Jan. 1, 1946. A. WEISS ET AL 2,392,207

METHOD AND MEANS FOR SAVING FUEL IN INTERNAL-COMBUSTION ENGINES

Filed Jan. 15, 1943 2 Sheets-Sheet 1

Fig. 1.

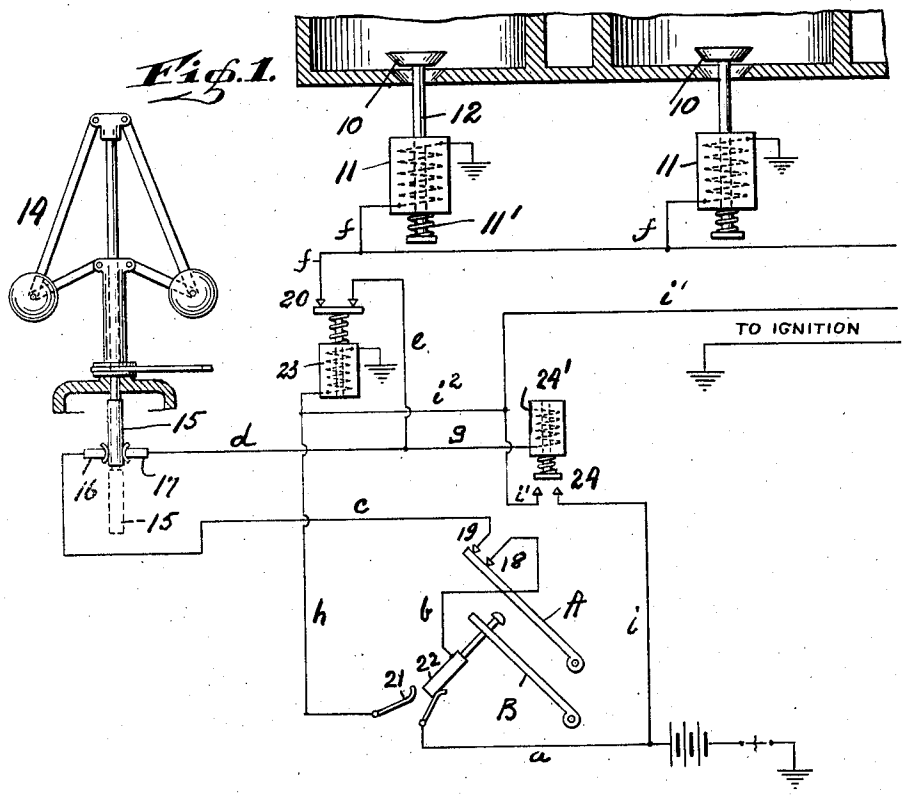


Fig. 3.

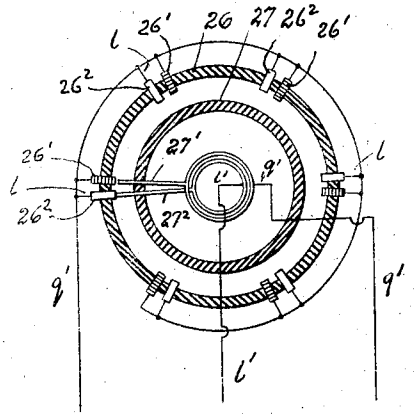
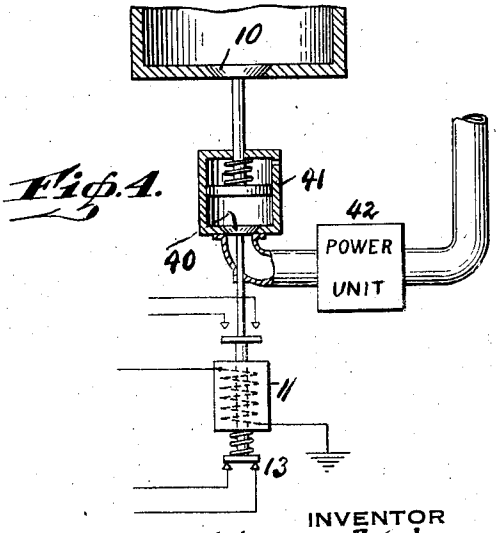


Fig. 4.



