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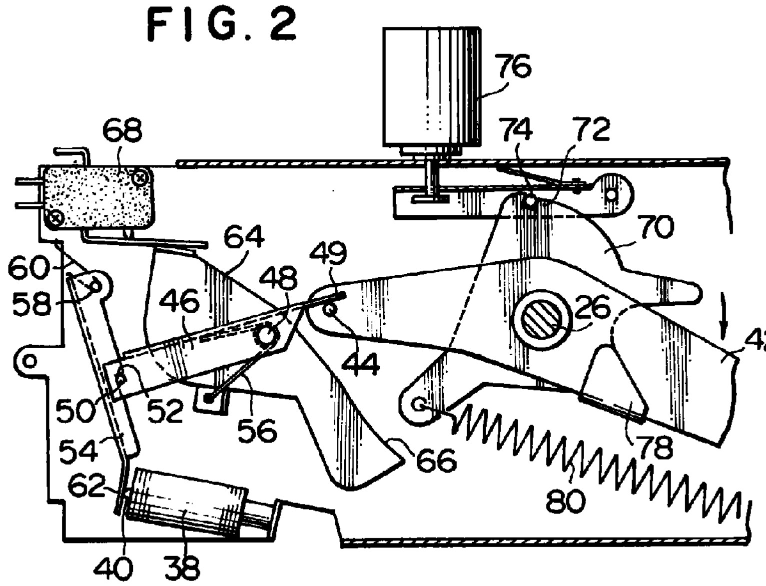
(54) Oil burner of the automatic combustion reduction type

(57) An oil burner of the automatic combustion reduction type which is capable of automatically controlling a temperature in a room in which the oil burner is placed. A thermistor 34 detects an increase in temperature in which a temperature in a room in which the oil burner is placed to a predetermined level, so that a solenoid 38 is actuated. This causes a wick 24 to be moved from a combustion increased position to a combustion decreased position.

FIG. 2



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Description

BACKGROUND OF THE INVENTION

This invention relates to an oil burner of the automatic combustion reduction type, and more particularly to an oil burner which is adapted to automatically reduce the amount of combustion when a temperature in a room in which the oil burner is placed is increased to a predetermined level.

In general, an oil burner of the wick operation type is so constructed that oil or kerosene sucked up by a wick for ignition and combustion is ignited by a suitable ignition means, resulting in combustion being carried out. When the combustion causes a temperature in a room in which the oil burner is placed to be increased, so that when the temperature reaches a predetermined temperature, a wick operating lever is manually operated to lower the wick to a predetermined level, to thereby control the amount of combustion.

It has been conventionally considered that an excessive increase in temperature in the room is detected by means of a bimetal element or the like, to thereby cause a vibration sensing fire-extinguishing device to be actuated, resulting in lowering the wick, leading to fire-extinguishing of the oil burner.

Such an oil burner using a wick as described above is decreased in price and maintenance cost and portable, resulting in still exhibiting deep-rooted popularity. Nevertheless, it is highly desirable to control the oil burner by means of a microcomputer to operate it at a room temperature as in a forced flue type oil burner.

SUMMARY OF THE INVENTION

The present invention has been made in view of the foregoing disadvantage of the prior art.

Accordingly, it is an object of the present invention to provide an oil burner of the automatic combustion reduction type which is capable of automatically controlling a temperature in a room in which the oil burner is placed.

It is another object of the present invention to provide an oil burner of the automatic combustion reduction type which is capable of preventing an undesirable increase in temperature in a room due to combustion.

It is a further object of the present invention to provide an oil burner of the automatic combustion reduction type which is capable of automatically reducing the amount of combustion when a temperature in a room in which the oil burner is placed is increased to a predetermined level.

It is still another object of the present invention to provide an oil burner of the automatic combustion reduction type which is capable of suitably applied to a wick operation type oil burner.

It is yet another object of the present invention to provide an oil burner of the automatic combustion reduction type which is capable of preventing waste of electric energy.

It is even another object of the present invention to provide an oil burner of the automatic combustion reduction type which is capable of reducing the manufacturing cost, being simplified in structure and facilitating the assembling.

It is a still further object of the present invention to provide an oil burner of the automatic combustion reduction type which is capable of preventing a significant increase in cost.

In accordance with the present invention, an oil burner of the wick operation type is provided wherein a wick operating shaft is operated to vertically move a wick within a combustion range between a combustion increased position and a combustion decreased position, as well as to a fire-extinguished position. The oil burner is characterized in that a thermistor is arranged for detecting an increase in temperature in a room in which the oil burner is placed to a predetermined level and a solenoid is actuated in response to detection of the temperature by the thermistor to lower the wick from the combustion increased position to the combustion decreased position by means of a mechanical wick lowering mechanism.

In a preferred embodiment of the present invention, the mechanical wick lowering mechanism comprises a wick operating lever arranged for rotating the wick operating shaft and provided at one end thereof with an engagement pin, a reset plate engaged with the wick operating lever so as to elastically force the wick operating lever in a wick lowered direction and moved within the combustion range, and an actuation plate engaged with the reset plate for holding the reset plate at an combustion increased position. The solenoid carries out release of the reset plate from engagement with the actuation plate to move the reset plate to the combustion decreased position.

In a preferred embodiment of the present invention, the combustion increased position is a maximum combustion position and the combustion decreased position is a minimum combustion position.

In a preferred embodiment of the present invention, a wick operating lever is arranged for rotating the wick operating shaft and a reset plate is arranged for lowering the wick from the combustion increased position to the combustion decreased position due to actuation of the solenoid. The solenoid includes a solenoid drive circuit. A switch is arranged for switching feeding of electricity to the solenoid drive circuit of the solenoid. A switch plate is arranged so as to be moved in association with the wick operating lever. The switch plate turns off the switch when the wick operating lever is moved to the fire-extinguished position and the reset plate moves the wick operating lever to the combustion decreased position and turns off the switch.

In a preferred embodiment of the present invention, the reset plate is provided thereon with a projection selectively operatively engaged with the switch and the reset plate and switch plate are coaxially mounted on a support shaft in a manner to be pivotally movable about the support shaft. An actuation plate is elastically forced and arranged so as to be engaged with the reset plate for holding the reset plate at a combustion increased position. The actuation plate is released from engagement with the reset plate to permit the reset plate to be elastically rotated about the support shaft, resulting in the projection of the reset plate to be engaged with the switch, leading to turning-off of the switch, when the solenoid receives a signal from the thermistor. The switch plate is associated with wick lowering operation of the wick operating lever at the fire-extinguished position, to thereby be engaged with the switch, resulting in the switch being turned off.

In a preferred embodiment of the present invention, a wick operating lever is arranged so as to be moved in association with the wick operating shaft to vertically move the wick, a reset plate is arranged for elastically driving the wick operating lever from a combustion increased position to a combustion decreased position, and an actuation plate is arranged for elastically holding the reset plate at the combustion increased position. The actuation plate is located oppositely to the solenoid so as to actuate the reset plate, to thereby rotate the wick operating lever to the combustion decreased position when the temperature is increased to the predetermined level. A stationary member is arranged so as to be normally kept stationary, and an elastic stopper and a holder are arranged between the stationary member and the wick operating lever so as to be engaged with each other at the combustion decreased position.

In a preferred embodiment of the present invention, the wick operating lever includes a plate section moved in association with the wick operating shaft and a lever section provided with an operation portion and the stationary member comprises a rotary plate held on a vibration sensing device against elastic return force. The stopper is provided on the lever section of the wick operating lever and the holder is provided on the rotary plate and the stopper and holder are normally kept engaged with each other.

In a preferred embodiment of the present invention, the stopper is elastically deformed, to thereby be disengaged from the holder during wick lowering operation of the wick operating lever, resulting in permitting movement of the wick operating lever.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and many of the attendant advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings in which like reference numerals designates like or corresponding parts throughout; wherein:

Fig. 1 is a fragmentary vertical sectional view generally showing an embodiment of an oil burner of the automatic combustion reduction type according to the present invention;

Fig. 2 is a sectional view showing a wick operation section in the oil burner of Fig. 1;

Fig. 3 is a circuit diagram showing an electronic control section in the oil burner of Fig. 1;

Fig. 4 is a sectional view of the wick operation section shown in Fig. 2 which is moved to a minimum combustion position due to detection of a decrease in temperature in a room to a predetermined level;

Fig. 5 is a sectional view of the wick operation section in Fig. 2 which is moved to a fire-extinguishing position by manual operation;

Fig. 6 is a sectional view showing a wick operation section in another embodiment of an oil burner of the automatic combustion reduction type according to the present invention;

Fig. 7 is a sectional view of the wick operation section shown in Fig. 6 which is moved to a minimum combustion position due to detection of an increase in temperature in a room to a predetermined level;

Fig. 8 is a sectional view of the wick operation section in Fig. 6 which is moved to a fire-extinguishing position by manual operation;

Fig. 9 is a sectional view of the wick operation section in Fig. 6 which is moved to a fire-extinguishing position by operation of a vibration sensing device;

Fig. 10 a sectional view showing a wick operation section in a further embodiment of an oil burner of the automatic combustion reduction type according t the present invention which is moved to to a maximum combustion position for normal combustion;

Fig. 11 is a sectional view of the wick operation section shown in Fig. 10 which is moved to a combustion decreased position due to detection of an increase in temperature in a room to a predetermined level;

Fig. 12 is a sectional view of the wick operation section in Fig. 10 which is moved to a fire-extinguishing position by manual operation; and

Fig. 13 is a sectional view of the wick operation section in Fig. 10 which is moved to a fire-extinguishing position by operation of a vibration sensing device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Now, an oil burner of the automatic combustion reduction type according to the present invention will be described hereinafter with reference to the accompanying drawings.

