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Description

The present invention refers to a safety device for boilers, in particular for domestic heating equipments, sectional boilers or the like.

More particularly, the present invention refers to a safety device which stops the feeding of a burner in order to stop the products of the combustion expelled from the burner from invading the room housing the boiler, istead of being expelled outwards by the chimney.

A boiler of the above kind comprises a burner, a combustion chamber, a heat exchanger fitted with a pilot flame nozzle and located above the combustion chamber and in which, as known, part of the heat of the gases coming from said combustion chamber is transmitted to an intermediate heating fluid (water, oil and the like); a hood for a chimney, located above said heat exchanger, via which the gases having passed through the exchanger are sent to the chimney.

When the exchanger is clogged by the solid residuals of combustion, the gases coming from the burner escape from the combustion chamber into said room; in the same manner, when the chimney is clogged, the gases direct themselves into the room rather than into the chimney. In both cases, the combustion is imperfect and the room is polluted by the products of this combustion.

Detecting instruments are known which are able to detect the quality and the quantity of the usual pollutants coming from combustion such as carbon monoxide or carbon dioxide, methane and other gaseous hydrocarbons. These instruments can be portable and are not adapted to intervene directly on the feeding of the boiler. They also have the following disadvantages:

1- Their sensors are not selective with respect to all the pollutants coming from an imperfect combustion, therefore they might erroneously signal the presence of pollutants in case a gaseous substance interferring with the sensors is present in the room;

2- the response times of the sensors are relatively long with respect to the variations of the concentrations of a pollutant; therefore, the pollutant is allowed to invade the room before the sensors intervene to signal it;

3- they are expensive and they may not be easily used in a device adapted to stop the feeding of the burner, due to their above mentioned features;

4- the devices fitted with sensors of above kind have an irreversible action on the feeding of the boiler's burner, that is they are not able to reset the feeding after they have stopped it; this entails the necessity of interventions on the same devices and on the feeding elements even in the case of an incorrect detection by the sensors for that described in above item 1.

U.S. A - 3,537,803 refers to a safety device for a gas fired furnace, which comprises: an enclosure, a combustion chamber within said enclosure, a flue connected to said combustion chamber for conducting the exhaust gases from said combustion chamber, a first opening in said enclosure admitting air into said combustion chamber and a second opening in said enclosure serving as a draft diverter for said flue. In addition, the improvement comprises: a plurality of temperature sensing devices mounted externally on said combustion chamber, one of said temperature sensing devices being mounted on said enclosure immediately above said opening serving as draft diverter; and means responsive to each of said temperature sensing devices for interrupting the fuel supply of said furnace when the temperature at any one of said sensing devices rises above a predetermined level.

The invention described in U.S. A - 3,537,803 does not solve any of the problems which are solved by the invention described in the present application; in particular the invention described in U.S. A - 3,537,803 has an irreversible effect on the supply of the furnace, as described in item 4 above. Furthermore the lack of two intervention thresholds is the cause of regulation instability due to useless interventions when the gases burnt by the burner tend to escape into the room because of momentary pressure drops in said room, for example when one lights a fire.

GB - A - 2 020 794 refers to a control means for gas fired heat generators of the type comprising a heater body provided with a heat-exchanger, wherein the supply of the gas to the burner is interrupted as a result of an increase in the quantity of carbon monoxide in the products of combustion due to contamination of the heat-exchanger or an overload at the burner, said means comprising a tube adapted to open at one end into the heater body and at the other end outside the body to remove products of combustion, and a heat sensitive device mounted on said tube to react to a rise in temperature so as to interrupt the supply of gas to the burner or to actuate a warning system.

The device described in G.B. - A- 2 020.794 has the following disadvantages: in particular it has an irreversible effect on the supply of the burner as described in item 4 above. Furthermore the supply may be obtained by connecting the electrical conductors which control the solenoid supply valve directly; in the device described in G.B. - A- 2 020.794 these conductors form an electrical network which also comprises a thermostat constituting said heat sensitive device mounted on said tube. It is quite easy to close the electrical circuit

by a by-pass conductor which cuts out the thermostat.

DE - A - 30 20 220 shows a safety device for a heat source which presents an inlet, a first outlet in a chimney and a second outlet in a room housing the heat source and a control transducer device which cuts out the heat source when the exhaust gases tend to invade the room housing the heat source or when the chimney is clogged. Two temperature sensors are provided in said device; one of these sensors is mounted on the outlet of the chimney and the other on the outlets in the room housing the heat source; the control transducer device is responsive to the difference of the values of the temperature measured by the sensors and cuts out the heat source when the difference is less than a nominal value defined by a potentiometer.

The present invention is intended to remedy these drawbacks. The invention, as claimed, solves the problem of how to create a safety device for boilers. By using a device according to the present invention, the following result is achieved: the feeding of the burner is stopped if the products of the combustion tend to invade the room housing the boiler and it is reset if the tendency is momentary.

The advantages offered by the device according to the present invention consist essentially of the fact that it is very simple to assembly it near the boiler, even if already installed, the assembly being also very reliable.

In one embodiment of the invention a boiler is provided having: an enclosure, a combustion chamber within the enclosure, a chimney connected to the combustion chamber for conducting the exhaust gases from the combustion chamber, a first opening in the enclosure admitting air into the combustion chamber and a second opening in the enclosure serving as a draft diverter for the chimney; the bolier further having: a plurality of temperature sensing devices mounted externally on the combustion chamber, one of the temperature sensing devices being mounted on the enclosure immediately above the opening serving as draft diverter for the chimney; safety devices responsive to each of the temperature sensing devices, the safety devices being electrically connected to a solenoid valve to interrupt the fuel supply of a burner housed in the combustion chamber when the temperature at any one of the sensing devices rises above a predetermined level and to maintain the fuel supply when the same temperature is lower than said level; a pilot flame nozzle to reset the combustion of the burner, wherein the safety devices comprise a defining element for defining two temperature thresholds, the first threshold being higher than the second threshold and coinciding with said level; at the second threshold, measured by the sensing devices, the safety devices acting on the solenoid valve in order to reset the feeding of the burner; electrical elements being provided to solve the problems caused by the variations of the resistence of the conductors necessary for electrical connection between the sensing devices and the safety devices.

