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2,469,271

OIL BURNER

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Fig. 1.

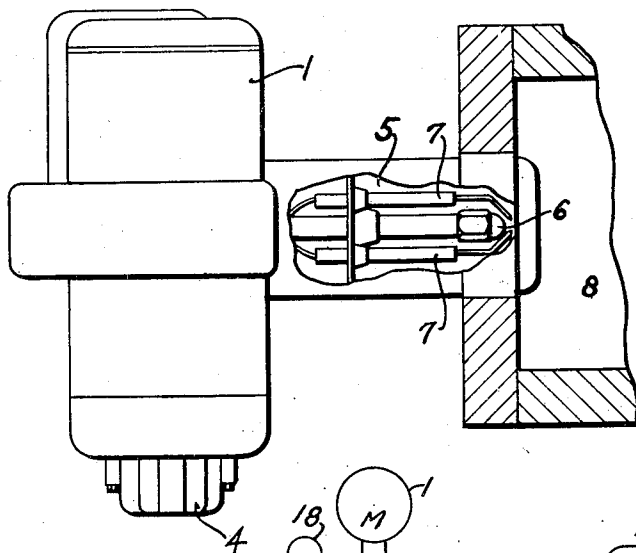


Fig. 2.

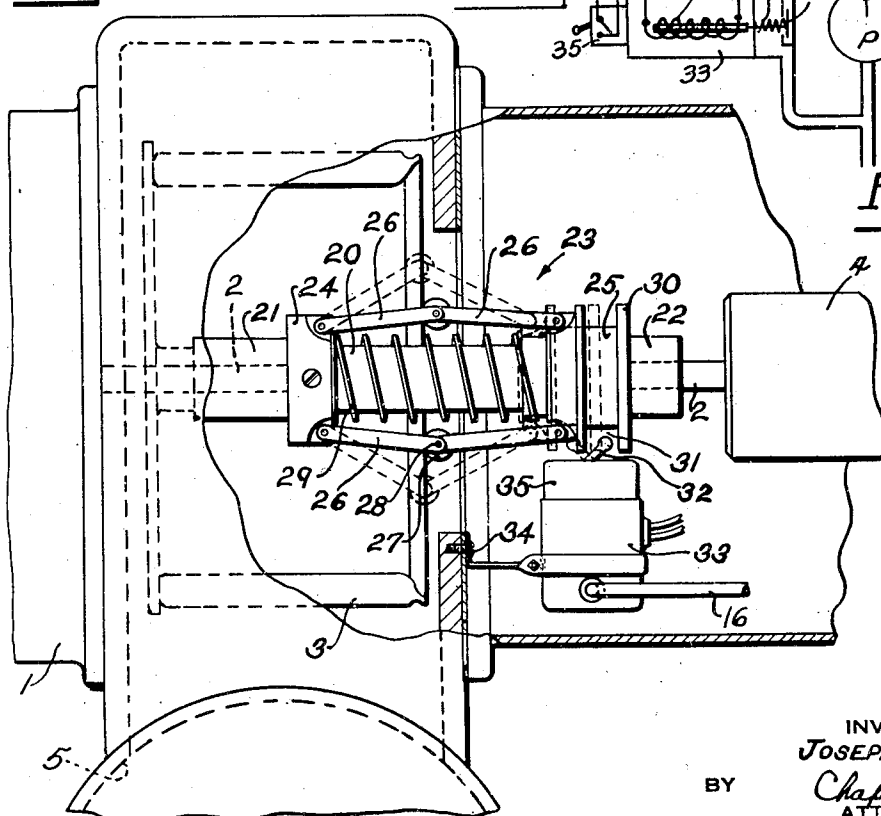
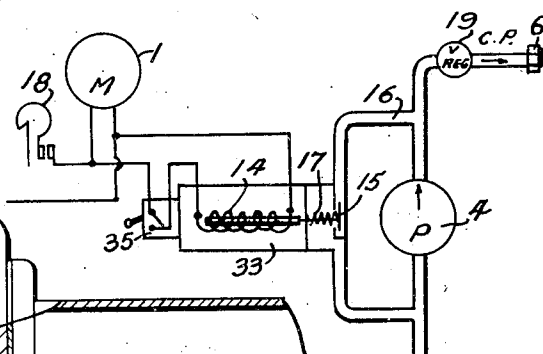


Fig. 3.