Referring first to Fig. 1, an embodiment of an oil burner of the automatic combustion reduction type according to the present invention is illustrated, which is generally designated by reference numeral 10. An oil burner of the illustrated embodiment is embodied in the form of a wick operation type oil burner. However, the oil burner of the present invention may be applied to an oil burner other than the wick operation type oil burner.

The oil burner of the illustrated embodiment may be constructed in substantially the same manner as a conventional wick operation type oil burner except an automatic combustion reducing mechanism which will be detailedly described hereinafter. More specifically, the oil burner 10 generally includes a wick receiving structure 12 arranged on an oil reservoir 14 and a combustion cylinder structure 16 supported on the wick receiving structure 12, each of which may be constructed in a manner as known in the art. The combustion cylinder structure 16 is a multi-cylinder type and includes an inner cylindrical member 18 and an outer cylindrical member 20, which are surrounded by an outermost heat-permeable cylinder 22. The wick receiving structure 12 has a wick 24 received therein, which is vertically moved through a wick operating or vertically moving shaft 26. More particularly, the wick receiving structure 16 includes an inner cylinder 28 and an outer cylinder 30 arranged so as to define a space therebetween, in which the wick 24 is movably received. Reference numeral 32 designates a casing member arranged so as to surround the wick receiving structure 12 and the oil reservoir 14.

One of features of the oil burner of the illustrated embodiment is in that it is equipped with an automatic combustion reducing mechanism constructed as shown in Figs. 1 to 3. The automatic combustion reducing mechanism includes an electronic control section. In the illustrated embodiment, the electronic control section, as shown in Figs. 1 to 3, includes a thermistor 34 arranged on the oil burner and more particularly on the casing 26 for detecting a temperature in a room in which the oil burner is placed for heating, a controller or variable resistor 36 for variably setting a temperature to be detected by the thermistor 34, a solenoid 38 including a pin 40 retractably moved depending on a signal detected by the thermistor 34, and a solenoid driving circuit 41 for controlling actuation of the solenoid 38 through the thermistor 34 and controller 36.

The automatic combustion reducing mechanism also includes a mechanical section or mechanical wick lowering section operatively connected to the above-described electronic control section. The mechanical section includes a wick operating lever 42 fixedly mounted on the wick operating shaft 26 to reversibly rotate the shaft 26 in both clockwise and counterclockwise directions. Thus, the wick operating lever 42 is pivotally moved about the shaft 26. The wick operating lever 42 is provided at one end thereof with a wick operating knob (not shown) operated for vertically moving the wick and at the other end thereof with a pin 44, so that manual vertical operation of the wick operating knob causes the lever 42 to be pivotally moved about the wick operating shaft 26, resulting in the pin 44 being vertically moved in a manner to be opposite to the knob. The mechanical section also includes a reset plate 46 pivotally mounted on a support shaft 48 so as to be pivotally moved about the shaft 48 and engaged at one end 49 thereof with the pin 44 of the wick operating lever 42, resulting in being pivotally moved through the pin 44 of the lever 42 when the lever 42 is moved for operating the wick 24. The reset plate 46 is provided at the other end thereof with a holder 50, which is engaged with a holding portion 52 of an actuation plate 54 of the mechanical section to regulate movement of the wick operating lever 42 as described hereinafter. Reference numeral 56 designates a spring engaged with the reset plate 46 for constantly urging the reset plate 46 in a direction of lowering the wick 24, so that the reset plate 46 may be rotated about the shaft 48 in a clockwise direction in Fig. 2 when the holder 50 of the reset plate 46 is disengaged from the holding portion 52 of the actuation plate 54, resulting in the one end 49 of the reset plate 46 lowering the pin 44 of the wick operating lever 42 by a predetermined distance, to thereby pivotally move the lever 42 from a maximum combustion position to a minimum combustion position.

The actuation plate 54 is mounted on a support shaft 58 so as to be pivotally moved thereabout and has a spring 60 engaged therewith through the shaft 58 so as to constantly urge the actuation plate 54 about the shaft 58, to thereby normally keep the holding portion 52 of the actuation plate 54 engaged with the holder 50 of the reset plate 46. In the illustrated embodiment, mounting of the actuation plate 54 on the shaft 58 is carried out through one end of the actuation plate 54 and the holding portion 52 is provided at an intermediate portion of the actuation plate 54. The actuation plate 54 has a drive section 62 in the form of a projection or extension, which is arranged so as to be accessible to the pin 40 of the solenoid 38, resulting in being selectively operatively associated or engaged with the pin 40. In the illustrated embodiment, the drive section 62 is provided at the other end of the actuation plate 54.

The mechanical section of the automatic combustion reducing mechanism also includes a switch plate 64 mounted on the support shaft 48 so as to be coaxial with the reset plate 46, resulting in being moved in association with the reset plate 46 when the pin 44 of the wick operating lever 42 is vertically pivotally moved about the shaft 26. The switch plate 64 is provided at a part of an outer periphery thereof with a slide contact section 66, with which the pin 44 of the wick operating lever 42 is slidably pressedly contacted when the lever 42 is at a position displaced from a combustion range, to thereby be pivotally moved about the shaft 48, so that the switch plate 64 turns off a switch 68 for the solenoid 38 and solenoid drive circuit 41. In the illustrated embodiment, the slide contact section 66 is provided at one end of the switch plate 64.

Reference numeral 70 designates a drive plate mounted on the wick operating shaft 26 coaxially with the wick operating lever 42. The drive plate 70 may be constructed in substantially the same manner as that of a conventional wick operation type oil burner. The drive plate 70 is provided with a holding portion 72, which is engaged with a holding pin 74 of a vibration sensing device 76 when the wick 24 is normally raised to a combustion position. Also, the drive plate 70 is provided with a holding element 78, which functions to hold the wick operating lever 42 and drive plate 70 together, to thereby permit the drive plate 70 to be moved with the wick operating lever 42 when the lever is operated for operating the wick 24. The drive plate 70 has a spring 80 operatively connected thereto, which function to constantly urge the drive plate 70 in a wick lowered direction or a direction of lowering the wick 24. More particularly, the spring 80 functions to forcibly the wick operating lever 42 in the wick lowered direction when the holding portion 72 of the drive plate 70 is disengaged from the holding pin 74 of the vibration sensing device 76, resulting in the wick 24 being lowered to a fire-extinguishing position. The vibration sensing device 76 is adapted to operate when it senses vibration of a predetermined level or more such as an earthquake or the like, so that the holding pin 74 of the vibration sensing device 76 is released from engagement with the holding portion 72 of the drive plate 70, to thereby actuate the drive plate 70.

In Fig. 3, reference numeral 82 designates an ignition means such as an ignition heater or the like and 84 is a power supply which may comprise dry cells and be commonly used for the solenoid 38 and solenoid drive circuit 41.

Now, the manner of operation of the oil burner of the illustrated embodiment will be described hereinafter with reference to Figs. 4 and 5 as well as Figs. 1 to 3.

When the wick operating lever 42 is manually operated through the knob (not shown) provided thereon, to thereby be rotated in a wick raised direction or a direction of raising the wick 24 as indicated at an arrow in Fig. 2, it raises the wick 24 for ignition and combustion and concurrently rotates the reset plate 46 abutted against the lever 42 in a counterclockwise direction in Fig. 2. This causes the wick 24 to be raised to a maximum combustion, so that the reset plate 46 is securely engaged at the holder 50 thereof with the holding portion 52 of the actuation plate 54. Such engagement between the reset plate 46 and the actuation plate 54 prevents the spring 56 from rotating the reset plate 46 toward a combustion decreased position set within a range of pivotal movement of the reset plate 46. This results in such a state as shown in Fig. 2 being obtained.

Then, when combustion is continued, so that the thermistor 34 detects that a temperature in a room in which the oil burner is placed is increased to a predetermined level, the solenoid 38 is actuated to cause the pin 40 of the solenoid 38 to pressedly force the drive section 62 of the actuation plate 54, resulting in the holding section 52 of the actuation plate 54 being released from engagement with the holder 50 of the reset plate 46, so that the spring 56 rotates the rest plate 46 toward the combustion decreased position in a clockwise direction in Fig. 2. This causes the reset plate 46 to somewhat rotate the wick operating lever 42 to the combustion decreased position in the wick lowered direction through engagement between the pin 44 of the lever 46 and the one end 49 of the reset plate 46. In this instance, the combustion decreased position may be a minimum combustion position. This results in combustion of the oil burner being kept at a minimum combustion state.