The invention will be described in greater detail below by referring to the drawings which represent non limiting embodiments in which:

Fig.1 is a schematic view of a boiler fitted with a device according to the present invention;

Fig.2 shows an embodiment of the invention in a block diagram;

Figs. 3-7 show further embodiments of the invention.

The boiler shown schematically in Fig.1 comprises a burner 1, connected to a feeding piping 2 for a gaseous fuel, fitted with a solenoid valve 3 able to permit or to stop the gas flow toward the burner 1; a combustion chamber 4 being located between the burner 1 and a heat exchanger 5. A hood 6 having a cavity for a chimney 7 is located above the exchanger 5; the hood 6 has a cavity 8 open toward the room. The burner is fitted with a pilot flame nozzle 9 which ensures the lighting and the stability of the combustion of burner 1 under any condition.

A first temperature sensor 10 is located below the burner 1 where a temperature value close to the room temperature is established when the boiler is on.

A second temperature sensor 11 is located near the cavity 8 in a zone which divides the inner space of said cavity 8 from the room; a temperature value close to the room temperature established in said zone when the boiler is on.

The first and second sensors 10 and 11 are electrically connected to a safety device 12 for boilers via a first conductor 13 and a second conductor 14, respectively. The device 12 is connected to a generator 15 and to the solenoid 3 via a third conductor 16 and a fourth conductor 17, respectively.

In the block diagram of Fig.2 the sensors 10 and 11 are connected to a first and a second safety device for boilers 12a and 12b, respectively, identical to said device 12 of Fig.1, via the conductor 13 and 14; the devices 12a and 12b are connected to a generator 15 via the conductors 15a and 15b and to the solenoid valve 3 via the conductors 16a and 16b.

In the block diagram of Fig.3 the sensors 9 and 10 are connected to a first and a second safety device for boilers 12a and 12b, respectively, identical to said device 12 of Fig.1, via the conductors 13 and 14; the devices 12a and 12b are connected to a generator 15 via the conductors 16a and 16b and to the solenoid valve 3 via the conductors 17a

and 17b. Furthermore, the devices 12a and 12b are connected to a first and to a second audio or visible signaller 18a and 18b, respectively, via conductors 19a and 19b. In this manner it is possible to identify immediately which of the two sensors 10 or 11 has emitted the signal indicating the flow of the burnt gases toward the room housing the boiler and to eliminate the obstacle which has caused this flow.

If the signaller 18a begins working, it means that the signal comes from sensor 10 and therefore the exchanger 5 must be cleaned; if the signaller 18b begins working, it means that the signal comes from sensor 11 and that the chimney must be cleaned.

The sensors 10 and 11 may be both thermocouples and thermistors; the latter may be both P.T.C. and N.T.C.

As known, the trend of an e.m.f. at the terminals of the thermocouples, expressed as a function of the temperature, is a monotonic curve not much different from a straight-line, in addition, the increment of the tension for a small increment of the temperature considered as an independent variable is very low. Such a trend is expressed in the graph of Fig.4.

A safety device fitted with temperature sensor made of thermocouples is shown in Fig.5. A sensor 10 or 11 is connected to a proportional amplifier 20 having an electric parameters gain which is very high and which has no distorsions in output signal. The amplifier 20 sends electrical pulses, proportional to the pulses received from the sensor 10 or 11, to an hysteresis network 21, which defines two intervention thresholds T_1 and T_2 of the device on the solenoid valve 3, T_1 being greater than T_2. The hysteresis network 21 sends output signals to an extinguishing network 22 connected to a power stage 23, fed by a rectifier transformer group 24.

Between the stage 23 and the group 24 a diode 25 is opportunely located. The stage 23 is connected to a solenoid 26 of the solenoid valve 3 which is earthed via a resistence 27. A diode 28 earths a first node 29 to void overcurrents linked to solenoid 26. A second node 30 is connected to stage 23 via solenoid 26 and to a delay network 31, whose output signal is sent to a chopper network 32, which contains a reference signal of the current intensity I_{ref} and whose output signal is sent to the stage 23.

A lamp 33, connected to node 30 and earthed, lights up when the solenoid is energized. When the temperature detected by one of the sensors 10 or 11 is above a value T_1, the hysteresis network 21 sends a signal to the stage 23 to act on the solenoid 26 so that the solenoid valve 3 stops the fuel feeding the burner 1; at the same time lamp 33 lights up. When, vice- versa, the temperature detected by one of the sensors 10 or 11 is below a value T_2, the hysteresis network 21 sends a signal to the stage 23 to act on the solenoid 26 so that the solenoid valve 3 opens the fuel feeding the burner 1 and at the same time lamp 33 goes off.

The hysteresis $S = (T_1 - T_2)$ between the intervention thresholds of the network 21 serves to void the regulation instability due to useless interventions when the gases burnt by the burner tend to escape towards the room because of momentary pressure drops in said room, for example when one lights a fire.

Fig.6 shows an electric network which controls a safety device according to the present invention in which the sensors 10 and 11 consist of thermistors both P.C.T. or N.T.C. The network consists of a mesh having four resistence sides R_1, R_2, R_3, R_4; between nodes A and B the rectifier transformer group 24, shown in Fig.5, is inserted to generate a low tension e.m.f. Between nodes C and D a safety device 12 is inserted which is fed by the group 24 and which is connected to solenoid 3.

Sensors 10 or 11 are represented by the variable resistence R_4, which is arranged in series with a rheostat R_5.

In order that nodes C and D are at the same potential, it is necessary that the following relation is valid:

$$A_1 \qquad R_4 + R_5 = R_3 x (R_1 / R_2)$$

The rheostat R_5 serves to determine the value of the temperature T_2, for which nodes C and D are at the same potential.

For a temperature T_m lower than T_2, the conductor 35, located between nodes C and D, would be crossed by a current I_n directed toward the direction of arrow F_2 which could damage the device 12. For this reason the conductor 35 is fitted with a diode 34 which voids the passage of the current I_m, directed toward the direction of the arrow F_1; for a temperature value T_M greater than T_2, the current I_m established in the conductor 35. The current I_m enables the device 12 to send an electrical signal to the solenoid valve 3 to stop the feeding to burner 1.

