



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.02.2006 Bulletin 2006/06

(51) Int Cl.:
F23N 5/10 (2006.01) F23N 5/24 (2006.01)

(21) Application number: **05380149.4**

(22) Date of filing: **05.07.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**
Designated Extension States:
AL BA HR MK YU

(71) Applicant: **ORKLI, S. COOP.**
20240 Ordizia (Gipuzkoa) (ES)

(72) Inventor: **Tristan, Jose A. Guirado**
20200 Beasain (Gipuzkoa) (ES)

(74) Representative: **Fernandez Guzman, Juan**
Apartado 213 (Dpto. Propiedad Industrial)
20500 Mondragon (Gipuzkoa) (ES)

(30) Priority: **03.08.2004 ES 200401895 P**

(54) **Safety gas valve with electromagnet**

(57) The gas safety valve for a household electrical appliance is the electromagnet (2) actuator type with a U-shaped magnetic core (11) and a movable armature (13) fixed to the member (4) to open up the flow of gas. The electromagnet (2) comprises a thin wire (15) actuating bobbin (7) wound on an insulating spool (13) engaged on one branch (11a) of the core and energised by a DC current, and a thick wire winding (6) on the second branch (11b) of the core for holding the armature (10) attracted and supplied by a flame thermocouple, and a moulded tubular-shaped isolator bushing integral with the spool (13) for the insertion and guiding of the two "phase" conductors (9,8), of the windings (7,6). The phase conductor (9) of the actuating bobbin (7) is formed by braiding the end of the thin wire, and then connected in the valve connector (24).

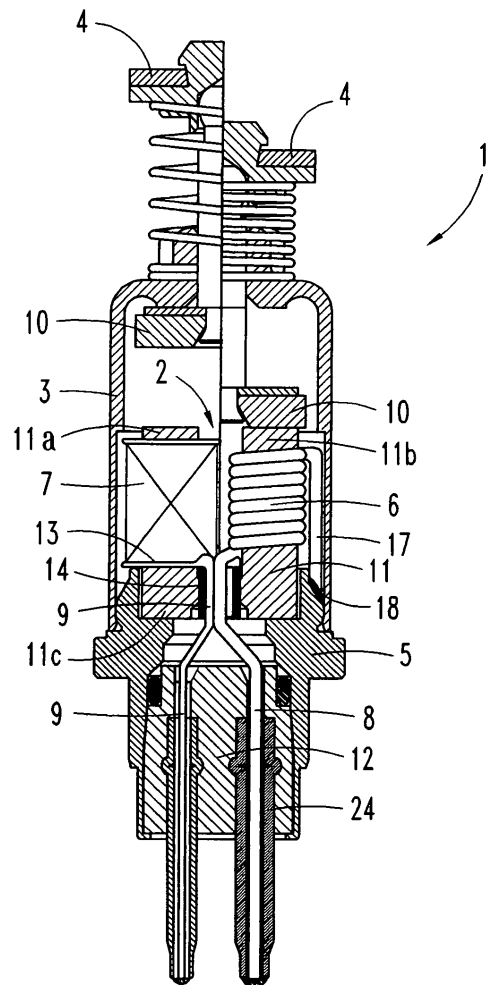


FIG. 1

Description

[0001] The present invention relates to a safety valve built into a fuel gas conduit of a household electrical appliance which has a movable armature actuated by means of an electromagnet and is kept attracted by a flame thermocouple for combustion control.

PRIOR ART

[0002] Publication EP-1063474-A and its equivalent ES-2154594-A disclose a gas safety valve with an initial actuating electromagnet as defined in the preamble of claim 1. The electromagnet is provided with an actuating bobbin made of thin wire and also of a thick wire winding for holding the electromagnet. Each of these two windings requires an output conductor to the power supply "phase" and an output conductor to the supply "ground". The actuating bobbin is supported on a plastic moulded insulating spool and fitted on one of the U-shaped magnetic core branches. The valve "ground" is associated with a metal socket supporting the magnetic core. Both ground conductors connected to the respective winding end are guided to the metal seat inside a sealing casing of the electromagnet, which is closed against the metal seat and welded against the latter here. The ends of each winding connected to a phase conductor issue from the electromagnet via a central hole in the core base, since there is no space inside the sealing casing to guide them around the core. Both "phase" and "ground" conductors have to be sturdy or rigid for their guidance and electrical connection to the outer connector terminals or lugs of the valve.