Normal or regular fire-extinguishing operation of the oil burner may be carried out by pivotally moving the wick operating lever 42 to a fire-extinguished position in the wick lowered direction by means of the knob (not) provided on the lever 42 as in the prior art.

When combustion is continued while keeping the wick at the minimum combustion position, so that a temperature in the room is decreased to a level below the predetermined level, the wick operating lever 42 is rotated in the wick raised direction. This causes the wick 24 to be raised and the reset plate 6 is engaged at the holder 50 thereof with the holding portion 52 of the actuation plate 54, so that combustion may be carried out at the maximum combustion position. When this causes a temperature in the room to be increased to the predetermined level, the wick 24 is lowered to the minimum combustion position by cooperation of the thermistor 34 and solenoid 38.

As can be seen from the foregoing, the illustrated embodiment is so constructed that the thermistor 34 detects an increase in temperature in a room in which the oil burner is placed to a predetermined level, to thereby actuate the solenoid 38, leading to lowering of the wick 24 to the combustion decreased position. Such construction permits the temperature to be automatically controlled during combustion without requiring any manual operation, resulting in utility and convenience of the oil burner being highly improved.

Also, the oil burner of the illustrated embodiment is constructed in the manner that the reset plate 46 is provided in association with the actuation plate 54 driven by the solenoid 38 and pressedly lowered by the wick operating lever 42. Such construction permits the oil burner of the illustrated embodiment to be conveniently applied to a wick operation type oil burner of the lever type. Further, the automatic combustion reducing mechanism in the oil burner of the illustrated embodiment may be readily operatively connected to a conventional wick operating mechanism through the pin of the wick operating lever 5, resulting in being applied to various kinds of conventional wick operating devices.

Referring now to Figs. 6 and 7, a modification of the above-described embodiment is illustrated. In an oil burner of the combustion reduction type of the modification, a reset plate 46 is provided on the other end thereof with a projection 86 extending toward a switch 68, so that when the projection 86 is pivotally moved toward the switch 68 due to rotation of the reset plate about a support shaft 48, it turns off the switch 68 as shown in 7.

The switch 68 functions to operate a power supply 84 (Fig. 3) for a solenoid drive circuit 41 for driving a solenoid 38 depending on a signal fed from a thermistor 34 (Fig. 3).

A switch plate 64 is provided at one end thereof with a slide contact section 66 and at the other end thereof with an abutment 88, so that movement of the wick operating lever 42 to a fire-extinguished position out of a combustion range permits a pin 44 of the wick operating lever 42 to be pressedly contacted with the slide contact section 66 of the switch plate 64 and the abutment 88 to pressedly operate the switch 68, to thereby turn off the switch 68 as shown in Fig. 8.

Fire-extinguishing by a vibration sensing device 76, as shown in Fig. 9, is preferably carried out by further rotating the wick operating lever 42 beyond such a position of the lever 42 due to fire-extinguishing by manual operation as shown in Fig. 8. This permits fire-extinguishing by the vibration sensing device 76 to be more positively accomplished. For this purpose, the slide contact section 66 of the switch plate 64 is preferably formed into an increased length.

The remaining part of the modification may be constructed in substantially the same manner as the above-described embodiment.

As described above, the modification is so constructed that the switch 68 is operated by each of the actuation plate 54 actuated by the solenoid 38 and the switch plate 64 actuated in association with operation of the wick operating lever 42. Such construction permits the solenoid 38 and solenoid drive circuit 41 to be fed with electricity only at a combustion increased position or maximum combustion position, to thereby prevent excessive energy consumption.

Also, in the modification, the reset plate 46 and switch plate 64 are coaxially pivotally mounted on a support shaft 48 and the switch 68 is subject to reverse connection, so that control of the solenoid drive circuit may be accomplished by the single switch 68 irrespective of the construction that the switch 68 is operated by each of the two members, resulting in reducing the manufacturing cost.

Further, in the modification, the reset plate 46 engaged with the actuation plate 54 and the switch plate 64 associated with the wick operating lever 42 are coaxially pivotally mounted on the common support shaft 48. Thus, the oil burner of the modification not only can be simplified in structure and facilitate the assembling but prevents a significant increase in cost.

Referring now to Figs. 10 to 13, another embodiment of an oil burner of the automatic combustion reduction type according to the present invention is illustrated. An oil burner of the illustrated embodiment includes a wick operating lever 42 securely mounted on a wick operating shaft 26 so as to be pivotally moved about the shaft 26. The wick operating lever 42 includes a plate section 42a moved in association with the wick operating shaft 26 and a lever section 42b provided at one end thereof with an operation portion 90, which are formed separately from each other. The lever section 42b is provided at the other end thereof with a pin 92. Correspondingly, the plate section 42a is formed at one end thereof with an elongated slide hole 94 in which the pin 92 of the lever section 42b is slidably fitted; so that when the lever section 42b is pivotally moved about a support shaft 96, the pin 92 is slid in the slide hole 94 to pivotally move the plate section 42a, to thereby rotate the wick operating shaft 26, resulting in a wick (not shown) being vertically moved.

The oil burner also includes a reset plate 46 which is mounted at one end thereof on the wick operating shaft 26 in a manner to be coaxial with the plate section 42a of the wick operating lever 42 and is arranged so as to be normally kept engaged at an intermediate portion thereof with the other end of the plate section 42a by means of a spring, as shown in Fig. 10. Also, the spring 98 keeps the reset plate 46 engaged at the other end thereof through a pin 50 with a holding step 52 of an actuation plate 54, so that when the reset plate 46 is released from engagement with the actuation plate 54, the reset plate 46 upwardly forces the plate section 42a by a predetermined distance by means of elastic force of the spring 98, resulting in the wick operating shaft being forcibly rotated from a combustion increased position to a combustion decreased position, as shown in Figs. 11 and 12.

The actuation plate 54 is mounted at one end thereof on a support shaft 58 so as to be pivotally moved about the support shaft 58 and pressedly urged against the other end of the reset plate 46 by means of a spring 60 such as a leaf spring. The holding step 52 engaged with the pin 50 of the reset plate 46 is formed at an intermediate portion of the actuation plate 54. The actuation plate 54 has the other end arranged so as to be accessible to a pin 40 of a solenoid 38.

The oil burner of the illustrated embodiment further includes a stationary member 100 normally kept stationary, which may be mounted on a base plate of a wick operating device of the oil burner. In the illustrated embodiment, the stationary member 100 comprises a rotary plate 102 mounted on the support shaft 96 so as to be coaxial with the lever section 42b of the wick operating lever 42 and pivotally movable about the support shaft 96. The rotary plate 102 is provided with a holding pawl 104 acting to move the lever section 42b and rotary plate 102 together during the wick operating operation. The holding pawl 104 is normally held on the lever section 42b of the wick operating lever 42.

The rotary plate 102 is also provided with a holding portion 106 which is adapted to be heldly engaged with a holding pin 108 of a vibration sensing device 76 during normal operation of the oil burner, to thereby normally keep the rotary plate 102 stationary against a return spring 80 of a coiled shape. The return spring 80 is held at one end thereof on the rotary plate 102 and at the other end thereof on a body of the oil burner, to thereby constantly urge the rotary plate 102 in a wick lowered direction. Thus, when the vibration sensing device 76 detects vibration of a predetermined level or more such as earthquake or the like to cause the holding portion 106 of the rotary member 102 to be released from engagement with the holding pin 108 of the device 76, the spring 80 forcibly rotates the lever section 42b through the rotary member 102 in the wick lowered direction, resulting in the wick (not shown) being lowered to a fire-extinguished position. The vibration sensing device 76 is so constructed that detection of vibration of a predetermined level or the like causes the holding pin 108 to be upwardly moved, to thereby be disengaged from the holding portion 106 of the rotary plate 102, resulting in the rotary plate 102 being rotated by elastic force of the return spring 80.

The oil burner of the illustrated embodiment further includes an elastic stopper 110 arranged between the stationary member 100 or rotary plate 102 and the wick operating lever 42 or lever section 42b. Correspondingly, the rotary plate 102 is provided with a stopper 112, with which the elastic stopper 110 is engaged when the wick operating lever 42 is lowered to the combustion decreased position. In the illustrated embodiment, the stopper 110 is mounted on the lever section 42b.

The remaining part of the illustrated embodiment may be constructed in substantially the same manner as the above-described embodiment.

Now, the manner of operation of the oil burner of the illustrated embodiment will be described hereinafter with reference to Figs. 10 to 13.

When the operation portion 90 provided on the one end of the lever section 42b of the wick operating lever 42 is downwardly moved, the wick operating shaft 26 is rotated through the plate section 42a of the wick operating lever 42 in a wick raised direction, resulting in the wick (not shown) being raised. At this time, the lever section 42b of the wick operating lever 42 is pivotally moved with the stationary member 100 or rotary plate 102, so that the plate section 42a engaged at one end thereof with the other end of the lever section 42b is pivotally moved to rotate the wick operating shaft 26. Also, the rotary plate 102 is engaged at the holding portion 106 thereof with the holing pin 108 of the vibration sensing device 76 against the return spring 80, to thereby be kept stationary at a wick raised position as shown in Fig. 10.

