

(19)



(11)

**EP 2 856 034 B1**

(12)

**EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:

**14.08.2019 Bulletin 2019/33**

(51) Int Cl.:

**A47J 27/62** <sup>(2006.01)</sup>      **F24C 15/10** <sup>(2006.01)</sup>  
**F23N 5/10** <sup>(2006.01)</sup>      **F23N 5/20** <sup>(2006.01)</sup>  
**F24C 3/12** <sup>(2006.01)</sup>      **F24C 15/00** <sup>(2006.01)</sup>

(21) Application number: **13737390.8**

(86) International application number:

**PCT/IB2013/054301**

(22) Date of filing: **24.05.2013**

(87) International publication number:

**WO 2013/175440 (28.11.2013 Gazette 2013/48)**

(54) **CONTROL DEVICE FOR GAS TAPS**

STEUERUNGSVORRICHTUNG FÜR GASHÄHNE

DISPOSITIF DE RÉGLAGE POUR ROBINETS À GAZ

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**

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(30) Priority: **25.05.2012 IT TO20120459**

(43) Date of publication of application:

**08.04.2015 Bulletin 2015/15**

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**EP 2 856 034 B1**

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## Description

### Field of the invention

**[0001]** The present invention relates to devices for control and/or detection of the supply of gas for appliances having one or more gas burners or similar flame generators. More in particular, the invention regards a control and/or detection device having a timing function, for example for enabling setting and/or adjustment and/or detection of a desired time interval of supply of gas to a respective burner or the like and/or for controlling and/or detecting the time that the burner remains lit.

### Prior art

**[0002]** Gas taps commonly used in cooking appliances and the like have a body, generally made of metal, provided with an inlet for connection to a gas-supply line, and an outlet for connection to a duct for delivery of the gas to the burner controlled by the tap. Mounted within the tap body are means for adjusting the flow of gas, constituted, for example, by an open/close element or partializer that can be position-adjusted via a manoeuvring rod and/or further levers or internal mechanisms. The rod projects axially from a proximal end of the tap body and is designed to turn about its own axis, for the purposes of the aforesaid flow adjustment. Coupled to the manoeuvring rod is a knob: a rotation imparted manually on the knob hence brings about rotation of the rod and consequent flow adjustment.

**[0003]** Provided within the tap body is a safety valve, which can be kept in the respective open condition by an electromagnet, the valve being of the open/closed type, for enabling or preventing, respectively, the flow of gas to the burner. The electromagnet is supplied via a thermoelectric generator, typically constituted by a thermocouple connected to a corresponding attachment or electrical connector of the tap body. The opposite end of the thermocouple, i.e., its sensitive part or hot junction, is installed in the proximity of the burner controlled by the tap. When the burner is lit, the sensitive part of the thermocouple generates an electromotive force (e.m.f.) in response to the heat generated by the flame to the burner, which determines a current that supplies the electromagnet of the safety valve, such as to keep the open/close element of the latter (associated to a movable core attracted by the electromagnet) in the respective open condition, countering the action of a spring.

**[0004]** Basically, as long as the burner is lit, the thermocouple generates a current that enables the electromagnet to keep the valve open; when the burner is turned off manually, or goes out accidentally, the electrical supply to the electromagnet ceases and the valve closes, forced in this direction by the aforesaid spring so as to prevent passage of gas between the inlet and the outlet of the tap.

**[0005]** For the aforesaid reasons, the rod of the tap is

able to translate along its own axis, in a direction of actuation, against the action of elastic means inside the tap body. This axial displacement can be obtained by pushing the knob of the tap and turning it. With this movement there occurs both an initial opening of the safety valve and the flow of gas to the burner, and the knob is kept in the pressed condition until the flame is lit on the burner. As has been said, in the presence of the flame, the thermocouple generates the current, which, via the electromagnet, keeps the valve in the open condition. Hence, after ignition of the flame, the user can release the knob.

**[0006]** Operatively associated to the tap there may also be a gas-lighter system, for generating sparks in the proximity of the burner in order to cause ignition of the flame.

This system usually comprises an electrical circuit that includes electrodes, generated between which are the aforesaid sparks following upon an electrical discharge. In some gas appliances, the lighter system is activated by exploiting the configuration of the tap, and especially the possibility of its rod translating axially. Consequently, by pressing the knob of the tap after turning it at least slightly, in addition to determining initial opening of the safety valve and flow of gas to the burner, the lighter system is also activated.

**[0007]** For this purpose, generally associated to the rod of the tap is an actuation element, which, in the course of axial displacement of the rod, causes switching of a microswitch of a normally open type, belonging to the electrical circuit of the lighter system. The microswitch may be of a type commonly available on the market for various uses and is anchored directly to the body of the tap, which has for this purpose at least one threaded hole for a corresponding fixing screw.

**[0008]** To a gas tap of the type referred to previously there may be associated a device for timed control of the supply of gas to a corresponding burner, i.e., to enable setting of a desired time interval of operation of the burner.

**[0009]** Timer devices are known, operatively coupled to a respective gas tap and having a corresponding knob, substantially coaxial to the knob of the tap. Via the knob of the device, a user can set a desired time interval of supply and then light the burner. Upon expiry of the time interval set, the device brings about closing of the safety valve inside the tap so as to interrupt supply of gas to the burner. For this purpose, the known device integrates a control circuit arrangement that basically includes timer means, which can be set via the corresponding knob, and controllable electrical switching means, connected between the thermocouple and the electromagnet of the safety valve of the gas tap. In a possible embodiment, the circuit arrangement of the known device also includes controllable electrical switching means connected in series to the circuit of the lighter system, designed to perform the functions of the microswitch previously referred to provided on taps of a traditional type.

**[0010]** Also known are devices in which there is envisaged the use of generic warning means, set within a cas-

ing of the device that is housed within the body of the appliance provided with the burner to be controlled. Associated to the emitters is a generic light guide for transmitting light radiation on the outside of the casing, in a region corresponding to a knob of the tap or to a ring nut of the device, for lighting up said elements and supplying to a user limited information on state of the device. In known solutions there is also envisaged the use of a panel display device, which is connected in common to various timer devices associated to the respective taps, but independent and installed in a remote position with respect thereto. The aforesaid panel display is designed to receive signals from the various timer devices and, given that it is substantially of an alphanumeric type, moreover enables supply of information on passage of time starting from ignition of the corresponding burner.

**[0011]** This solution is relatively inconvenient, for example when the timing function is active for a plurality of the devices associated to the taps. In this case, the user has to govern in a specific way display of the residual programming time of the device of interest by acting on the device itself or else on the panel display. Display of information for a number of devices on a single display complicates the control and data-communication logic. The possible simultaneous display of information on a number of devices complicates production of the display and increases the overall dimensions thereof. Problems of a practical nature, for example for manufacturers of electrical household appliances, derive also from the need to accommodate the display on the product, such as the panel of the cooking surface purposely prearranged.

**[0012]** WO 2010/134040 A1 discloses a gas appliance control device having the feature of the preamble of claim 1. WO2011090844 A1 discloses an illuminator for a knob, having a light guide that may receive light from a light source fixed behind an appliance console at a variety of different extensions. DE102005032508 A1 discloses an operating device having a light conductor designed as an attachment part for a gripping portion in a household appliance, the light conductor having a mechanical attachment unit with a screw thread, for attaching the gripping portion at the household appliance.

#### Summary of the invention

**[0013]** In its general terms, the object of the present invention is to provide a control and/or detection device of the type indicated above, having improved structure and functions as compared to the prior art, in particular in relation to the display of information for a user. An additional object of the invention is to indicate a device of the above sort that will be compact and inexpensive to produce, easy to assemble, and of contained cost, high reliability, and convenience of use.

**[0014]** The above and other objects still, which will emerge more clearly hereinafter, are achieved according to the present invention by a gas appliance control device

according to claim 1.

**[0015]** Preferential embodiments of the control device according to the invention are specified in the dependent claims.

#### Brief description of the drawings

**[0016]** Further purposes, characteristics, and advantages of the present invention will emerge clearly from the ensuing detailed description and from the annexed drawings, which are provided purely by way of explanatory and non-limiting example and in which:

- Figure 1 is a schematic perspective view of a gas-supplied appliance provided with a control device according to a possible embodiment of the invention;
- Figure 2 is a detail of Figure 1;
- Figure 3 is a view similar to that of Figure 2, but with a part of the appliance removed;
- Figures 4 and 5 are a perspective view and a view in side elevation of a known gas tap, provided with a switch forming part of a gas-lighter system of a gas-supplied appliance;
- Figure 6 is a partial and schematic perspective view of a control device according to the invention, in a condition where it is installed on the appliance;
- Figure 7 is a partial and schematic perspective view of the device of Figure 9, but from a different angle and with a part of the appliance removed;
- Figures 8 and 9 are exploded views, from different angles, of the device of Figures 6-7, with some parts of the appliance;
- Figures 10-13 are exploded views, from different angles, of the device and of the parts of Figures 8 and 9;
- Figure 14 is a schematic cross section of some components of the device of Figure 6 assembled together, aimed at illustrating operation of a corresponding light guide;
- Figure 15 is a schematic cross section of some components of the device of Figure 6 assembled together, amongst which an elastic element provided for urging a ring nut of the device itself;
- Figures 16 and 17 are perspective views, from different angles, of a circuit arrangement of the device of Figures 8 and 9;
- Figures 18, 19 and 20 are partial perspective views of the device of Figures 8-9, in different steps of assembly;
- Figures 21 and 22 are partial perspective views of the device of Figures 8-9;
- Figure 23 is a view similar to that of Figure 7, but with a control knob of a gas tap removed;
- Figure 24 is a perspective view of the same type as that of Figure 6, but rotated and partially sectioned;
- Figure 25 is a simplified block diagram of a circuit arrangement of a device according to the invention, connected between a thermocouple and the electromagnet of a gas tap;

- Figure 26 is a schematic perspective view of a device according to a possible variant of the invention;
- Figure 27 is a flowchart aimed at exemplifying a possible operating mode of a device according to the invention;
- Figure 28 is a partial and schematic perspective view of a control device according to a variant embodiment, in a condition where it is installed on the appliance;
- Figure 29 is a partial perspective view of the device of Figure 28, with some components removed;
- Figure 30 is a perspective view of a motion-transmission member of the device of Figures 28-29;
- Figures 31-32 are perspective views, from different angles, of a control means of the device for a tap used in combination with the device of Figures 28-29;
- Figures 33-34 are perspective views, from different angles, of a control member of the device of Figures 28-29, with a corresponding angular-position sensor;
- Figure 35 is a view similar to that of Figure 28, but regarding a different embodiment of a device according to the invention; and
- Figure 36 is a partial perspective view of the device of Figure 35, with some components removed.

#### Description of preferred embodiments of the invention

**[0017]** Figure 1 is a schematic representation of a gas-supplied appliance 1, equipped with a control device according to the present invention, hereinafter also defined for ready reference as "timer device".

**[0018]** In the example illustrated, the appliance 1 is a cooking appliance, and more in particular a cooking hob, of a general conception in itself known, of which just the elements useful for an understanding of the invention are represented. The timer device according to the invention may in any case also be used in other types of appliances provided with at least one gas burner, or similar flame generator, controlled via a respective tap, such as for example boilers, in particular for domestic heating.

**[0019]** The structure or body of the appliance 1 includes a lower box 2, which is fixed to an upper lid 3, defining a working area 4 identified in which are various cooking locations 5, as well as a command area 6. As per the known art, mounted within the structure of the appliance 1 are various functional components, amongst which - for what is of interest herein - taps for control of the supply of gas to the burners (not represented in detail herein) - of the various cooking locations 5. For this purpose, as may be noted in Figure 2, a wall 3a of the lid 3 has - in a position corresponding to the command area 6 - a series of through openings 7, projecting from each of which is the actuation rod 11 of the tap 10 of a corresponding burner. As may be appreciated from Figure 3, the taps 10 are fixed within the structure of the appliance, in positions corresponding to the openings 7, all according to the known art. The taps 10 are of a type in itself

known, in particular of the type described in the introductory part of the present description.

**[0020]** By way of example, in the example of embodiment represented, only one of the taps 10 is equipped with a timer device provided according to the invention, designated as a whole by 20. Once again by way of example, the four taps 10 of Figure 3 not equipped with the device 20 are provided with traditional pushbutton microswitches, some of which are designated by MS, of the type traditionally belonging to the electrical circuit of a gas-lighter system. The microswitches MS are fixed with a screw S to the corresponding tap body.

**[0021]** Figures 4 and 5 exemplify a gas tap 10 of a type generally known on the market, as described in the introductory part of the present description. In general terms, the body of the tap 10 has a front portion 10a, projecting from which is the corresponding rod 11 - here not visible in so far as it is engaged by the corresponding control knob 12, but which extends along the axis designated by A - and a rear portion 10b, provided in which are the inlet and the outlet for the gas, as well as the attachment for the thermocouple, where the front portion 10a has overall dimensions generally small with respect to the rear portion 10b. In Figures 4 and 5 the inlet and outlet for the gas are designated by 10c and 10d, whilst the attachment for the thermocouple is designated by 10e. In the case of the tap 10 illustrated also visible is an actuation element 10f, operatively constrained to the corresponding control rod to move therewith only in an axial direction, according to a technique well known in the sector. In practice, the element 10f is coupled to the rod so that, when this is turned about the axis A, the element 10f remains substantially stationary. When, instead, the rod 11 is translated axially along the axis A, the element 10f follows the axial movement of the rod. With said axial movement - and in particular when the rod is pressed by means of the knob 12 - the element 10f pushes a shaft 10g, which brings about opening of the safety valve of the tap 10, as explained previously, said valve being then kept open thanks to the corresponding electromagnet, once the flame of the burner has been lit. When the user releases the knob 12, the actuation element 10f follows the movement of axial return of the control rod.

