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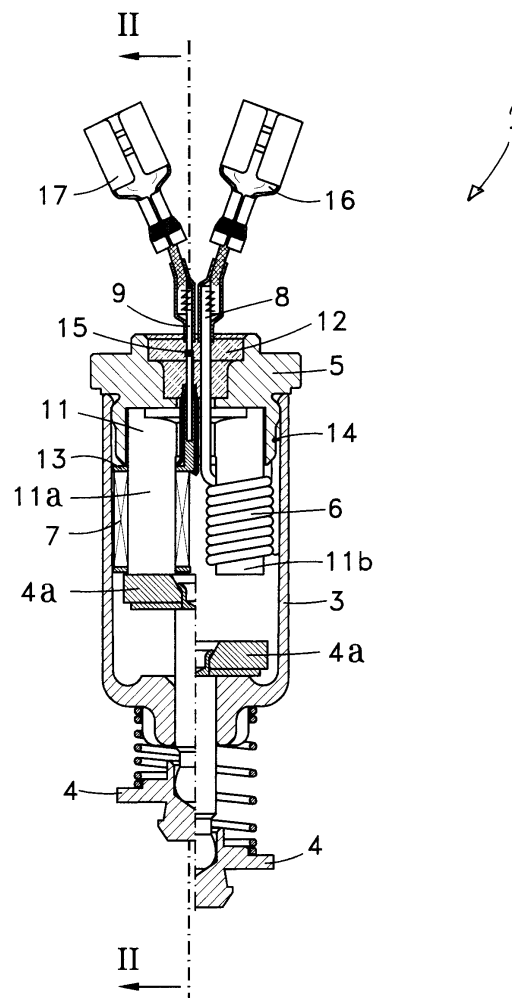
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(54) **Electromagnet assembly for a safety gas valve**

(57) Electromagnet assembly (1) for a safety gas valve comprising an electromagnet (4a,6,7,11) with two windings (6,7), a moving armature (4a) connected to the valve member (4), being attracted to open the flow of gas in the main pipe of a tap, a sealed casing (3) for the electromagnet, a metal socket (5) for electrical contact to ground, two output leads (8,9), and an electrical insulating member for the tight sealing (12) of the casing (3), traversed by said output leads (8,9). One arm (11a) of the U-shaped core has a winding for the actuating attraction, and the other arm (11b) has a thick wire winding energised by a holding thermocouple.



**FIG. 1**

## Description

**[0001]** The present invention relates to a safety valve built into a fuel gas pipe of a domestic electrical appliance, provided with a moving armature actuated by an electromagnet and held in the attracted state for the purpose of controlling combustion by means of a thermocouple.

### PRIOR ART

**[0002]** A known electromagnet assembly, for actuating the safety valves on domestic electrical gas combustion appliances, as described in EP-619460-A1, has a winding of very low ohmic resistance, constructed in several thick wire turns, distributed on the two arms of a U-shaped core. The moving armature of this electromagnet is attracted towards the core, opening the valve for the flow of gas and the consequent ignition at the burner that it supplies. The electromagnet assembly is actuated manually for ignition, and once the electromagnet magnetic circuit is closed, a thermocouple heated sufficiently by the flame is able to hold it in the actuated position, so that the valve is kept open. Due to the low value of the e.m.f. generated by the thermocouple, such as 20 mV, no electrical insulation of the winding output leads is needed. A second output lead is soldered internally to a metal ground contact socket. The core arms are not sheathed with an electrical insulator. Thus the distance between the inner flat faces of the core arms is not more than 2 mm and the overall size of the electromagnet assembly is very small. There is no other electrical insulation in the electromagnet assembly than for the axial connection plug of a first "phase" lead in its passage towards the exterior via the metal ground socket. The core rests directly on this ground socket, so it is not necessary to insulate it. The electromagnet is housed in a tight casing closed by said ground socket to prevent gas from entering. The tight seal of the connecting plug passage is obtained easily by means of sealing O-rings.

**[0003]** JP8226630 discloses a safety valve for a gas cooker appliance, where a single body houses two electromagnets for actuating a valve, one of which electromagnets is supplied by a thermocouple and the second electromagnet is connected to a circuit for controlling its energizing.

**[0004]** JP7324738 discloses an electromagnetic safety gas valve, which opens and is held by means of two windings of widely differing electrical resistance, both supplied by a flame sensor thermocouple.

**[0005]** JP8233148 discloses an electromagnetic safety gas valve with an electromagnet assembly housed in a tight casing, which has two coaxially aligned electromagnets, each with an individual winding. One of them, with a larger number of turns, is pushed manually and keeps the second one actuated while at the same time attracting the valve member. The action of both

electromagnets is combined to hold the valve open, only when both electromagnets are energized

**[0006]** JP10267159-A shows a thermocouple connection to the electromagnet of a magnet assembly of a safety gas valve. The connection terminal of the end wire of the winding is insulated from a metal sealing socket connected to ground with an insulating sheath, and the thermocouple cable is connected to the electromagnet assembly and insulated from the metal ground socket by means of a pin bolt made of resin fitting snugly in the socket.