The plate section 42a of the wick operating lever 42 is normally kept abutted at the other end thereof against the reset plate 46 adapted to be pivotally moved by elastic force of the spring 98 and the actuation plate 54 is constantly urged toward the reset plate 46, to thereby be normally kept engaged with the reset plate 46 by elastic force of the spring 60 at the combustion increased position. The solenoid 38 actuated by a thermistor (not shown) is arranged in proximity to the actuation plate 54, so that when a temperature in a room in which the oil burner is placed is increased to a predetermined level, the solenoid 38 is actuated to disengage the actuation plate 54 from the reset plate 46. This results in the reset plate 46 somewhat pivotally moving the plate section 42a of the wick operating lever 42 in the wick lowered direction, so that the wick (not shown) may be moved from the combustion increased position to the combustion decreased position, as shown in Fig. 11.

The elastic stopper 110 arranged between the wick operating lever 42 or lever section 42b and the stationary member 100 or rotary plate 102 is abutted against the stopper 112 of the of the rotary plate 102 in association with pivotal movement of the wick operating lever 42, to thereby reduce shock applied to the wick operating lever 42 by the spring 98.

An oil burner of this type generally employs an automatic fire-extinguishing mechanism such as the vibration sensing device 76, wherein the wick operating lever 42 is forcibly rotated in the wick lowered direction by the return spring 80. In such a structure, arrangement of the stoppers 110 and 112 for stopping operation of the wick operating lever 42 often prevents smooth rotation of the wick operating lever 42 during the automatic fire-extinguishing operation of the automatic fire-extinguishing mechanism, to thereby prevent the automatic fire-extinguishing operation from being smoothly carried out. In this connection, the illustrated embodiment is so constructed that the stationary member 100 is constituted by the rotary plate 102 kept stationary during normal combustion operation and the stoppers 110 and 112 are arranged between the lever section 42b and the rotary plate 102. Thus, when the vibration sensing device 76 is actuated to cause the holding pin 108 of the vibration sensing device 76 to be released from engagement with the rotary plate 102, the rotary plate 102 is rotated together with the lever section 42b due to elastic force of the return spring 80, to thereby cause the stoppers 110 and 112 to be concurrently rotated without being engaged with each other, resulting in ensuring smooth movement of the wick operating lever, as shown in Fig. 4.

Also, suitable arrangement of the elastic stopper 110 with respect to the stopper 112 leads to deformation of the stopper 110 when excessive force is applied to the wick operating, to thereby forcibly disengage the stopper 110 from the stopper 112, so that only the wick operating lever 42 may be manually rotated for fire-extinguishing, as shown in Fig. 12.

As can be seen from the foregoing, in the illustrated embodiment, detection of an increase in temperature in a room in which the oil burner is placed to a predetermined level causes the wick operating lever 42 to be moved from the combustion increased position to the combustion decreased position through the solenoid 38, actuation plate 54, spring 98 and reset plate 46, during which the elastic spring 100 is kept engaged with the stopper 112, so that shock applied to the wick operating lever 42 at the combustion decreased position may be reduced to prevent vertical deviation of the combustion decreased position, to thereby ensure smooth and stable transfer to the combustion decreased position.

Also, the illustrated embodiment causes the stopper 110 to be kept from engagement with the stopper 112 during automatic fire-extinguishing by the vibration sensing device 76, resulting in the automatic fire-extinguishing being smoothly carried out, because the stopper 110 is provided at the lever section 42b and the stopper 112 is provided on the rotary plate 102 rotated by the return spring 80.

Further, in the illustrated embodiment, the stopper 110 is constructed so as to exhibit elasticity sufficient to disengage the stopper 110 from the stopper 112 when excessive force is applied to the wick operating lever 42, so that an operator or user may recognize that manual operation carried out within normal combustion range between the combustion increased position and the combustion decreased position requires relatively large force, to thereby prevent abnormal combustion out of the combustion decreased position. Also, manual application of excessive force to the wick operating lever permits fire-extinguishing to be carried out on the oil burner, for example, when any abnormal combustion or emergency occurs.

While preferred embodiments of the invention have been described with a certain degree of particularity with reference to the drawings, obvious modifications and variations are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

Claims

1. An oil burner (10) of the automatic combustion reduction type wherein a wick operating shaft (26) is operated to vertically move a wick (24) within a combustion range between a combustion increased position and a combustion decreased position, as well as to a fire-extinguished position, characterized in that:

    a thermistor (34) is arranged for detecting an increase in temperature in a room in which the oil burner is placed to a predetermined level; and

    a solenoid (38) is actuated in response to detection of the temperature by said thermistor to lower the wick from the combustion increased position to the combustion decreased position by means of a mechanical wick lowering mechanism.

2. An oil burner as defined in Claim 1, characterized in that said mechanical wick lowering mechanism comprises a wick operating lever (42) arranged for rotating said wick operating shaft and provided at one end thereof with an engagement pin (44), a reset plate (46) engaged with said wick operating lever so as to elastically force said wick operating lever in a wick lowered direction and moved within said combustion range, and an actuation plate (54) engaged with said reset plate for holding said reset plate at an combustion increased position; and

    said solenoid carries out release of said reset plate from engagement with said actuation plate to move said reset plate to the combustion decreased position.

3. An oil burner as defined in Claim 1 or 2, characterized in that said combustion increased position is a maximum combustion position and said combustion decreased position is a minimum combustion position.

4. An oil burner as defined in Claim 1, characterized in that:

    a wick operating lever (42) is arranged for rotating said wick operating shaft;

    a reset plate (46) is arranged for lowering said wick from the combustion increased position to the combustion decreased position due to actuation of said solenoid;

    said solenoid includes a solenoid drive circuit (41);

    a switch (68) is arranged for switching feeding of electricity to said solenoid drive circuit of said solenoid;

    a switch plate (64) is arranged so as to be moved in association with said wick operating lever;

    said switch plate turns off said switch when said wick operating lever is moved to said fire-extinguished position; and

    said reset plate moves said wick operating lever to said combustion decreased position and turns off said switch.

5. An oil burner as defined in Claim 4, characterized in that:

    said reset plate is provided thereon with a projection (86) selectively operatively engaged with said switch;

    said reset plate and switch plate are coaxially mounted on a support shaft (48) in a manner to be pivotally movable about said support shaft;

    an actuation plate (54) is elastically forced and arranged so as to be engaged with said reset plate for holding said reset plate at a combustion increased position;

    said actuation plate is released from engagement with said reset plate to permit said reset plate to be elastically rotated about said support shaft, resulting in said projection of said reset plate to be engaged with said switch, leading to turning-off of said switch, when said solenoid receives a signal from said thermistor; and

    said switch plate is associated with wick lowering operation of said wick operating lever at the fire-extinguished position, to thereby be engaged with said switch, resulting in said switch being turned off.

6. An oil burner as defined in Claim 1, characterized in that:

    a wick operating lever (42) is arranged so as to be moved in association with said wick operating shaft to vertically move said wick;

    a reset plate (46) is arranged for elastically driving said wick operating lever from a combustion increased position to a combustion decreased position;

    an actuation plate (54) is arranged for elastically holding said reset plate at the combustion increased position;

said actuation plate is located oppositely to said solenoid so as to actuate said reset plate, to thereby rotate said wick operating lever to the combustion decreased position when the temperature is increased to the predetermined level;

a stationary member (100) is arranged so as to be normally kept stationary; and

an elastic stopper (110) and a holder (112) are arranged between said stationary member and said wick operating lever so as to be engaged with each other at the combustion decreased position.

7. An oil burner as defined in Claim 6, characterized in that:

said wick operating lever includes a plate section (42a) moved in association with said wick operating shaft and a lever section (42b) provided with an operation portion (90);

said stationary member comprises a rotary plate (102) held on a vibration sensing device (76) against elastic return force;

said stopper is provided on said lever section of said wick operating lever and said holder is provided on said rotary plate;

said stopper and holder are normally kept engaged with each other.

8. An oil burner as defined in Claim 6, characterized in that:

said stopper is elastically deformed, to thereby be disengaged from said holder during wick lowering operation of said wick operating lever, resulting in permitting movement of said wick operating lever.

