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COMBINED AIR VALVE AND FUEL PUMP FOR INTERNAL COMBUSTION ENGINES

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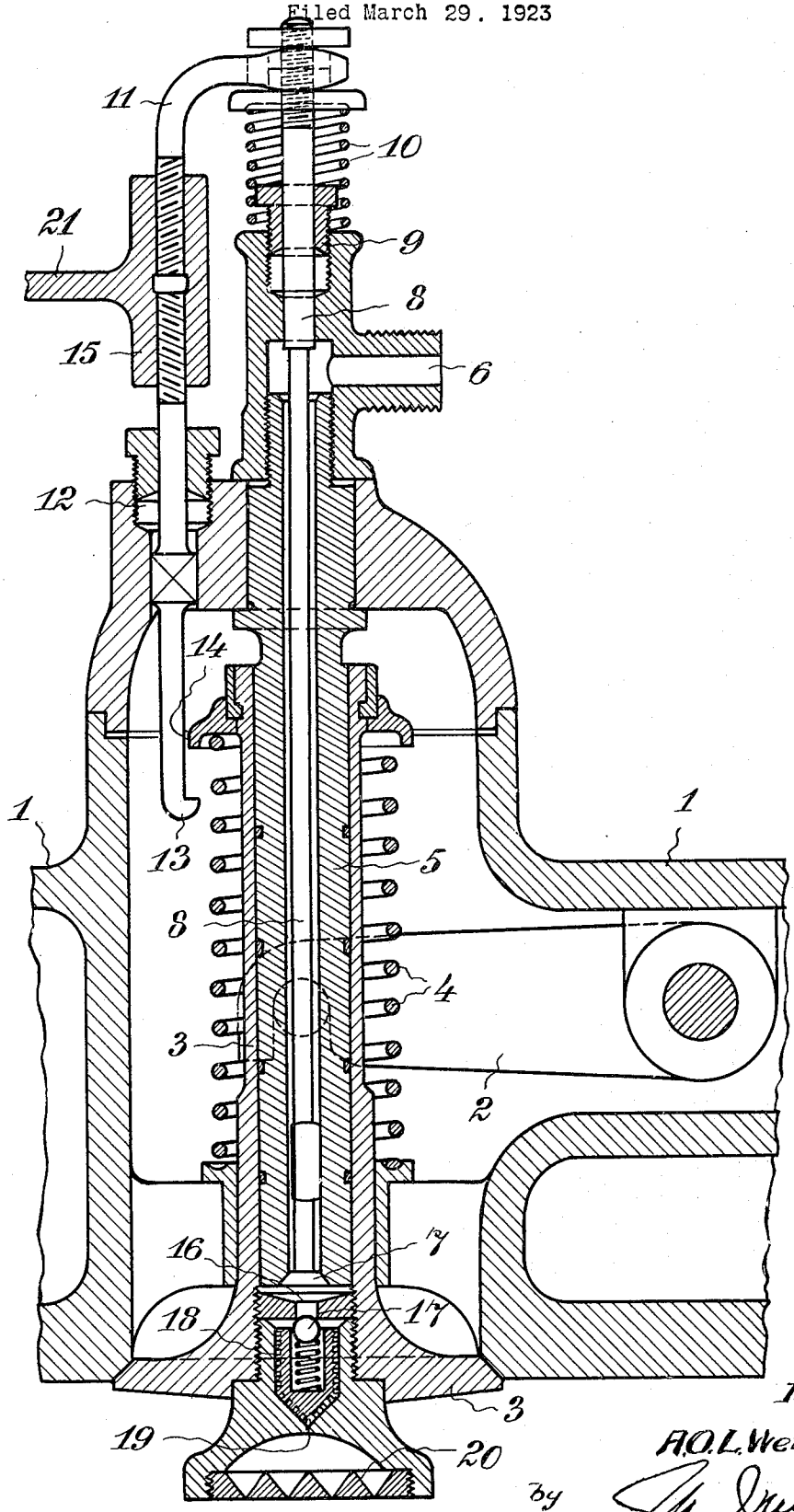

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COMBINED AIR VALVE AND FUEL PUMP FOR INTERNAL-COMBUSTION ENGINES.

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To all whom it may concern:

Be it known that I, ARTHUR OSKAR LEONARD WENNERBY, a citizen of the Kingdom of Sweden, and residing at Halmstad, in the county of Halland, Kingdom of Sweden, have invented a new and useful Combined Air Valve and Fuel Pump for Internal-Combustion Engines, of which the following is a specification.

My invention relates to a combined air valve and fuel pump arrangement for use in internal combustion engines provided within the hollow cylinder cover with a chamber for compressed air needed for the combustion and for scavenging of the engine cylinder or cylinders and wherein the air valve or valves arranged within said hollow cylinder cover are each placed coaxially around an inlet pipe for the fuel and slidable lengthwise in relation thereto. The invention is characterized substantially by the fact that a mechanism for controlling an air valve, which mechanism preferably but not necessarily is placed within the hollow cylinder cover, is used also for driving and controlling a corresponding fuel pump coacting with the air valve in a manner to be more fully described below.