[0003] The thick winding wire for the thermocouple energized winding is sufficiently rigid for its ends themselves to be the output conductors of the thermocouple winding. The ends of the actuating bobbin thin wire have to be spliced to a respective sturdy output conductor before being connected to the valve electrical connector. An actuating bobbin of the safety valve is constructed by means of a very thin wire, for example of a diameter between 0.08 and 0.1 mm, and a high number of enclosed loops or turns on the plastic spool, for instance between 400 and 700 loops. The problem therefore has to be solved of connecting both ends of the thin wire winding to the thick output conductors for the connection of the respective phase and ground. In addition, the problem arises of insulating the phase conductors of both windings from each other, as well as the passage through the central hole in the magnetic core and the metal seat for the electromagnet. The actuating bobbin plastic spool is very small-sized, especially the constructional details used as means for guidance and insulation of the output conductors, which raise a problem of configuration of the moulded piece for its assembly on one of the core branches only without the guidance means of both phase conductors interfering during the installation of one or other winding on each branch of the core.

[0004] On the safety valve of the prior art mentioned above, the actuating bobbin has a rigid output conductor to the phase guided through the core, which is inserted in an insulating terminal post on the plastic spool, and the end of the thin wire of the bobbin is spliced to the rigid phase conductor in a central cavity in the metal seat.

DISCLOSURE OF THE INVENTION

[0005] The object of the present invention is a gas safety valve adapted to a household electrical appliance whose actuating electromagnet has a winding for controlling combustion using a thermocouple and an initial valve actuating bobbin, as defined in claim 1.

[0006] The electromagnet is constructed on a U-shaped core and the actuating bobbin and the winding for the thermocouple are each assembled on one branch of the core. The actuating bobbin attracts the movable electromagnet armature to avoid the manual pushing the valve member open during the prior thermocouple heating interval. The special construction of the electromagnet and of the output conductors "phase" and "ground" for the actuating bobbin and the holding winding, resolve the problems raised in the prior art, in particular the construction of both output conductors for the bobbin supply phase and ground, around 0.4 mm and 0.6 mm thick respectively, using the ends of the bobbin thin wire themselves, and their guidance through the valve insulated from each other and from the metal parts of the electromagnet. The safety valve actuating bobbin is constructed by means of a wire with a preferred thickness of 0.1 mm, and a high number of wire turns enclosed in the plastic spool, preferably between 400 and 500 turns, to be supplied by an electrical circuit provided with a capacitor which discharges an instant current peak of 2-3 A in the bobbin for resetting the armature.

[0007] Also resolved by the invention are the problems stemming from the lack of space in the small sealing casing where the magnet assembly is housed, for the mounting of the actuating bobbin and the thick wire winding for the thermocouple on either branch of the core, and due to the lack of space also the rear electrical connections of the four wire ends, taking them out of the core to the valve outer connector lugs or terminals.

DESCRIPTION OF THE DRAWINGS

[0008]

FIG. 1 is a longitudinal sectional view of a gas safety valve showing an actuating bobbin and a holding winding energized by a flame thermocouple.

FIG. 2 is a plan view of the safety valve in figure 1. Figures 3A and 3B are views of the support spool of the actuating bobbin shown in figures 1 and 2.

DETAILED DESCRIPTION OF THE INVENTION

[0009] In reference to figures 1 to 3, a preferred embodiment of safety valve 1 according to the invention, comprises an electromagnet 2 with an actuating bobbin 7 and a thermocouple winding 6 each fitted on one branch 11a, 11b of a U-shaped core 11. The movable electromagnet armature 4a is connected to the valve member 4 and is attracted instantly to open up the flow of gas by means of bobbin 7, supplied with a current peak of 2-3 A. The electromagnet 2 is housed in a sealing casing 3 that closes against a metal socket 5, which is the support for the circular base 11c of the core and represents the electrical "ground" pole of the valve.

[0010] In one example of construction, the diameter of the circular section of the electromagnet core 11 is around 7.5 mm and the separation space between its two branches 11a, 11b is around 1.5 mm. The actuating bobbin is constructed with 400-500 turns of wire about 0.1 mm thick, enclosed in a semicircular section spool 13 provided with two transverse flanges 13a, 13b covering either end of the bobbin 7, about 8 mm apart from each other in the axial direction, and fitted on one of said branches 11a of the core.