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OIL BURNER

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1 Claim. (Cl. 158—28)

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This invention relates to the automatic household type of oil pressure atomizing burner. Its purpose is to provide a new way for making the automatic burner run on an efficient air-oil ratio without smoking when it starts up and shuts down. It is not new to do this in other ways. An example of prior art is seen in my Patent No. 1,985,934 of 1935. The invention consists in the new way, involving new combinations of structure and modes of operation as will be explained.

Generally considered the automatic oil burner should be adjusted to get an air-oil ratio which will give most efficient operation during the long running heating periods. This is very well known. In many automatic oil burners it is not feasible with their equipment to use this knowledge. The difficulty is that in the short periods of starting and stopping, the burner smokes. It is not unusual to prevent this smoking by adjusting for excess air to favor said short periods of operation. When the automatic burner is thus adjusted, the long heating periods of operation have the ratio with excess air. This causes inefficient operation. My said patent shows one way to avoid the inefficient operation. The present application shows a new way.

The new way involves a centrifugal governor, a normally open by-pass conduit to unload the oil pump, and an electrically controlled valve means to close this by-pass conduit.

Referring now to the drawings:

Fig. 1 is a top view of the type of automatic oil burner in which the invention may be built or applied with accessory parts to practice the invention;

Fig. 2 is a detail view to indicate how the centrifugal element may be applied to a burner, and

Fig. 3 is a diagrammatic view to show the operation to be discussed for the combination in the arrangement of Fig. 2.

The arrangement of Figs. 1 and 2 indicates the burner parts, motor 1, shaft 2, fan 3, oil pump 4, air tube 5, atomizing nozzle 6, ignition means 7, and fire box 8. These parts will be readily understood in their general relation one to another.

Referring now to Fig. 2, this view, showing shaft 2 and fan 3, illustrates the centrifugal device or element for actuating a solenoid operated valve 33 in an oil by-pass conduit as will be later described in connection with Fig. 3.

Ordinarily the type of motor drive shaft 2 or transmission has a removable flexible coupling 20 with a collar 21 mounted on the "fan" section of shaft 2 and another collar 22 mounted on the

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"pump" section of shaft 2. As shown, there is mounted a centrifugal governor of a usual type (generally designated by numeral 23) on shaft 2. A collar 24 is fixed on collar 21 of the "fan" shaft and rotates therewith. Another collar 25, telescopically slidable on collar 22 of the "pump" shaft, is mounted thereon with two pairs of linked arms 26 joining the two collars 24 and 25. Weights 27 on the intermediate pivots 28 for the arms 26 and a spring 29, urging the slidable collar 25 away from fixed collar 24, complete a usual type of governor construction. The slidable collar 25 has spaced flanges 30 to form a groove 31 in which is positioned an end of a switch arm 32 for a solenoid switch 35. It will be obvious that the switch arm can be moved between an "off" and an "on" position as the governor moves from idle to full speed. The latter position is indicated in dotted lines. The solenoid valve 33 is attached to the fan casing as at 34.

As seen in Fig. 3, the solenoid switch 35 is connected to the circuit between a thermostat 18 and the motor 1. A valve 15 of solenoid 33 is located in a by-pass conduit 16 joining the pressure and suction sides of the pump 4. When the switch 35 is closed and a solenoid coil 14 energized, by-pass valve 15 is closed. The valve 15 is normally held open by a spring 17 around the valve stem arranged with spring bias to hold the valve open. The solenoid is strong enough to overcome this spring for a quick closure in the circumstances stated.

When the motor circuit is opened by the thermostat 18 indicated, or a relay controlled by such a thermostat, the solenoid coil 14 is de-energized and the spring 17 opens valve 15 instantly. The valve opening operation does not depend, as the valve closing operation does, upon the speed of the motor.