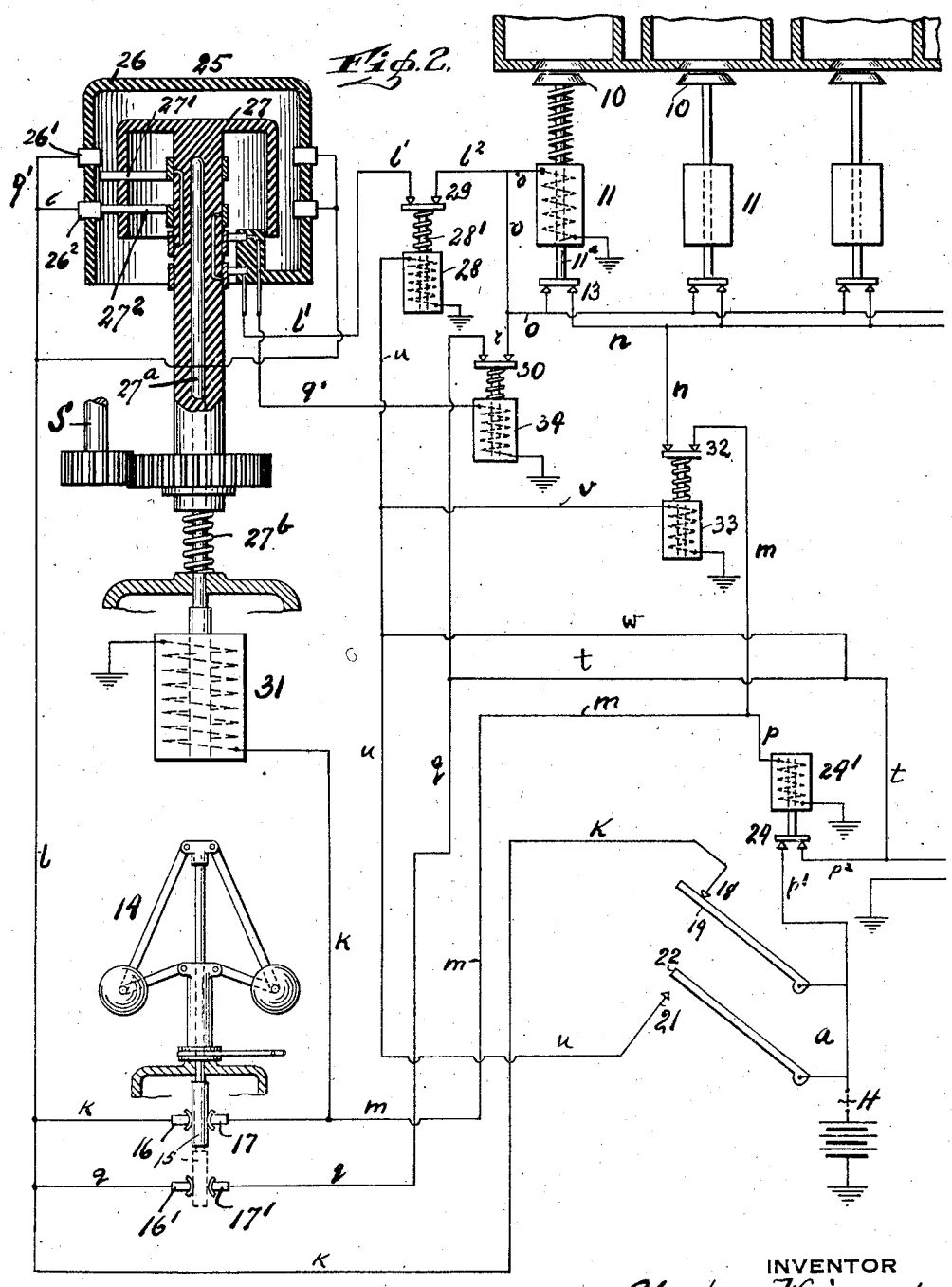
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METHOD AND MEANS FOR SAVING FUEL IN INTERNAL-COMBUSTION ENGINES

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Fig. 2.



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METHOD AND MEANS FOR SAVING FUEL IN INTERNAL-COMBUSTION ENGINES

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Application January 15, 1943, Serial No. 472,534

10 Claims. (Cl. 123—97)

This invention relates to internal combustion engines of motor vehicles.

