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(54) Safety gas valve with an electromagnet

(57) The flame safety gas valve is built into a domestic tap and has an electromagnet (2), energised with DC voltage, and a moving armature (4a) with a valve sealing member (4) coupled, a seat (5) for supporting the core (11) connected to a ground (9) lead, and a connecting washer (7) with a central plug connected to phase (8) lead. The electromagnet (2) is built with a U-shaped core (11), which is linked to the connecting washer (7), and with two coils (12, 12') each wound on a respective semi-bobbin (13, 13'). The electromagnet is coupled (6,10,16,17) both electrically and mechanically to the safety gas valve.

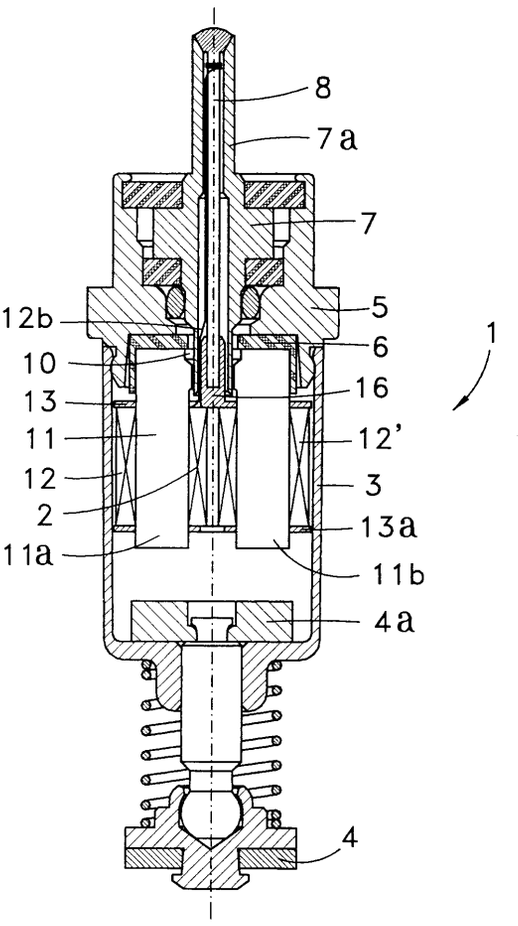

FIG. 1

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Description

[0001] The present invention relates to a flame safety gas valve for burners, operated by an electromagnet, and to the construction of the electromagnet.

PRIOR ART

[0002] Flame safety gas valves for domestic burners are known. Operated by an electromagnetic arrangement energised by a flame detector thermocouple, they are built into the body of the tap that supplies the gas to the burner. The safety electromagnetic arrangement, as described in EP-619460 (ES-9300894U), is of miniature construction, includes a valve sealing member that slides in an axial direction with the electromagnet moving armature, and comprises an insulating outer cylindrical casing, the electromagnet housed in the casing, which has a U-shaped core with two half-round section arms, a metal support seat for the electromagnet core, a coil ground lead electrical connection, and a central connection plug for a coil phase lead, which passes through the metal seat to the outside of the electromagnetic arrangement. The known safety electromagnetic arrangement is built into a gas tap cylindrical housing, and the resetting of the electromagnetic core for opening the valve is done manually by pushing the rotary spindle of the tap. The e.m.f. of a thermocouple energises the known safety valve electromagnet to retain the armature and keep the valve open. The distance separating the two half-round core arms is 2.2 mm and the core air gap when the valve is in the off position is 1.5 mm. The electromagnet has low ohmic resistance - in the region of 20 milliohms - and the coils have 16 coarse turns. The thermocouple-energised electromagnet does not have flanged insulating bobbins for the coil winding nor problems of construction due to the electrical insulation between its coupled parts. The core is necessarily connected to the ground lead through its metal support seat, because it will make contact via the armature and the valve stem with the rotary spindle of the tap when it is pushed for manual resetting.

