engine is increased or maintained at a constant value when the air conditioner has increased the load on the engine.

It is possible to substitute an electrical control system in place of the vacuum control system just described. In this event, a solenoid may be used in place of the servo **62**. A diagrammatic representation of an electrical control system which may be utilized with the subject invention is shown in Figure 2. In the electrical control system as shown in Figure 2, a refrigeration unit fan is indicated at **100** and is actuated whenever the master switch **102** is closed. The speed of fan **100** is determined by the bridge circuit indicated at **104** which includes the multi-throw switch **106**. A compressor actuating solenoid is shown at **108** and is adapted to be actuated only when a switch **110** is closed along with the master switch **102**. A fast idle cam actuating solenoid **112** is connected in parallel with the compressor solenoid **108** and is likewise energized when the compressor switch **110** is closed. Thus, the added load imposed on the engine by actuating the compressor circuit is compensated for by a similar actuation of the fast idle cam **30'** to increase the idle opening of the throttle valve **12**.

It is apparent that various structural modifications may be made in the aforedescribed engine idle speed controlling device within the scope of the hereinafter appended claims.

We claim:

1. Apparatus for controlling the idling speed of the engine of an automotive vehicle comprising in combination, an automotive accessory adapted to be driven by the engine, a carburetor for supplying a combustible mixture of fuel and air to said engine, said carburetor having a throttle valve for controlling the quantity of mixture supplied to the engine, a lever mounted for movement with the throttle, said lever including an adjustable stop member, a gravity actuated fast idle cam eccentrically pivoted on the carburetor and adapted to coact with said stop member to control engine idling speed, temperature responsive means connected to said cam to provide increased throttle opening when the engine is cold and idling, and means operable when said accessory is operative to actuate said cam independently of the temperature responsive means to increase the throttle opening during idling conditions.

2. Apparatus for controlling the idling speed of the engine of an automotive vehicle comprising, in combination, an automotive accessory adapted to be driven by the engine, a carburetor for supplying a combustible mixture of fuel and air to said engine, said carburetor having a throttle valve for controlling the quantity of mixture supplied to the engine, a lever mounted for movement with the throttle, said lever including an adjustable stop member, a fast idle cam eccentrically pivoted on the carburetor, said cam including a progression of low to high step surfaces, said stop member being adapted to severally engage said plurality of surfaces, said cam adapted to be actuated by gravity to position the low cam step adjacent said stop; temperature responsive means connected to said cam to provide increased throttle opening when the engine is cold and idling, and means operable when said accessory is operative to actuate said cam independently of the temperature responsive means to increase the throttle opening during idling conditions.

3. Apparatus for controlling the idling speed of the engine of an automotive vehicle comprising in combination, an automotive accessory adapted to be driven by the engine, a carburetor for supplying a combustible mixture of fuel and air to said engine, said carburetor having a throttle valve for controlling the quantity of mixture supplied to the engine, a lever mounted for movement with the throttle, said lever including an adjustable stop member, a fast idle cam eccentrically pivoted on the carburetor, said cam including a progression of low to high step surfaces, said stop member being adapted to severally engage said plurality of surfaces, said cam adapted to be actuated by gravity to position the low cam step adjacent said stop, temperature responsive means connected to said cam to provide increased throttle opening when the engine is cold and idling, a servo operatively connected to said cam, a conduit adapted to connect said servo with a source of engine vacuum, control means for said accessory, said control means including a valve device in said conduit, said valve device adapted to communicate engine vacuum with the servo to move the cam to increase the degree of throttle opening when the control means actuates the accessory.

4. Apparatus for controlling the idling speed of the engine of an automotive vehicle comprising in combination, an automotive accessory adapted to be driven by the engine, a carburetor for supplying a combustible mixture of fuel and air to said engine, said carburetor hav-

ing a throttle valve for controlling the quantity of mixture supplied to the engine, a lever mounted for movement with the throttle, said lever including an adjustable stop member, a gravity actuated fast idle cam eccentrically pivoted on the carburetor and adapted to coact with said stop member to control engine idling speed, temperature responsive means connected to said cam to provide increased throttle opening when the engine is cold and idling, means operable when said accessory is operative to actuate said cam to increase the throttle opening, and a lost motion connection between said cam and said accessory operable means permitting the temperature responsive means to control the cam independently of accessory operation.

5. Apparatus for controlling the idling speed of the engine of an automotive vehicle comprising in combination, an automotive accessory adapted to be driven by the engine, a carburetor for supplying a combustible mixture of fuel and air to said engine, said carburetor having a throttle valve for controlling the quantity of mixture supplied to the engine, a lever mounted for movement with the throttle, said lever including an adjustable stop member, a fast idle cam eccentrically pivoted on the carburetor, said cam including a progression of low to

high step surfaces, said stop member being adapted to severally engage said plurality of surfaces, said cam adapted to be actuated by gravity to position the low cam step adjacent said stop, temperature responsive means connected to said cam to provide increased throttle opening when the engine is cold and idling, means operable when said accessory is operative to actuate said cam to increase the throttle opening, and a lost motion connection between said cam and said accessory operable means permitting the temperature responsive means to control the cam independently of accessory operation.

6. An idling speed controlling apparatus as set forth in claim 3 in which the operative connection between said servo and said cam includes a lost motion device permitting the temperature responsive means to actuate said cam independently of accessory operation.

References Cited in the file of this patent

UNITED STATES PATENTS

2,720,087	Groene	Oct. 11, 1955
2,762,235	Olson et al.	Sept. 11, 1956
2,807,146	Jackson	Sept. 24, 1957