Since sensors 10 and 11 are not located near the device 12, one must take into account the problems caused by the variations of the resistence of the conductors necessary for electrical connection between the sensors and the device.

To overcome this disadvatage, the structure shown in Fig.7 is used; in said figure, the electrical feeding of the solenoid valve 3 is accomplished by connecting electrically the solenoid valve 3 to the high distribution network 36, while the regulation of said feeding is carried out in low tension. This expedient allows a decrease in the fall of pressure

along the feeding conductors.

The rectifier transformer group 24 is fitted with an inlet I_R connected to the distribution network 36 and with three outlets U_1, U_2, U_3, connected to a first operating network 37, to a second operating network 38 and to the power stage 23, respectively; said networks 37 and 38 being identical.

The power stage 23 is connected to the solenoid valve 3 to determine the opening and the closing states thereof. The sensor 10 is connected, via a conductor 41, at one end to the terminal 39 of the first operating network 37 and at the other end to earth 40. Two calibration rheostats 42 and 43 are arranged in series in the conductor 41. The outlet of the network 37 is connected to the inlet of a shielding network 44, one of the functions of which is to negate the effects of the high tension which acts on a light signaller 45, connected to network 44 and to earth 40. The outlet of network 44 is connected to a first inlet of the power stage 23.

The network 37 contains a current or tension reference signal R_{ref}. In operation, when, for example, the current I_a which crosses a detection line of network 37 is less than R_{ref}, the network 37 sends a first signal to network 44 enabling it to light the signaller 45 and to send a signal to the power stage 23 for which the stage 23 keeps the solenoid valve 3 open; vice-versa, when the current I_a is greater than R_{ref}, the network 37 sends to network 44 a second signal which enables it to turn off the signaller 45 and to send a signal to the power stage 23 for which the power stage 23 closes the solenoid valve 3.

The variation of the current or of the tension in the network 37 depends on the value of the resistence of the sensors, the value being a function of the temperature to which the sensors are subjected and on the calibration which the rheostats 40 and 41 have undergone.

The sensor 11 is connected via a conductor 46 at one end to the terminal of the second operating network 38 and at the other end to the earth. Two calibration rheostats 48 and 49 are arranged in series in relation to the conductor 41.

The outlet of the network 38 is connected to the inlet of a shielding network 50 which is able, amongst other things, to negate the effects of the high tension acting on the light signaller 51 connected to network 50 and to earth 40. The outlet 50 is connected to a second inlet of the power stage 23.

The network 38 contains a current or tension reference signal R_{ref}. In operation, when for example the current I_a, which crosses a detection line of network 38, is less than R_{ref}, the network 38 sends a first signal to network 50 enabling it to light the signaller 51 and to send a signal to power stage 23, as a result of which the power stage 23 keeps the solenoid valve 3 open; vice-versa, when the current I_a is greater than R_{ref}, the network 38 sends a signal to network 50 enabling it to turn off the signaller 51 and to send a power signal to the power stage 23, as a result of which the power stage 23 closes the solenoid valve 3.

The current or tension variation inside the network 38 depends on the value of the resistence of the sensor 11; the value being a function of the temperature to which the sensor 11 undergoes and of the calibrations which the rheostats 48 and 49 have undergone.

The closure of the solenoid valve 3, upon overheating of one of the sensor 10 and 11, may be caused by the closing of the exchanger 5 or of the chimney 7. In these cases the signallers 45 and 51 indicate which of the sensors is involved in the failure of the boiler so that the failure may be removed.

Claims

1. A boiler having: an enclosure, a combustion chamber (4) within the enclosure, a chimney (7) connected to the combustion chamber (4) for conducting the exhaust gases from the combustion chamber (4), a first opening in the enclosure admitting air into the combustion chamber (4) and a second opening in the enclosure serving as a draft diverter for the chimney (7); the boiler further having: a plurality of temperature sensing devices (10,11) mounted externally on the combustion chamber (4), one of the temperature sensing devices (10,11) being mounted on the enclosure immediately above the opening serving as draft diverter for the chimney (7); safety devices (12) responsive to each of the temperature sensing devices (10,11), the safety devices (12) being electrically connected to a solenoid valve (3) to interrupt the fuel supply of a burner (1) housed in the chamber (4) when the temperature at any one of the sensing devices (10,11) rises above a predetermined level and to maintain the fuel supply when the same temperature is lower than said level; a pilot flame nozzle (9) to reset the combustion of the burner (1), **characterized** by the fact that the safety devices (12) comprise a defining element (21) for defining two temperature thresholds (T_1,T_2), wherein the first threshold (T_1) is higher than the second threshold (T_2) and coincides with said level; at the second threshold (T_2), measured by the sensing devices (10,11), the defining element (21) acting on the solenoid valve (3) in order to reset the feeding of the burner (1); electrical elements being provided to solve the problems caused

by the variations of the resistence of the conductors necessary for electrical connection between the sensing devices (10,11) and the safety devices (12).

2. A boiler according to claim 1, **characterized** by the fact that the defining element (21) is a hysteresis network (21) which defines the temperature thresholds (T_1,T_2).

3. A boiler according to claim 2, **characterized** by the fact that the hysteresis network (21) is a part of a circuit including also a proportional amplifier (20) having a high gain of electrical parameters and void of distorsions in the output signal; the amplifier (20) sending electrical signals proportional to the electrical signals coming from the sensing devices (10,11) to the hysteresis network (21); the hysteresis network (21) sending output signals to an exstinguishing network (22) connected to a power stage (23), fed by a rectifier-transformer group (24), a diode being arranged between the group (24) and the stage (23); the stage (23) being connected to a solenoid (26) of the solenoid valve (3) which controls the feeding of the burner (1); the solenoid (26) being earthed by a resistence (27); a diode (28) earthing a first node (29) to avoid overcurrents linked to the solenoid (26), a second node (30) being connected to the stage (23) via the solenoid (26) and to a delay network (31) whose output signal is sent to a chopper network (32) containing an electrical reference value (I_{Ref},R_{Ref}) and whose output signal is sent to the stage (23).