It will be obvious from Fig. 2 that the governor will turn the switch 35 to operative position only when a high speed condition of the governor is attained and not before. It can further be seen that the relation between the switch arm 32 and its operating flange 30 is such that the latter needs to reach its dotted line position before the switch is on. There will be lost motion in the operation indicated. It will be clear then that the solenoid is energized and acts to block off the by-pass 16 only after the motor 1 is energized by the thermostat and fan 3 has built up to full or substantially full motor speed.

On the shut down of burner operation: it will be seen that the instant the thermostat opens the motor circuit the solenoid valve is deener-

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gized. The return of the switch arm 32 to its "off" position is accomplished as the governor 23 idles to a position of rest on shaft 2. Thus arm 32 is cocked into position for the next starting operation.

From what has been said, it will be clear that the pump 4 is normally unloaded. It will not in unloaded condition put any pressure on the usual pressure regulating valve 19 to open the latter to the nozzle for delivering oil for burning. The oil delivery for burning can not start until the burner motor has started and in addition operated long enough to get up to high speed. In this motor starting period the fan is delivering air, which is the excess air wanted to start the air-oil burning operation without smoking. When this excess air is supplied to the ignition zone, without oil until the burner motor gets up to high speed, the excess air condition is being established. When the pump by-pass valve 15 is closed, the air condition is ready for the oil supply. The latter starts at its constant atomizing pressure, controlled by any usual automatic constant pressure regulating valve such as valve 19 in the line beyond the high side of the by-pass conduit described for the pump. It takes but a moment to start the flame. It starts under conditions of excess air in the air oil starting ratio. But very shortly after starting the oil supply catches up to the air supply. Being adjusted for the efficient operating ratio, the long running period will operate at such ratio although the starting period operation has a different ratio, with excess air to avoid smoking.

When the thermostat 18 shuts off the current to the motor the following operation takes place to avoid smoking in the short stopping period. As explained, the by-pass valve 15 opens to unload the pump the instant the motor current is shut off. This stops the oil delivery from the pump and removes pressure from the regulating valve 19. That valve closes without the possibility of intermittently opening in the stopping period, and oil for burning is effectively and instantly stopped. But there is to be considered a small amount of unburned oil which may be at or ooze to and out of the nozzle even though the pump is unloaded and the pressure regulating valve shut off. For such residual oil, the air supply continues after the oil shut-off has occurred at high speed. Thus there is excess air for burning such residual oil at the nozzle and without smoking. The excess air is supplied by the coasting of the fan between high speed motor operation at the instant of opening the motor circuit and the time when the motor comes to a full stop. The inertia of the parts will cause considerable coasting. If more is wanted in any case, the fan may have its parts weighted as a fly wheel, or the fan may be made with a free wheeling connection to its drive shaft. The latter has the

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advantage of taking off the friction factor of the unloaded oil pump. However, these items for increasing the fan coasting are not per se necessary to the invention as claimed. They are merely mentioned as known ways to increase coasting time when desirable in the practice of the invention as claimed.

As has been said, the combination disclosed is not the only way to get the operation indicated in the diagram of Fig. 3. It is a new and useful way with these advantages. The practice is simple, the parts are simple, the cost is low. All that is needed in making the combination in its preferred form is a governor device to actuate the switch of a single solenoid controlled valve in a pump by-pass conduit with the wiring as indicated. This can be added to a commercial form of automatic household burner to give the result wanted for the combination.

Having disclosed my invention and how to practice it, I claim:

An electrically operated automatic oil burner of the oil pressure atomizing type having a pressure atomizing nozzle, a pump for supplying oil under high pressure thereto, a conduit connecting the pump and the nozzle, a pressure regulating valve in said conduit, and in combination therewith an unloading by-pass for the pump, a self-opening spring pressed valve in said by-pass, a magnetic device adapted when energized to close said valve against its spring, a switch to energize said magnetic device, a fan to supply air, an air tube to conduct air from the fan to the nozzle, a motor for driving the fan and the pump, a driving transmission coupling said motor, fan and pump, a centrifugal governor mounted on said driving transmission, means on said governor to close said switch and energize said magnetic device when said governor reaches high speed operation, whereby said unloading by-pass will be closed and said pump will operate to deliver oil to said nozzle outlet only when said magnetic device is energized under conditions of high speed motor operation, all for the purpose described.

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