FIG. 1

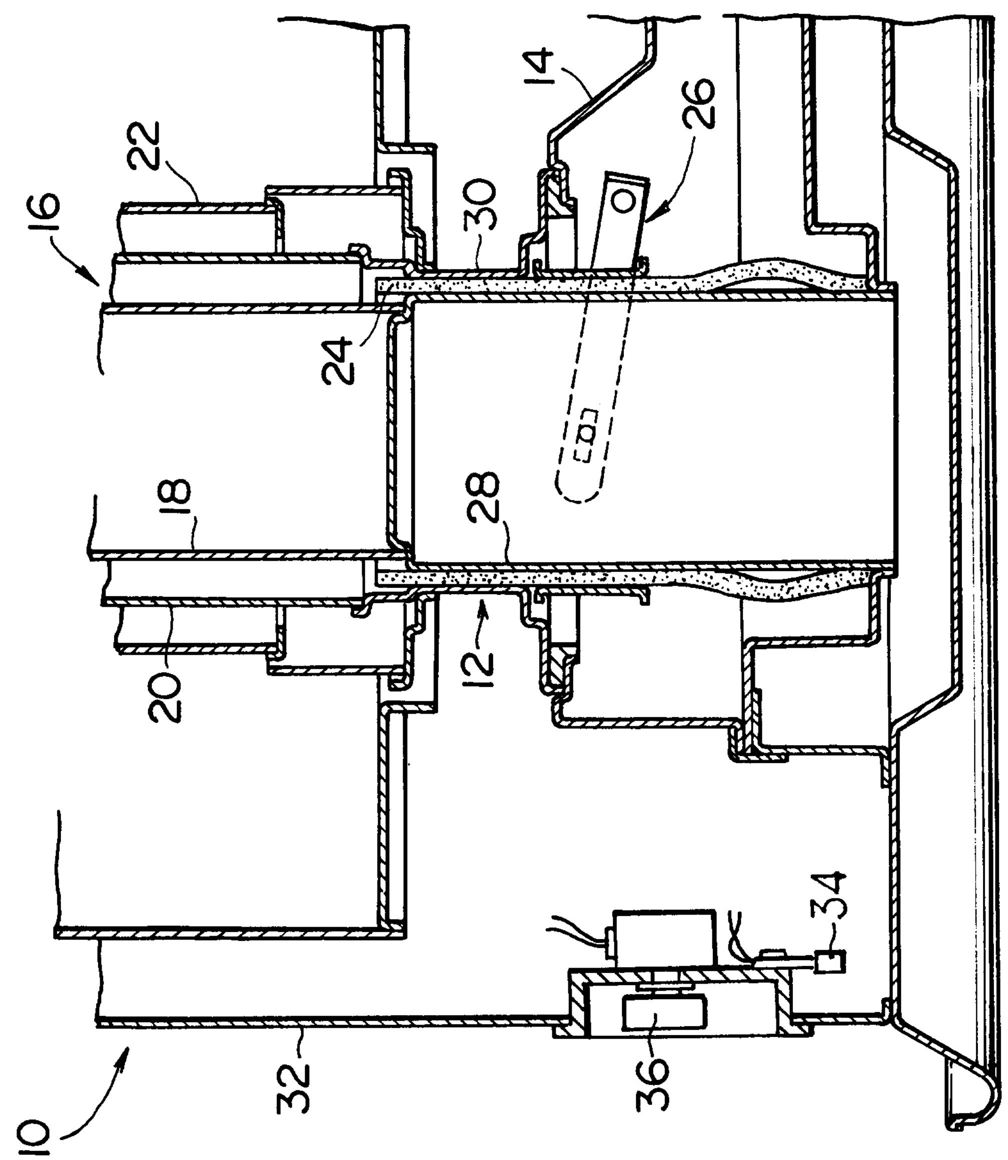

FIG. 2

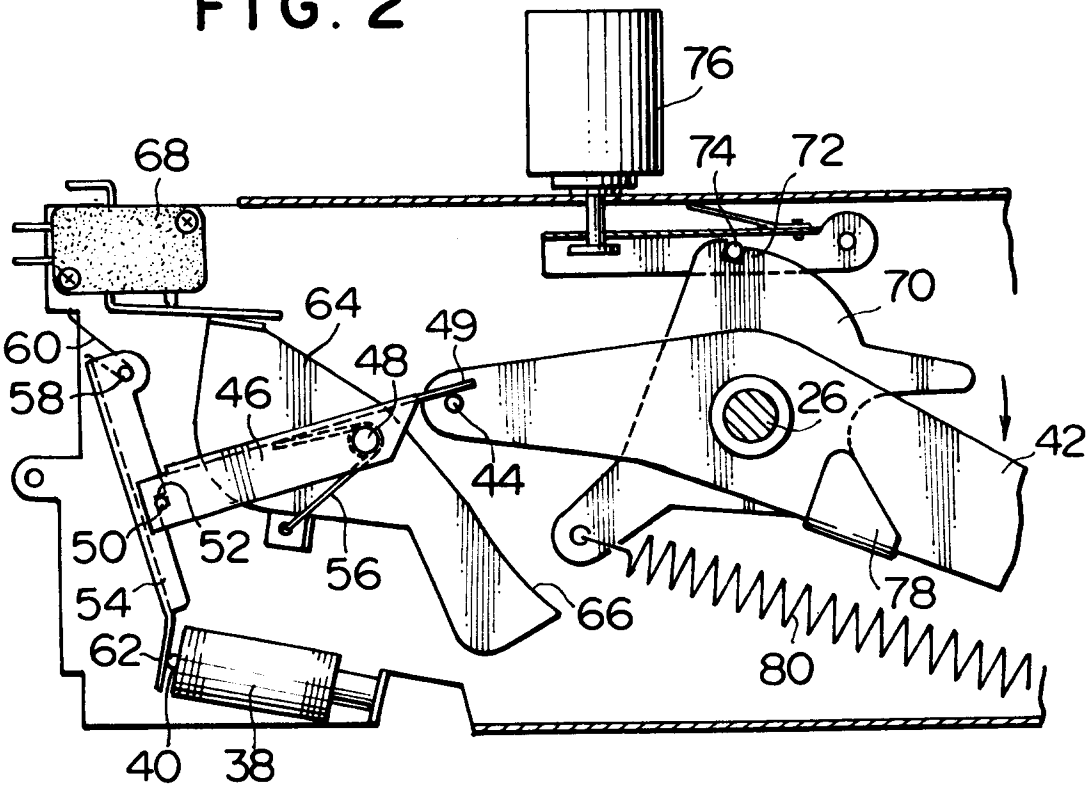
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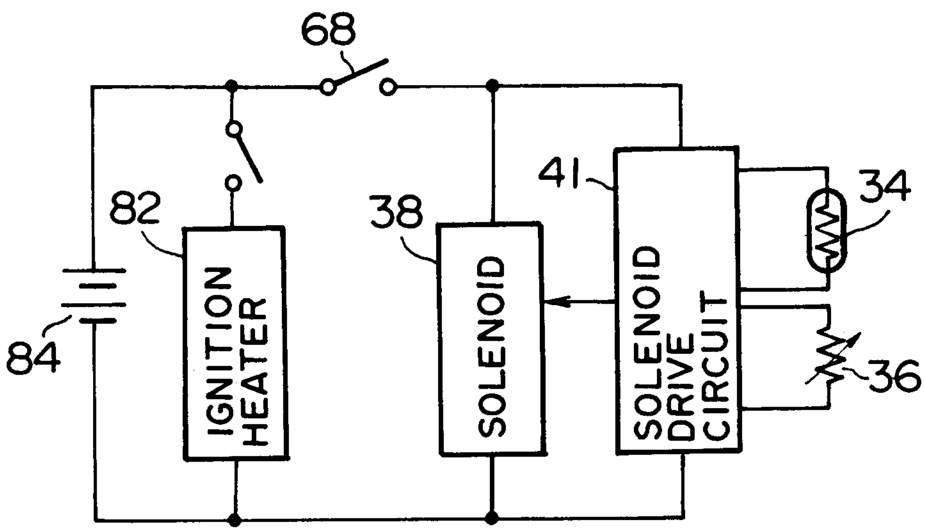
FIG. 3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SOLENOID
SOLENOID DRIVE CIRCUIT
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FIG. 4