### DISCLOSURE OF THE INVENTION

**[0007]** The object of the present invention is an electromagnet assembly with two windings on a single core of a safety gas valve on a domestic electrical appliance for the purpose of controlling its combustion by means of a thermocouple, as defined in claim 1.

**[0008]** The electromagnet assembly according to the invention has a single U-shaped core and two windings, each on one of the arms of the core, the first of them supplied at a voltage, such as 50 Vdc, for the initial actuation of the assembly until the thermocouple is warmed sufficiently, which then energizes the other winding to hold the electromagnet assembly in the actuated position, so that the safety valve is kept open. The construction of the electromagnet assembly with the two different windings according to the invention prevents the presence of the user pressing the valve member until the thermocouple is heated sufficiently.

**[0009]** The particular construction of the electromagnet assembly overcomes the problems stemming from the shortage of space in the small sealed enclosure where the electromagnet assembly is housed, in particular for installing the two windings and the means for the electrical insulation both of the electromagnet assembly core and the two output leads to the exterior, which are connected to the thermocouple and to a battery, respectively. It also provides the solution to the problem of the space needed to run off from the core the four wire ends, of which one from each winding will be soldered to the electromagnet assembly metal sealing socket, which is connected to the domestic electrical appliance "ground". In addition, the invention solves the problem of the tight sealing of the passage of the winding output leads running to the exterior by way of the metal ground socket, using means different from the sealing O-rings known previously, which cannot be fitted here due to the shortage of space caused by the two axial output wires.

### DESCRIPTION OF THE DRAWINGS

**[0010]** FIG. 1 is a longitudinal section view of the electromagnet assembly for a safety valve according to the invention.

FIG. 2 is a partial sectional view of the electromagnet assembly in figure 1, according to the line II-II.

## DETAILED DESCRIPTION OF THE INVENTION

**[0011]** A preferred embodiment of an electromagnet assembly 1 for a safety gas valve comprises an electromagnet with two windings 6, 7 on a single core 11, whose moving armature 4a is linked to the valve member 4 and is attracted to open the flow of gas, a sealed electromagnet housing casing 3, a metal socket 5 which closes the sealed casing 3 and which represents the electrical contact to ground, two output leads 8,9, running out axially to the outside of the electromagnet assembly 1, which are the respective electrical connection to "phase" of the two windings 6,7, and an electrical insulating member for the tight sealing 12 of the casing 3, through which the above-mentioned output leads 8, 9 pass.

**[0012]** One arm 11a of the U-shaped core carries a winding 7 for the actuating attraction and opening of the valve member 4, and the other arm 11b carries a thick wire winding 8 energized by a holding thermocouple. The two arms of the core 11 are semicircular section and have flat opposing faces, with a separation gap such as only 2 mm. The metal ground socket 5 is formed of a disc-shaped base where the core 11 rests and which acts as a tight seal for the housing 3 at the end opposite to the valve member 4, and with a thin ring 5a projecting towards the interior of the casing 3, which surrounds the core base 11, securing it by means of staking with two thin edges 10 over the slot gap between the arms 11a and 11b. Said retaining ring 5a belonging to the metal socket 5 is also used for the electrical connections of the two respective "ground" end wires 7a and 14 of windings 6 and 7, by means of welding.

**[0013]** The holding winding 6 is supplied by a thermocouple which is connected to the "phase" lead on the outside of the electromagnet assembly by means of a fast-on terminal 16, and to the metal ground socket 5 directly by external contact on it. The phase lead 8 is the actual end wire of the winding, which can be run through the middle by way of the core 11 and the metal socket 5 to the exterior without using guide means on account of its thickness of 0.6 mm. Like the known electromagnet assembly, winding 6 has only 10 turns of thick 0.6 mm diameter wire, with an electrical resistance of 10-15 milliohms, and it is insulated electrically from the core by means of its varnish coating. Due to the shortage of space in the casing 3, the other end of wire 14 of winding 6 connected to ground is run laterally along the outside of the core and soldered to the retaining ring 5a at the point of its circumference referenced with number 14 in the figure 1. Although the issue of the two end wires 8 and 14 is represented here on the same plane, they in fact issue from the core 11 according to two planes forming a right angle, and the welding point is on the same side as the staking 10.