**[0022]** In traditional applications, as has been said, the actuation element 10f can be advantageously exploited also for causing switching in closing of a microswitch MS forming part of the lighter system, which is fixed to the body of the tap via the screw S, typically a microswitch connected to the a.c. voltage of a domestic electrical wiring system, such as a 220-V a.c. voltage.

**[0023]** Visible in Figures 6 and 7 is a timer device 20 according to a possible embodiment of the invention. The supporting structure of the device 20 comprises a boxlike casing 21 - for housing at least part of a corresponding circuit arrangement and a mechanical-transmission arrangement - as well as a command means 22 for setting at least one time of supply of gas to the burner controlled by the corresponding tap 10. In the condition where the

device 20 is assembled on the appliance (Figure 6), the casing 21 is housed within the structure 2-3, and hence in a concealed position, with just the command means 22 accessible from outside. Preferably, the casing 21 is set between a rear portion of the tap 10 and the wall 3a of the structure provided with the opening projecting from which is at least the actuation rod 11. Very preferably, the casing 21 is shaped so as to receive through it at least part of a front portion of the tap 10. For this purpose, in a preferred embodiment, the casing 21 is shaped so as to define a passage, inserted within which is the aforesaid front portion of the tap. As will be seen hereinafter, in one embodiment, various components of the device 20 (such as the ones designated hereinafter by 25, 40 and 41) are purposely configured for determining the presence of the aforesaid passage.

**[0024]** In a preferred embodiment, the command means 22 comprises a ring nut member or knob, which is operatively set between a knob 12 for manual actuation of the rod 11 of the tap 10 and the outer face of the wall 3a. In the assembled condition of the device 20, the command means 22 - hereinafter referred to for simplicity as "ring nut" - is mounted movable, in particular angularly movable or rotatable, and is basically coaxial to the knob 12. In one embodiment (not represented), the ring nut 22 may also be axially movable, for example in order to bring about switching of control elements of the tap 10 and/or of the device 20. Of course, the shape and proportions of the ring nut 22 as represented, with respect to the knob 12, are merely indicative.

**[0025]** In a preferred embodiment, the ring nut 22 - which can function as light guide for performing also light-warning functions - represents the only component of the device 20 that is visible and operable from outside the structure of the appliance 1. In other possible embodiments, from the outside of the aforesaid structure there may be noted at least partially also other components of the device 20, for example a light-warning element.

**[0026]** In a preferred embodiment, the structure of the device 20 has means for coupling the casing 21 to the body of the tap 10. In the example illustrated, the coupling means comprise a bracket 23, which is preferably made of metal or thermoplastic material and is operatively set between the casing 21 and the body of the tap 10. Advantageously, fixing of the bracket 23 can be carried out by exploiting at least one screw that is normally associated to the body of the tap 10, for example a screw used for its fixing to the structure of the appliance 1 or a screw S that, according to the known art, is used for fixing the microswitch MS referred to previously (Figures 3 and 4). Also fixing of the casing 21 to the bracket 23 can be obtained with screws, or else via mutual coupling and engagement means, such as engagement reliefs or teeth that fit in respective seats.

**[0027]** In variant embodiments (not represented), the bracket 23 may be associated to or integrated with the casing 21, for example by overmoulding plastic material of a part of the casing 21 on the bracket 23, or shaping

a part of the body of the casing 21 like a bracket, in order to perform directly functions of coupling to the body of the tap. In other possible embodiments (not represented), the casing 21 of the device may be fixed to the structure of the appliance 1, via a purposely provided bracket or else directly.

**[0028]** Figures 8 and 9 show, from different angles, the components of the timer device according to one embodiment of the invention, as well as some components of the appliance 1 already referred to previously. Visible in these figures are the tap 10, the mounting bracket 23, a first part 40 of the casing 21, a circuit arrangement 25 that equips the device, a connector 26 belonging to an external wiring system (not represented), a control or motion-transmission element 27 for a switching means of the circuit arrangement 25, a transmission member 28 co-operating with the movable part of a sensor of the arrangement 25, a further transmission member 29 which can be actuated by the ring nut 22 to turn the member 28 accordingly, a member 30 intermediate between the transmission member 29 and the ring nut 22, a second part 41 of the casing 21, a sealing element 31, which is preferably of an annular type, designed to operate between the ring nut 22 and the front surface of the wall 3, and an intermediate annular element 32, which is designed to be operatively set between the knob 12 of the tap 10 and the ring nut 22 and is forced on the latter by a spring - visible only in Figure 15, designated by 32a - set between the inside of the knob 12 and the intermediate annular element 32.

**[0029]** The components of Figures 8 and 9 are visible, at a larger scale, in Figures 10-13. With particular reference to Figures 10 and 11, and as already mentioned, the tap 10 may be of a type in itself known on the market, as described in the introductory part of the present description and with reference to Figures 4 and 5.

**[0030]** In traditional applications, as has been said, the actuation element 10f may advantageously be exploited also for causing switching in closing of the microswitch MS forming part of the lighter system. As will be seen, in a particularly advantageous embodiment of the invention, the circuit arrangement of the device 20 includes a switching means, which performs also the functions of the aforesaid microswitch MS provided according to the known art. In the case of use of the timer device according to this embodiment, as exemplified here, the traditional microswitch MS may be omitted, and the screw S normally used for its fixing (Figures 3 and 4) may be exploited for fixing the bracket 23 to the body of the tap 10.

**[0031]** A possible embodiment of the bracket 23 is visible in Figures 10 and 11. In this non-limiting example, the bracket 23 is made of metal and has a longitudinal member 23a rising from which is a first upright part 23b, provided with a hole 23c for the passage of a screw (not represented), for example for engagement in an internal screw 10h provided on the body of the tap 10. Said internal screw may advantageously be the one usually provided for the screw S for fixing the microswitch MS pro-

vided according to the known art. Branching off from the longitudinal member 23a are two cross members 23d, generally parallel to one another and substantially orthogonal with respect to the upright 23a, provided with respective holes 23e for securing the casing 21, for example via screws. At least one of the cross members 23d can have an upright terminal part 23f, which is preferably substantially orthogonal to the cross member itself, which functions as contrast or resting element with respect to the structure of the appliance 1. It should be noted that the shape illustrated for the bracket 23 is provided merely by way of example, other shapes evidently being possible, which are preferably defined according to the shape of the tap and/or of the casing 21 and/or to the structure of the appliance.

**[0032]** The part 40 of the casing defined hereinafter for simplicity as "container" is substantially box-shaped and made of plastic material, with a bottom wall 40a and peripheral walls 40b that define a cavity or a seat for housing at least part of the circuit arrangement 25 and of the transmission arrangement including the transmission members 28-30, which are preferably toothed transmission members. Preferably, one of the peripheral walls 40b closes only partially the corresponding side of the container 40, thus defining a side opening 40c (Figure 11). At said side opening 40c, from the bottom wall 40a an appendage 40d projects outwards, aimed at providing a first part of a connector body, visible as a whole in Figure 7, fitted within which is the connector 26.

**[0033]** In a preferred embodiment, one of the peripheral walls 40b has an opening or gap 40e (Figure 11), the function of which will be clarified hereinafter, to which there preferably corresponds a slit 40f (Figure 10) defined in the bottom wall 40a. In one embodiment, such as the one represented, the bottom wall 40a is also provided with holes 40g for fixing the casing to the bracket 23, as well as a pair of slits 40h (Figure 10), which are preferably generally parallel and in a position set alongside with respect to the appendage 40d.

**[0034]** The casing 21 of the device 20 is configured for coupling with the body of the tap 10, and for this purpose has a passage, in which a corresponding part of the tap may be received passing through it. For example, in the embodiment illustrated, the bottom wall 40a has a through opening 42, which is preferably, but not necessarily, substantially circular. Preferably, moreover, the container 40 defines a hollow portion 42a, projecting within the corresponding cavity, where the opening 42 is located. Very preferably, moreover, the container 40 also defines an external recess, for housing partially, and with possibility of movement, the actuation element 10f of the tap 10.

**[0035]** In the embodiment illustrated, the bottom wall 40a and the peripheral wall 40b that has the gap 40e define together, within the container 40, the aforesaid hollow portion 42a, having an outer profile that is at least in part cylindrical. As may be seen in Figure 10, moreover, a part of the bottom wall 40a defines the aforesaid exter-

nal recess 42b, between the opening 42 and a respective wall 40b, in particular the one provided with the gap 40e.

**[0036]** With reference also to Figures 12-13, the circuit arrangement 25 preferably includes a printed-circuit board (PCB), designated by 25a, which is at least partially housed within the casing 21 and mounted on which are electrical and/or electronic components, connected to tracks (not represented) made of electrically conductive material defined on the circuit board 25a. Illustrated in the figures are only the components useful for an understanding of the invention, other electronic components being, however, possibly present, such as active or passive components or microcontroller circuits or memories.

**[0037]** In one embodiment, the circuit board 25a has a respective passage that surrounds at least in part the passage of the casing 21. In the example of embodiment, the passage of the circuit board 25a is in the form of an opening or slot 25b having a profile at least in part similar to or congruent with that of the opening 42 of the bottom wall 40a of the container 40 and/or of the corresponding hollow portion 42a, and the circuit board 25a is mounted in a position generally close to the bottom wall 40a. In the example, the slot 25b extends as far as an edge of the circuit board 25a and has at least a corresponding portion shaped like an arc of circumference. In other embodiments, the passage of the circuit board 25a may be circular, such as a hole, for example if the portion 42a is generally cylindrical or if it is absent.

**[0038]** The specific embodiment of the control circuit provided on the circuit board 25a may comprise - in general terms - components described in WO 2010/134040, for performing the functions described in said document and/or other specific functions envisaged according to the present invention. An example of circuit will in any case be described hereinafter with reference to Figure 25. For what is of specific interest herein - and also with reference to Figures 10-11 - in one embodiment, an end or projecting portion 25c of the circuit board 25a provides a male electrical connector, the terminals of which are obtained from electrical tracks, in particular of an edge-connector or card-edge type, which, in the condition where the device 20 is assembled, is in a position corresponding to the appendage 40d of the container 40, provided for coupling with the external connector 26.

**[0039]** According to the invention, the circuit arrangement 25 includes light-emitting means, which may comprise one or more emitters, for example of a LED type. Preferably, these emitter means are mounted on a face of the circuit board 25a - here defined as upper face - in the proximity of the passage of the casing 21. In the example represented, a number of emitters 43 are provided, arranged at intervals apart around the slot 25b. Given that, in the example, the slot 25b extends as far as an edge of the circuit board 25a, the emitters 43 are arranged according to the profile of the arc-shaped part of the slot itself, preferably at substantially regular intervals.

**[0040]** The circuit arrangement 25 comprises detection or sensor means, for detecting the angular position of

the ring nut 22 and supplying accordingly a signal representing a time interval of supply of the burner controlled by the tap 10. In the example, these sensor means include a stationary component 44, preferably mounted on the upper face of the circuit board 25a. In one embodiment, the sensor means are of a resistive type, such as a rotary potentiometer or trimmer, actuated by a corresponding part that may be set in rotation following upon a rotation of the ring nut.

**[0041]** In one embodiment, the signal for activation of the timing function of the device 20 is supplied to the circuit arrangement 25 by a control element. Preferably, this control element comprises a switching means, such as a pushbutton switch, preferably a low-power switch, in particular, for voltages ranging between 1 V and 24 V, which can be switched following upon axial displacement of the rod 11 of the tap, for example, the switch designated by 45. Advantageously, if the circuit of the device 20 is prearranged also for connection to a system for lighting the burners of the appliance 1, the signal generated by switching of the control element may also be used for governing the lighter system. In the example represented in Figures 11 and 12, the control element represented by the pushbutton switch 45 is provided on the upper face of the circuit board 25a. Preferably, but not necessarily, the switch 45 is a double-contact switch.

**[0042]** The motion-transmission element 27 is configured for transmitting an axial movement of the control rod 11 of the tap 10 to the switch 45, and for this purpose is mounted movable on the casing 21, in particular in a slidable way. At least one part of the motion-transmission element 27 faces the outside of the casing 21 in order to be able to interact or couple with the actuation element 10f of the tap 10. In embodiments not represented, it is also possible to provide a motion-transmission element configured for direct coupling to the rod 11.

**[0043]** In the embodiment exemplified, the element 27 has a base part 27a and an upright part 27b, the latter being shaped for engaging slidably in a vertical direction in the gap 40e (Figure 11) and in the slit 40f (Figure 10). In effect, and as may be appreciated, for example, in Figure 7, the element 27 is coupled to the container 40 so that its base part 27a overlies the pushbutton of the switch 45 in order to be able to cause switching thereof, in particular, via further interposed elastic means (see, for reference, Figure 20). The upright part 27b of the element 27 facing the outside of the casing 21 has a seat for engagement of the element 10f of the tap, said seat being here defined by two projections 27c (Figures 10 and 16) received between which is a part of the element 10f. In this way, the axial movement of the rod of the tap, due to pressure applied on the knob 12, brings about a corresponding vertical movement of the element 27 (downwards, as viewed in Figure 7).