When driving on smooth roads or downhill the vehicle may be allowed to run by its own momentum after acquiring some speed. Free wheeling hitherto used for this purpose has not proved very practical and is in fact just as objectionable as is the depression of the clutch, for the reason that when the wheels are free the vehicle has the tendency to sway and easily skids. On the other hand, to have the vehicle run by its own momentum by merely cutting off the ignition has the disadvantage that the braking action during the regular strokes of the pistons tends to cut short the momentum so that by such method there is hardly any saving of fuel. Such methods are also objectionable because of the necessity to repeatedly turn on and off the ignition or operation of the clutch pedal.

The object of our invention is to provide a new method and means whereby when the vehicle or engine acquires a certain speed the operation of the engine may be automatically rendered ineffective and the braking effect of the pistons eliminated permitting, thereby, the vehicle to run by its own momentum for considerable distances until the speed of the vehicle or engine reaches a certain low, and thus affording a considerable saving of fuel.

Another object is to provide a new method and means whereby the rendering of the engine ineffective will be made to occur on the release of the accelerator, automatically, at the beginning of or during the regular exhaust or timed periods and when the speed of the vehicle or engine reaches a certain low the engine will be automatically rendered again effective at the end or during the timed periods, so that the changing from effective to ineffective operation and vice versa of the engine will take place without causing any shocks or jars.

Our invention also has other objects in view which will be clear from the following detailed description thereof.

To accomplish our objects our new method consists in that when the vehicle acquires a certain speed, the accelerator pedal is released and either one of the regular valves in each cylinder or a special valve provided therein will be opened automatically and kept open as long as the vehicle continues to run by its own momentum, so that while the pistons continue to perform their regular strokes no pressure will be created in the cylinders that will tend to reduce the momentum and when the speed of the vehicle or engine reaches a certain low said valves will automatically close at the end or during the timed periods.

The novel means employed by us to carry out this new method include electric means for actuating said valves, a speed controlled switch mechanism, adapted at high speed and when the accelerator is released, to close an electric circuit which will cause said electric means to open said valves and retain them open until the speed falls to a certain low and means for automatically closing said valves.

For the purpose of timing the opening and closing of said valves in the different cylinders so that the same shall occur during the exhaust periods, we provide in conjuction with the speed controlled switch mechanism, a distributor-like make and break mechanism impelled from the regular timing mechanism of the engine.

To make our invention more clear the same is illustrated in the accompanying drawings in which similar reference characters denote corresponding parts and in which

Fig. 1 is a diagrammatic view of our novel means constituting the subject of our invention;

Fig. 2 is a diagrammatic view of a modified form thereof;

Fig. 3 is a cross sectional view of detail of the modification shown in Fig. 2 and

Fig. 4 is a sectional view of another modified detail.

10 denotes a valve in each cylinder of an internal combustion engine. This valve may be any one of the already existing valves, or may be an auxiliary valve provided for the purpose of this invention. If such auxiliary valve is used, it is adapted to be normally closed under action of a spring 11¹ or otherwise, and to be automatically opened by suitable electric means, such as the armature 12 of solenoid 11.

14 denotes a speed controlled mechanism, such as a governor controlled switch, whose contact piece 15 is adapted to bridge contact points 16, 17 while the vehicle or engine is running within certain limits of speed.

One of the contact points, say 16, may be electrically connected to a manual switch 18, 19 which may be actuated from the accelerator pedal A and which is adapted to be closed when the accelerator is in released position, as shown. The other contact point 17 may be electrically connected to the solenoid 11 through a normally closed switch 20.

This switch 20 is actuated by the spring controlled armature of a solenoid 23 which when

energized will cause said switch to open. Solenoid 23 will be energized by closing a manual switch 21, 22 which may be actuated from the brake pedal B or a knob (not shown) conveniently located near said pedal.

Simultaneously with the closing of the speed controlled switch 15, 16, 17 the ignition may be automatically shut off, and upon the opening of switches 15, 16, 17 and closing of the manual switches 21, 22 the ignition may be automatically restored. This may be effected by means of a solenoid 24^1 whose armature controls a switch 24 as will be hereinafter shown.

The operation is as follows:

When the accelerator pedal A is released closing switch 18, 19 while the vehicle or engine has acquired a certain speed, the switch 15, 16, 17 controlled by governor or other speed controlled mechanism 14 is automatically closed. The battery circuit through wires *a*, *b*, *c*, *d*, *e*, closed switch 20, and wire *f* energizes solenoids 11, whose armatures 12 when attracted against its spring force 11' will open valves 10 of the cylinders. At the same time another branch of the battery circuit through wire *g* energizes the solenoid 24', causing switch 24 to open and thereby automatically shut off the ignition, through wires *i*, *i'*.