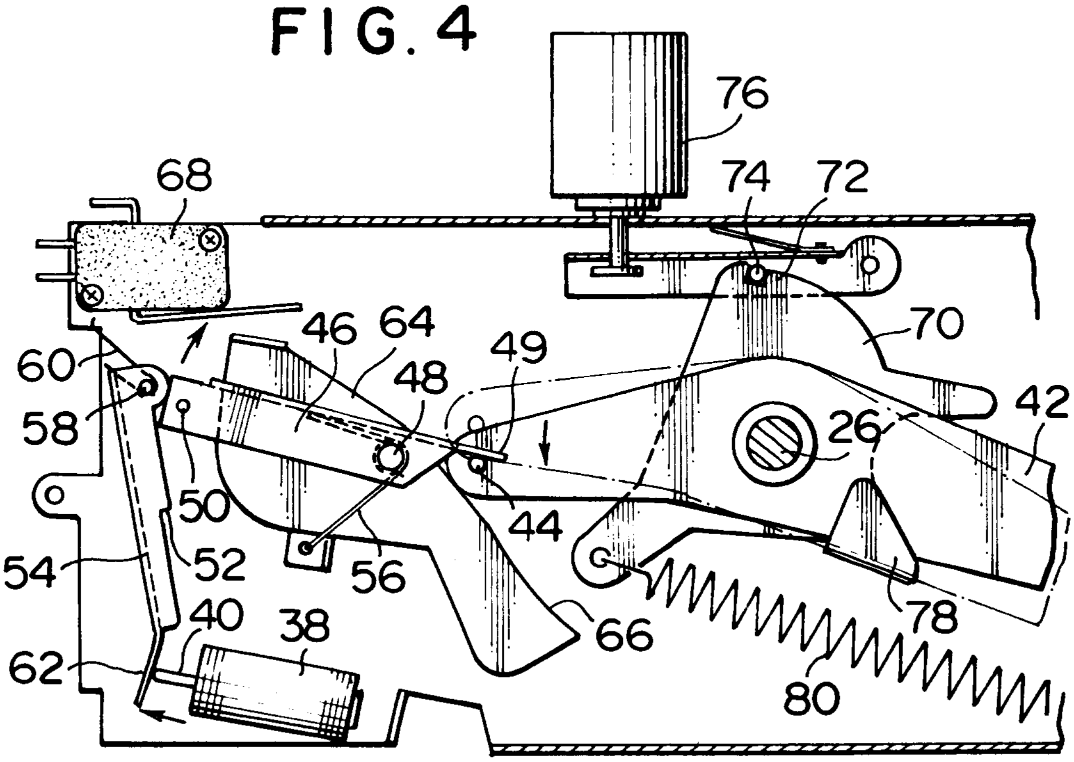
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FIG. 5

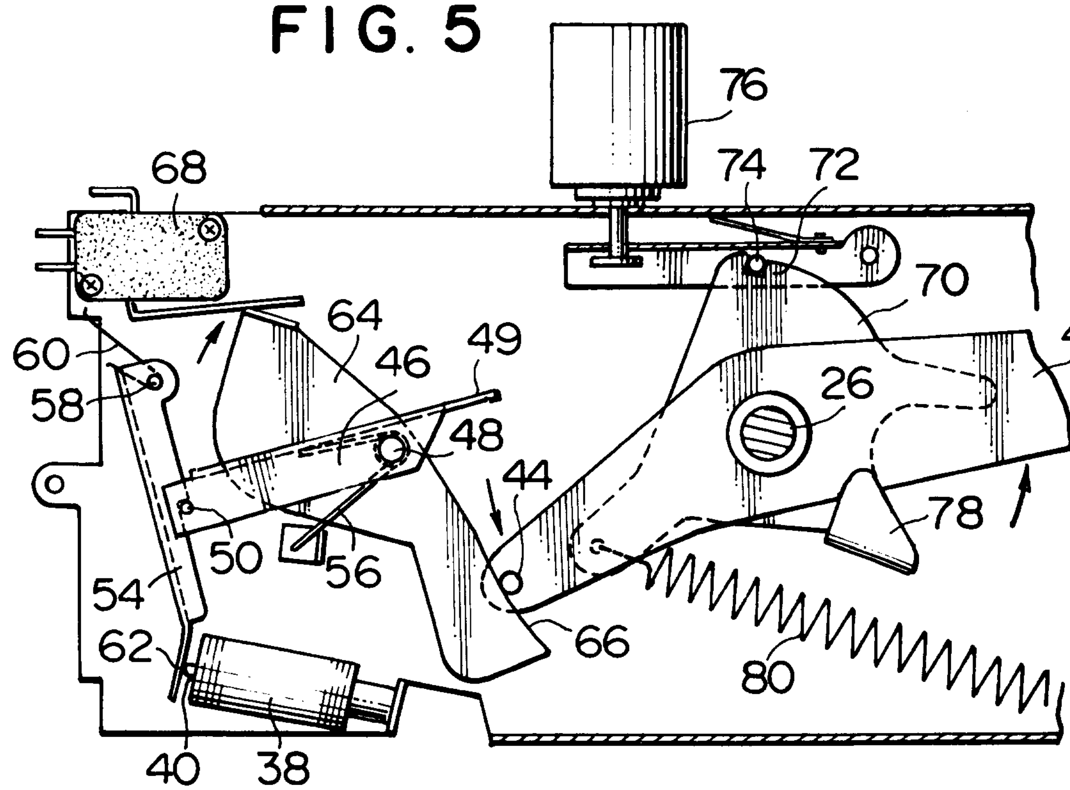
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FIG. 6

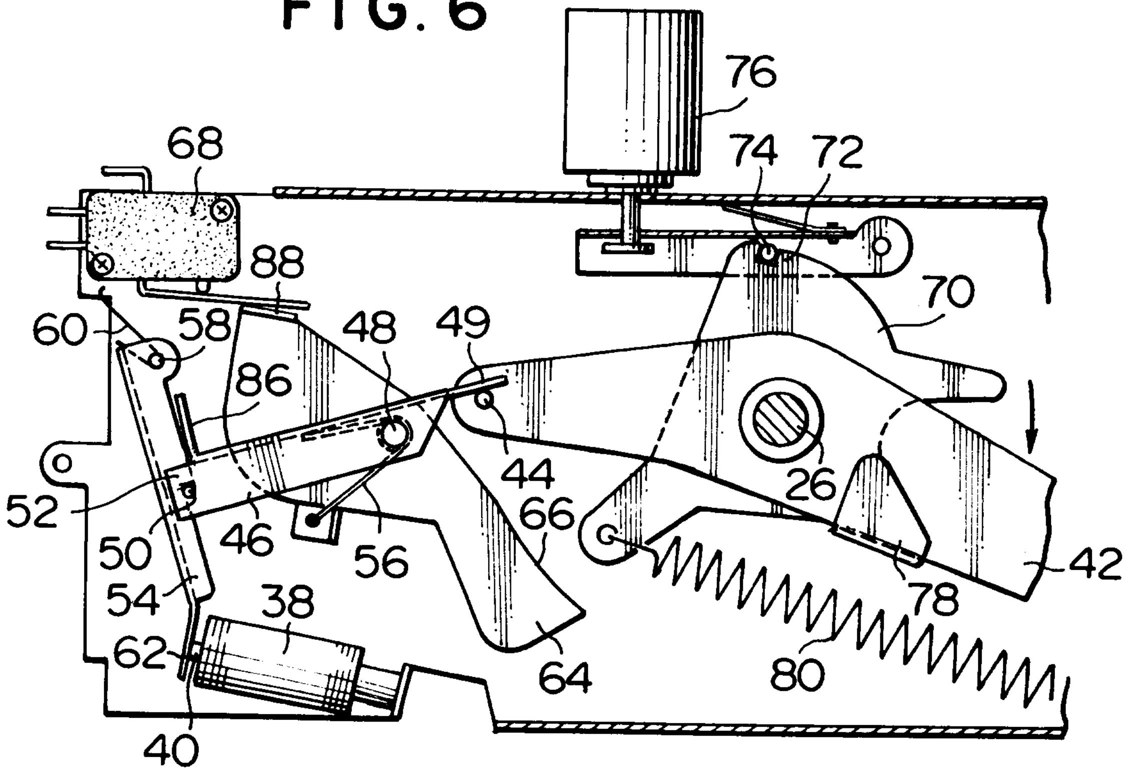
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FIG. 7

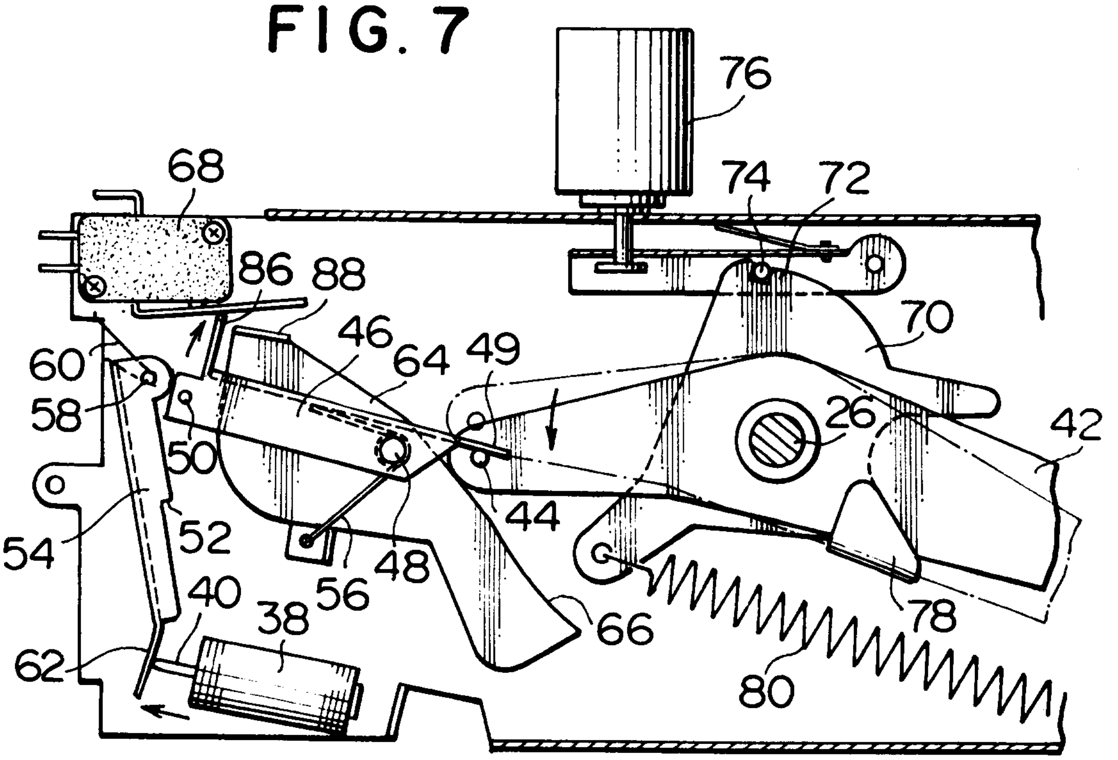
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FIG. 8

