Sept. 19, 1967 D. E. TUTCH 3,342,454

AIR CONTROL DEVICE FOR CARBURETED ENGINES

Filed June 21, 1965

Fig. 1.

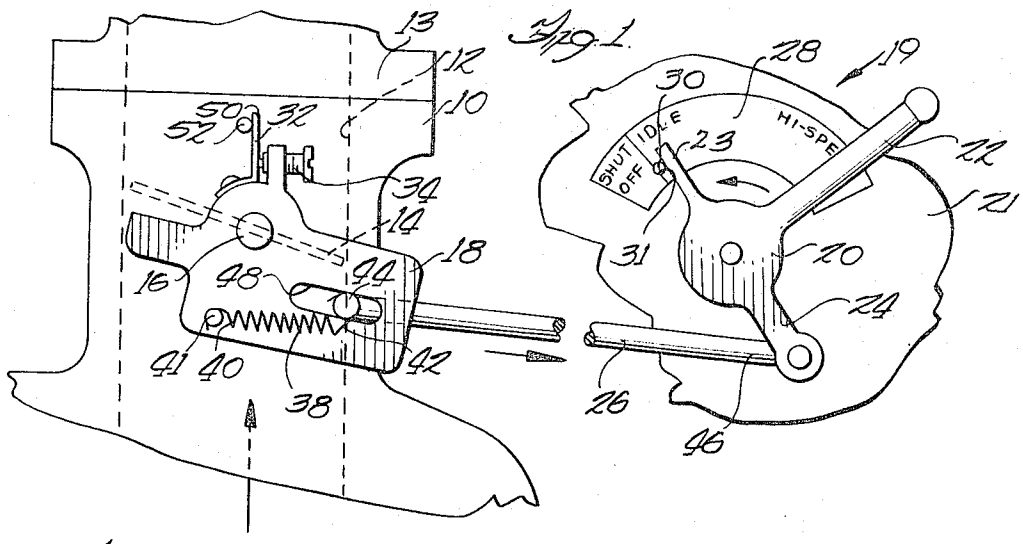


Fig. 2.

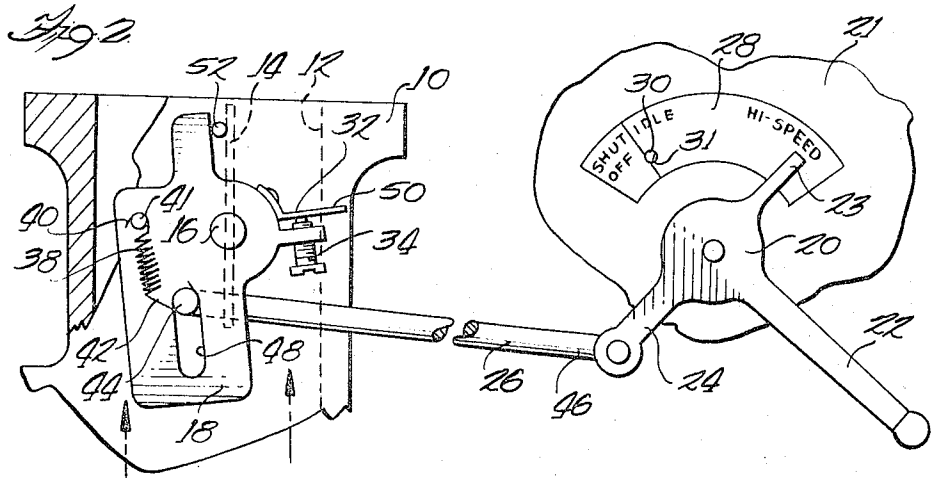
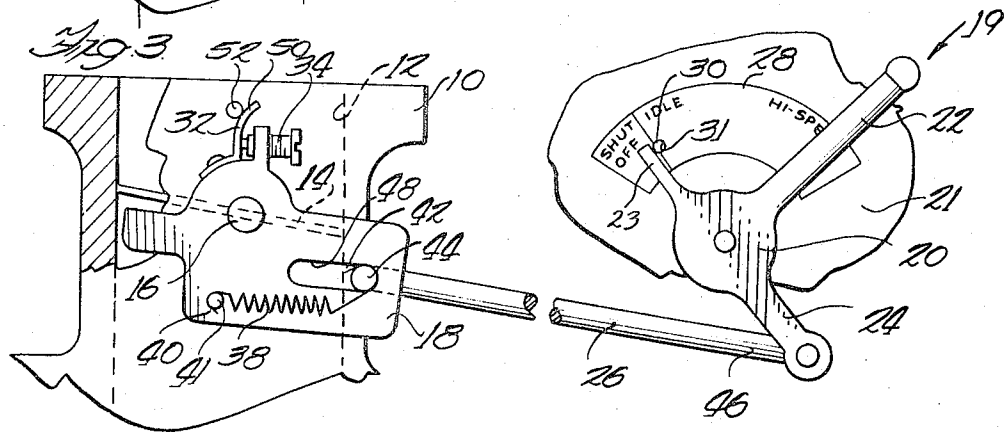


Fig. 3.