[0003] DE-2360411 discloses an insulating flanged bobbin for a two-coil electromagnet, built in two semi-bobbins joined by a hinge-like interconnection, wherein the link wire between the two series coils is guided through an opening in the form of a window. The hinge-like interconnection permits the alignment of both semi-bobbins for their continuous individual winding.

[0004] DE-2651218 shows a transformer coil with two windings for fitting in separate cores, wherein the ends of the secondary winding are connected respectively to a connection bush in an insulating housing integral with the bobbin.

[0005] US-3998425 discloses an electromagnet for a safety valve secured on a valve housing, wherein the electromagnet core is insulated from the casing by means of an insulating body.

DISCLOSURE OF THE INVENTION

[0006] The object of the invention is a flame safety gas valve with a moving armature electromagnet coupled to the valve and provided with external electrical connections for its energising with DC voltage, as defined in the claims.

[0007] The electromagnet and its coupling according to the invention form part of the safety valve, the protective casing of which and its electrical connection outlets are of the same configuration and the same dimensions as the known thermocouple-energised electromagnetic arrangement. The safety valve is built into the housing of a gas supply tap body.

[0008] The present invention solves the problem of the construction and coupling of the electromagnet, adapted to the known thermocouple-energised electromagnetic arrangement. The electromagnet is energised by the voltage from a DC source - for instance 50V dc -which means that methods of electrical insulation have to be incorporated between the coupled parts of the electromagnet arrangement. The U-shaped magnetic core also has the same diameter and same distance between its arms as that of the electromagnet arrangement for thermocouple, as there is no advantage in diversifying its manufacture. To prevent leaks of magnetic flux, the core now has to be insulated from the metal seat of the electromagnet. The electromagnet comprises means for connecting the ends of the coil to respective external phase and ground leads, means of insulation between the coil and the core, and means of insulation between the core and the core support seat.

[0009] The invention, moreover, solves the problem of the winding of two series coils in the opposite direction, each on its respective insulating flanged semi-bobbin, which will be engaged in the two arms of the magnetic core. The coils have numerous fragile copper wire turns. Each one of the two semi-bobbins contains a respective bobbin flange, needed for insulating the coils and for protection against mechanical aggression, and a housing for the phase and ground lead connection terminals. The distance separating the two arms of the core, however, is very small and it has to have room for both bobbin walls for the insulation of the coils and for the thickness of both layers of turns of the two coils. The armature separation distance or air gap cannot be reduced to simplify the electromagnet because it is predetermined by the travel of the valve sealing member in order to obtain a given valve flow opening.

[0010] The winding of the two series coils includes the means for guiding and for protecting the wire that acts as a jumper between them by way of a window in the hinge-like interconnection between the two semi-bobbins.

DESCRIPTION OF THE DRAWINGS

[0011] A preferred embodiment of the invention is rep-

resented in figures 1 to 5, wherein:

[0012] FIG. 1 is a view of a flame gas safety valve with the electromagnet and its coupling according to the invention.

[0013] FIG. 2 is a front elevational view of the electromagnet of fig. 1, showing one of the halves sectioned.

[0014] FIG. 3 is a side elevational view of the insulating bobbin of the electromagnet of fig. 2.

[0015] FIG. 4 is a plane view of the insulating bobbin of the electromagnet of fig. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0016] With reference to figure 1, the safety valve 1 according to the invention comprises an electromagnet 2 housed in a protective casing 3, a valve sealing member 4, a sliding armature 4a that moves the sealing member, a metal support seat 5 for the electromagnet, an insulating bushing 6 between the electromagnet 2 and the support seat 5, a connecting washer 7 insulated from the support seat 5 and provided with a hollow external contact plug 7a, an electromagnet phase lead wire 8, which passes through the external contact plug 7a axially, a ground lead wire 9 (fig. 3) soldered to the support seat 5, and a rivet 10 securing the electromagnet core 11.