4. A boiler according to claim 1, **characterized** by the fact that the means to avoid the effects due to the variations of electrical resistences include the rectifier transformer group (24) having an inlet (I_{Ref}) connected to a distributor network (36) and three outlets (U_1,U_2,U_3) connected to a first operating network (38) and to the power stage (23), respectively; the power stage (23) being connected to the solenoid valve (3) to determine the opening and closing states thereof; one of the sensing devices (10,11) being connected, via a conductor (41,46) at one end to a terminal (39,47) of the operating network (37,38) and at the other end to the earth (40); two calibration rheostats (42,43,48,49) being inserted in series in the conductor (41,46), the outlet of the network (37,38) being connected to the inlet of a shielding network (44,50) also able to avoid the effects of the high tension on a signaller (45,51) connected to the network (44,50) and to the earth (40); the outlet of the network (44,50) being connected fo a first inlet of the power stage (23); the network (37,38) containing a current or tension reference signal (I_{Ref},R_{Ref}).

Patentansprüche

1. Ein Kessel weist folgende Glieder auf: einen Mantel, eine Verbrennungskammer (4), die innerhalb des Mantels gelagert ist, einen mit der Verbrennungskammer (4) angeschlossenen Kamin (7), der für den Auslaß der Abgase aus der Verbrennungskammer (4) dient; eine erste Öffnung im Mantel für den Luftzutritt in die Verbrennungskammer (4) und eine zweite Öffnung im Mantel, die zum Ableiten der Abgase in Richtung des Kamins (7) dient; außerdem umfaßt der Kessel folgende Vorrichtungen: mehrere Temperaturfühler (10,11), die sich in der Außenseite der Verbrennungskammer (4) befinden, wobei einer der Temperaturfühler (10,11) an dem Mantel unmittelbar über der Öffnung, die zum Ableiten der Abgase in Richtung des Kamins (7) dient, angeordnet ist; Sicherheitsvorrichtungen (12) mit einem Rückmeldungssystem, das auf die Temperaturfühler (10,11) reagiert, wobei die Sicherheitsvorrichtungen (12) an einem Elektroventil (3) angeschlossen sind, damit die Kraftstoffspeisung eines Brenners (1) der Verbrennungskammer (4) ausgeschaltet wird, wenn die Temperatur, die durch einen der Temperaturfühler (10,11) abgemessen wird, über einen vorbestimmten Wert steigt und die Kraftstoffspeisung ermöglicht, wenn die Temperatur niedriger als der obige Wert ist; eine Steuerflammedüse (9), die zur erneuten Anzündung des Brenners (1) dient, dadurch gekennzeichnet, daß die Sicherheitsvorrichtung (12) mit einem Regulierungsglied (21) ausgestattet ist, welches zwei Temperaturstufen (T_1,T_2) definiert, wobei die erste höher als die zweite ist, un mit dem genannten Wert übereinstimmt; auf der zweiten Stufe (T_2), die von den Temperaturfühlern (10,11) aufgezeigt wird, aktiviert das Regulierungsglied (21) das Elektroventil (3) zur erneuten Anzündung des Brenners (1); wobei elektrische Vorrichtungen zur Vermeidung solcher Probleme dienen, die mit Wiederstandsschwankungen der elektrischen Leitungen, die zur Verbindung unter den Fühler (10,11) und der Sicherheitsvorrichtung (12) dienen, zusammenhängen.

2. Kessel nach Anspruch 1, dadurch gekennzeichnet, daß das Regulierungsglied (21) aus einem Hysteresenetz besteht, welches die Temperturstufen (T_1,T_2) definert.

3. Kessel nach Anspruch 1, dadurch gekennzeichnet, daß das Hystersenetz (21) zu einem Kreis mit einem proportionellen Verstärker (20) gehört, der einen hohen Gewinn an elektrischen Parametern bewirkt und die Abweichungen des Ausgangssignals vermeidet; der Verstärker (20) sendet elektrische Signale zum Hysteresenetz (21), die zu den elektrischen Signalen, die aus den Fühlern (10,11) kommen, proportionell sind; das Hystersenetz (21) sendet Ausgangssignale zu einem Löschungsnetz (22), das mit einer durch eine Transformator-Gleichrichter-Einheit (24) gespeisten Leistungsstufe (23) verbunden ist, wobei eine Diode zwischen der Transformator-Gleichrichter-Einheit (24) und der Leistungsstufe (23) angeordnet ist; die Leistungsstufe (23) ist mit einem Solenoid (26) des Elektroventils (3) verbunden, das die Speisung des Brenners (1) kontrolliert; der Solenoid ist durch einen Wiederstand (27) geerdet; eine Diode (28) erdet einen ersten Knoten (29), um zu vermeiden, daß sich Exstrastrom bildet, der an den Solenoid (26) verkettet ist; ein zweiter Knoten (30), der mit der Leistungsstufe (23) durch den Solenoid (26) verbunden ist, wie auch an ein Verpätungsnetz (31), dessen Ausgangssignal an ein Chopper-Netz (32) gesendet wird, das Bezugswerte (I_{Ref},R_{Ref}) enthält und dessen Ausgangssignal an die Leistungsstufe (23) gesendet wird.

4. Kessel nach Anspruch 1, dadurch gekennzeichnet, daß die elektrische Vorrichtungen, die zur Vermeidung solcher Probleme dienen, die Transformator-Gleichrichter-Einheit (24) umfaßen, die einen Eingang (I_{Ref}) hat, der mit einem Ferteilungsnetz (36) verbunden ist, und hat außerdem drei Ausgänge (U_1,U_2,U_3), die jeweils mit einem ersten Operationsnetz und an die Leistungsstufe (23) Verbunden sind; die Leistungsstufe (23) is mit dem Elektroventil (3) verbunden, um das Öffnen und Schließen des Ventils (3) zu bewirken; einer der Temperaturfühler (10,11) ist durch eine Leitung (41,46) an einem Ende einer Klemmer (39,47) des Operationsnetzes (37,38) und an anderen Ende an die Erde (40) angeschloßen; zwei Eichrheostate (42,43,48,49) sind mit mit der Leitung (41,46) hintereinandergeschaltet; der Ausgang des Netzes (37,38) ist mit dem Eingang eines Schutznetzes (44,50) verbunden, das unter anderem dazu dient, die Auswirkungen der Hochspannung zu vermeiden, welche ein mit Netz (44,50) und Erde (40) verbundenes Lichtsignal (45,51) betätigt; der Ausgang des Netzes (44,50) ist mit einem ersten Eingang der Leistungsstufe (23) verbunden; zu dem Netz (37,38) gehört ein Bezugsignal (IRef) in Strom oder Spannung.