The invention is illustrated in the accompanying drawing, which shows the cylinder cover forming a chamber for compressed air and the combined air valve and fuel pump arranged therein in longitudinal section.

Referring to the drawing the numeral 1 represents the cylinder cover, a fraction of which is shown in the drawing only, said cylinder cover being hollow and forming a chamber for compressed air, and 2 represents an oscillating lever which positively opens the air valve 3 said valve being carried back into its closing position by means of a spring 4. The air valve is carried out in the shape of a sleeve slidably arranged around a spindle 5 fixed to the cylinder cover and forming as well a tubular inlet member for the fuel entering through the fitting 6 as a plunger belonging to the fuel pump, the sleeve shaped air valve forming the slidable cylinder of said pump. At the end of the spindle 5 facing the engine cylinder (not shown) is arranged a fuel valve 7, the spindle 8 of which extends through the cylinder cover 1 to the outside thereof and is tightened against the same by means of a packing box 9. The valve 7 is normally kept closed by means of a spring 10 arranged outside of the cylinder cover and acting upon the spindle 8. The outer end of said spindle is adjustably connected with a rod 11, which through a packing box 12 extends into the hollow cylinder cover 1 substantially parallel with the axis of the air valve, said rod being at the inner end, i. e. within the cylinder cover, provided with an abutment 13. A corresponding abutment 14 is arranged on the sleeve shaped air valve 3 and the rod 11 is divided in two parts connected to each other by means of a right and lefthand threaded sleeve nut 15, by means of which the relative distance between the abutments 13 and 14 will be adjustable. Beneath the valve 7 a valve seat 16 for a ball valve 17 is arranged within the sleeve shaped air valve 3. The valve 17 is adapted to be closed in a direction opposite to that of the valve 7 by means of a spring and rests within a sprayer bushing 18, which is provided with outside spiral grooves and coacts with an inlet opening 19, through which the fuel is ejected against the carburettor grate 20 and through the same into the engine cylinder.

The working of the arrangement is as follows:

When the air valve 3 is opened by means of the lever 2 at the periodically repeated oscillations of the same a fuel chamber is formed between the inner end of the fixed spindle 5 and the seat 16 and when the abutment 14, at the opening movement of the valve 3, strikes the abutment 14 the valve 7 is opened and the fuel is permitted to flow into the chamber described above. During the closing movement of the air valve 3, which movement is effected by means of the spring 4, the abutments 13 and 14 are first carried apart so that the valve 7 becomes closed. As the valve 3 is moving further towards closing position, which movement takes place very rapidly, the fixed spindle 5 acts as a plunger and presses the fuel from the chamber referred to above through the valve 17 to the sprayer 18 and the carburettor grate 20 and finally into the engine cylinder.

It will be obvious that the period of time, during which the valve 7 is kept open, determines the quantity of fuel injected during each stroke of the fuel pump and that the length of said period of time is determined by the distance between the abut-

ments 13 and 14. By means of the sleeve nut 15 said distance may be varied and thus the quantity of fuel fed into the engine cylinder as well as the amount of effective power generated by the engine and the speed of the same may be controlled simply by turning the nut 15.

The particulars shown in the drawing but not referred to in the foregoing description are without influence upon the invention, and it will be obvious that the invention also with regard to described particulars may be varied within certain limits, since the main feature is only the coaction between the valves 3 and 7 effected by means of the abutments 13 and 14.

If desired, the nut 15 may be provided with a lever 21, which may be connected with a governor driven by the combustion engine for the purpose of automatically controlling the quantity of fuel injected and for maintaining a substantially constant speed of the engine at different loads on the same.

The manner of and arrangements used for the opening and closing of the air valve 3 are without influence upon the invention and may be effected in many different ways. The controlling mechanism for said valve needs not necessarily be located within the hollow cylinder cover, but the valve may as well be extended outside of the same and the control may be effected by suitable outside means. Further it is not necessary to use a sleeve nut or the like for shortening and lengthening the rod 11 and thereby for controlling the quantity of fuel injected, since other mechanical means acting in the same manner may also be used for the same purpose and the main point is that such means shall be able to vary the distance between the abutments 13 and 14 only. The spraying arrangement 18, 19 and the carburettor grate 20 may also be carried out in various modifications without influence upon the invention. Thus the invention is not limited to the embodiment thereof shown in the accompanying drawing.

What I claim is:—

1. Combined air valve and fuel pump arrangement for internal combustion engines having a hollow cylinder cover forming a chamber for compressed air, comprising for each cylinder of the engine a fuel inlet pipe fixed within the hollow cylinder cover, a sleeve shaped air valve arranged coaxially around said fuel pipe slidably lengthwise in relation thereto and thereby acting as a fuel pump, means for opening and closing said air valve in correct timing with regard to the strokes of the engine, a fuel valve provided at the inner end of the fuel inlet pipe facing the engine cylinder and controlling means interposed between the fuel valve and the air valve so that the former is controlled in correct timing in relation to the latter.