**[0044]** In a preferred embodiment, between the control element represented by the switch 45 and the corresponding actuation element 27, the aforesaid elastic means, or damping means, are provided, in particular

having the function of operating the pushbutton of the switch 45 and compensating for possible tolerances of production and assembly and/or preventing risks of excessive stresses exerted by the element 27 on the switch 45. In the embodiment exemplified, and as may be appreciated, for example, in Figure 17, said means comprise an elastic element 46, in particular a helical spring, operatively set between the element 27 and the pushbutton of the switch 45. In the example, one end of the spring 46 is fitted on a pin 27d (Figure 10) projecting from the lower face of the head part 27a of the element 27, and the opposite end is engaged on the pushbutton of the switch 45. The spring 46 is calibrated so that, beyond a certain degree of compression thereof, it will transfer to the pushbutton of the switch 45 the force necessary for switching, said spring 46 being also able to absorb or compensate for possible excessive stresses.

**[0045]** In embodiments not represented, the damping function can be integrated directly in the motion-transmission element, for example by providing in its body an elastically deformable part, having spring functions.

**[0046]** The circuit arrangement 25 of the device includes first connection means for electrical connection to the electromagnet of the safety valve of the tap 10. Once again with reference to the example of Figures 10-11 and 16-17, connected to the circuit board 25a are electrical conductors or wires 47, represented schematically, for connection of the circuit of the device 20 to the electrical attachment or connector 10e of the tap 10, i.e., the attachment where the thermocouple is traditionally connected. Connected to the conductors or wires 47 of the arrangement 25 is a corresponding connector 47a, of a type complementary to the attachment 10e of the tap 10 and/or to the electrical connector of the electromagnet of the safety valve. Preferably, the connector 47a is of a type designed to perform the functions of connection proper to the traditional connectors for thermocouples used on taps of the type considered herein, in particular, a connector 47a of an axial type, or of a radial type, or of a Faston type.

**[0047]** In the example represented (see, for example, Figures 10, 16 and 18) the connector 47a includes two generally coaxial parts, not indicated, and in particular a central part and a peripheral part. The central part, which is at least partially cylindrical, is made of electrically insulating material and defines at the centre an axial seat (Figure 10), housed within which is a corresponding contact, connected to one of the conductors 47. The peripheral part, connected to the other conductor 47, is in the form of a shaped metal lamina, fitted on the central part and with a corresponding generally arched contact portion that surrounds at least partially the insulating central part, at a distance therefrom. The central part of the connector 47a can be inserted in the attachment 10e for the thermocouple (see Figure 7) so that in the corresponding axial seat there fits a terminal with central pin of the attachment 10e (see, for example, Figure 5), which thus electrically couples to the internal contact of the seat it-

self. The arched portion of the peripheral part of the connector 47a, by exploiting a certain elasticity thereof, bears, instead, upon an external cylindrical part of the attachment 10e.

**[0048]** In variants not represented, the conductors 47 may be absent, with the connector 47a connected or associated directly to the support of the circuit arrangement 25, with said connector, support, and casing of the device 20 appropriately shaped for enabling a connection to the connector 10e of the tap 10.

**[0049]** More in general, the electrical connectors, such as a first connector towards the electromagnet of the safety valve of the tap and a second connector towards the thermocouple, may be of the same type or else of different types: in the latter case, the timer device can function also as "adapter" between different connectors, i.e., between a thermocouple having a first type of connector and an electromagnet or safety valve of a gas tap having a second type of electrical connector, or else a timer 20 having a first connector 25d different from a second type of connector 47a.

**[0050]** The arrangement 25 likewise includes second connection means for electrical connection to the thermoelectric generator of the tap 10, i.e., the corresponding thermocouple. In the device 20 represented the conductors of the thermocouple - not represented - that equips the tap 10 are connected to the circuit arrangement 25a via fast-coupling connectors, which are preferably blade connectors, such as Faston connectors. In the example represented, projecting from the lower face of the circuit board 25a are two blade contacts 25d+ and 25d-(hereinafter, where not strictly necessary, designated simply by 25d), in particular of a male Faston type, which are generally L-shaped and are parallel to one another. The contacts 25d pass through the slits 40h of the bottom 40a of the container 40 so that their contact part projects outwards, as may be seen, for example, in Figure 22, providing an electrical connector of the device 20 for the thermocouple. On the aforesaid projecting part of the contacts 25d there may be fitted the connectors of the thermocouple, which in this case are of a female Faston type.

**[0051]** It will be appreciated that, in the example represented, the connection means proper to the thermocouple (here female Faston connectors) are of a different type from the connection means of the thermocouple provided by the tap (here the attachment 10e of a coaxial type): the device 20 consequently functions as "adapter", as explained above.

**[0052]** Note that the contacts 25d could be replaced by a cable with two conductors provided with a connector for a thermocouple.

**[0053]** The circuit board 25a preferably has positioning and fixing through holes 25e, designed to couple with reliefs 401 (Figure 11) of the bottom wall 40a of the container 40, said reliefs being axially hollow for receiving the screws that pass also into the holes 40g of the bottom 40a (Figure 10). At the holes 25e bushings 25f are pref-

erably mounted, on the upper face of the circuit board 25a, basically having the function of spacers and/or positioning elements with respect to the casing part 41, defined hereinafter as "lid". The bushings 25f may possibly form part of the lid 41.

**[0054]** In a preferred embodiment of the timer device 20, the movable part of the position-sensor means - actuated by, or including, the shaft designated by 28b - is able to rotate about an axis that is different from the axis about which the ring nut 22 turns, in particular is substantially parallel thereto, and operatively set between the ring nut 22 and the movable part of the sensor means is a transmission arrangement; i.e., the device 20 comprises a transmission arrangement, set between the control element or ring nut 22 and the position-sensor means.

**[0055]** In the preferred embodiment, the aforesaid transmission arrangement includes a first transmission member that is substantially coaxial to the ring nut 22 and is able to turn therewith. This first transmission member has an axial cavity, in which there may be received a corresponding part of the tap 10, and the ring nut 22 is coupled in a separable way to this transmission member.

**[0056]** Preferably, the transmission arrangement includes at least one second transmission member, which is engaged in rotation with the first rotating member and is able to set in rotation the movable part of the position-sensor means.

**[0057]** In the example represented, the transmission arrangement comprises the rotating members previously designated by 29 and with 28, which represent the aforesaid first and second transmission members, respectively.

**[0058]** Once again in Figures 10 and 11 there may be noted a possible embodiment of the rotating member 28, directly integrated in which is an actuation element for actuating the movable part of the sensor means. For this purpose, the member 28 co-operates with the stationary component 44 of the position-sensor means, such as a variable resistor, hereinafter defined for simplicity as "potentiometer".

**[0059]** In a preferred embodiment, the member 28 basically comprises a gear, the axis of rotation B of which is defined by a pin 28a projecting from its upper face, said pin being designed for engagement in a respective cylindrical rotation seat 41d of the lid 41 (Figure 12).

**[0060]** Projecting, instead, from the lower face of the member 28 is a shaft 28b, coaxial to the upper pin 28a, which provides an element for actuation of the movable part of the position-sensor means. The shaft 28b preferably has a cross section that is at least in part square (not circular), designed to couple mechanically to an internal movable member of the potentiometer 44, partially visible in Figure 17, where it is designated by 44a: in practice, then, the shaft 28b of the member 28 provides the element for actuation of the movable part 44a of the potentiometer or trimmer 44.

**[0061]** In a preferred embodiment, mechanical end-of-travel means are provided for rotation of the member 28,

which preferably comprise an element carried by the member itself, designed to interact with a stationary contrast element. For this purpose, in the case represented, projecting from the lower face of the member 28 is an arrest element 28c, designed to interfere with a fixed contrast element of the container 40. A contrast element of this sort is designated by 40i in Figure 18. The arrest element 28c and the contrast element 40i may be shaped, for example, in such a way that the useful travel of the ring nut 22 is approximately  $320^\circ$ . In one embodiment, the element 28c and the contrast element 40i are shaped so as to provide a point of respective mild engagement, for example so as to define an initial position of inactivity of the device 20 (for example, the element 28c may be shaped so that it can snap into the hollow seat of the element 40i). The angular area corresponding to a complete rotation - for example in a clockwise direction - in the proximity of the contrast element 40i (for example, with the element 28c engaged in a releasable way in the cavity of the contrast element 40i) defines an area or position of mechanical zero. This angular area, which may be approximately  $12^\circ$  wide, has a particular meaning for operation of the device 20, in so far as, together with the ring nut 22 positioned in the aforesaid area, it is generally in a state of inactivity. In this example, then, the duration of the interval of supply of the burner increases with rotation of the ring nut 22 in a counter-clockwise direction.

**[0062]** According to variants not represented, means for providing a snap coupling or engagement that defines an angular position or angular area of mechanical zero may be associated to other elements of the device, such as the ring nut 22 and/or the member 29.

**[0063]** The second rotating member 29 constitutes an axially hollow transmission element, which can be coupled in a separable way to the ring nut 22 and is coaxial thereto in order to turn according to the axis denoted by A in various figures, also corresponding to the axis of rotation of the stem 11 of the tap 10.

**[0064]** For this purpose, in the example illustrated, the member 29 comprises a circular ring gear 29a, projecting from the upper face of which are engagement elements 29b. Preferably, at least two engagement elements 29b are provided in diametrically opposite positions. Very preferably, the engagement elements 29b have a substantially cylindrical shape.

**[0065]** Advantageously, the transmission member 29 is rotatably supported by a corresponding portion of the casing 21, at the corresponding passage. For this purpose, in the example represented, projecting from the lower face of the circular ring gear 29a is a cylindrical annular part 29c, having a smaller circumference than the one defined by the teeth of the ring gear 29a. The cylindrical part 29c is designed to insert with minimal play or with slight interference in the through opening 42 of the bottom wall 40a of the container 40 so that it can turn therein about the axis A, sustained on the hollow portion 42a. In the assembled condition of the device 20, and as

may be noted, for example, in Figure 19, the toothings of the two members 28 and 29 mesh together so that rotation of the member 29 causes rotation of the member 28, and hence of the shaft 28b, coupled to the angular sensor represented by the potentiometer 44.

**[0066]** Coming now to Figures 12-13, in a preferred embodiment, the transmission arrangement also includes the intermediate member 30, prevalently located within the casing of the device 20. The intermediate member 30 has a respective axial cavity and is operatively set between the ring nut 22 and the transmission member 29 so as to turn therewith according to the axis A. The ring nut 22, prevalently located on the outside of the appliance 1, is preferably made of transparent material, for example a transparent thermoplastic material, such as polycarbonate or methacrylate, for performing functions of light guide or optical guide, in order to receive and/or transfer light radiation, in particular, from the inside to the outside of the appliance 1.

**[0067]** The through cavity of the member 30 preferably has a diameter greater than that of the member 29. Preferably, the intermediate member 30 has a generally annular shape, with an end face facing the upper face of the toothed member 29, in order to be able to rest at least partially thereon.

**[0068]** According to an advantageous characteristic, a light or optical guide is provided - here made up of a number of parts, such as the elements 22 and 30 - preferably made of transparent thermoplastic material, for transferring a light signal from the inside of the device 20 and/or of the appliance 1 to the outside of the appliance 1.

**[0069]** In one embodiment, the member 30 performs functions of light guide or optical guide, for transfer of light radiation generated by the emitter means 43 to the ring nut 22. In this embodiment, the member 30 and at least part of the ring nut 22 are made of a transparent material, for example methacrylate, or in any case a material that is able to transmit the light generated by the emitters 43.

**[0070]** For this purpose, in a preferred embodiment, the diameter at the base of the member 30 is greater than the diameter defined by the teeth of the member 29 so that a peripheral annular region of the upper face of the member 30 faces directly the emitters 43, as may be noted, for example, from Figure 20. Preferably, the intermediate member 30 has a frustoconical outer profile, in particular with an inclination of its peripheral wall  $30_1$  (Figure 14) substantially equal to  $45^\circ$  with respect to the base. In this way, the light radiation generated by the emitters 43 impinges on the annular region of the lower face of the member 30 that projects beyond the member 29. The light radiation is reflected within the body of the member 30 by the peripheral wall  $30_1$ , in a substantially orthogonal or radial direction, i.e., towards the surface of the axial cavity of the member 30. As will be seen hereinafter, in the axial cavity of the member 30 there is received, preferably in a separable way, a corresponding portion of the ring nut 22, which can then transfer the light frontally,

beyond the wall 3a of the appliance.

**[0071]** The internal surface of the member 30 defines seats 30a, in the form of axial recesses, of a shape complementary to at least part of the outer profile of the engagement elements 29b of the member 29 in order to enable mutual coupling thereof that enables transmission of a rotation of the member 29 to the member 30, as may be seen, for example, in Figure 20. In the example of embodiment illustrated, then, at least two seats 30a are provided, in diametrically opposite positions, preferably having a substantially semi-cylindrical profile.

**[0072]** The lid 41 of the casing, made of plastic material, has a respective bottom wall 41a, defined in which is a through opening 41b, here circular, which forms part of the aforesaid passage of the casing 21 and inserted in which is part of the tap 10. In the example, the through opening 41b has a diameter substantially corresponding to that of the opening 42 of the container 40 and/or substantially corresponding to the diameter of the portion of tap 10 on which it is mounted. The bottom wall 41a of the lid 41 also has holes 41c for the passage of the screws used for fixing the lid and the container together and/or with respect to the bracket 23, the screws also passing between the spacer bushings 25f previously mentioned. On the internal face of the lid 41 the cylindrical seat 41d is also defined, for receiving a corresponding portion of the pin 28a of the toothed member 28. In embodiments not represented, the lid 41 and the container 40 are associated to one another and/or fixed via means different from the ones illustrated, such as means for mutual engagement of the lid and/or of the container, preferably of a snap-in type, or else fixed by gluing or welding, in particular, welding of a laser or vibration type, or by hot remelting of a plastic material of at least one of the lid and the container. Coupling or fixing between the lid 41 and the container 40 is preferably of the sealed type, possibly with the aid of sealing elements set in between.