[0011] The actuating bobbin 7 has a moulded plastic insulating spool 13 (FIG. 3A and 3B) made up of one tubular spool wall and two transverse flanges 13a, 13b enclosing the layers of wound thin wire, about 8 mm apart from each other. The core branch 11a wherein the bobbin 7 is fitted is semicircular section. The winding of thick wire 6, of about 0.6 mm, formed prior to its installation on the core 1, is inserted on the other branch 11b from above. The facing flat faces of both core branches 11a, 11b are spaced with a gap between them as little as 1.5 mm. For its electrical connection to the electromagnet 2 power supply, the actuating bobbin 7, whose wire is as thin as 0.1 mm, is provided with a phase conductor 9 and the thick wire winding 6 of around 0.6 mm is provided with a phase conductor 8, which is itself the end of the winding wire 6. Both electromagnet 2 "phase" output conductors 9, 8 issue axially to the lugs 24 of the safety valve outer connector. Being connected electrically to the core 1, the metal socket 5 has a circular surface within the sealing casing 3, of which on two points 18, 18' (FIG. 2) both ground conductors 16 and 17 guided laterally to the core 11 are welded separately.

[0012] The insulation and guidance means for both phase conductors 9, 8 comprise a moulded isolator bushing 14, integral with a spool wall 13 and extending from it in the axial direction, which passes through the central hole in the core 11. Both phase conductors 9, 8 are guided from the wound wire end next to the base of the core 11c, entering first through the isolator bushing 14, and at the outlet from the latter by means of an insulating filler 12 in the outer connector. Due to the small gap between the two branches 11a, 11b of the core, the spool 13 is also constructed with a separating lip 23 extending radially from a transverse flange 13b, for the separation of the

thick wire winding 6 fitted on the other branch 11b of the core.

[0013] Being made of thin wire the actuating bobbin 7 needs the two sturdy conductors, the phase conductor 9 and ground conductor 16, to be taken to their respective outer electrical connection on the valve. Both bobbin 7 output conductors 9, 16 are constructed by means of the braiding of their respective thin wire end to the outlet of the spool 1, until reaching a thickness of 0.4 mm, so that each of them becomes sturdy enough for their guidance and handling during the assembly of the electromagnet 2.

[0014] The isolator bushing 14 is preferably moulded in a hollow tubular shape with two openings or insertion mouths 19, 20 which are adjacent and transverse to the axis of the spool 13. The phase conductor 9, in the form of braiding of the thin wire end, is passed through an insertion opening 20 in the isolator bushing 14. Likewise, the thermocouple winding phase conductor 8 is introduced from a second insertion opening 19, after the bobbin 7 has already been fitted on the core branch 11a. Both transverse openings 19, 20 in the isolator bushing are separated by an intermediate partition 14a for insulation between both phase conductors 9, 8. The isolator bushing 14 also has a longitudinal opening 21 to allow for its diametric expansion, which is also helps to facilitate the insertion of the phase conductor 9 in the isolator bushing 14, through being flexible. When both phase conductors 9, 8 are inserted, the longitudinal opening 21 is closed with a drop of resin to prevent the phase conductor 9 from being pulled out.

[0015] The ground conductor 16 is guided from its spool 13 outlet in the open end of the core 11 towards the periphery away from the core 11. For this purpose the spool is made up of at least one transverse flange 13b next to the base of the core 11c and two notches 22 cut in the transverse flange 13b, one on either side of the tubular bushing 14, by means of which the bobbin 7 ground conductor 16 is tensioned and guided, with one conductor turn 16a encircling the isolator bushing 14, towards the outside of the circular profile of the core 11 for welding up on a surface point 18 of the metal socket 5.

Claims

1. Gas safety valve adapted for controlling combustion on an household electrical appliance, of the type having an electromagnet (2) actuator with a U-shaped magnetic core (1) provided with a circular base (11c), that attracts a movable armature (10) raising the shaft and closure member (4) of the valve (1) in their axial direction so as to open up the flow of gas, said safety valve including a metal socket (5) for the magnetic core which forms the electrical supply "ground" connection of the electromagnet (2) and a sealed casing enclosed by the metal socket (5) housing the electromagnet (2), which comprises a thin wire (15) actuating bobbin (7) fitted on one of the branches

(11a) of the core, and energised by an external DC current pulse for the attraction of the armature (4a), and a thick wire winding (6) on the second branch (11b) of the core for holding the armature (10) attracted and supplied by a flame thermocouple, an insulating spool (13) supporting the bobbin (7), and means for the electrical (12-14) insulation of the two "phase" conductors (9,8) of both windings guided through a central hole in the core base (11c) for the respective electrical connection in an outer electrical connector (24) of the valve, **characterised in that** the actuating bobbin (7) being constructed with several layers of thin wire (15), its phase output conductor (9) is formed directly at the end of the bobbin and guided together with the phase conductor (8) of the thick wire winding (6), each of these departing from its respective winding end (7,6) on the corresponding core branch (11a,11b) and passing through the core (11c) insulated from each other, by means of a hollow isolator bushing (14) extending in the axial direction, which is moulded integral with the spool (13) and is provided with at least one opening (19-21) for the insertion and guiding of both phase conductors (9, 8) during the assembly of the electromagnet (2) to beyond the base (11c) of the core.