Inventor
David E. Tutch
Melburn E. Laundry
Attorney

United States Patent Office 3,342,454
Patented Sept. 19, 1967

3,342,454

AIR CONTROL DEVICE FOR CARBURETED ENGINES

David E. Tutch, Lynd, Minn., assignor to International Harvester Company, Chicago, Ill., a corporation of Delaware

Filed June 21, 1965, Ser. No. 465,519
6 Claims. (Cl. 251—288)

This invention relates to an air control device, and more particularly, the invention relates to an air control device suitable for use with conventional internal combustion engine carburetors and intake manifolds to prevent engine "run-on," that is, the tendency of an engine to continue to operate under its own power after turning off the ignition switch.

In many applications of carbureted engines such as when an engine is utilized as a power unit or in truck and tractor installations, the engines may be operated normally at very high temperatures, and frequently, merely turning off the ignition switch does not stop the engine as combustible fuel mixtures continue to be drawn into the engine intake manifold and continue to ignite by spontaneous combustion.

Various devices have been utilized in the past to prevent engine run-on including air control devices to shut off the flow of air to the intake manifold. Unfortunately, many of these devices have been relatively expensive while other air control devices utilized to completely shut off air supplied to the engine have required objectionably critical adjustments of linkage to prevent inadvertent shutoff of the engine when it was desired to obtain an engine idle position.

Further, such devices have often been unacceptable due to an objectionable dependence on an operator's sense of touch to ascertain the relative difference between throttle positions of engine idle and engine shutoff.

Thus, a general object of the invention is to provide an improved air control device suitable for use with conventional carburetors.

Another object of the invention is to provide an air control arrangement having resilient linkage connections to eliminate the need for precise adjustments of linkage to an associated throttle lever and to prevent inadvertent engine shutoff when the throttle lever is moved to an idle position.

Another object of the invention is to provide an air control device adaptable for use with conventional internal combustion engine carburetors having throttle control means to prevent inadvertent shutoff of the engine.

Another object of the invention is to provide an air control system for an internal combustion engine carburetor including a simple linkage arrangement to permit a positive and complete shutoff of air moving through the carburetor to prevent engine run-on after the ignition has been turned off.

These and other objects of the invention will become apparent by consideration of the following detailed description and associated drawings wherein:

FIG. 1 is a side elevational view partially in section of an air shutoff device for a carbureted engine with an associated throttle control lever being shown in idle position;

FIGS. 2 and 3 are views similar to FIG. 1 but with the throttle control lever and control device shown in a high-speed position in FIG. 2 and in an engine shutoff position in FIG. 3.

Referring to the drawings there is shown a portion of a carburetor **10** for an associated internal combustion engine, not shown, the carburetor being of the updraft type and having an air and fuel outlet line or throat **12** communicatively connected to an associated engine intake manifold **13**, a portion of which is shown in FIG. 1, to receive combustible mixtures of air and fuel from the carburetor.

The carburetor **10** has a throttle or butterfly valve **14** rotatably positioned within the throat **12**, the valve being mounted on a rotatable throttle valve shaft **16** having an externally projecting end to which a throttle valve plate **18** is secured. Rotation of the throttle valve plate **18** effects rotation of the throttle valve **14** between a fully open position illustrated in FIG. 2 and a fully closed position illustrated in FIG. 3. An intermediate or idle position of the valve **14** is illustrated in FIG. 1 in which position the throttle valve restricts the fuel and air mixture moving to the intake manifold to achieve idling of the associated engine.

Operator control means **19** are provided to control rotation of the throttle valve plate **18** and includes a throttle control lever **20** rotatably mounted on the frame **21** of an associated vehicle to be operated, a portion of which is shown, and including a handle **22**, an indicator arm **23** and a connector arm **24** which is pivotally connected by means of an associated linkage, a control rod **26** being shown, to the throttle plate **18**.