**[0073]** Projecting from the same face of the lid 41, preferably along the corresponding perimeter, are reliefs 41e, for centring the lid itself on the container 40, as well as a side wall 41f, designed to close the opening 40c of the container 40 (Figure 11). Projecting outwards from the aforesaid wall 41f is an appendage 41g, set in a position corresponding to that of the appendage 40d of the container 40. In the assembled condition of the device 20, the appendages 40d and 41g define at least part of an electrical-connector body, which houses the portion 25c of the circuit arrangement 25 on which the connector 26 is coupled (see, for reference, Figure 7 or Figure 24, in which a part of the wiring to which the connector 26 belongs is also visible). The portion 25c and/or the corresponding connector body 40d, 41g, on one side, and the connector 26, on the other side, may advantageously be provided with engagement means and/or polarization or encoding means in order to enable electrical coupling only with a predefined connector 26 and/or in a unique direction. The polarization or encoding means may, for example, comprise seats and/or cavities and/or holes

made in the circuit board 25a and/or in the connector 25c and/or in the connector body 40d, 41g, designed to couple with respective polarization or encoding means of the connector 26. Likewise, the engagement means may, for example, comprise at least one tooth for engagement on the connector 26 and a corresponding seat for engagement on the circuit board 25a and/or the connector 25c and/or the corresponding connector body, or vice versa.

**[0074]** In the embodiment illustrated the connector appendages or portions 40d and 41g define at least one of engagement means and polarization means, for unique coupling with the predefined connector 26. More in particular, the appendage 41g includes a tooth (see, for example, Figure 12) designed to couple in a corresponding seat of the body of the connector 26, whereas the appendage 40d has an insertion "key" comprising reliefs and cavities (partially visible in Figure 11), for coupling with a respective substantially complementary part of the connector 26.

**[0075]** The connector 26 is preferably provided with elastic electrical terminals or connections, designed to contact the respective electrical terminals of the connector 25c, which are preferably made in the form of electrical tracks on the circuit board 25a, but could also be constituted by rigid metal terminals. The connection of the connector 26 to the corresponding wiring may, for example, be obtained by insulator-punchthrough connection means.

**[0076]** In the example of embodiment provided, the ring nut 22 has an axial cavity, in which there may be received a corresponding part of the gas tap, preferably comprising at least part of the rod 11. The ring nut 22 has a gripping portion 22a, which is preferably provided on the surface with knurling or the like. The outer profile of the gripping portion 22a is preferably substantially frustoconical, with major diameter on its face opposite to the wall 3a of the appliance, and in particular with an inclination of its peripheral wall 22<sub>1</sub> (Figure 14) substantially of 45°. Preferably, moreover, at the upper end of the axial cavity of the ring nut, the gripping portion 22a defines an inclined annular wall 22<sub>2</sub>, in particular with an inclination substantially of 45° and opposite to that of the external peripheral wall 22<sub>1</sub>.

**[0077]** On the opposite face of the portion 22a a seat 22b is defined for the sealing element 31, which is preferably an annular gasket, of an O-ring type. In the condition where the device 20 is installed, the element 31 is designed to co-operate in a sealed way with the front surface of the wall 3a of the appliance.

**[0078]** Rising from the lower face of the gripping portion 22a is a cylindrical hollow portion 22c, on the outer surface of which seats 22d are defined, in the form of axial recesses, having a shape at least in part complementary to the outer profile of the engagement elements 29b of the toothed member 29 in order to obtain mutual coupling between them that enables transmission of a rotation of the ring nut 22 to the member 29, as may be seen, for example, in Figure 24. In the example of embodiment

illustrated, then, at least two seats 22d are provided, in diametrically opposite positions, preferably having a substantially semi-cylindrical profile. In general, then, the seats 30a of the intermediate member 30 and the seats 22d of the ring nut 22, in the form of axial recesses, are preferably such as to couple to one another or face each another so as to provide seats of a shape substantially complementary to the outer profile of the respective engagement elements 29b of the rotating member 29, in particular, seats having a substantially cylindrical profile.

**[0079]** In a preferred embodiment, the end face 22<sub>3</sub> (Figure 14) of the cylindrical portion 22c of the ring nut 22 opposite to the gripping portion 22a is inclined inwards; i.e., it has an inclination opposite to that of the peripheral wall 22<sub>2</sub> of the portion 22a, in particular an inclination substantially equal to 45° with respect to the axis of rotation.

**[0080]** Figure 14 exemplifies a mode of transmission of light from an emitter 43 to the ring nut 22. It may be noted that in this figure the representation of some components of the device has been omitted, for greater clarity.

**[0081]** As has already been seen, an outer annular part of the lower face of the member 30 is set facing the emitters 43. The light radiation LR emitted by an emitter 43 impinges on the bottom face of the member 30 and then proceeds inside it in an axial direction, until it encounters the corresponding inclined peripheral wall 30<sub>1</sub>. The wall 30<sub>1</sub> hence reflects at least part of the light radiation in a substantially radial direction (i.e., a direction substantially orthogonal to that of the radiation entering the body of the member 30), in the direction of the centre of the member 30.

**[0082]** Possibly, one or more surfaces of the components involved may be treated for improving transfer of light radiation. The various walls of the optical guide could even present angles and/or conformations different from the ones exemplified, provided that the function described is guaranteed.

**[0083]** The radiation propagates in the cylindrical portion 22c of the ring nut 22, fitted in the cavity of the member 30. The radiation proceeds in the body of the portion 22c in a radial direction, in the direction of the axis of rotation, until it encounters the inclined end face 22<sub>3</sub> of the cylindrical portion 22c. This face 22<sub>3</sub> now reflects at least part of the radiation within the cylindrical portion 22c, in an axial direction, until it encounters the inclined wall 22<sub>2</sub> defined at the top end of the axial cavity of the ring nut. The wall 22<sub>2</sub> then reflects at least part of the radiation again in a radial direction, now outwards, over the gripping portion 22a of the ring nut, towards its part that projects radially from the knob 12 of the tap. The radiation proceeds in the body of the gripping portion 22a until it encounters the corresponding peripheral wall 22<sub>1</sub>, which reflects again the radiation in an axial direction, so that it is evident for the user.

**[0084]** Preferably, the outer diameter of the cylindrical portion 22c is smaller than the diameter of the opening

7 provided on the wall 3a of the appliance and only slightly smaller than the diameter of the opening 41b of the lid, in such a way that the ring nut 22 can be turned manually.

The outer diameter of the cylindrical portion 22c is also slightly smaller than the diameter of the axial cavity of the member 30 so that it can be inserted therein, with the corresponding seats 22d that fit on the part of the engagement elements 29b opposite to the part that is engaged in the seats 30a of the member 30, as may be appreciated, for example, from Figure 24. Consequently, the arrangement is such that a rotation imparted manually on the ring nut 22 is transmitted both to the toothed member 29 and to the intermediate member 30, given the coupling of the elements 29b of the member 29 with the seats 30a and 22d of the member 30 and of the ring nut 22, respectively. Rotation of the member 29 then brings about rotation of the member 28, with the shaft 28b, and thus variation of the adjustment value of the potentiometer 44.

**[0085]** The intermediate element 32 also has a generally annular shape and is provided for being operatively mounted between the ring nut 22 and the knob 12, preferably at least partially in a concealed position, as may be seen for example in Figure 24. It may be noted that intermediate elements similar to the element 32 are normally provided in knobs for gas taps, on the aforesaid known intermediate elements there being mounted an annular gasket, designed to operate in a sealed way on the outer surface of the appliance.

**[0086]** In a preferred embodiment, and as may be noted in Figure 15, the element 32 is pushed by a spring 32a - mounted inside the knob 12, in order to press the ring nut 22 towards the surface 3a of the appliance: in this way, the sealing element 31 of the ring nut 22 is pushed against the surface 3a. Possibly, also the element 32 may be provided with an annular gasket on its bottom face, for improving the seal between the element 32 itself and the ring nut 22.

**[0087]** In the example represented, the knob 12 of the tap 10 has a main part that includes a cylindrical wall 12a and a top closing wall 12b, extending from a bottom face of which is a cylindrical shank 12c, substantially coaxial to the wall 12a. Defined in the shank 12c is an axial seat 12d for receiving and engaging the rod 11 of the tap 10, with a coupling such that a rotation imparted on the knob 12 will cause rotation of the rod 11. The diameter of the axial passage of the intermediate element 32 is slightly greater than that of the shank 12c, whereas the outer diameter of the element 32 is only slightly smaller than the inner diameter of the cylindrical wall 12a of the knob. In this way, the knob 12 can also be pressed to enable axial sliding of the rod 11 of the tap 10, with the knob itself that can slide on the element 32, the latter resting on the ring nut 22.

**[0088]** It goes without saying that the inner diameter of the axial passage of the ring nut 22 is only slightly greater than that of the shank 12c of the knob 12 and that the inner diameters of the axial passages of the mem-

bers 29 and 30 are such as to enable insertion through them of the head portion 10a (Figures 10-11) of the tap 10, which also passes through the openings 42 and 40b of the container 40 and of the lid 41 of the casing 21.

**[0089]** Figure 18 represents a condition of partial assembly of the timer device, visible in which is the container 40 within which the circuit arrangement 25 including the circuit board 25a is located. In Figure 19 the toothed transmission members 28 and 29 are also assembled, whilst Figure 20 also includes the intermediate member 30. Figures 21 and 22 represent, instead, in different views, the casing 21 assembled, with the circuit arrangement and the transmission arrangement previously described inside it. From these figures there may be appreciated the compact configuration of relatively small thickness of the casing 21, and it may be noted how the axial cavity of the transmission member 29 defines at least one respective portion of the passage for the front part of the tap. It may likewise be appreciated that the transmission arrangement described, thanks to the axial cavities of the members 29 and 30, enables adequate shielding of the inside of the casing 21, also in the case where the ring nut 22 is removed. It will be appreciated that the movement of the ring nut 22 is transferred to the corresponding sensor means 44 via the transmission arrangement 28-30. In this way, any direct stress on the sensor means and/or on the circuit board 25a is prevented. It will likewise be appreciated that, in the embodiment illustrated, the part of the transmission system to which the ring nut 22 - i.e., the member 29 - is associated does not touch the circuit board 25a, but is supported by a portion (42a) of the casing.

**[0090]** Figure 23 shows the condition of further assembly of the casing 21 on the tap 10, by means of the bracket 23, and with the ring nut 22. It should be noted that Figure 23 - as likewise Figure 7 described previously where the knob 12 is further represented - is provided merely by way of example given that, in the actual condition where the device 20 is installed, between the ring nut 22 and the casing 21 there extends the wall 3a of the appliance 1. Figure 24 illustrates the device 20 in partial cross section, in this figure there being visible the transmission arrangement formed by the members 28-30 coupled together via the elements 29b of the member 29, as well as the gasket 31 set between the ring nut 22 and the front surface of the wall 3a.

**[0091]** The presence of the transmission arrangement described prevents the need to associate the manual-control means of the device directly to the corresponding sensor, thereby preventing stresses on the sensor itself and/or on the circuit board on which it is mounted. In this perspective, it is preferable, although not indispensable, for the part of the transmission arrangement to which the ring nut 22 (i.e., the member 29) is associated not to touch in any case the circuit board, but to be supported by a portion of the casing of the device projecting within its cavity (for such a case it is hence also advantageous that the circuit board has a passage for this portion of the

casing).

**[0092]** The transmission arrangement envisaged according to a preferred embodiment of the invention provides also a sort of "adapter" between a control means and the corresponding movement-sensor means, and especially between the control means here represented by the ring nut 22 and the sensor means represented by the potentiometer 44. In other words, thanks to a kinematic arrangement of the type considered, a "custom" mechanical arrangement of the device 20 and/or of the control means can be adapted to a sensor of a "standard" type available on the market.

**[0093]** As already clarified, the device 20 is prearranged for performing at least a function of timing of the supply of gas to the burner controlled by the tap 10, and includes for this purpose at least a timer circuit and a means for manual setting of the supply interval, here represented by the ring nut 22, which can be operated from the outside of the structure of the appliance and is substantially coaxial to the knob 12 of the tap 10. In one embodiment, such as the one described previously, the knob 12 and the ring nut 22 can be turned by a user, preferably independently of one another, about the axis A, in order to enable, on the one hand, adjustment of the flow of gas admitted to the burner and, on the other hand, setting of the time of supply of the burner. The knob 12 is also axially movable, unlike the ring nut 22 (on the other hand, as has been mentioned, in possible variant embodiments also the ring nut 22 could translate axially).

**[0094]** As represented schematically in Figure 25, the timer circuit MC is implemented in the circuit arrangement 25, which likewise includes first switching means Q1, which can be controlled for causing interruption of electrical supply to the solenoid EM of the safety valve of the tap 10, upon expiry of the time interval set via the ring nut 22, and thus cause passage of the aforesaid valve into the respective closed condition. For this purpose, the first switching means Q1 are preferably connected in series between the thermocouple TC provided for the tap 10 and the electromagnet EM of the corresponding safety valve.

**[0095]** The timer circuit MC can be obtained in any known way, for example including, in the circuit arrangement 25, a commercially available microcontroller provided with clock or timer function, which can preferably be supplied with a low d.c. voltage (for example 3 -- 12 Vdc) via a supply stage or stabilized power supply. Hence, the device 20 is preferably a low-voltage device. The aforesaid microcontroller MC, in which the program or software for control of the device can be implemented, is connected in signal communication to the position-sensor means, here represented by the potentiometer 44, from which the information regarding the time interval set is obtained.