When the low limit of speed has been reached, the speed controlled switch 15, 16, 17 automatically opens as a result of which the solenoids 11, and 24' become disenergized so that the valves 10 are permitted to close and the ignition restored, rendering the engine again effective, and the speed of the vehicle may now be increased by actuating the accelerator pedal A.

If, for some reason, it is desired to render the engine effective while the vehicle is running under its own momentum at sufficiently high speed, as for instance when driving down a steep hill or on a wet road, and thereby afford an additional braking action on the wheels by the compression strokes of the pistons, the manual switch 21, 22 may be closed. As a result thereof, the battery circuit through wire *h* will energize solenoid 23 causing switch 20 to open so that the solenoid 11 will be disenergized permitting the valves 10 to close. At the same time another branch of the battery circuit through wire i^2 will restore the ignition.

In the modification according to Fig. 2 the opening and closing of the valves 10 are adapted to be effected automatically only during the timed periods in the different cylinders.

To this end we provide, in addition to the speed controlled switch, a number of relays or solenoids controlled switches and a distributor like make and break mechanism 25. This mechanism may be composed of a stationary hollow body 26 and a longitudinally slidable revolving body 27 telescoping in said hollow body 26. This hollow body 26 bears on its circumference, two annular rows of insulated contacts, one pair of contact points 26', 26^2 for each cylinder (Fig. 3).

The rotary body 27 is slidably mounted on a central spindle 27^a which is impelled from the timing shaft S of the engine and bears two vertically superposed insulated brushes 27', 27^2 which during rotation of the body 27 are adapted to consecutively cooperate with the contacts 26', 26^2 respectively of each cylinder and make and break certain battery circuits as will be hereinafter described. The spindle 27^a of the body 27 under action of spring 27^b is adapted to normally be elevated so that the brush 27' is level with the contacts 26'. It is also connected with or part of the armature of a solenoid 31 which when energized, as will be hereinafter described, will cause the spindle and consequently the body 27 to slide downwardly so as to bring the brush 27^2 in alignment with contacts 26^2.

14 denotes the speed controlled switch mechanism, similar to that shown in Fig. 1, adapted to control with its bridging contact 15 two sets of contacts 16, 17 and 16', 17' according to the speed. Contact point 16 of the set 16, 17 is electrically connected to switch 18, 19 controlled from the accelerator pedal and to all contact points 26', 26^2 of body 26. The other contact 17 of said set is electrically connected to solenoid 31.

Of the other set of contacts 16', 17' one contact point 16' is also electrically connected to manual switch 18, 19 and also to all the contacts 26', 26^2 of the body 26 of the distributor mechanism 25. The other connections will be apparent from this operation of the device which is as follows:

When a hand switch H is open, the engine operates normally.

When it is desired to save fuel and run the vehicle at its own momentum, after it acquires a certain speed, then on closing switch H, releasing accelerator pedal A, thereby closing manual switch 18, 19, the speed actuated switch 15, 16, 17 will close. One battery circuit will flow along wires *a*, *k* and energize solenoid 31. The spring actuated armature of this solenoid will cause the body 27 to be longitudinally displaced within the body 26, so that the brush 27^2 will be on the same level with the circular row of contacts 26^2 on the body 26.

The timing of the make and break mechanism is such that contacts 26^2, 27^2 for the different cylinders will close at the beginning of or during the timed periods in the different cylinders and the contacts 26', 27' will close at the end of said timed periods.

A second battery circuit will then flow through wires *l*, contacts 26^2, 27^2, wire *l'*, closed switch 29, wire l^2 to solenoids 11. When the solenoids 11 are energized their armatures 11^a will open the valves 10 and at the same time close switches 13, so that a third branch of the battery circuit may now flow along wire *m*, closed switch 32, wire *n*, closed switch 13 and wire *o* to continue to feed the solenoids 11 so as to maintain the valves 10 open as long as the vehicle or engine continues to run with a certain speed. At the same time another branch of the battery circuit flowing through wire *p*, energizes solenoid 24' which shuts off the ignition by opening switch 24 between wires *p'*, p^2.