A throttle control panel or plate **28** is provided on the vehicle and is conventionally associated with the indicator arm **23** of the control lever **20** so that an operator of the vehicle may readily determine the direction in which to rotate the throttle control lever to achieve a particular engine speed, the control plate **28** having appropriate conventional markings thereon to indicate a high-speed, idle and shutoff position of the carburetor throttle valve.

Stop means **30** are provided on the indicator panel **28** to prevent inadvertent movement of the control lever **20** past a predetermined point corresponding to a throttle valve idle position and comprises a spring-loaded ball **30** positioned between the indicator plate **28** the vehicle frame **21** and an opening **31** in a position intermediate idle and shutoff position markings. The ball **30** is biased by a spring, not shown, away from the frame toward the plate **28** and has a portion thereof protruding from the opening **31** which is relatively smaller in diameter than the ball **30**. Thus, the ball **30** is yieldable in one direction between the plate **28** and the frame to act as a partial stop to rotation of indicator arm **23** and yet to permit override of the arm **23** as an operator moves the throttle control lever counterclockwise as viewed in the drawings from a high-speed position toward idle position. As should be clear, the spring loaded ball **30** does not completely stop movement of the indicator arm but is a sufficient stop or obstacle to rotation of lever **20** to give notice to the operator that idle position has been reached; thus, inadvertent movement of the control lever into shutoff position is prevented. When it is desired to move the throttle control lever **20** from idle position, FIG. 1, to shutoff position, FIG. 3, it is necessary merely to apply an additional amount of rotational force to the throttle control lever in a counterclockwise direction to overcome an associated spring, not shown, of the ball **30** to override the ball and to move the lever into the shutoff position.

The air shutoff device **10** includes first resilient means comprising a leaf spring **32** mounted on the throttle plate **18** to resiliently resist rotation of the throttle valve **14** beyond a predetermined point corresponding to an engine idle position to shutoff position. A leaf spring-adjusting screw **34** is mounted on the throttle plate **18** in a position adjacent the leaf spring **32** for adjustment of the leaf spring. Second resilient spring means cooperates with the control rod **26** to move the plate **18** in a counterclockwise direction as viewed in the drawing, and comprises a coil

spring 38 having one end 40 connected to the throttle plate 18 by means of a pin 41 mounted on plate 18, the spring 38 having a looped second end 42 connected to a first end 44 of control rod 26 which is connected to throttle control lever 20.

Throttle control rod 26 is pivotally connected at a second end 46 to the connector portion 24 of the throttle control lever 20, the other end 44 comprising a push pull portion extending transverse to the main portion of rod 26 and being adjustably slidably positioned within an elongated slot 48 provided in the throttle plate 18.

Leaf spring 32 is cantilevered radially outwardly from the throttle plate 18 and has a far end 50 which is adapted to contact a spring stop 52 on the carburetor 10, the spring stop 52 being adapted to contact the leaf spring 32 with valve 14 in a position corresponding to an engine idle position.

The manner in which the air shutoff device of the invention operates will now be explained. When it is desired to operate an associated carbureted engine, not shown, at a high-speed, control lever 20 is positioned with its indicator arm 23 at a clockwise end of the control plate 28 pointing to the high-speed marking, as in FIG. 2. In this position of the control lever, the throttle valve 14 is in a substantially vertical position within the throat 12 to permit relatively unrestricted movement of a fuel-air mixture upwardly in the throat, as indicated by the arrows in FIG. 2, to an associated intake manifold 13.

The elongated slot 48 has a left and right hand end, as viewed in FIGS. 1 and 3; and control rod 26 is moved adjacent the left hand end of the slot 48 to obtain a clockwise rotation of the throttle valve 14 about its center of rotation comprising shaft 16.

To run the engine in an idle position, the control lever 20 is rotated counterclockwise as viewed in the drawings to the position shown in FIG. 1 with the indicator arm 23 pointing to the idle marking on the control plate. The indicator arm 23 is stopped at the idle position by detent pin 30. In this position of the control lever, control rod 46 has been moved to the right, as viewed in the drawings, with its one end 44 at an intermediate position within the elongated slot 48, rod 26 being connected to throttle plate 18 by means of the spring 38 which biases throttle valve 14 and throttle plate 18 in a counterclockwise direction as indicated in FIG. 1 where valve 14 restricts the amount of fuel-air mixture flowing into the intake manifold 13.