**[0096]** The first switching means Q1 preferably include at least one switch that can be controlled for opening or varying the electrical circuit of the thermocouple TC, when the time interval in which the burner 5a is to remain

lit set via the ring nut 22 has elapsed. The controllable switch may be of an electro-mechanical type, for example a relay, or else of an electronic type, for example a MOSFET, and is preferably, but not necessarily, of a normally open type, switchable via a pulse or signal governed by the timer circuit MC. In a preferred embodiment, the switch Q1 is an electronic switch, in particular a MOSFET with extremely low channel resistance, set in series to the thermocouple TC-electromagnet EM circuit. A switch of this sort guarantees, in the case of conduction, an extremely low resistance of the circuit and enables requirements of miniaturization to be met.

**[0097]** According to possible variants, the switching means may include a device or circuit configured for varying the electrical circuit of the thermocouple, for example a load (such as a resistance), which, when rendered active, reduces the current to the electromagnet EM.

**[0098]** As has been said, in a preferred, albeit non-exclusive, embodiment of the invention, the device 20 is also prearranged for the purposes of control of a lighter system. The circuit part regarding the lighter system can be obtained in any known way, and is not necessarily implemented in the circuit arrangement 25.

**[0099]** In a variant embodiment not represented, the circuit arrangement 25 of the device can include second control means or controllable switches, which are preferably of higher power than the first switching means Q1, in particular for a 220-V mains supply voltage, in order to control directly a lighter module (for example, for connecting in series two terminals thereof). Also these further switching means, which are preferably of a normally open type, are switchable via a pulse or signal generated by the arrangement 25.

**[0100]** The potentiometer 44, or other component that stands in for it, basically has the function of detecting the position, among a plurality of possible positions, assumed by the manual-control means represented by the ring nut 22, this position representing the duration of the time interval set. As has been said, in a preferred embodiment, the stationary component 44 is constituted by a rotary potentiometer, in particular of a resistive type, preferably of the type designed to be mounted and/or welded directly on a circuit board 25a, such as a commercial trimmer, but its functions may be evidently obtained via other electrical and/or electronic components, such as for example optical or magnetic encoders and sensors. The person skilled in the branch will hence appreciate that the actuation element of the sensor means do not necessarily have to be represented by a rotary shaft, such as the shaft 28b, it being possible to obtain it with some other type of movable element.

**[0101]** In the example described previously, the emitters 43, which are preferably distributed in a circle around the head portion of the tap 10, bring about lighting-up of the ring nut 22, which is made of transparent plastic material, or in any case a material designed to function as light guide. Also other mechanical parts for transmission of the rotational movement - at least the intermediate

member 30 and preferably also the toothed member 29 - are preferably made of a similar material, for example polycarbonate, in order to function as optical guide. In this way, the light generated by the emitters 43 is visible from outside the casing 21. The light warnings, generated by the emitters 43 under the control of the timer circuit MC are useful for a user of the device 20. For example:

- a rapidly flashing light may be used to indicate that the device is awaiting programming of the time of supply of the burner;
- a light that stays on may be used to indicate that the device 20 has not been programmed;
- a slowly flashing light may be used to indicate that the device has been programmed and that a cycle of automatic turning-off is in progress;
- a rapidly flashing light may be used to indicate that the end of the supply time is near, and that the flame will be turned off within a few instants.

**[0102]** As already mentioned, in addition or as an alternative, there may also be provided warning means of some other type, for example of an acoustic type, such as the buzzer BZ. In such a case, for example, different acoustic signals may indicate different events, such as confirmation of programming, approach of expiry of the supply time set, effective end of the supply time set.

**[0103]** The control element, represented by the switch 45, of the circuit arrangement 25 basically has the function of generating the command signal that the microcontroller circuit MC handles for determining or controlling initial closing of the switch Q1 and start-up or otherwise of a time count. The signal generated by the switch 45 can also be used by the arrangement 25, and, in particular, by its microcontroller MC, for generating the switching pulse of the control means associated to the circuit of the lighter system.

**[0104]** Assembly of the device 20 is very simple. Once the casing 21 has been assembled on the bracket 23, the latter is fixed to the body of the corresponding tap 10, already mounted on the part 2 of the structure of the appliance 1. The head portion 10a of the tap is thus inserted in the through opening of the casing 21, with the actuation element 10f of the tap that is located in a position corresponding to the recess 42b of the container 40 (see, for reference, Figures 22-23), coupled to the motion-transmission element 27 of the device 20.

**[0105]** The connector 47a is connected to the corresponding attachment 10e of the tap, whereas the conductors of the thermocouple TC are connected to the blade contacts 25d (Figure 22). After assembly of the part 3 of the structure of the appliance 1, the ring nut 22 is fitted through the through opening 7 of the wall 3a of the structure so that its cylindrical bottom portion 22c is inserted in the toothed member 29, thus obtaining also coupling between the engagement elements 29b and the seats 22d. Then coupled to the stem 1 1 of the tap is the knob 12, on the shank 12c of which the element 32 has

been previously fitted. The coupling between the stem 11 and the shank 12c is configured for enabling removal of the knob 12 and of the ring nut 22 itself by the user, for example for cleaning.

**[0106]** General operation of the device may be at least in part similar to the one described in the document No. WO 2010/134040, to which the reader is referred. In brief, for the purposes of programming of a desired time interval in which the burner 5a is to remain lit, the user has to turn the ring nut 22 for setting the desired time, for example ranging between 1 and 120 minutes. The user then turns the knob 12 and presses it in order to bring about initial opening of the safety valve and activation of the gas lighter. The pressure exerted on the knob 12 causes axial displacement of the stem 11 and of the actuation element 10f, and hence movement of the motion-transmission element 27, with consequent switching of the control element represented by the switch 45. The signal generated by the switch 45 is used by the control logic of the device 20 for controlling closing of the switching means Q1 provided on the circuit arrangement 25, connected in series between the thermocouple TC and the electromagnet EM of the safety valve, in order to start counting of the time and generate the command signal of the switch associated to the lighter system, when this function is envisaged. Once the burner 5a has been lit, the heat generated by the flame causes the thermocouple TC to generate the current necessary to keep the safety valve of the tap 10 open.

**[0107]** At the end of the time interval set via the ring nut 22, the control logic generates a new signal of switching of the switching means Q1, which in this way open the circuit of the electromagnet EM, with consequent closing of the safety valve of the tap 1. The burner is thus turned off once the pre-set time has elapsed.

**[0108]** The device 20 preferably has a predefined position of non-intervention in order to enable normal use of the tap 10 and of the corresponding burner without activation of the timing function. This position may conveniently be represented by an angular position of "zero" of the ring nut 22, which will be purposely provided with suitable indications. When the ring nut 22 is in this position, detected via the transmission arrangement 28-30 and the sensor 44, the functions of the circuit that are associated to the time count will not be active. However, pressure on the knob 12 will cause, in the ways already described above, generation of the signal that determines closing of the switching means in series between the thermocouple and the electromagnet in order to guarantee the electrical continuity necessary for opening the safety valve, and/or will cause generation of a signal for control of the lighter module.

**[0109]** In a different embodiment, the control logic of the device 20 envisages that programming will be carried out by the user after the flame to the burner 5a has already been lit. In this case, the user has to carry out lighting of the burner in the way described above (turn the knob 12 and press it, with consequent switching of the switch 45

and activation of the lighter system). Following upon ignition of the flame, the device 20 is activated in a programming mode, signalled, for example, by a fast flashing of the ring nut 22. Next, if within a given time interval the user does not turn the ring nut 22, the supply of gas proceeds in a traditional way (i.e., without timed turning-off), for example with the ring nut 22 lit up continuously via the emitters 43. Instead, in the case where it is desired to program the device 20, the user turns the ring nut 22 and then presses the knob 12 as a confirmation of programming; in this case, the device can signal confirmation of programming (for example, acoustically or with a fast flashing of the ring nut) and start-up of the countdown (with flashing of the ring nut that, for example, becomes slower).

**[0110]** Figure 26 illustrates a variant whereby, in addition or as an alternative to the emitters 43, the circuit arrangement 25 includes at least one emitter 43', associated to which is a stationary light guide LG. In the example, the emitter 43' is directly mounted on the circuit board 25a and, in a position corresponding thereto, the lid 41 of the casing defines a positioning seat 41h for the light guide LG, which projects or gives out on the outside of the casing 21. In this case, the wall 3a defines an opening or window 3b for viewing the light guide LG. In other variants (not represented) the light guide LG may be absent, with the emitter 43' mounted or configured so as to project directly on the outside of the casing, within a purposely shaped seat 41h, possibly with associated sealing means, such as a perimetral gasket. In other variants (not represented) the light guide LG may extend in the opening or window 3b of the wall 3a, preferably with further sealing means between the light guide LG and the wall 3a, or else there may be provided a further optical guide or transparent element associated in a sealed way to the wall 3a. The emitter 43' may also be in a position that is more raised with respect to the plane defined by the circuit board 25a, for example by means of its terminals, in which case the light guide LG may have a more contained axial development as compared to the case exemplified. In the limit, the emitter 43' itself could project slightly on the outside of a corresponding hole of the casing 21, in an area corresponding to the window 3b.

**[0111]** The flowchart of Figure 27 describes an example of logic of operation of the system forming the subject of the invention, in one embodiment thereof.

**[0112]** Block 101 is the starting block and highlights the condition of flame off and device 20 not programmed, i.e., in a quiescent state. Block 102 represents the step of ignition of the burner, which can be obtained by turning and pressing the knob 12 of the tap 10: rotation enables an initial flow of gas to the burner, whilst pressure exerted on the knob brings about switching of the switch 45, preferably activating a lighter module. Block 103 represents the condition of flame lit on the burner, following upon which the device 20 is activated or can be activated in a programming mode. In a possible embodiment, activation in said mode is determined by switching of the switch

45 (block 102), detected by the control circuit of the device 20. In a preferred embodiment, passage to the programming mode is determined by detection of the effective ignition of the flame, inferred, for example, from the signal generated by the thermocouple. Activation in the programming mode is signalled to the user, for example via a fast flashing of the emitters 43, which can be detected on the ring nut 22. Block 104 is a testing block, with which a check is made to verify whether the user has carried out, within a given time, programming of the device 20 by turning the ring nut 22 beyond the zero position. If he has not (output NO), control passes to block 105, with which the warning mode changes state, for example with the emitters 43 lit up continuously, and then to block 106, with which supply of gas to the burner is made to proceed in a normal way, i.e., without there being established a time of forced extinction. Otherwise (output YES from block 104), control passes to block 107, for detecting the extent of the angular movement of the ring nut 22, and hence the time set by the user, with corresponding indication. The user then confirms programming (block 108), by applying a brief pressure on the knob 12 of the tap, detected by the circuit of the device 20 via switching of the switch 45. Control passes to block 109, for confirmation and notification that programming has been carried out. The notification may be of a visual type, via suitable flashing of the ring nut, and/or acoustic type, if the device is provided, for example, with a buzzer. Control then passes to block 110, with which the timer circuit MC starts countdown of the time of supply of the burner, preferably with a change of state of the warning light, for example, a slow flashing of the emitters 43. Block 111 expresses the fact that a time of forewarning of end of supply of gas to the burner has elapsed, which may depend upon the total time set via the ring nut 22. Once this time of forewarning has elapsed a visual and/or acoustic warning is issued, for example a fast flashing of the emitters 43 and/or a series of frequent beeps generated by the aforesaid buzzer (if present). Control then passes to block 112, which is a testing block, where a check is made to verify whether the user wishes to prolong supply of gas to the burner, via rotation of the ring nut 22 (and/or brief pressure applied on the knob 12). If he does not (output NO), control passes to block 113, where, at the end of the time set via the ring nut 22, the device issues a command for switching of the switching means Q1, causing connection between the thermocouple TC and the electromagnet EM to cease and consequently turning off the flame. Preferably, there is also issued a suitable visual and/or acoustic warning, for example a continuous flashing of the emitters 43 and/or two prolonged beeps separated from one another (if the buzzer is envisaged). The device 20 then sets itself in a quiescent state.

**[0113]** In the case where the user prolongs the supply time (output YES from block 112), control passes to block 114, in which a brief pressure exerted on the knob 12 (and/or rotation of the ring nut 22) is detected. In block

115 the warning for activation of the programming mode is issued, such as a fast flashing of the emitters 43, and the device remains in the wait state, for a given time interval, awaiting further confirmation of programming, for example obtained with a brief pressure exerted on the knob 12 of the tap, detected in block 116. Control then returns to block 109, for confirmation and notification that reprogramming has been carried out.

**[0114]** It is clear that numerous variations may be made by a person skilled in the art to the device described by way of example; without thereby departing from the scope of the invention as defined in the annexed claims. The various characteristics of the various examples may be combined at least in part together to form devices that may even be different from the ones represented and described by way of non-limiting example.

**[0115]** Previously, specific reference has been made to embodiments where the visual-warning means for the user are represented by light emitters, such as LEDs, in particular set within the casing 21 of the device 20 and with a system of light guide designed to transmit the light radiation on the outside. In other embodiments, the warning means proper to the device 20 may include a display of alphabetic and/or numeric and/or abstract characters, for example of a LED or LCD type, at the knob 12, preferably in a central or axial position.