2. The gas safety valve according to claim 1, wherein said isolator guide bushing (14) is formed with two insertion openings (19, 20), at least one of which is transverse to the axis of the spool (13), for guiding either of the two "phase" conductors (9, 8).

3. The gas safety valve according to claim 1, wherein said isolator guide bushing (14) is formed with two insertion openings (19, 20) transverse to the axis of the spool (13), for guiding either of the two "phase" conductors (9,8), separated and isolated from each other by means of an axially extending internal partition (14a).

4. The gas safety valve according to claim 1, wherein both output conductors (9,16) from the actuating bobbin (7) are constructed by means of braiding the corresponding thin wire end (15), wherein the "ground" conductor end (16) is welded on a surface point (18) of the metal socket (5), being guided for this purpose by means of a turn (16a) of the braided conductor encircling a cylindrical surface of the isolator bushing (14).

5. The gas safety valve according to claim 1, wherein both output conductors (9, 16) from the actuating bobbin (7) are constructed by means of braiding the corresponding thin wire end (15), wherein the "ground" conductor end (16) is welded on a surface (18) of the metal socket, and the spool (13) is formed with two transverse flanges (13a, 13b) covering each end of the bobbin (7), and two notches (22) cut in a

transverse flange (13b), one on either said of the isolator bushing (14), by means of which the bobbin ground conductor (16) is tensioned and guided away from the circular profile of the core (1) for its welding up on a surface point (18) of said metal socket (5).

6. The gas safety valve according to claim 1, wherein the two ends of the actuating bobbin are covered by two transverse spool flanges (13a, 13b), one of them provided with an extending radial lip (23) for separating the thick wire winding (6) on the other branch (11b) of the core.

7. The gas safety valve according to claim 1, wherein, the diameter of the core (1) of the electromagnet being around 7.5 mm and the gap space between its two branches (11a,11b) around 1.5 mm, the actuating bobbin (7) is constructed with 400 to 500 turns of wire approximately 0.1 mm thick, enclosed in a semicircular section spool (13) fitted on one branch (11a) of the core, and with two transverse flanges (13a, 13b) covering each end of the bobbin (7) about 8 mm apart from each other.