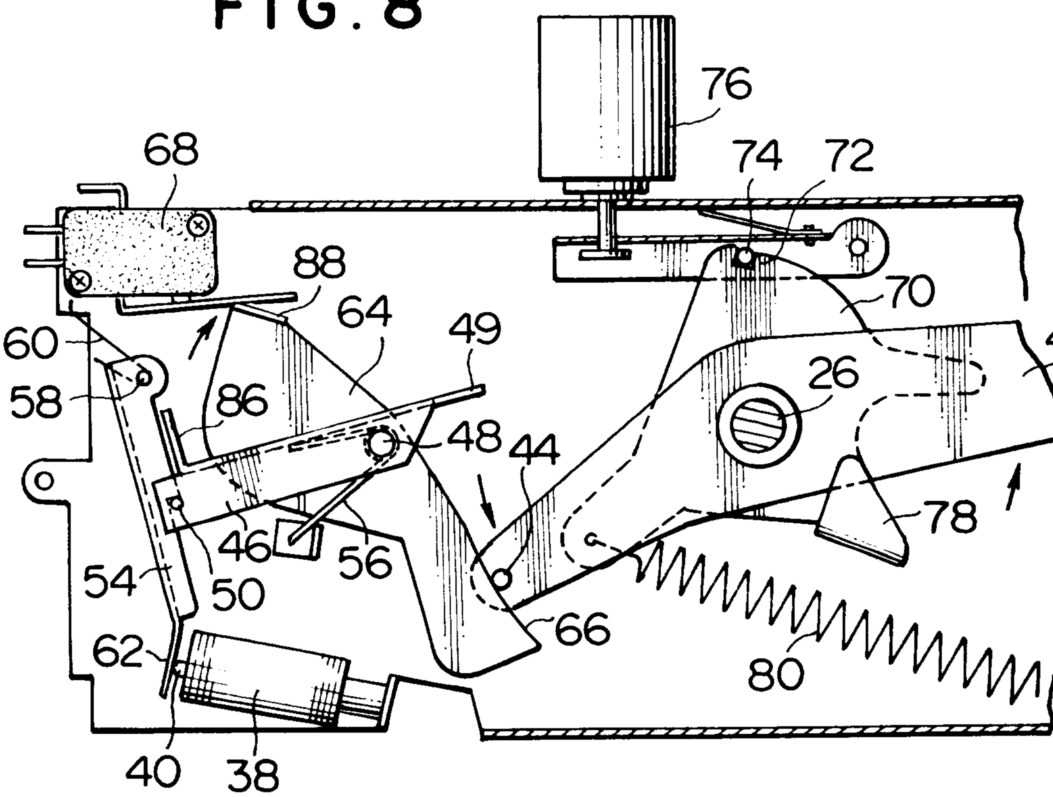
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FIG. 9

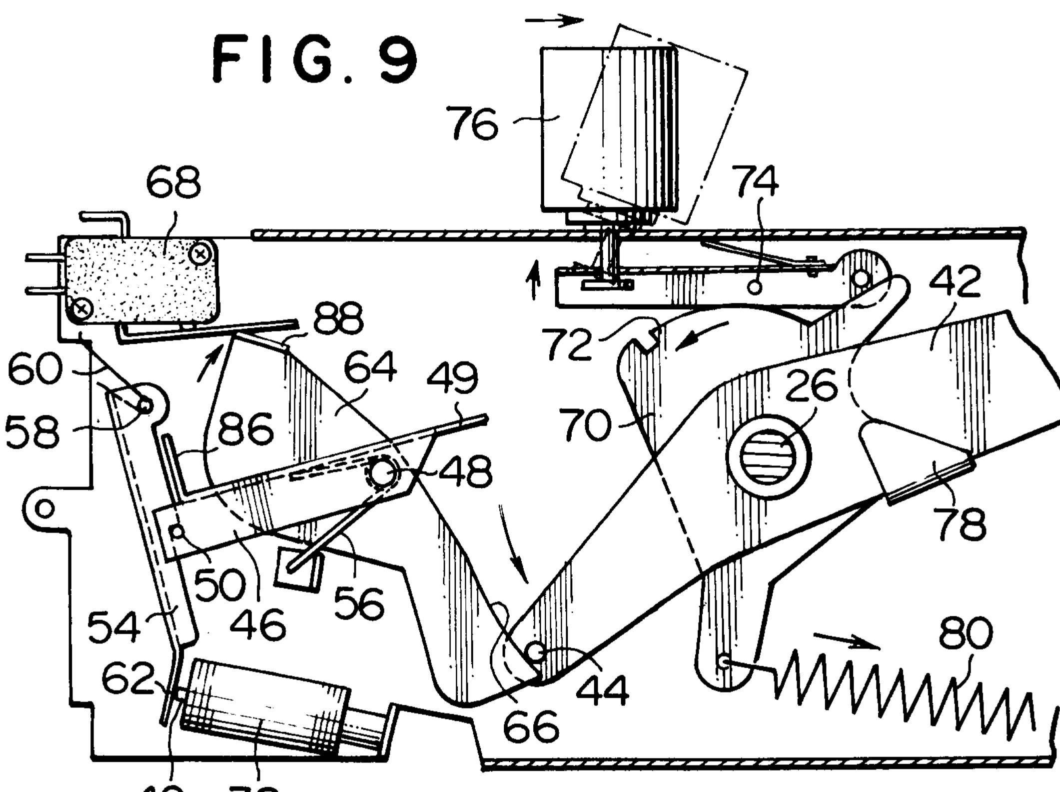
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FIG. 10

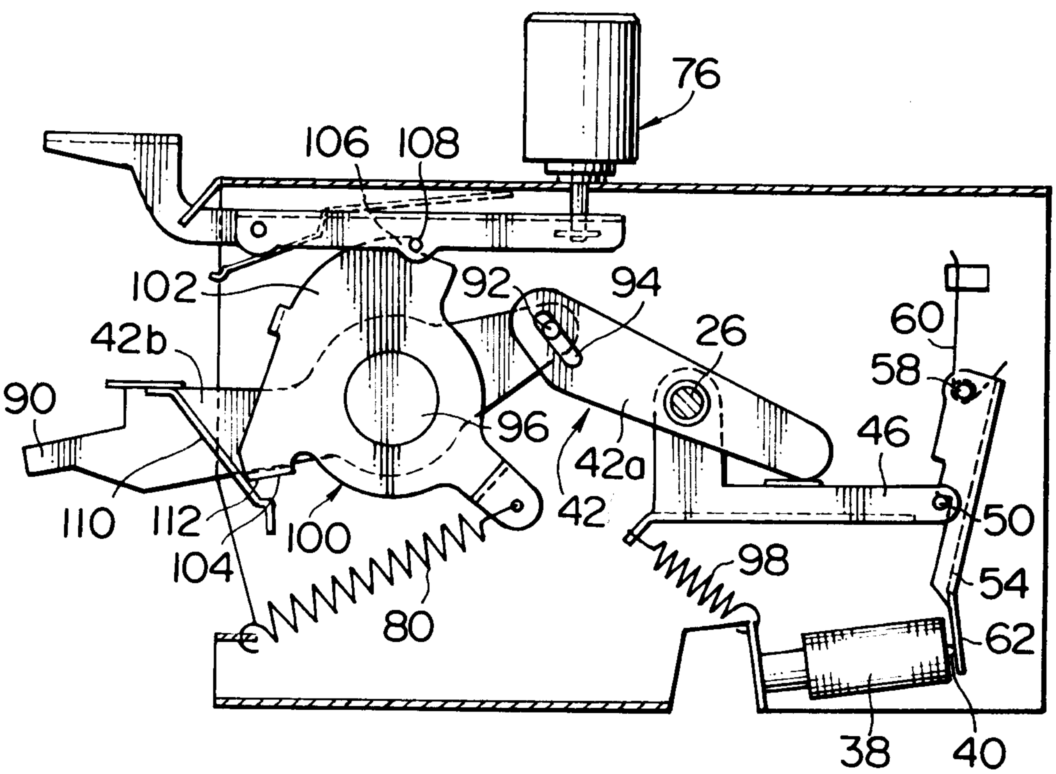
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FIG. 11