Revendications

1. Chaudière comprenant: une carrosserie, une chambre de combustion (4) dans la carrosserie, une cheminée (7) reliée à la chambre de combustion (4), une première ouverture dans la carrosserie pour l'arrivée d'air dans la chambre de combustion (4) et une seconde ouverture dans la carrosserie servant de commutateur pour la cheminée (7); en outre, la chaudière comprend: plusieurs capteurs de température (10, 11) montés à l'extérieur de la chambre de combustion (4) un des capteurs (10, 11) étant installé dans la carrosserie immédiatement au-dessus de l'ouverture qui sert de commutateur pour la cheminée (7); des dispositifs de sécurité (12) qui interviennent en réponse à chacun des capteurs de température (10, 11), les dispositifs de sécurité (12) étant reliés électriquement à une soupape électrique (3) pour interrompre l'alimentation en combustible à un brûleur (1) disposé dans la chambre de combustion (4) lorsque la température mesurée par un des capteurs (10, 11) monte au-dessus d'une valeur fixée à l'avance et pour maintenir l'alimentation en combustible lorsque la température est inférieure à cette même valeur; une tuyère pour la flamme pilote (9) servant à rétablir la combustion du brûleur (1) caractérisée par le fait que le dispositif de sécurité (12) comprend un élément de définition (21) qui fixe deux seuils de température (T_1, T_2) dans lequel le premier seuil (T_1) est plus élevé que le second (T_2) et coïncide avec cette valeur de température; au second seuil (T_2) mesuré par les capteurs (10, 11), l'élément (21) agissant sur la soupape électrique (3) afin de rétablir la combustion du brûleur (1); des éléments électriques étant prévus pour résoudre les problèmes causés par les variations de la résistance des conducteurs nécessaires au relais entre les capteurs (10, 11) et le dispositif de sécurité (12).

2. Chaudière selon la Rev.1, caractérisée par le fait que l'élément de définition (21) est un réseau à hystérésis (21) qui définit les seuils de température (T_1, T_2).

3. Chaudière selon la Rev.1, caractérisée par le fait que le réseau à hystérésis (21) fait partie d'un circuit qui comprend également un amplificateur proportionnel (20) qui a un gain élevé en paramètres électriques et est exempt de déformations dans le signal de sortie; l'amplifi-

cateur (20) en envoyant des signaux proportionnels aux signaux électriques qui proviennent des capteurs (10, 11) au réseau à hystérésis (21); le réseau à hystérésis (21) en envoyant des signaux de sortie à un réseau d'extinction (22) reliée à un réseau de puissance (23) alimenté par un groupe transformateur-redresseur (24), une diode étant installée entre le groupe (24) et le réseau de puissance (23); le réseau de puissance (23) étant relié à un solénoïde (26) de la soupape électrique (3) qui contrôle l'alimentation du brûleur (1); le solénoïde (26) étant relié à la terre par l'intermédiaire d'une résistance (27); une diode (28) reliant à la terre un premier noeud (29) pour empêcher les extra-courants dérivant du solénoïde (26); un second noeud (30) étant relié au réseau de puissance (23) par le solénoïde (26) et à un réseau retardateur (31) dont le signal de sortie est envoyé à un réseau de sélecteur mécanique (32) qui contient des valeurs de référence (I_{Ref}, R_{Ref}) et dont le signal de sortie est envoyé au réseau de puissance (23).

4. Chaudière selon la Rev. 1, caractérisée par le fait que les moyens pour résoudre les effets dus aux variations des résistances électriques comprennent le groupe transformateur-redresseur (24) qui a une entrée (I_{Ref}) reliée à un réseau de distribution (36) et trois sorties (U_1, U_2, U_3) reliées respectivement à un premier réseau opérationnel (38) et au réseau de puissance (23); le réseau de puissance (23) étant relié à la soupape électrique (3) pour en déterminer l'ouverture et la fermeture; un des capteurs de température (10, 11) étant relié par un conducteur (41, 46) à une extrémité à une borne (39, 47) du réseau opérationnel (37, 38) et à l'autre extrémité à la terre (40); deux rhéostats de tarage (42, 43, 48, 49) étant introduits en série sur le conducteur (41, 46), la sortie du réseau (37, 38) étant reliée à l'entrée d'un réseau protecteur (44, 45) apte entre autres à empêcher les effets de haute tension qui agissent sur un signaleur lumineux (45, 51) relié au réseau (44, 50) et à la terre (40), la sortie du réseau (44, 50) étant reliée à une première entrée du réseau de puissance (23); le réseau (37, 38) contenant un signal de référence (I_{Ref}) en courant ou en tension.