**[0014]** The actuating winding 7 is supplied at 50 Vdc, has 700 turns of fine wire with an approximate diameter of 0.08 mm, including its insulating varnish, and it will

conduct a current of up to 1 A for a period of time lasting several seconds. The winding 7 is wound on an insulating bobbin 13 (fig. 2), which has a cylindrical central insulating flange 13a, which traverses the base of the core 11 axially and receives the "phase" output wire 9 inserted, and a lateral insulating output flange of a winding end wire 7a, which is welded to the "ground" ring 5a at its circumference. The axial flange 13a is enclosed in a protective insulating sheath 18 to run the fine end wire of winding 7 against the cylindrical axial flange 13a. The phase end wire of winding 7 is spliced afterwards on phase lead 9 before the latter has passed to the exterior by way of the metal socket 5. Said splice 15, shown in figure 2, together with the end of the protective sheath 18, is imbedded with a thermosetting resin, which seals tightly the centre passage of the output leads 8, 9 of each of the windings through the metal ground socket 5. A fast-on terminal 17 is connected on the outside to the phase lead 9 of actuating winding 7.

## Claims

1. Electromagnet assembly for a safety gas valve using a flame sensor thermocouple in a domestic electrical appliance, the electromagnet assembly (1) being provided with two windings (6, 7), both attracting a moving armature (4a) to close a magnetic circuit (11) and lift a valve member (4a) that opens the flow of gas, with means (5,8,9) for electrical connection of the two windings (6,7) to the energization source, one of which being a metal socket (5) connected the electrical ground of the appliance that closes the tight casing of the electromagnet assembly (3), means (12,13,18) of electrical insulation of the windings (6,7) and of the means (5,8,9) of electrical connection, and means (5,12) of tight sealing of the electromagnet assembly (1) in the said casing (3), characterised in that both windings are wound on a common magnetic circuit with a single U-shaped core (11) resting its base on said metal ground socket (5), and in that one (6) of said windings (6,7) energised by the thermocouple, is of low resistance and is wound directly on one arm (11b) of the core, while the other one (7) of these windings, being of high resistance, is energised by a DC voltage supply, thus attracting the moving armature (4a), and it is wound on an insulating bobbin (13) fitted on the other arm (11a) of the core, and the two respective output leads (8,9) for the connection to a supply "phase" pass axially through the core base (11) and said metal socket (5), with tight sealing and insulated from each other.
2. The electromagnet assembly of claim 1, characterised also in that the output lead (9) of the high resistance winding (7) is inserted into a flange (13a) integral with said insulating bobbin (13) that projects

from it centrally, and the wire end of the winding (7) is guided towards the splice (15) with the output lead (9) through the inside of a sheath (18) enclosing this flange (13a).

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3. The electromagnet assembly of claim 1, characterised also in that the core (11) is secured by means of the staking, from the opposite sides of the core base, of two edges over the slot separating the two arms (11a, 11b) belonging to a ring (5a) projecting from the metal socket (5), on the periphery of which the two winding end wires (7a, 14) corresponding to the ground connection are welded.

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4. The electromagnet assembly of claim 1, characterised also in that the tight sealing of the passage of the two output leads (8, 9) for the connection to the supply phase, is achieved by means of a thermosetting resin filler (12) in a cavity in the metal ground socket (5).

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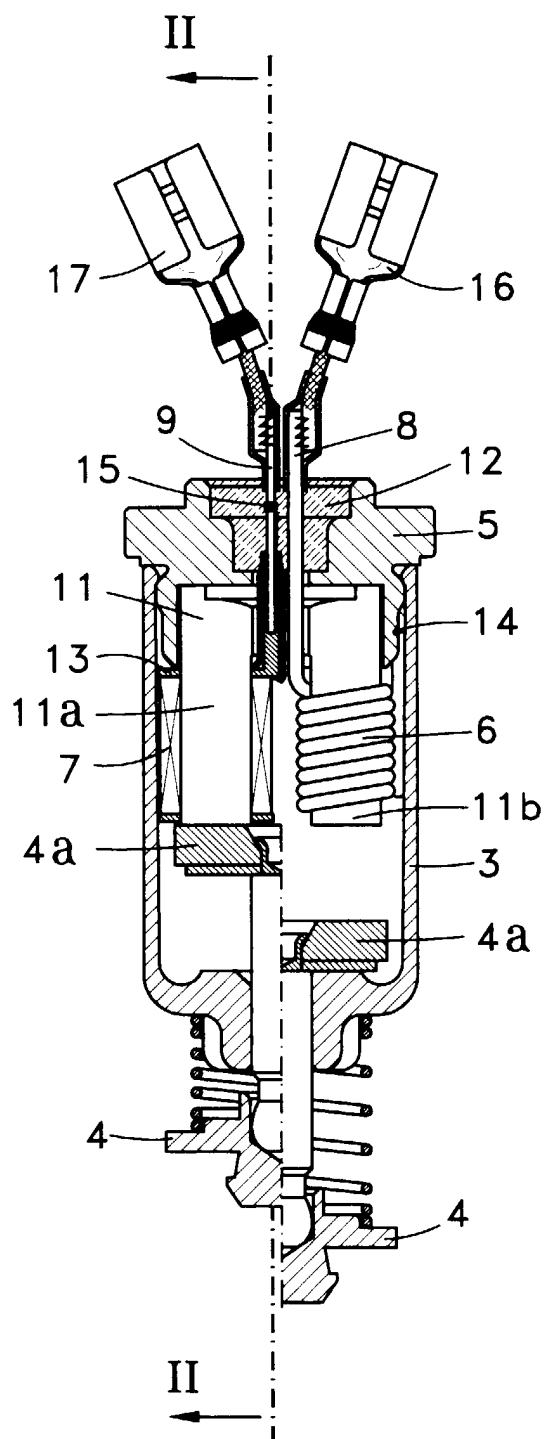