[0017] The electromagnet 2 comprises the U-shaped core 11 with two half-round section arms 11a and 11b extended in an axial direction and two series coils 12 and 12', each superimposed around a respective core arm 11a and 11b. The two coils 12, 12' are wound on a round insulating bobbin, built with two half-round section semi-bobbins 13 and 13', which are juxtaposed by their flat sides. Each of the semi-bobbins 13, 13' has a protective flange 13a at either end.

[0018] To do the wrapping during the manufacture of the electromagnet, the two semi-bobbins 13, 13' are separated by turning each one 90° to one side around a hinge-like interconnection 14, which unites two adjacent flanges 13a until they become coaxial. The hinge-like interconnection 14 has a V-shaped longitudinal groove 15 (fig. 2 close view) and a window machined in the centre (not shown in the drawings) of the hinge-like interconnection 14, through which the jumper wire between the two coils 12, 12' is passed. Once the winding of the coils 12, 12' is completed, each with numerous layers of very fine wire, when the two semi-bobbins 13, 13' are faced up and engaged in the core arms 11a, 11b, this jumper wire between the two coils 12, 12' is housed in the V-groove 15, free of strain and protected from mechanical aggression. In an embodiment of the electromagnet according to the invention, the distance d separating the arms 11a, 11b is 2.2 mm, the air gap or armature movement for resetting is 1.5 mm, the semi-bobbins 13, 13' have an outside diameter of 9.8 mm, including the flanges 13a, a wall thickness of 0.3 mm which is the minimum possible for moulding. Each one of the two coils 12, 12' has an uneven number of layers of 0.08 mm diameter copper wire including the varnish impregnation, amounting to approximately 770 turns. The current for the initial armature resetting is up to 0.8A and the current to keep the armature 4a closing the magnetic circuit of the core 11 is some 15mA. The voltage energising the electromagnet 2 for resetting is, for example, 50V dc while for maintenance it is 1V dc. Said electromagnet energising voltage and maintenance current values, are predetermined by the characteristics of the electromagnet energising circuit.

[0019] Each one of the moulded semi-bobbins 13, 13' has on one of the flanges 13a a respective tubular-shaped integral terminal 16, 17, in which the corresponding phase or ground lead wire is threaded, and to each of these a respective coil 12, 12' wire end is tied. The terminal 16 for connecting the phase lead wire 8 is centred on a flange 13a of one semi-bobbin 13, extended in an axial direction, while the terminal 17 for connecting the ground lead wire 9 is situated on the outside edge of a flange 13a of the other semi-bobbin 13', extended in a transverse direction. Each one of these flanges 13a has a recess 16a, 17a for receiving the terminal 16, 17 of the opposite flange 13a.

[0020] The end wire 12b of coil 12' issues from the flange 13a of the bobbin and after running round the edge of the insulating terminal 16 is housed in the plug 7a without the need for any special insulation against the support seat 5, which is electrically "ground", until being wound at the outer end tip of the phase lead 8. Since the core 11 is electrically "phase" on the electromagnet 2, and having no contact with a exterior manual thrust member, the connecting washer 7 extends towards the electromagnet 2 with a pod rivet 10, which fastens the core and prevents the phase lead 8 from being torn when the plug 7a is removed from its connection socket.

Claims

1. Flame safety gas valve, which is built into a cylindrical housing of a domestic gas supply tap, the valve (1) has an electromagnet (2) and a moving armature (4a) attached to a valve sealing member (4), a coaxial seat (5) supporting the electromagnet core (11) connected to a ground lead (9) of the electromagnet, a central connecting washer (7) provided with a central plug connected to a phase lead (8) of the electromagnet, and means (6,10,16,17) for coupling the electromagnet (2) to said electrical connection means (5,7), characterised in that the electromagnet (2) is built with a U-shaped core (11) linked to the central connecting washer (7), two multi-layer series coils (12, 12'), each supported around a half-round section insulating semi-bobbin (13,13') and said electromagnet coupling means (6,10,16,17) comprise two terminals (16,17) protruding from a respective semi-bobbin (13,13') in

the direction of said electrical connection means (5,7) for housing the phase (8) and ground (9) leads.