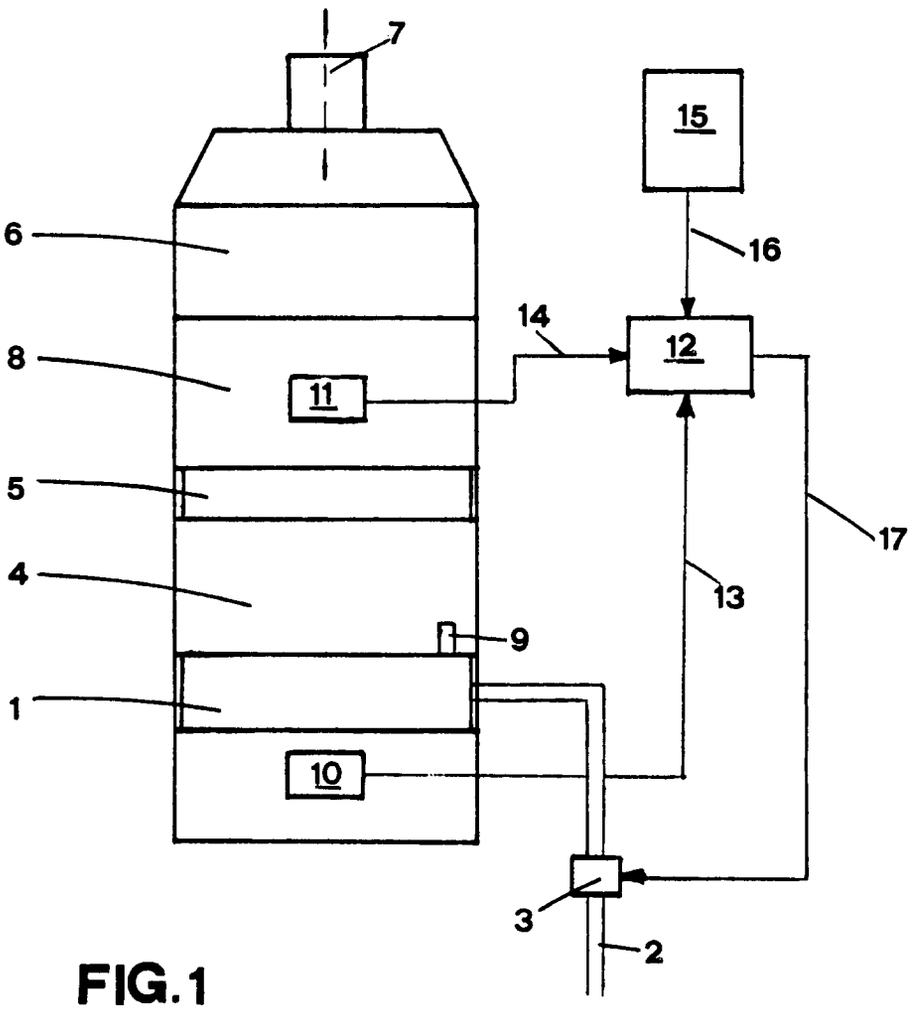

FIG.1

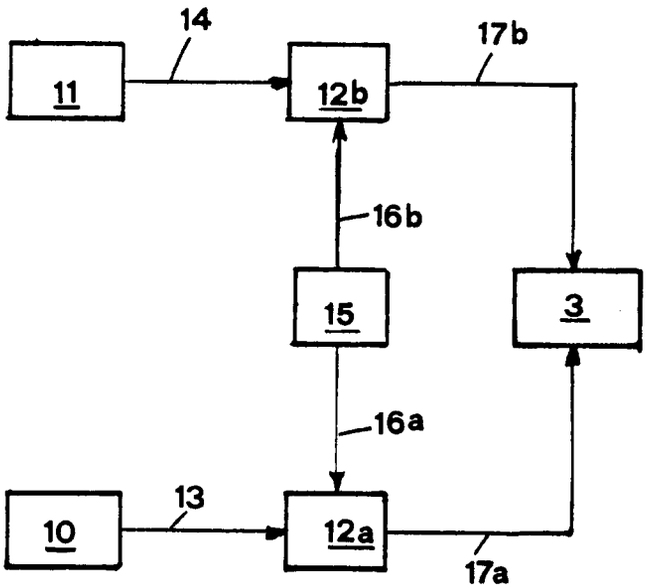
14
17b
11
12b
16b
15
3
16a
13
10
12a
17a

FIG.2

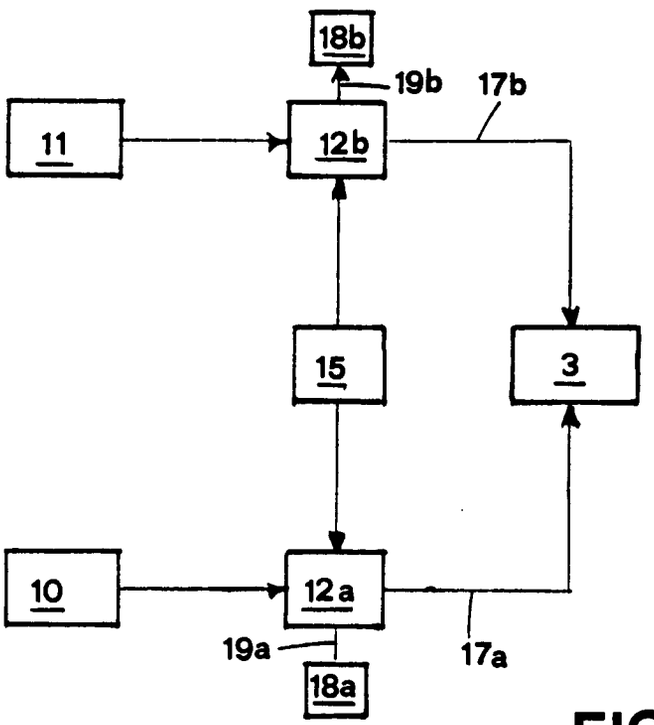
18b
19b
17b
11
12b
15
3
10
12a
19a
17a
18a