FIG. 1

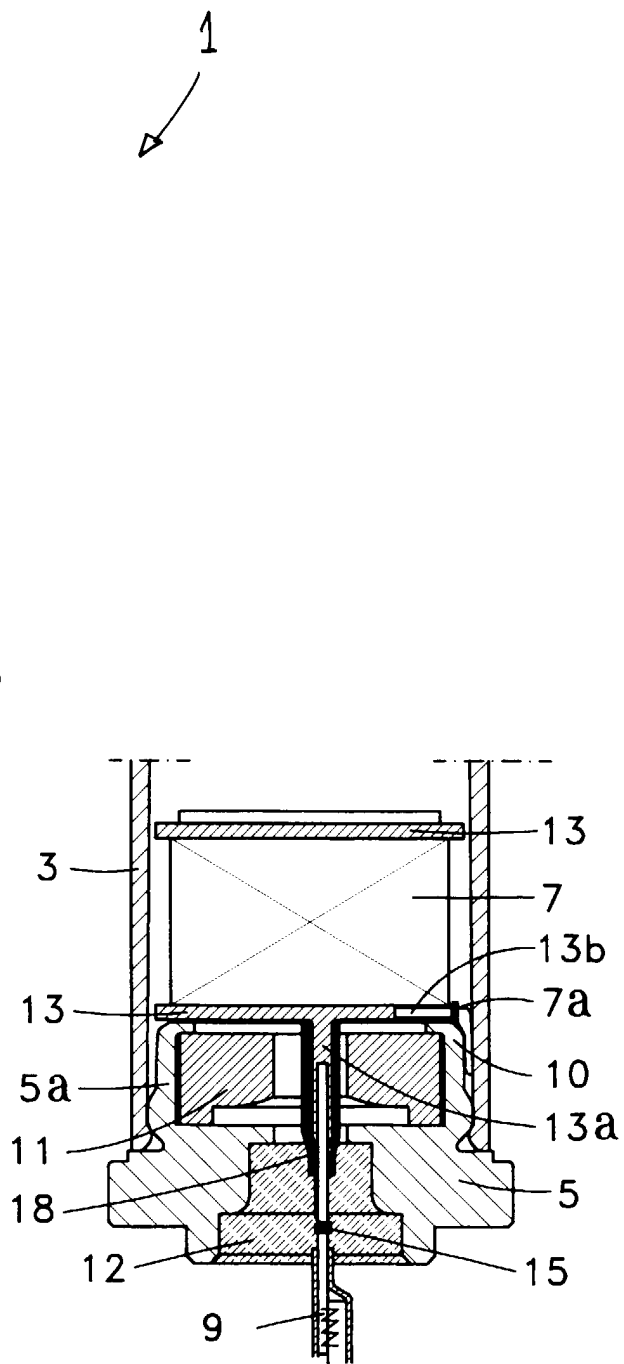


FIG. 2



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 00 50 0103

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.7)
Y	US 2 962 093 A (MATTHEWS) 29 November 1960 (1960-11-29) * column 4, line 17 - line 52; figures * ----	1	F23N5/10
Y	DE 19 59 057 A (JUNKERS) 27 May 1971 (1971-05-27) * page 2, column 3; claims 1-4; figures * ----	1	
A	DE 23 54 014 A (VAILLANT) 30 April 1975 (1975-04-30) * figures * -----	3	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F23N
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>12 September 2000</b>	Examiner <b>Kooijman, F</b>
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone  Y : particularly relevant if combined with another document of the same category  A : technological background  O : non-written disclosure  P : intermediate document</p> <p>T : theory or principle underlying the invention  E : earlier patent document, but published on, or after the filing date  D : document cited in the application  L : document cited for other reasons  .....  &amp; : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 50 0103

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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12-09-2000

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