**[0116]** Such a case is exemplified in Figure 28, where the warning means comprise a small display D, in particular a numeric or alphanumeric display, preferably of a light-emitter-diode (LED) or liquid-crystal-display (LCD) type. In an embodiment of this sort, of course, the control circuitry exemplified in Figure 25 is prearranged for control of the display D, instead of the emitters 43 and/or 43'. On the other hand, not ruled out is the possibility of providing in one and the same device 20 both a display D and one or more emitters 43 and/or 43'.

**[0117]** It will be appreciated that the logic previously described with reference to the possible warnings issued by the emitters 43 may be applied also to the case of use of the display D, where in addition and/or as an alternative to the flashing of characters displayed there may also be envisaged specific wordings and/or symbols of information for the user. In one embodiment, the display D may be used to indicate visually to the user, in a precise way, the programming time whilst this is set by turning the ring nut 22 and/or may be used to inform the user, after ignition of the flame, on the residual time and/or on the passage of time of supply of the gas. For example, in a preferred embodiment, the control logic of the device 20 is configured in such a way that display of the residual time is rendered active after ignition of the burner and programming of a time by the user, for example with a display of a count-down type. In an advantageous embodiment, the control logic is configured for activating a display of the progressive time of cooking if the user lights the burner but does not carry on with programming of the device 20 that equips the corresponding tap, with a display of an incremental type (for such a case, start-up of the incre-

mental count of the time can start from detection of the flame, for example obtained via the circuit FD or the electrical signal generated by the thermocouple). Advantageously, the control logic can also be configured in order to enable reset of display of the progressive time, starting

off a new progressive count (for example, by applying a brief pressure on the knob 12). In these embodiments, the active condition of the display D evidently represents also the condition of ignition of the flame on the burner. **[0118]** On the other hand, in other possible embodiments, it is possible to provide a display on demand of the residual time and/or of the progressive time: in this case, for example, after start-up of a cooking process the display D is sent, after a predetermined time, into a quiescent state, i.e., a state where it is substantially turned off and, following upon a brief pressure applied on the knob 12 (which can be detected via the switch 45) the residual time for which the flame is lit and/or the time that has elapsed from ignition of the flame is displayed (according to the cases). Preferably, in any case, it is possible for the display of the residual time in count-down mode to be rendered active in an autonomous way by the control logic, upon reaching of a predetermined time of forewarning prior to expiry of the time for which the flame is lit programmed via the adjuster (for example, three minutes before expiry programmed via the ring nut, the countdown starts to be displayed on the display D). The forewarning time can also be notified in other ways, for example via a suitable flashing indication on the display and/or providing acoustic-warning means, such as for example a buzzer or a similar tone generator.

**[0119]** Obviously, the cases of information that can be represented to the user via the display D may be various, such as for example a confirmation that the device 20 has entered the programming mode correctly and/or a confirmation of the time set by the user.

**[0120]** In a particularly advantageous embodiment of the invention, the display D is in a position substantially stationary with respect to the knob 12. In other words, also by turning the knob 12 for adjustment of the flow of gas, the position of the display D does not change, in particular, with respect to the user appliance in such a way that the corresponding information can be conveniently read by a user. In a particularly advantageous embodiment of the invention, the aforesaid visual-warning means D are set in a substantially stationary position with respect to the ring nut 22: in other words, also by turning or moving the ring nut 22, the position of the display D does not change.

**[0121]** For this purpose, the device 20, in particular its casing 21, includes supporting means for the display D. In a preferred embodiment, these supporting means belong to the fixed structure of the device 20. In the case exemplified, the supporting means are associated to the casing 21, it being possible for the supporting means to be integrated or fixed or welded to at least part of the casing 21. More in particular, and as may be noted in particular in Figure 29, the-bottom wall of the container

40 - and especially its portion 42a - has a cylindrical stretch 42c from which there rises at least one upright lateral part 143, having at the top end a supporting and/or fixing wall 144, substantially set in cantilever fashion, for the display D. The electrical connection between the display D and the circuit arrangement may be made in any known way, for example via electrical conductors (in this case, in the parts 143-144 there may also be defined passages and/or grooves for said conductors) and/or by providing electrically conductive paths directly on the plastic parts 143-144, connected to corresponding tracks of the circuit board 25a, or else by stamping electrical metal terminals (such as sectional elements sheared from a metal strap) with the plastic body of the container 40. Also possible is a wireless connection of the display D to the arrangement 25, for example with a suitable coupling of an inductive type, such as a circuit arrangement with a receiving inductance or antenna associated to the display D and a transmitting inductance or antenna associated to the circuit 25.

**[0122]** The container 40 and the lid 41 of the casing 21 prevalently form a first part of the stationary structure of the device, which houses at least part of the circuit arrangement 25 and is designed for installation within the body 2, 3 of the appliance 1. The walls 143 and 144 form, instead, a second part of the stationary structure, which projects from the aforesaid first part of structure and is configured for supporting the display means D in a fixed, or not angularly rotatable, position and where, in the condition where the device 20 is installed, said second part of structure projects on the outside of the body 2, 3 of the appliance 1.

**[0123]** In this solution, as illustrated in Figure 30, a motion-transmission member 51 is provided, designed for coupling with the rod 11 of the tap 10. The motion-transmission member 51 has a body 52 of a generally cylindrical shape, with an axial seat 52a for receiving and engaging the rod 11 of the tap 10, with a complementary coupling or in any case a coupling such that a rotation imparted on the member 51 will cause a rotation of the rod 11 (for example, the rod 11 and the seat 52a can have an at least in part semi-cylindrical shape). It should be noted that in Figure 29, the motion-transmission member has not been illustrated merely for reasons of clarity of representation.

**[0124]** Defined on the peripheral surface of the body 52 is at least one coupling appendage 52b with curved profile, defining at least one engagement seat 52c, in which there can be inserted, preferably with axial movement, a corresponding part of the knob 12, such as a part having a shape complementary to said at least one appendage and/or seat. In the example represented in Figures 31-32, the body of the knob 12 is generally cylindrical and hollow, having an axial cavity 12a of dimensions designed to receive the motion-transmission member 51 with the corresponding peripheral appendage 52b, as well as the upright part 143 and the supporting wall 144 of the container 40. The knob 12 has an upper wall 12b,

provided with a central through opening, mounted in which is a protection lid 12c, which is substantially annular and preferably has a transparent window, not shown. The knob 12 has, in particular on the inner surface of the wall defining the cavity 12a, an engagement projection 12d, designed to couple with the aforesaid seat 52c defined by the appendage of the member 51, substantially with a shape fit or a complementary coupling. The seat 52c and the projection 12d are shaped in such a way that a rotation and an axial thrust imparted on the knob 12 will cause a corresponding rotation and a corresponding axial displacement, respectively, of the member 51, and hence of the rod 11 of the tap 10, in particular, without interfering with the upright part 143 and the supporting wall 144 of the container 40. The seat 52c and the projection 12d are moreover shaped for enabling, if need be, separation of the knob 12 from the member 51 by exerting a tensile force on the knob.

**[0125]** The sensor means for detecting the movement of the ring nut 22 are designated by 50 in Figure 29 and may, for example, be constituted by a resistive potentiometer or by an encoder and, in general terms, by any sensor designed to detect a rotation and/or angular position of the ring nut 22. In the example represented in Figures 33-34, a resistive potentiometer is provided, of a conception in itself known, the movable part of which can be turned about an axis that is different from the axis about which the ring nut 22 turns, in particular substantially parallel thereto. Associated, and preferably fitted, to the movable or rotary part of the potentiometer or trimmer, within the stationary component designated by 50a, is an angularly mobile element or wheel designated by 50b, designed to co-operate with the ring nut 22 for transmitting a movement. In the assembled condition, the stationary part 50a of the potentiometer is fixed to the circuit board 25a and electrically connected to its conductive tracks. In this solution the transmission arrangement 28-30 is not necessary, and the ring nut 22 has a shape slightly different from that of the previous embodiments.

**[0126]** In the assembled condition, the peripheral edge of the wheel 50b rests with slight pressure on the outer surface of the cylindrical portion 22c of the ring nut 22, as exemplified in Figures 33-34, so that a rotation of the ring nut induces rotation of the wheel 50b. For this purpose, preferably the wheel 50b is at least in part formed or coated with an elastic material, for example an elastomeric material, designed to guarantee a coefficient of friction sufficient to cause rotation of the ring nut 22 to bring about a corresponding angular movement of the wheel 50b. The cylindrical portion 22b of the ring nut has an internal step 22c that defines a contrast surface for the ring nut itself, in particular for resting on the end of the cylindrical portion 42c of the container 40 (Figure 29). Of course, also other modes of coupling in rotation between the ring nut and the potentiometer are possible, for example via gear coupling or by providing a suitable transmission system between the adjuster and the mobile part of the sensor means.

**[0127]** Figures 35 and 36 exemplify a variant embodiment in which the device 20 is equipped with warning means D' that consist of a single source of light, for example a LED, which is mounted on the supporting wall 44.

**[0128]** As may be appreciated, the arrangement is similar to the one described previously with reference to Figures 28-34, apart from slight modifications in the shape of the knob 12, and especially in relation to the dimension of the through opening of its front wall. Also in this case, the LED 43" can be supplied via conductors, conductive tracks, or in wireless mode (for example, with an inductive coupling). It goes without saying that, instead of just one LED, there may be provided a plurality of LEDs. The use of one or more LEDs according to the variant proposed does not necessarily enable display of times, but may be useful for supplying at least some warnings in this regard, for example, the operativeness of the device 20, its entry into the programming phase, confirmation of the time set, forewarning of expiry of the time set, condition of ignition of the flame and/or its extinction, etc. Instead of one or more LEDs, on the wall 44 there may be envisaged one or more lamps, or the terminal part of one or more optical guides.

**[0129]** In the embodiments previously exemplified, to one and the same control element 45 there are associated both activation of the lighter system, and the functions of the device 20 linked to timing, but it is clear that even a number of control elements may be provided, such as two separate contacts or switches. In such a variant, for example, the control element connected to the timing can be switched via the adjuster 22, which in this case will be mounted axially mobile. As already mentioned, moreover, the device 20 may not perform functions linked to lighting of the burner.

**[0130]** Previously reference has been made to the use of control means, amongst which the switch Q1, designed to modify the state of the electrical connection between the electrical-connection means 47 and 25d, i.e., to open the thermocouple-solenoid electrical circuit when the time interval set via the adjuster 22 has elapsed. As has already been mentioned, according to possible variants, the control means may be prearranged for modifying the state of the connection referred to above, without necessarily opening the aforesaid circuit, but simply varying it (for example, by inserting in parallel to the thermocouple a load or a resistance that reduces the current to the solenoid).

**[0131]** In the embodiments described previously, the means for detecting the movement of the adjuster 22, associated to the transmission arrangement, are represented by a rotary potentiometer or trimmer, but in possible variants it is possible to provide a linear potentiometer, with a movement of the corresponding mobile part along a respective axis, in particular orthogonal to the axis A, for example envisaging a pinion-and-rack transmission system. The rotary potentiometer previously described has a seat engaged in which is the element 28b of the member 28, whereas in the case of a linear poten-

tiometer this would preferably have a slider in relief, operatively coupled - for example - to a rack element engaged to a toothing of the member 28, which functions in this case as pinion.

**[0132]** As an alternative to what has been explained previously, the device 20 could even comprise only just some of the parts or functions described above.

## Claims

1. A gas appliance control device, in particular for appliances that comprise at least one gas tap (10) having a safety valve that includes an electromagnet that can be supplied via a thermo-electric generator, the gas appliance control device (20) comprising:

- a manual-control means (22);
- a circuit arrangement (25) that includes:
  - control means (MC, QI);
  - electrical-interconnection means (47, 25d+, 25d-);
  - detection means (44, 44a), configured for detecting actuation of the manual-control means (22) and supplying corresponding signals to the control means (MC, QI), the detection means (44, 44a) including a stationary component (44) and a movable part (44a);
- a supporting structure (21, 23), which can be associated in a stationary way with respect to a gas tap (10), wherein the supporting structure (21, 23) includes at least one first part of stationary structure (40, 41) that defines a housing for at least part of the circuit arrangement (25), the first part of stationary structure (40, 41) being designed for being housed within a body (2, 3) of the gas appliance (1), wherein the first part of stationary structure (40, 41) comprises a casing (21) that defines at least part of a passage (29, 41b), in which a corresponding part (10a, 11) of the gas tap (10) is receivable; wherein the control means (MC, Q1) are designed for counting the time, and the gas appliance control device (20) includes optical warning means which comprise
  - one or more light emitters (43) operatively arranged within the casing (21) in the proximity of said passage (29, 41b), and
  - a light-guide for transferring a light signal from the inside of the casing (21) to the outside of the body (2, 3) of the gas appliance (1), the light-guide comprising a first light-guide element and a second light-guide element (30) coupled together,
 wherein the manual-control means (22) has a

body which is made at least in part of a material designed to transmit the light signal generated by the one or more emitters (43), wherein the first light-guide element comprise a first body part (22a) of the body of the manual-control means (22), the first body part (22a) being designed to be positioned on the outside of the body (2, 3) of the gas appliance (1), and the second light-guide element (30) being also housed at least in part within the casing (21) in a rotatable way, and having a body made at least in part of a material designed to transmit the light signal generated by the one or more emitters (43),

## characterized in that:

- the first light-guide element comprise a second body part (22c) of the body of the manual-control means (22), the second body part (22c) being designed to be positioned on the inside of the body (2, 3) of the gas appliance (1),
- the gas appliance control device comprise a mechanical-transmission arrangement (28-30) set between the body of the manual-control means (22) and the movable part (44a) of the detection means (44, 44a),
- the mechanical-transmission arrangement (28-30) includes the second light-guide element (30), and
- the second body part (22c) of the body of the manual-control means (22) is coupled in a separable way to the second light-guide element (30).