FIG.3

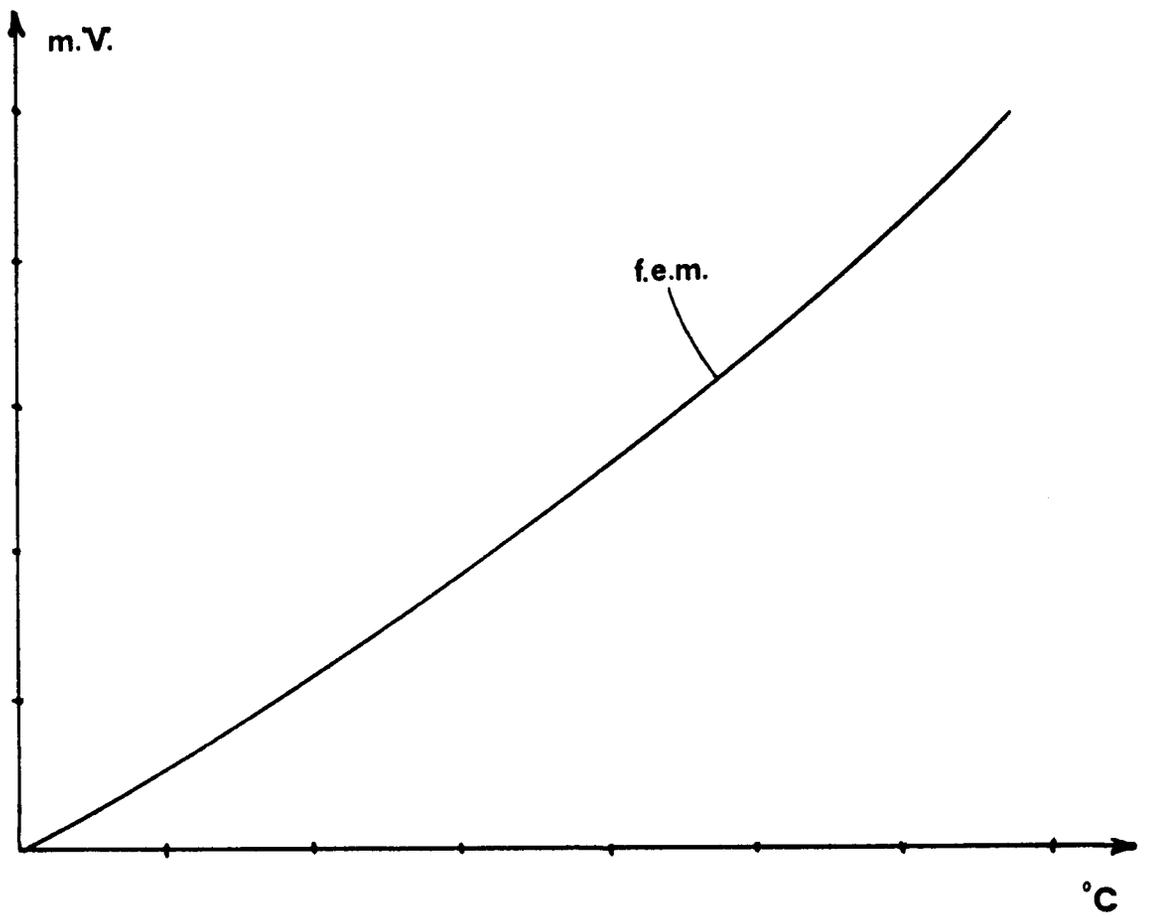

FIG.4

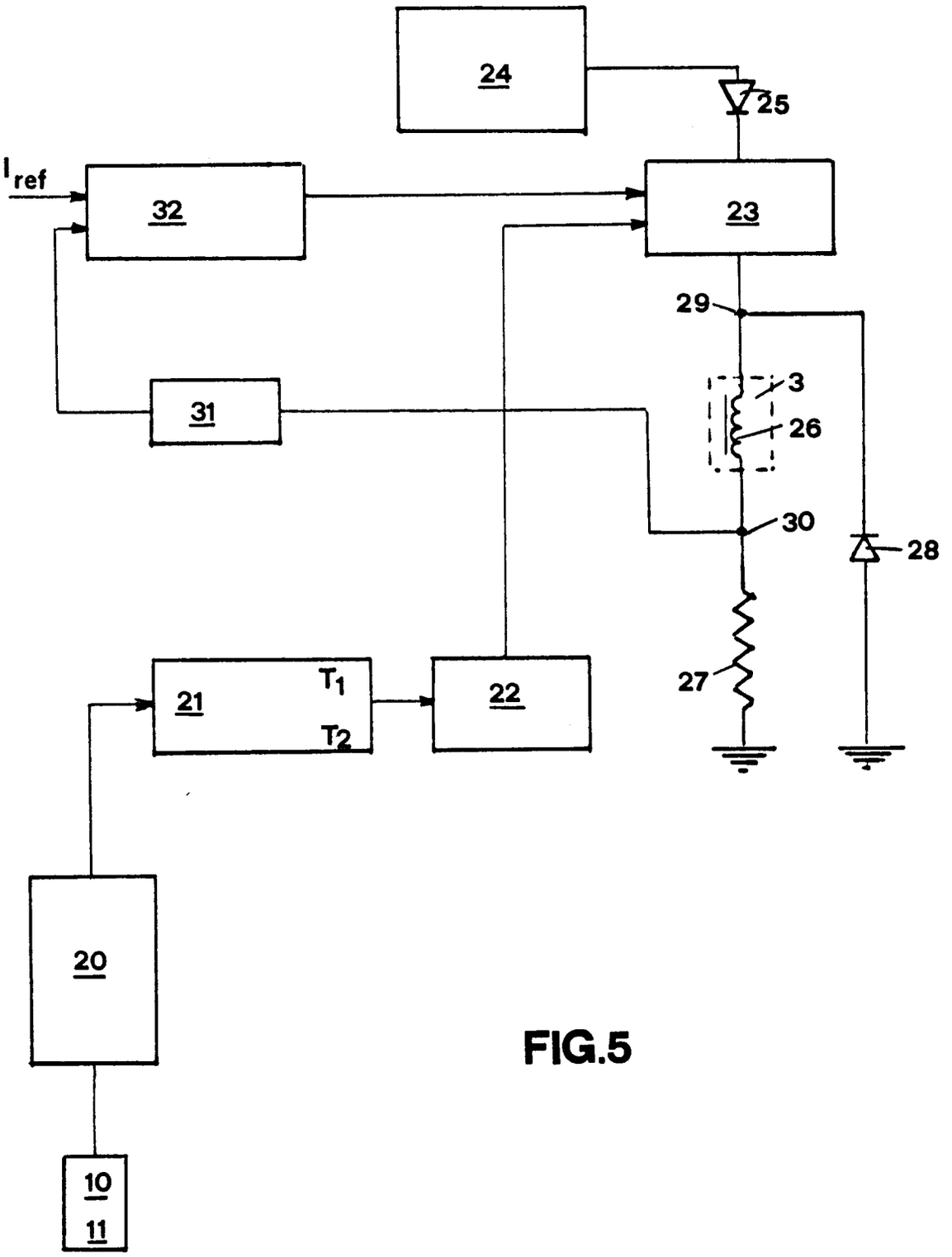