Now when the momentum has decreased to a certain low, the speed actuated switch 14 closes contacts 15, 16', 17' after opening contacts 16, 17. At that instant the battery circuit through solenoid 31 will be broken, disenergizing the latter and permitting body 27 to move back under its spring force to the position in which contacts 26' and contact 27' are brought to the same level and ready to close the circuits therethrough successively as the body 27 rotates. As a result thereof the battery circuit will flow through wire *q'* contacts 26', 27' to energize a solenoid 34, whose armature will open switch 30 just at the instant contacts between brush 27^2 and contacts 26^2 have been made. In the meantime another branch of said circuit will flow along wire *q*, switch 30, wires *z*, *o* to solenoids 11 holding them energized until the regular timed periods. When

the solenoids 11 are disenergized the valves 10 will close. At the same time a fourth battery circuit through wire *t* will restore ignition.

If for any reason it is desired to close the valves 10 while the vehicle is still running under its momentum with sufficient speed, the manual switch 21, 22 is closed. One battery circuit will then flow along wire *u*, to solenoid 28, another through wire *v* to solenoid 33 and a third through wire *w* to ignition. The solenoids 28, 33 will be energized and as a result thereof, open switches 29 and 32, permitting the valves 10 to close. At the same time the circuit through wire *w* will restore ignition.

In Figure 4 I have shown a modification in which the solenoid 11, actuates a valve 40, of a hydraulic or pneumatic compressor 41 or the like suitably connected to a power unit 42.

It is understood that various other modifications may be made in the construction of our device without departing from the principle of our invention. We, therefore, do not wish to limit ourselves to the details described and shown.

What we claim is:

1. A method of controlling the operation of an internal combustion engine, consisting in that when the engine acquires a certain speed, the fuel feed control is interrupted and the engine rendered ineffective by automatically causing the opening of a valve and simultaneously cutting out ignition, so that the engine may continue to run by its acquired momentum, and when the speed of the engine reaches a certain low limit said valve automatically is caused to close and the ignition is restored, thereby rendering the engine again effective.

2. In an internal combustion engine having manual fuel feed control means, means for enabling the engine to freely run by its acquired momentum and thereby reduce the consumption of fuel, comprising a valve in its cylinder, speed controlled means and means simultaneously actuated by said fuel feed control means and said speed controlled means to automatically open said valve and render the operation of said engine ineffective upon the release of said fuel feed means and the instant engine acquires a certain speed, and means for automatically closing said valve when the speed of the engine reaches a certain low limit and thereby render the operation of said engine again effective.

3. In an internal combustion engine having manual fuel feed control means, of means for enabling the engine to freely run by its acquired momentum and thereby reduce the consumption of fuel, comprising a valve in its cylinder, speed controlled means, means simultaneously actuated by said fuel feed control means and said speed controlled means to automatically cause the opening of said valve, so as to render the operation of said engine ineffective, means for causing the opening of said valve to occur during a timed period in said engine and means for automatically causing the closing of said valve when the speed of the engine reaches a certain low limit and thereby render the operation of the engine again effective.

4. In an internal combustion engine according to claim 3 in which there are also provided means for automatically cutting out ignition simultaneously with the opening of said valve and means for automatically restoring said ignition simultaneously with the closing of said valve.

5. In an internal combustion engine having an accelerator means, a valve in the cylinder of said engine, means for automatically causing the opening of said valve and thereby render the operation of said engine ineffective when the engine reaches a certain high speed, said means including an electric circuit, an accelerator controlled switch and a speed controlled switch for said circuit, and means for automatically causing the closing of said valve and render the operation of said engine again effective when said circuit is broken through the opening of said second switch.

6. In an internal combustion engine according to claim 5 in which the means for opening said valve also include an electric make and break mechanism and timing means for operating said mechanism, so as to cause the opening and closing of said valve during a timed period of said engine.

7. In an internal combustion engine according to claim 5 in which the means for opening said valve also include a manual switch to control said electric means so as to cause the automatic closing of said valve before the lower speed limit is reached.

8. In an internal combustion engine according to claim 5 in which the means for opening said valve include a solenoid.

9. In an internal combustion engine according to claim 5 in which the means for opening said valve include a fluid compressor and means for controlling said compressor.

10. The method of controlling the operation of an internal combustion engine for a motor vehicle consisting in that when said engine acquires a certain speed, the accelerator pedal is released and said engine automatically rendered ineffective by causing the opening of a valve, so that said engine may continue to run by its acquired momentum and when the speed of the engine reaches a certain low limit, said valve is automatically caused to close to render the engine again effective, the opening and closing of said valve occurring at timed periods.

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