2. The device according to Claim 1, wherein:

- the body of the manual-control means (22) has an axial cavity, in which there may be received a corresponding part (10a) of the gas tap (10);
- the second light-guide element (30) has an axial cavity generally coaxial to the axial cavity of the body of the manual-control means (22); and
- in the axial cavity of the second light-guide element (30) is at least partially received in a separable way a substantially cylindrical portion of the body of the manual-control means (22) that forms said second body part (22c).

3. The device according to Claim 1, wherein at least one of the second light-guide element (30) and the body of the manual control means (22) includes at least one peripheral wall generally inclined, preferably at 45°, for causing a reflection within said second light-guide element (30) and/or said body of the manual-control means (22) of a light beam generated by the one or more light emitters (43).

4. The device according to Claim 2, wherein the second light-guide element (30) has an end face that faces the one or more light emitters (43).
5. The device according to Claim 4, wherein:
- the second light-guide element (30) has a generally frustoconical peripheral profile, with the major base corresponding to said end face, in such a way that a light beam generated by the one or more light emitters (43) is reflected inside the second light-guide element (30) in a radial direction.
6. The device according to Claim 4, wherein:
- fitted or coupled in the axial cavity of the second light-guide element (30) is said second body part (22c) of the body of the manual-control means (22), said second body part (22c) being generally cylindrical, hollow, and having an internal profile that includes a respective inclined wall (22<sub>3</sub>) in such a way that the light beam generated by the one or more light emitters (43) is reflected inside said substantially cylindrical portion (22c) in an axial direction thereof.
7. The device according to Claim 6, wherein:
- the first body part (22a) of the body of the manual-control means (22) includes a flanged portion generally opposite to said second body part (22c), the flanged portion having an internal profile that includes a respective inclined wall (22<sub>2</sub>), designed to reflect further said light beam in a radial direction, towards an external peripheral profile of said flanged portion (22a).
8. The device according to Claim 7, wherein: the flanged portion further includes an inclined peripheral wall (22<sub>1</sub>) designed to reflect the light beam again in an axial direction of the flanged portion.
9. The device according to any one claims 1-8, wherein:
- the manual-control means (22) is movable with respect to a first axis (A), and the movable part (44a) of the detection means (44, 44a) is movable with respect to a second axis (B).
10. The device according to any one of claims 1-9, wherein:
- the manual-control means (22) can be actuated by a user for setting a time interval; and
  - the detection means (44, 44a) are configured for detecting actuation of the manual-control means (22);
- the electrical interconnection means (47, 25d+, 25d-) comprise first electrical-connection means (47), configured for connection to an electromagnet (EM) of a safety valve, and second electrical-connection means (25d+, 25d-), configured for connection to a thermo-electric generator (TC),
  - the control means (MC, Q1) are configured for modifying the state of an electrical connection between the first electrical-connection means (47) and the second electrical-connection means (25d+, 25d-) upon expiry of the aforesaid time interval.
11. The device according to any one of claims 1-10, wherein the circuit arrangement (25) comprises a circuit board (25a) having a respective opening (25b) substantially at said passage (29, 41b), and the one or more light emitters (43) are arranged on the circuit board (25a) in the proximity of said opening (25b).
12. The device according to any one of claims 1-11, wherein the optical warning means comprise at least one from among:
- one or more light emitters (43) mounted on a circuit board (25a) of the circuit arrangement;
  - a plurality of light emitters (43) arranged at least approximately according to a circumference or an arc of circumference.
13. The device according to any one of claim 1-12, wherein the circuit arrangement (25) is prearranged for supplying, via the optical warning means, a plurality of different indications designed to notify different operating states of the gas-appliance control device (20), comprising one or more of the following:
- an indication that the gas-appliance control device is awaiting programming by a user;
  - an indication of a condition of failure to program the gas-appliance control device on the part of a user;
  - an indication of confirmation of a programming of the gas-appliance control device by a user;
  - an indication for notifying that a programming of the gas-appliance control device has been cancelled by a user;
  - a forewarning of interruption of supply of gas the gas-appliance control device;
  - a warning for indicating interruption of supply of gas by the gas-appliance control device.
14. A gas appliance, in particular a household appliance, comprising a gas-appliance control device according to one or more of the preceding claims, the appliance comprising at least one gas tap (10) for control of the supply of gas to a burner (5a), the gas appliance

(1) having a body (2, 3), partially housed within which is the gas tap (10), the body (2, 3) of the gas appliance (1) having at least one opening (7) at the gas tap (10), and wherein the supporting structure (21) of the gas-appliance control device (20) is substantially housed within the body (2, 3) of the gas appliance (1) with the manual-control means (22) that projects at least partially on the outside of the body (2, 3) of the gas appliance (1) through said opening (7).

## Patentansprüche

1. Steuerungsvorrichtung für Gasgeräte, insbesondere für Geräte, die mindestens einen Gasabgriff (10) mit einem Sicherheitsventil haben, das einen Elektromagneten enthält, der über einen thermoelektrischen Generator versorgt werden kann, wobei die Steuerungsvorrichtung für Gasgeräte (20) aufweist:
  - eine Einrichtung zur manuellen Steuerung (22);
  - eine Schaltungsanordnung (25), die beinhaltet:
    - eine Steuerungseinrichtung (MC, Q1);
    - eine Einrichtung zur elektrischen Verbindung (47, 25d+, 25d-);
    - eine Detektierereinrichtung (44, 44a), die ausgebildet ist, eine Betätigung der Einrichtung zur manuellen Steuerung (22) zu erfassen und entsprechende Signale an die Steuerungseinrichtung (MC, Q1) zu senden, wobei die Detektierereinrichtung (44, 44a) eine stationäre Komponente (44) und ein bewegliches Teil (44a) aufweist;
    - eine Haltestruktur (21, 23), die in stationärer Weise in Bezug auf einen Gasabgriff (10) verbindbar ist, wobei die Haltestruktur (21, 23) mindestens einen ersten Teil in Form einer stationären Struktur (40, 41) aufweist, der ein Gehäuse für mindestens einen Teil der Schaltungsanordnung (25) bildet, wobei der erste Teil in Form einer stationären Struktur (40, 41) so gestaltet ist, dass er in einem Hauptteil (2, 3) des Gasgeräts (1) untergebracht wird, wobei der erste Teil in Form einer stationären Struktur (40, 41) eine Gehäuseeinrichtung (21) aufweist, die zumindest einen Teil eines Durchgangs (29, 41b) begrenzt, in welchem ein entsprechender Teil (10a, 11) des Gasabgriffs (10) aufnehmbar ist; wobei die Steuerungseinrichtung (MC, Q1) zum Zählen der Zeit ausgebildet ist, und die Steuerungsvorrichtung für Gasgeräte (20) eine optische Warneinrichtung enthält, die aufweist
      - eine oder mehrere Leuchteinrichtungen (43), die funktionsmäßig in der Gehäuseeinrichtung

(21) in der Nähe des Durchgangs (29, 41b) angeordnet sind, und

- einen Lichtleiter zum Überführen des Lichtsignals aus dem Inneren der Gehäuseeinrichtung (21) in den Außenbereich des Hauptteils (2, 3) des Gasgeräts (1), wobei der Lichtleiter ein erstes Lichtleiterelement und ein zweites Lichtleiterelement (30), die miteinander gekoppelt sind, aufweist,
- wobei die Einrichtung zur manuellen Steuerung (22) einen Körper hat, der zumindest teilweise aus einem Material hergestellt ist, das dazu geeignet ist, das von der einen oder den mehreren Leuchteinrichtungen (43) erzeugte Lichtsignal durchzulassen,
- wobei das erste Lichtleiterelement einen ersten Hauptteil (22a) des Körpers der Einrichtung zur manuellen Steuerung (22) aufweist, wobei der erste Hauptteil (22a) so gestaltet ist, dass er auf der Außenseite des Körpers (2, 3) des Gasgeräts (1) positionierbar ist, und das zweite Lichtleiterelement (30) ebenfalls zumindest teilweise innerhalb der Gehäuseeinrichtung (21) in drehbarer Weise untergebracht ist und einen Körper hat, der zumindest teilweise aus einem Material hergestellt ist, das zum Durchlassen des von der einen oder den mehreren Leuchteinrichtungen (43) erzeugten Lichtsignals geeignet ist, **dadurch gekennzeichnet, dass**
- das erste Lichtleiterelement einen zweiten Hauptteil (22c) des Körpers der Einrichtung zur manuellen Steuerung (22) aufweist, wobei der zweite Hauptteil (22c) so gestaltet ist, dass er im Inneren des Hauptteils (2, 3) des Gasgeräts (1) positionierbar ist,
- die Steuerungsvorrichtung für Gasgeräte eine mechanische Getriebeanordnung (28-30) aufweist, die zwischen dem Körper der Einrichtung zur manuellen Steuerung (22) und dem beweglichen Teil (44a) der Detektierereinrichtung (44, 44a) angeordnet ist,
- die mechanische Getriebeanordnung (28-30) das zweite Lichtführungselement (30) enthält, und
- der zweite Hauptteil (22c) des Körpers der Einrichtung zur manuellen Steuerung (22) in abnehmbarer Weise mit dem zweiten Lichtführungselement (30) gekoppelt ist.

2. Einrichtung nach Anspruch 1, wobei:

- der Körper der Einrichtung zur manuellen Steuerung (22) eine axiale Aussparung hat, in der ein entsprechender Teil (10a) des Gasabgriffs (10) aufnehmbar ist;
- das zweite Lichtleiterelement (30) eine axiale Aussparung hat, die generell coaxial zu der axialen Aussparung des Körpers der Einrichtung

- zur manuellen Steuerung (22) ist; und  
 - in der axialen Aussparung des zweiten Lichtleiterelements (30) ein im Wesentlichen zylindrischer Bereich des Körpers der Einrichtung zur manuellen Steuerung (22), der den zweiten Hauptteil (22c) bildet, zumindest teilweise in abnehmbarer Weise aufgenommen ist.
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3. Einrichtung nach Anspruch 1, wobei das zweite Lichtleiterelement (30) und/oder der Körper der Einrichtung zur manuellen Steuerung (22) mindestens eine periphere Wand aufweist, die generell geneigt ist, vorzugsweise unter 45°, um eine Reflexion im Inneren des zweiten Lichtleiterelements (30) und/oder im Körper der Einrichtung zur manuellen Steuerung (22) für einen Lichtstrahl, der durch die eine oder die mehreren Leuchteinrichtungen (43) erzeugt ist, zu bewirken.
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4. Einrichtung nach Anspruch 2, wobei das zweite Lichtleiterelement (30) eine Stirnfläche hat, die der einen oder den mehreren Leuchteinrichtungen (43) zugewandt ist.
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5. Einrichtung nach Anspruch 4, wobei:
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- das zweite Lichtleiterelement (30) ein im Allgemeinen kegelförmiges peripheres Profil hat, wobei die Hauptbasislinie der Stirnfläche derart zugeordnet ist, dass ein von der einen oder den mehreren Leuchteinrichtungen (43) erzeugter Lichtstrahl im Inneren des zweiten Lichtleiterelements (30) in radialer Richtung reflektiert wird.
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- 30
- 35
6. Einrichtung nach Anspruch 4, wobei:
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- der zweite Hauptteil (22c) des Körpers der Einrichtung zur manuellen Steuerung (22) in die axiale Aussparung des zweiten Lichtleiterelements (30) eingepasst oder damit verbunden ist, wobei der zweite Hauptteil (22c) im Wesentlichen zylindrisch und hohl ist und ein Innenprofil hat, das eine entsprechende geneigte Wand (22<sub>3</sub>) derart enthält, dass der von der einen oder den mehreren Leuchteinrichtungen (43) erzeugte Lichtstrahl im Inneren des im Wesentlichen zylindrischen Bereichs (22c) in seiner axialen Richtung reflektiert wird.
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7. Einrichtung nach Anspruch 6, wobei:
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- der erste Hauptteil (22a) des Körpers der Einrichtung zur manuellen Steuerung (22) einen Flanschbereich aufweist, der im Wesentlichen gegenüberliegend zu dem zweiten Hauptteil (22c) angeordnet ist, wobei der Flanschbereich ein Innenprofil hat, das eine entsprechende geneigte Wand (22<sub>2</sub>) hat, das geeignet ist, den Lichtstrahl weiter in einer radialen Richtung hin zu einem externen peripheren Profil des Flanschbereichs (22a) zu reflektieren.
8. Einrichtung nach Anspruch 7, wobei: der Flanschbereich ferner eine geneigte periphere Wand (23<sub>1</sub>) aufweist, die geeignet ist, den Lichtstrahl wieder in eine axiale Richtung des Flanschbereichs zu reflektieren.
9. Einrichtung nach einem der Ansprüche 1-8, wobei:
- die Einrichtung zur manuellen Steuerung (22) in Bezug auf eine erste Achse (A) bewegbar ist, und das bewegliche Teil (44a) der Detektierereinrichtung (44, 44a) in Bezug auf eine zweite Achse (B) bewegbar ist.
10. Einrichtung nach einem der Ansprüche 1-9, wobei:
- die Einrichtung zur manuellen Steuerung (22) von einem Benutzer zur Festlegung eines Zeitintervalls betätigbar ist; und
- die Detektierereinrichtung (44, 44a) zum Erfassen einer Betätigung der Einrichtung zur manuellen Steuerung (22) ausgebildet ist;
- die Einrichtung für elektrische Verbindung (47, 25d+, 25d-) eine erste elektrische Verbindungseinrichtung (47), die zum Verbinden mit einem Elektromagnet (EM) eines Sicherheitsventils ausgebildet ist, und eine zweite elektrische Verbindungseinrichtung (25d+, 25d-) aufweist, die zur Verbindung mit einem thermoelektrischen Generator (TC) ausgebildet ist,
- die Steuerungseinrichtung (MC, Q1) ausgebildet ist, den Zustand einer elektrischen Verbindung zwischen der ersten elektrischen Verbindungseinrichtung (47) und der zweiten elektrischen Verbindungseinrichtung (25d+, 25d-) bei Ablauf des zuvor genannten Zeitintervalls zu ändern.
11. Einrichtung nach einem der Ansprüche 1-10, wobei die Schaltungsanordnung (25) eine Leiterplatte (25a) mit einer entsprechenden Öffnung (25b) im Wesentlichen an dem Durchgang (29, 41b) aufweist, und die eine oder die mehreren Leuchteinrichtungen (43) auf der Leiterplatte (25a) in der Nähe der Öffnung (25b) angeordnet sind.
12. Einrichtung nach einem der Ansprüche 1-11, wobei die optische Warneinrichtung aufweist:
- eine oder mehrere Leuchteinrichtungen (43), die auf einer Leiterplatte (25a) der Schaltungsanordnung montiert sind; und/oder
- mehrere Leuchteinrichtungen (43), die zumin-

dest ungefähr entsprechend einem Umfang oder eines Bogens des Umfangs angeordnet sind.