FIG.5

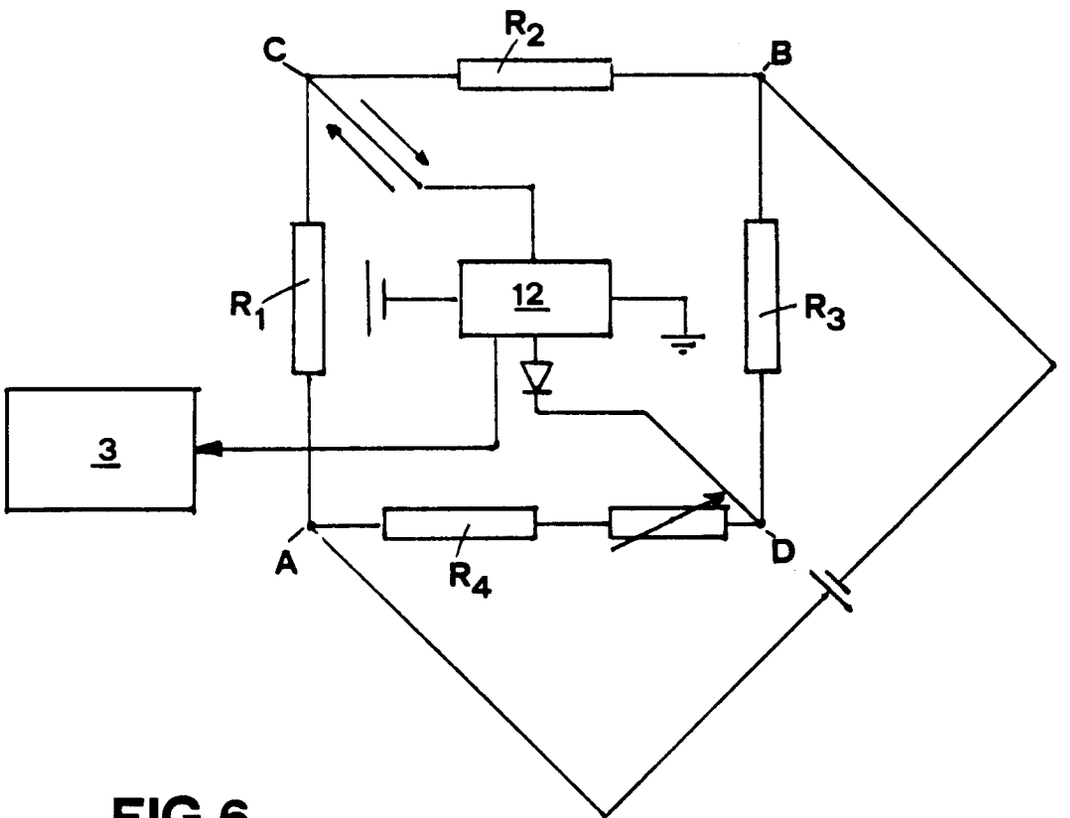

FIG.6

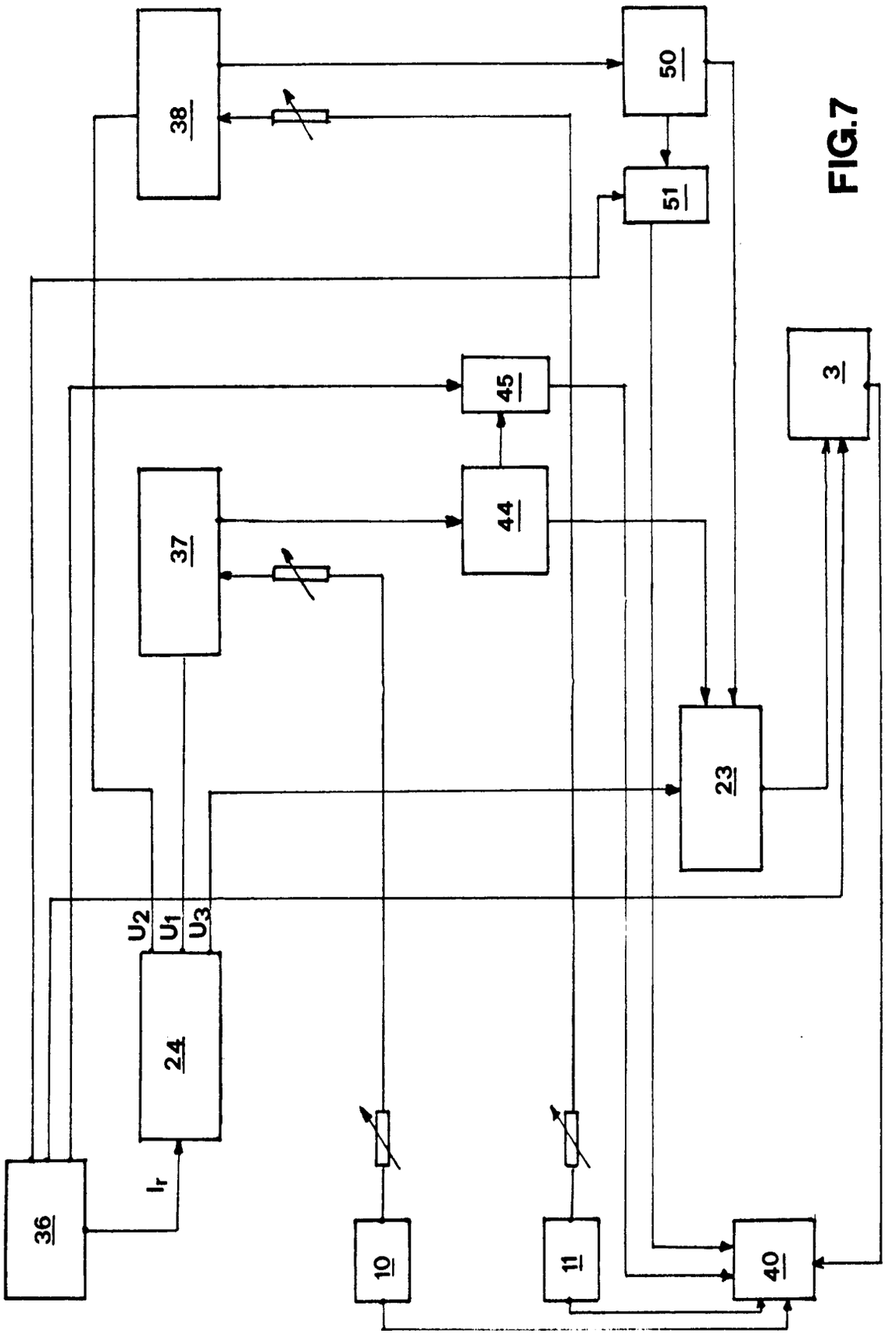

FIG.7