Means are provided to ensure that the throttle valve 14 is in exactly the position desired for idling when indicator arm 23 is at idle position such means comprising spring stop 52 cooperating with leaf spring 32 which is relatively stronger than spring 38 to resist the action of coil spring 38 and rod 26 to completely shut off air movement to the intake manifold by moving the throttle valve to the position shown in FIG. 3.

Spring stop 52 encounters end 50 of leaf spring 32, resisting counterclockwise rotation of leaf spring 32 and the throttle valve 14 beyond idle position, FIG. 1. Adjustments of leaf spring 32 to secure exactly the correct position desired to obtain idling of the engine are effected by screw 34 which may be moved toward or away from leaf spring 32 into a greater or lesser contact with leaf spring to adjust the position of the leaf spring with respect to throttle plate 18.

When it is desired to completely shut off the engine, control lever 20 is moved in a counterclockwise direction to override the yieldable ball 30 and to obtain a shutoff position, FIG. 3. As should be clear from the illustration FIG. 1, control rod 26 is ineffective to completely close throtle valve 14 until the one rod end 44 encounters the left hand end of elongated slot 48. An exact positioning of the push pull portion 44 of the rod 26 within the elongated slot 48 to secure an idle position is not required since the rod end 44 may come to rest at any intermediate point within the elongated slot without danger of completely closing the valve 14, that is, moving valve 14 to completely shut off the throat 12. As the control lever 20 is moved to the shutoff position, the control rod 26 contacts the right hand end of the elongated slot 48 causing a positive mechanical connection between the throttle control plate and the control linkage. When the control rod 26 encounters the right hand end of the slot 48, it renders the coil spring ineffective. The force of the control rod urging the plate 18 to the right, in a counterclockwise direction as viewed in the drawing is relatively greater than the resisting force of leaf spring 32 against stop 52. This results in a bending of spring 32 as shown in FIG. 3 completely closing the throat 12 to any flow of air therethrough, thus eliminating any possibility of air being drawn into the intake manifold along with residual fuel in the carburetor resulting in a combustible air and fuel mixture and consequent engine run-on.

By means of the novel arrangement between leaf spring 32 and the coil spring connection of control rod 26 to the throttle plate, inadvertent shutoff of the engine when the throttle lever is placed in idle position is completely avoided. While other air shutoff devices depend to a great extent upon operator "feel" to distinguish between idle position and shutoff throttle position, the novel stop means of the present invention avoids this problem by giving ample notice to the operator when the throttle control lever is in idle position.

Since modifications of the details of the structure as illustrated are contemplated, the invention should be limited only by the scope of the appended claims.

What is claimed is:

1. In an internal combustion engine having an engine fuel and air induction system including a carburetor and an intake manifold, said carburetor having a throat communicatively connected to said intake manifold, a rotatable throttle valve in said throat to restrict the flow of air therethrough, a control arrangement for said valve comprising: a throttle plate rotatably mounted on said carburetor and connected to said throttle valve to rotate said throttle valve; second resilient means being connected between said throttle plate and an associated throttle control lever, said resilient means being adapted to rotate said throttle plate and said associated throttle valve in a first direction tending to close said valve with a predetermined force upon rotation of said control lever in said first direction; first resilient means being mounted on said throttle plate and being adapted to resist movement of said throttle valve in said first direction from an idle position to a completely closed position with a predetermined biasing force relatively greater than the force of said second resilient means; and means to render the first resilient spring means ineffective at a predetermined position of opposition to said second resilient means to completely close said throat to a flow of air and fuel therethrough.

2. In an internal combustion engine having a carburetor, said carburetor having a combustion air outlet line and a throttle valve rotatably mounted in said line and including control means to rotate said throttle valve; an air shutoff device in combination therewith comprising first resilient means arranged to oppose the rotation of said throttle valve in a first direction from a predetermined point corresponding to an idle position of said engine toward a second position of said valve completely closing off said air outlet line; second resilient means to move said valve in said first direction from a fully open position to an idling position and thence to a shutoff position; and control means cooperating with said second resilient means and arranged to render the second resilient means ineffective at a predetermined position of opposition with respect to said first resilient means, said control means having a force relatively greater than said first resilient means to overcome said first resilient means and to move said throttle valve into a completely closed position.