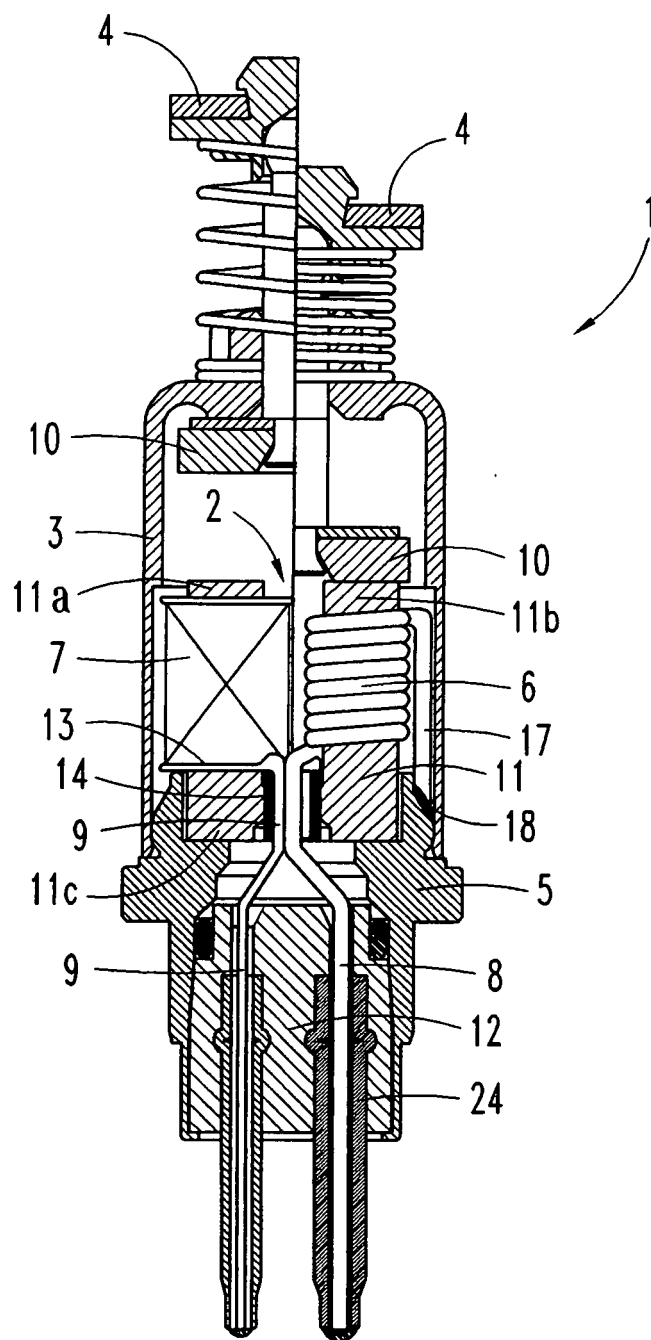


FIG. 1

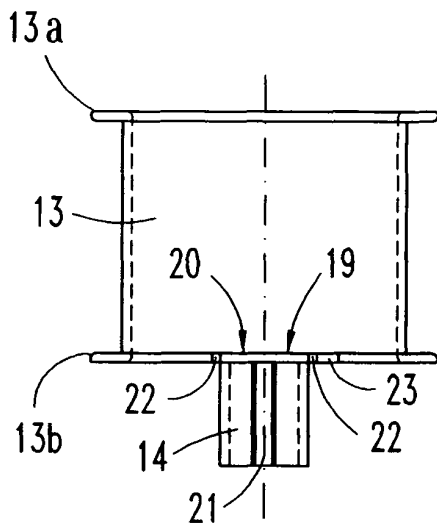


FIG. 3A

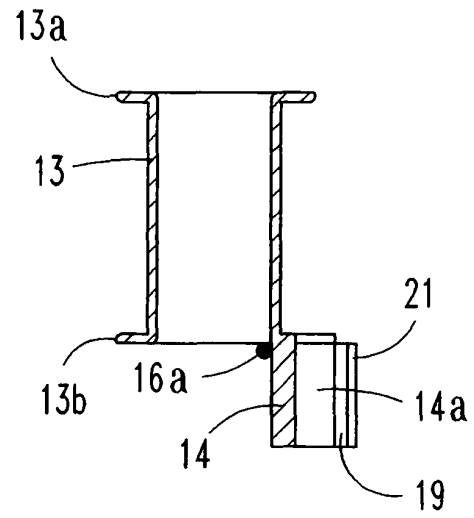


FIG. 3B

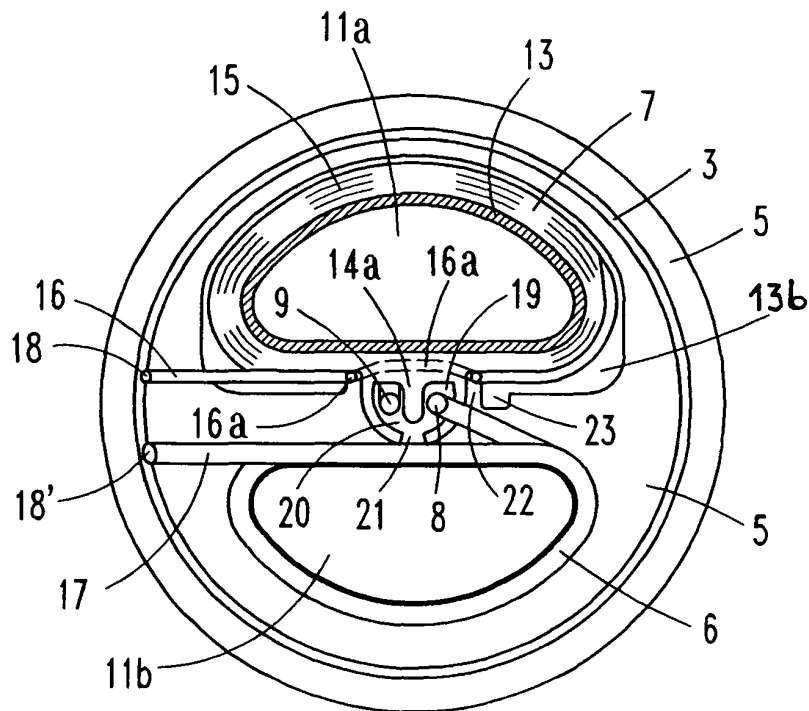


FIG. 2