2. Combined air valve and fuel pump arrangement for internal combustion engines having a hollow cylinder cover forming an air chamber, comprising for each cylinder of the engine a fuel inlet pipe fixed within the hollow cylinder cover, a sleeve shaped air valve arranged coaxially around said fuel pipe slidably lengthwise in relation thereto and thereby acting as a fuel pump, said air valve being combined with suitable means for opening and closing of the same in correct timing with regard to the strokes of the engine, a fuel valve provided at the inner end of the fuel inlet pipe facing the engine cylinder and normally closing said inlet pipe, controlling means combined with the air valve and positively coacting with corresponding controlling means combined with the fuel valve in such a manner that the latter is opened by the former near the end of its opening movement and that the fuel valve is closed during the beginning of the closing movement of the air valve and kept closed during the latter part of the same.

3. Combined air valve and fuel pump arrangement for internal combustion engines having a hollow cylinder cover forming an air chamber, comprising for each cylinder of the engine a fuel inlet pipe fixed within the hollow cylinder cover, a sleeve shaped air valve arranged coaxially around said fuel pipe slidably lengthwise in relation thereto and thereby acting as a fuel pump, said air valve being combined with suitable means for opening and closing the same in correct timing with regard to the strokes of the engine, a fuel valve provided at the inner end of the fuel inlet pipe facing the engine cylinder and normally closing said inlet pipe, a spindle connected with said fuel valve and extending outside of the cylinder cover, a rod affixed to said fuel valve spindle and intruding into the cylinder cover substantially parallel to the axis of the air valve, an abutment affixed to the inner end of said rod inside of the hollow cylinder cover and another abutment affixed to the air valve and coacting with the first mentioned abutment for opening the fuel valve in correct timing in relation to the air valve.

4. Combined air valve and fuel pump arrangement for internal combustion engines having a hollow cylinder cover forming an air chamber, comprising for each cylinder of the engine a fuel inlet pipe fixed within the hollow cylinder cover, a sleeve shaped air valve arranged coaxially around said fuel pipe slidably lengthwise in relation thereto and thereby acting as a fuel pump, means for opening and closing said air valve in correct timing with regard to the strokes of the engine, a fuel valve provided

at the inner end of the fuel inlet pipe facing the engine cylinder, a second fuel valve arranged within the hollow air valve nearer to the engine cylinder than the first mentioned fuel valve and opening in the opposite direction, and controlling means interposed between the said first mentioned fuel valve and the air valve for controlling the former in correct timing in relation to the latter.

5. Combined air valve and fuel pump arrangement for internal combustion engines having a hollow cylinder cover forming an air chamber, comprising for each engine cylinder a fuel inlet pipe fixed within the hollow cylinder cover, a sleeve shaped air valve arranged coaxially around said fuel pipe slidably lengthwise in relation thereto and thereby acting as a fuel pump, means for opening and closing said air valve in correct timing with regard to the strokes of the engine, a fuel valve provided at the inner end of the fuel inlet pipe facing the engine cylinder and normally closing said inlet pipe, a spindle connected with said fuel valve and extending outside of the cylinder cover, a rod adjustably affixed to said fuel valve spindle and intruding into the cylinder cover substantially parallel to the axis of the air valve, said rod being divided in parts, which are adjustable lengthwise in relation to each other, an abutment arranged on the inner end of said rod inside the hollow cylinder cover, and another abutment arranged on the sleeve of the air valve and coacting with the firstmentioned abutment for controlling the fuel valve in correct timing in relation to the air valve.

6. Combined air valve and fuel pump arrangement for internal combustion engines having a hollow cylinder cover forming an air chamber, comprising for each cylinder of the engine a fuel inlet pipe fixed within the hollow cylinder cover, a sleeve shaped air valve arranged coaxilly around said fuel pipe slidably lengthwise in relation thereto and thereby acting as a fuel pump, controlling means arranged within the hollow cylinder cover for the purpose of opening and closing the air valve in correct timing with regard to the strokes of the engine, a fuel valve provided at the inner end of the fuel inlet pipe facing the engine cylinder, a second fuel valve arranged within the sleeve shaped air valve nearer to the engine cylinder than the firstmentioned fuel valve and opening in the opposite direction, a spindle connected with the first mentioned fuel valve and extending outside of the cylinder cover, a rod adjustably affixed to said spindle and intruding within the hollow cylinder cover substantially parallel to the axis of the air valve, said rod being divided in two parts, which are adjustable lengthwise in relation to each other, an abutment arranged on the inner end of said rod inside the hollow cylinder cover, and another abutment arranged on the sleeve of the air valve and coacting with the firstmentioned abutment for controlling the firstmentioned fuel valve in correct timing in relation to the air valve.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR OSKAR LEONARD WENNERBY.

Witnesses:
G. PETERSSON,
ERIC ERICSON.