3. An air shutoff device for an associated carbureted

engine having an intake manifold to receive mixtures of air and fuel, said engine having a carburetor having an air and fuel outlet line communicatively connected to said intake manifold, a throttle valve being rotatably mounted in said outlet line, said shutoff device comprising; control means for rotating said throttle valve between a fully opened position and a fully closed position; stops means for preventing inadvertent movement of said control means past a predetermined point corresponding to an idle position of said valve; first resilient means in contact between said carburetor and said control means to resist rotational movement of said throttle valve in a first direction from said valve open position toward said valve closed position beyond a predetermined idle position of said throttle valve, said first resilient means having a predetermined biasing force; second resilient means acting in opposition to said first resilient means and tending to maintain said throttle valve in idle position for a predetermined range of movement of said control means, said second resilient means being relatively weaker than said first resilient means; and means connected to said control means to render said second resilient means ineffective at a predetermined position of said control means between a valve idle position and a valve closed position, whereupon said control means overcomes said first resilient means upon movement of said control means in said first direction past said stop means effecting rotation of said valve to a closed position to prevent the flow of air to said intake manifold.

4. In an internal combustion engine having a combustion air line, a butterfly valve rotatably mounted in said line for movement between an open position and a closed position, a throttle plate connected to said valve to rotate said valve, the improvement of control means for rotating said plate comprising: control lever means yieldably connected to said plate, said plate having an elongated slot therein having first and second ends, said control lever means having a push pull end being slidably positioned within said slot; second resilient means having first and second ends and being connected at said first end to said plate and being connected at said second end to said push pull end to resist movement of said control lever means in a first direction as said push pull end moves toward said second end of said slot between a valve open position and a valve closed position; said push pull end being adapted by application of rotational force to said control lever means to rotate said throttle plate and said throttle valve to a completely open position upon contacting said first end of said slot and being adapted to completely close said throttle valve upon contacting said second end of said slot; first resilient means mounted on said throttle plate to resist rotation, beyond a predetermined point corresponding to an idling position of said engine, of said throttle plate and throttle valve as said throttle valve is rotated toward a closed position; means connected to said throttle plate to adjust the relative position at which said first resilient means will oppose rotation of said throttle plate and throttle valve toward said closed position; yieldable stop means adapted to resist movement of said control lever means beyond a predetermined point corresponding to an idling position of said engine, said control lever means being

adapted to override said yieldable stop means by application of an additional amount of rotational force, said push pull end being adapted upon further movement of said control lever means in said first direction to render said first resilient means ineffective and to overcome said first resilient means to completely close said throttle valve.

5. An air shutoff device for an associated carburetor, said carburetor including an air and fuel mixture line and a throttle valve rotatably mounted in said line, said air shutoff device comprising: a throttle plate rotatably mounted on said carburetor and being connected to said throttle valve for rotation of said throttle valve within said line, said throttle plate having an elongated slot therein having first and second ends; a leaf spring mounted on said throttle plate and having a free end extending radially outwardly from said throttle plate with respect to a center of rotation of said throttle plate; adjusting means secured to said throttle plate being adapted to adjust the position of said leaf spring relative to said throttle plate; stop means secured to said carburetor and being in line with said leaf spring, said stop means being adapted to encounter said leaf spring at a predetermined rotational position of said plate corresponding to an idle position of said throttle valve; throttle control means connected to said plate to rotate said throttle plate and said throttle valve connected thereto including throttle control linkage having a push pull end positioned within said elongated slot, said push pull end being adapted to encounter said first end of said elongated slot to move said throttle valve rotatably in a first direction corresponding to an open line position, said control linkage push pull end being adapted to move within said slot in a second direction toward said second end of said elongated slot to move said throttle valve toward a closed line position; a coil spring connected between said throttle plate and said push pull end of said control rod to oppose movement of said control linkage in said second direction, said coil spring being relatively weaker than said leaf spring; said control linkage push pull end rendering said leaf spring ineffective when said push pull end encounters said second end of said elongated slot, whereupon further movement of said linkage in said second direction overcomes said leaf spring, bending said leaf spring against its stop to completely close said air and fuel mixture line.

6. The control device of claim 1 including means to adjust the position and biasing force of said first resilient means to adjust the relative position of said throttle valve with respect to the position of said control lever to effect idle and closed position of said valve.

References Cited

UNITED STATES PATENTS

1,428,812	9/1922	Simon	251—279 X
1,519,517	12/1924	Thayer	251—279 X
1,628,506	5/1927	Lyman	251—243 X
2,065,167	12/1936	Wirth et al.	251—78
2,323,737	7/1943	Tritle	251—279 X
2,428,708	10/1947	Heftler	251—279 X
2,753,148	7/1956	Oetiker	251—288 X

M. CARY NELSON, *Primary Examiner.*

R. C. MILLER, *Assistant Examiner.*