2. The safety gas valve of claim 1, wherein said means (6,10,16,17) for coupling the electromagnet (2) further comprise a pod rivet (10) extended from said connecting washer (7) to secure the core (11) and an insulating bush (6) between the core (11) and said support seat (5).

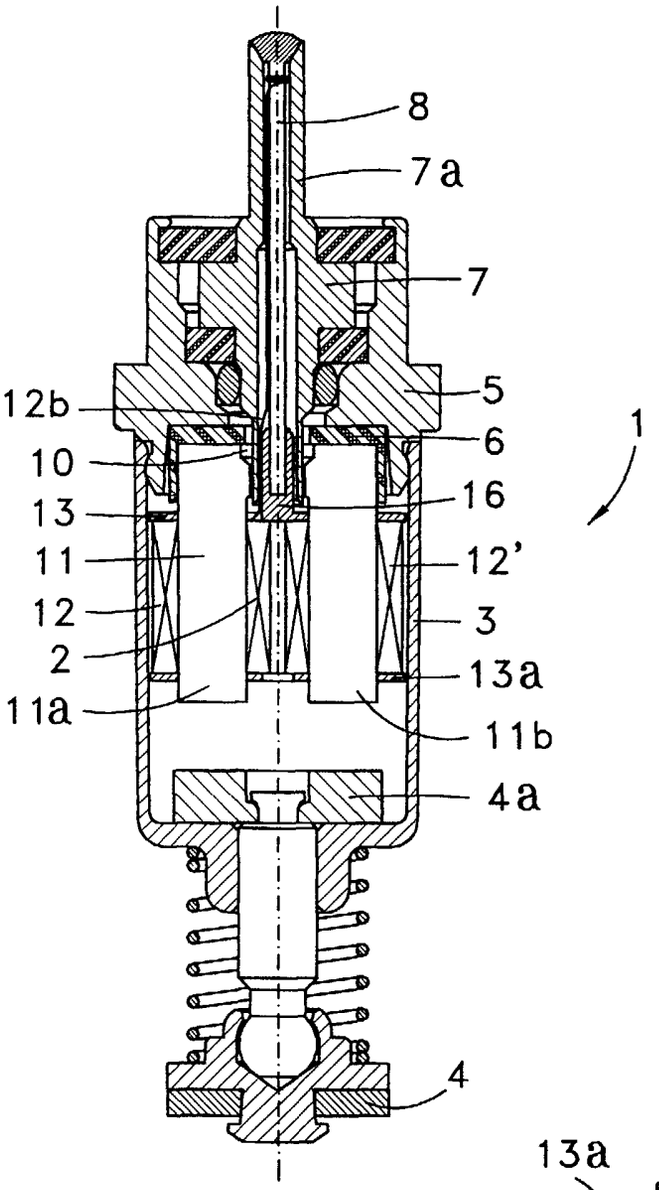
8
7a
7
5
12b
6
10
16
13
12'
11
12
3
2
13a
11a
11b
4a
4
1