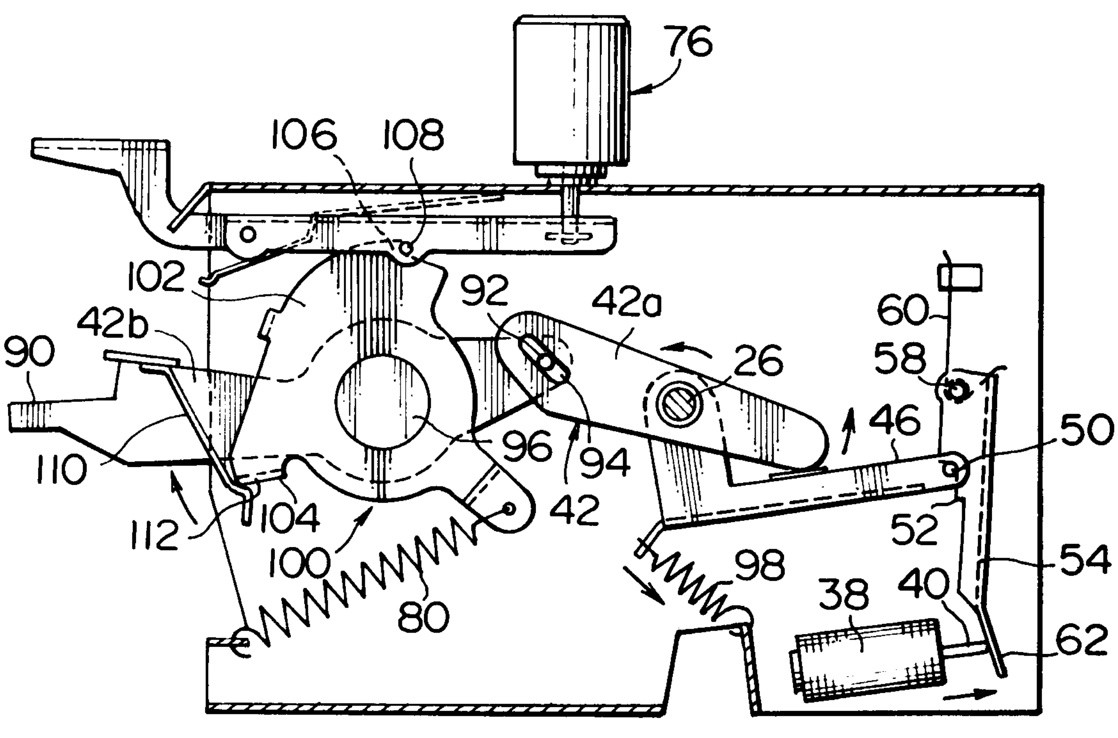
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FIG. 12

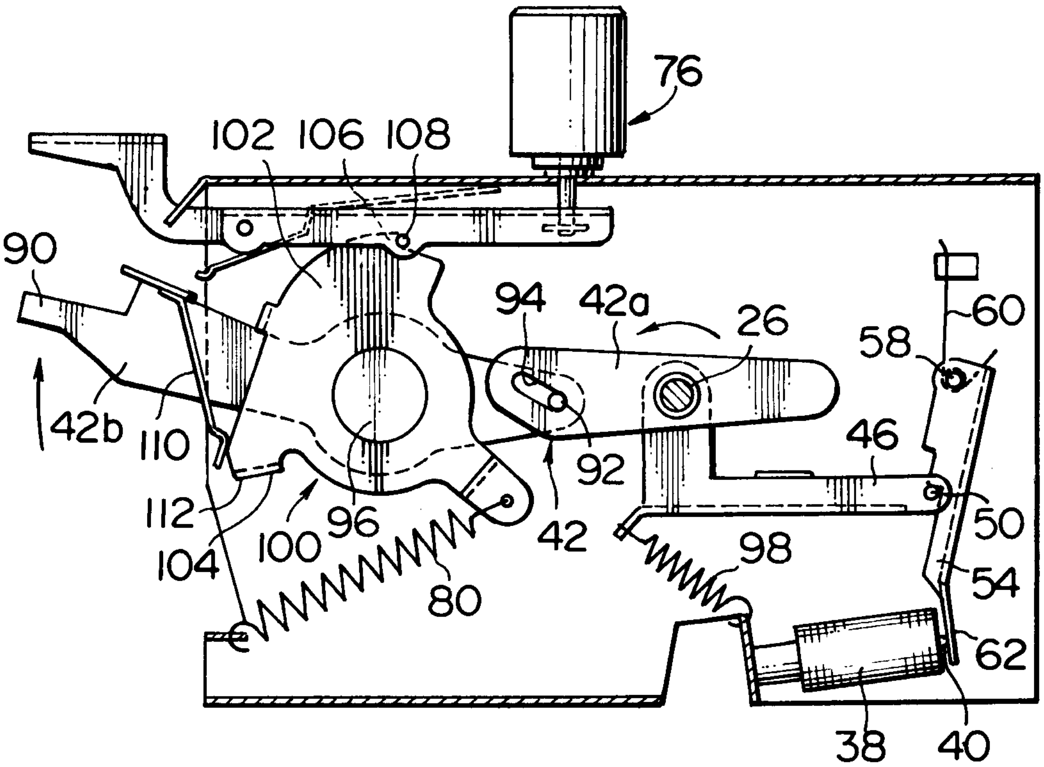
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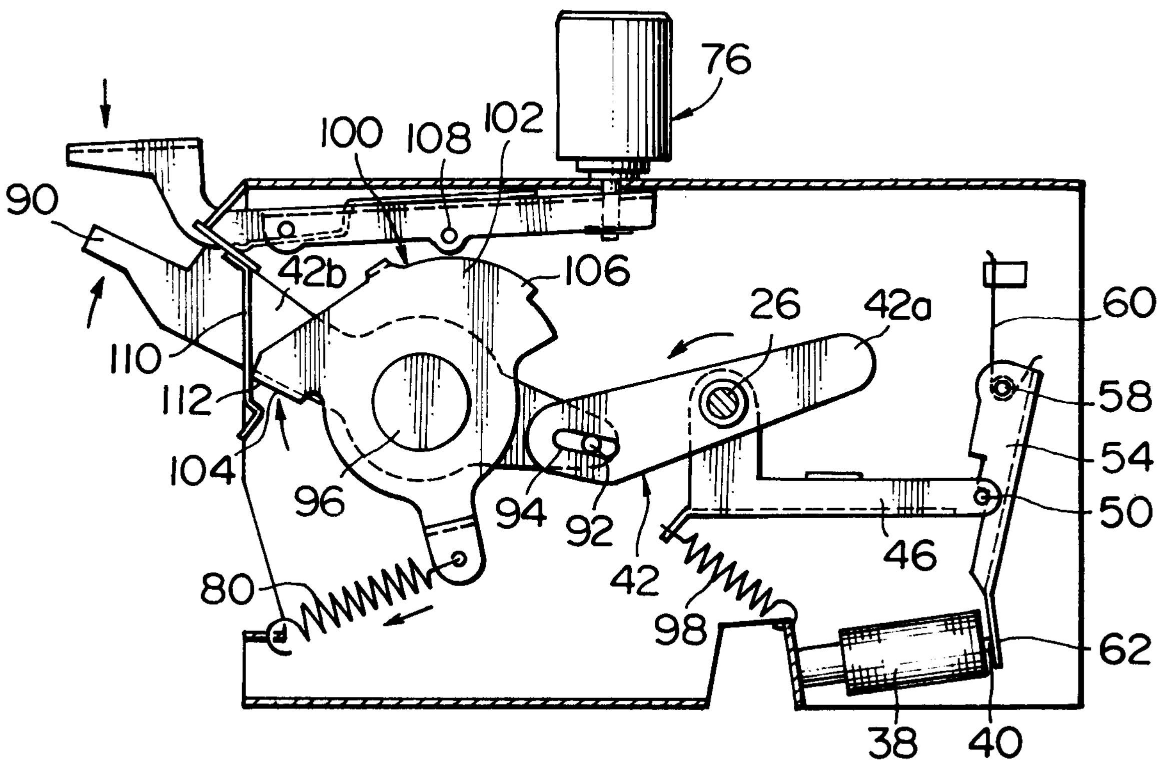
FIG. 13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European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 9857

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	EP-A-0 473 563 (GOBLET) * the whole document * ---	1,2	F23N1/00 F24C5/06
A	PATENT ABSTRACTS OF JAPAN vol. 012 no. 484 (M-776) ,16 December 1988 & JP-A-63 201422 (MATSUSHITA ELECTRIC IND CO LTD) 19 August 1988, * abstract; figure * ---	1-3	
A	PATENT ABSTRACTS OF JAPAN vol. 010 no. 044 (M-455) ,21 February 1986 & JP-A-60 194213 (SHARP KK) 2 October 1985, * abstract; figure * -----	1	

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

F23N
F24C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11 May 1995	Kooijman, F

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