FIG. 1

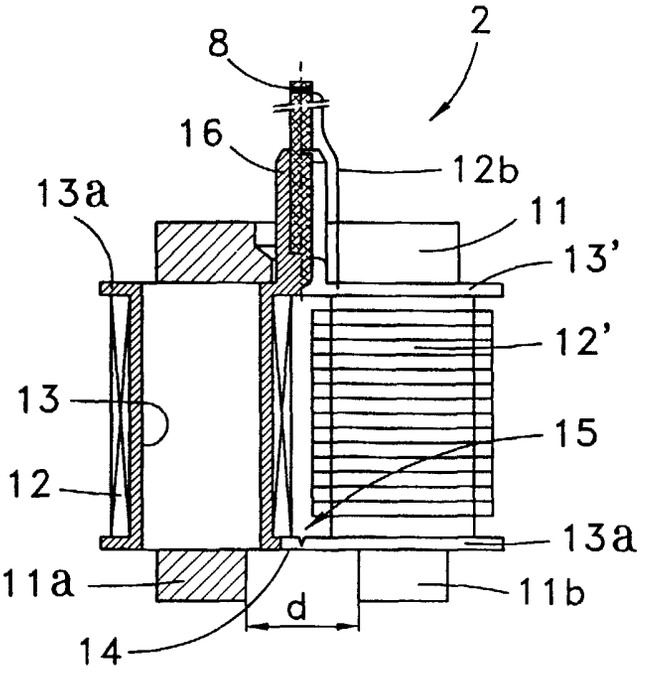
2
8
16
12b
13a
11
13'
12'
13
15
12
13a
11a
11b
d
14

FIG. 2

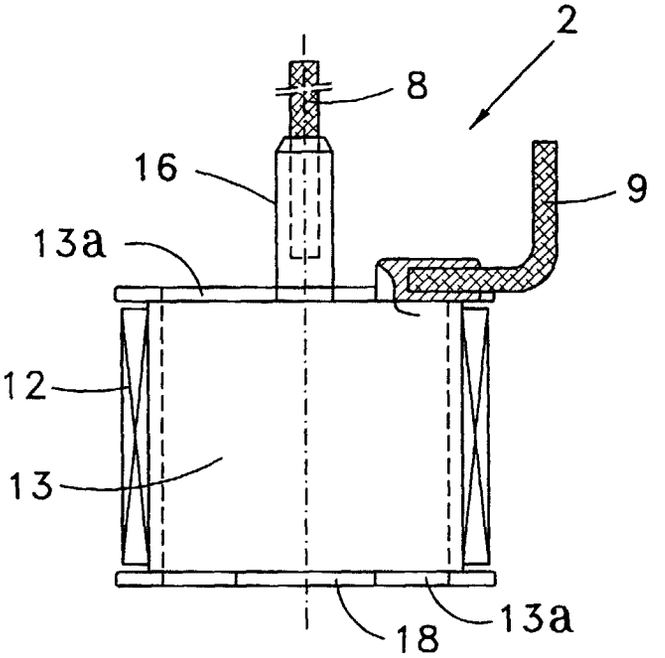

FIG. 3

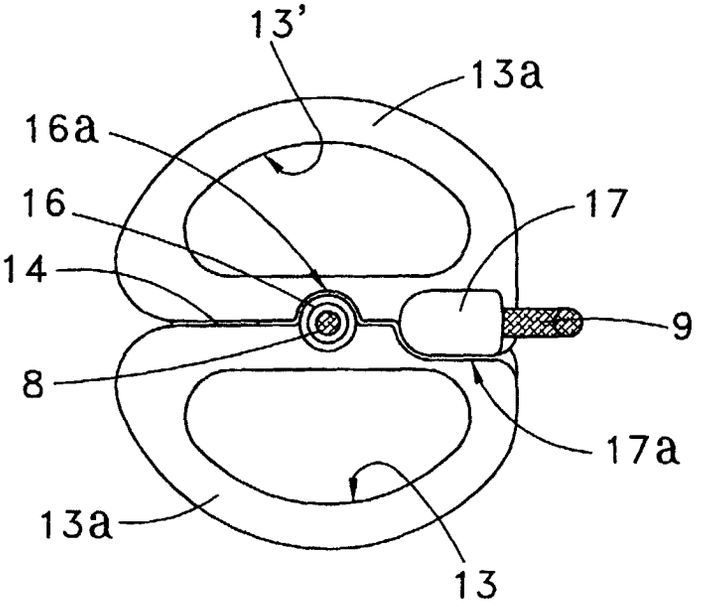

FIG. 4