13. Einrichtung nach einem der Ansprüche 1-12, wobei die Schaltungsanordnung (25) im Voraus dafür ausgelegt ist, über die optische Warneinrichtung mehrere unterschiedliche Indikationen bereitzustellen, die geeignet sind, unterschiedliche Betriebszustände der Steuerungsvorrichtung für Gasgeräte (20) zu berichten, wobei darin enthalten ist:

- eine Indikation, dass die Steuerungsvorrichtung für Gasgeräte auf die Programmierung durch einen Benutzer wartet; und/oder
- eine Indikation einer Fehlerbedingung, um die Steuerungsvorrichtung für Gasgeräte auf Seite eines Benutzers zu programmieren; und/oder
- eine Indikation zur Bestätigung einer Programmierung der Steuerungsvorrichtung für Gasgeräte durch den Benutzer; und/oder
- eine Indikation zur Benachrichtigung, dass eine Programmierung der Steuerungsvorrichtung für Gasgeräte von einem Benutzer gelöscht worden ist; und/oder
- eine Vorwarnung der Unterbrechung der Zufuhr von Gas der Steuerungsvorrichtung für Gasgeräte; und/oder
- eine Warnung zur Anzeige einer Unterbrechung der Gaszufuhr durch die Steuerungsvorrichtung für Gasgeräte.

14. Gasgerät, insbesondere Haushaltsgerät, mit einer Steuerungsvorrichtung für Gasgeräte gemäß einem der vorhergehenden Ansprüche, wobei das Gerät mindestens einen Gasabgriff (10) zur Steuerung der Gaszufuhr zu einem Brenner (5a) aufweist, wobei das Gasgerät (1) einen Hauptteil (2, 3) aufweist, der teilweise den Gasabgriff (10) aufnimmt, wobei der Hauptteil (2, 3) des Gasgeräts (1) mindestens eine Öffnung (7) an dem Gasabgriff (10) hat, und wobei die Haltestruktur (21) der Steuerungsvorrichtung für Gasgeräte (20) im Wesentlichen in dem Hauptteil (2, 3) des Gasgeräts (1) mit der Einrichtung zur manuellen Steuerung (22) aufgenommen ist, die zumindest teilweise auf der Außenseite des Körpers (2, 3) des Gasgeräts (1) durch die Öffnung (7) hervorsteht.

## Revendications

1. Dispositif de réglage d'appareil à gaz, en particulier pour des appareils qui comprennent au moins un robinet de gaz (10) ayant une soupape de sécurité qui comprend un électroaimant qui peut être alimenté via un générateur thermoélectrique, le dispositif de réglage d'appareil à gaz (20) comprenant :

- un moyen de réglage manuel (22) ;
- un agencement de circuit (25) qui comprend :
  - un moyen de réglage (MC, Q1) ;
  - un moyen d'interconnexion électrique (47, 25d+, 25d-) ;

un moyen de détection (44, 44a) configuré pour détecter l'actionnement du moyen de réglage manuel (22) et fournir des signaux correspondants au moyen de réglage (MC, Q1), le moyen de détection (44, 44a) comprenant un composant fixe (44) et une partie mobile (44a) ;

- une structure de support (21, 23) qui peut être associée d'une manière fixe par rapport à un robinet de gaz (10), dans lequel la structure de support (21, 23) comprend au moins une première partie de la structure fixe (40, 41) qui définit un boîtier pour au moins une partie de l'agencement de circuit (25), la première partie de la structure fixe (40, 41) étant conçue pour être logée à l'intérieur d'un corps (2, 3) de l'appareil à gaz (1), dans lequel la première partie de la structure fixe (40, 41) comprend un boîtier (21) qui définit au moins une partie d'un passage (29, 41b) dans lequel une partie correspondante (10a, 11) du robinet de gaz (10) peut être reçue ;

dans lequel les moyens de réglage (MC ; Q1) sont conçus pour compter le temps, et le dispositif de réglage d'appareil à gaz (20) comprend des moyens d'avertissement optiques qui comprennent :

- un ou plusieurs émetteurs de lumière (43) agencés de manière opérationnelle à l'intérieur du boîtier (21) à proximité dudit passage (29, 41b), et
- un guide de lumière pour transférer un signal de lumière depuis l'intérieur du boîtier (21) à l'extérieur du corps (2, 3) de l'appareil à gaz (1), le guide de lumière comprenant un premier élément de guide de lumière et un second élément de guide de lumière (30) couplés ensemble, dans lequel le moyen de réglage manuel (22) a un corps qui est réalisé au moins en partie avec un matériau conçu pour transmettre le signal de lumière généré par les un ou plusieurs émetteurs (43),

dans lequel le premier élément de guide de lumière comprend une première partie de corps (22a) du corps du moyen de réglage manuel (22), la première partie de corps (22a) étant conçue pour être positionnée sur l'extérieur du corps (2, 3) de l'appareil à gaz (1), et le second élément de guide de lumière (30) étant également logé au moins en partie à l'intérieur du boîtier (21) d'une manière rotative, et ayant un corps réalisé, au moins en partie avec un matériau

conçu pour transmettre le signal de lumière généré par les un ou plusieurs émetteurs (43),

**caractérisé en ce que :**

- le premier élément de guide de lumière comprend une seconde partie de corps (22c) du corps du moyen de réglage manuel (22), la seconde partie de corps (22c) étant conçue pour être positionnée à l'intérieur du corps (2, 3) de l'appareil à gaz (1),
- le dispositif de réglage d'appareil à gaz comprend un agencement de transmission mécanique (28-30) déterminé entre le corps du moyen de réglage manuel (22) et la partie mobile (44a) du moyen de détection (44, 44a),
- l'agencement de transmission mécanique (28-30) comprend le second élément de guide de lumière (30), et
- la seconde partie de corps (22c) du corps du moyen de réglage manuel (22) est couplée d'une manière séparable, au second élément de guide de lumière (30).

**2.** Dispositif selon la revendication 1, dans lequel :

- le corps du moyen de réglage manuel (22) a une cavité axiale dans laquelle on peut recevoir une partie correspondante (10a) du robinet de gaz (10) ;
- le second élément de guide de lumière (30) a une cavité axiale généralement coaxiale par rapport à la cavité axiale du corps du moyen de réglage manuel (22) ; et
- dans la cavité axiale du second élément de guide de lumière (30), est au moins partiellement reçue, d'une manière séparable, une partie sensiblement cylindrique du corps du moyen de réglage manuel (22) qui forme ladite seconde partie de corps (22c).

**3.** Dispositif selon la revendication 1, dans lequel au moins l'un parmi le second élément de guide de lumière (30) et le corps du moyen de réglage manuel (22) comprend au moins une paroi périphérique généralement inclinée, de préférence à 45°, pour provoquer une réflexion à l'intérieur dudit second élément de guide de lumière (30) et/ou dudit corps du moyen de réglage manuel (22) d'un faisceau de lumière généré par les un ou plusieurs émetteurs de lumière (43).

**4.** Dispositif selon la revendication 2, dans lequel le second élément de guide de lumière (30) a une face d'extrémité qui fait face aux un ou plusieurs émetteurs de lumière (43).

**5.** Dispositif selon la revendication 4, dans lequel :

- le second élément de guide de lumière (30) a un profil périphérique généralement tronconique, avec la base majeure qui correspond à ladite face d'extrémité, de sorte qu'un faisceau de lumière généré par les un ou plusieurs émetteurs de lumière (43) est reflété à l'intérieur du second élément de guide de lumière (30) dans une direction radiale.

**6.** Dispositif selon la revendication 4, dans lequel :

- montée ou couplée dans la cavité axiale du second élément de guide de lumière (30), on trouve ladite seconde partie de corps (22c) du corps du moyen de réglage manuel (22), ladite seconde partie de corps (22c) étant généralement cylindrique, creuse, et ayant un profil interne qui comprend une paroi inclinée (22<sub>3</sub>) respective de sorte que le faisceau de lumière généré par les un ou plusieurs émetteurs de lumière (43) est reflété à l'intérieur de ladite partie sensiblement cylindrique (22c) dans sa direction axiale.

**7.** Dispositif selon la revendication 6, dans lequel :

- la première partie de corps (22a) du corps du moyen de réglage manuel (22) comprend une partie à bride généralement opposée à ladite seconde partie de corps (22c), la partie à bride ayant un profil interne qui comprend une paroi inclinée (22<sub>2</sub>) respective, conçue pour refléter davantage ledit faisceau de lumière dans une direction radiale, vers un profil périphérique externe de ladite partie à bride (22a).

**8.** Dispositif selon la revendication 7, dans lequel :

- la partie à bride comprend en outre une paroi périphérique inclinée (22<sub>1</sub>) conçue pour refléter le faisceau de lumière à nouveau dans une direction axiale de la partie à bride.

**9.** Dispositif selon l'une quelconque des revendications 1 à 8, dans lequel :

- le moyen de réglage manuel (22) est mobile par rapport à un premier axe (A) et la partie mobile (44a) du moyen de détection (44, 44a) est mobile par rapport à un second axe (B).

**10.** Dispositif selon l'une quelconque des revendications 1 à 9, dans lequel :

- le moyen de réglage manuel (22) peut être actionné par un utilisateur pour régler un intervalle de temps ; et
- les moyens de détection (44, 44a) sont configurés pour détecter l'actionnement du moyen

- de réglage manuel (22) ;
- les moyens d'interconnexion électrique (47, 25d+, 25d-) comprennent des premiers moyens de connexion électrique (47), configurés pour se raccorder à un électroaimant (EM) d'une soupape de sécurité, et un second moyen de connexion électrique (25d+, 25d-) configuré pour se raccorder à un générateur thermoélectrique (TC),
  - les moyens de réglage (MC, Q1) sont configurés pour modifier l'état d'une connexion électrique entre le premier moyen de connexion électrique (47) et le second moyen de connexion électrique (25d+, 25d-) suite à l'expiration de l'intervalle de temps mentionné précédemment.
- 11.** Dispositif selon l'une quelconque des revendications 1 à 10, dans lequel l'agencement de circuit (25) comprend une carte de circuit imprimé (25a) ayant une ouverture (25b) respective sensiblement au niveau dudit passage (29, 41b) et les un ou plusieurs émetteurs de lumière (43) sont agencés sur la carte de circuit imprimé (25a) à proximité de ladite ouverture (25b).
- 12.** Dispositif selon l'une quelconque des revendications 1 à 11, dans lequel les moyens d'avertissement optiques comprennent au moins l'un parmi :
- un ou plusieurs émetteurs de lumière (43) montés sur la carte de circuit imprimé (25a) de l'agencement de circuit ;
  - une pluralité d'émetteurs de lumière (43) agencés au moins approximativement selon une circonférence ou un arc de circonférence.
- 13.** Dispositif selon l'une quelconque des revendications 1 à 12, dans lequel l'agencement de circuit (25) est pré-agencé, pour fournir, via le moyen d'avertissement optique, une pluralité de différentes indications conçues pour notifier différents états opérationnels du dispositif de réglage d'appareil à gaz (20), comprenant un ou plusieurs parmi les éléments suivants :
- une indication que le dispositif de réglage d'appareil à gaz attend le programme par un utilisateur ;
  - une indication d'une condition de défaillance pour programmer le dispositif de réglage d'appareil à gaz sur la partie d'un utilisateur ;
  - une indication de confirmation d'une programmation du dispositif de réglage d'appareil à gaz par un utilisateur ;
  - une indication pour notifier qu'une programmation du dispositif de réglage d'appareil à gaz a été annulée par un utilisateur ;
  - un signe avant-coureur d'interruption d'alimen-

tation de dispositif de réglage d'appareil à gaz ;

- un avertissement pour indiquer l'interruption d'alimentation de gaz par le dispositif de réglage d'appareil à gaz.

- 14.** Appareil à gaz, en particulier un appareil électroménager, comprenant un dispositif de réglage d'appareil à gaz selon une ou plusieurs des revendications précédentes, l'appareil comprenant au moins un robinet de gaz (10) pour régler l'alimentation du gaz par rapport à un brûleur (5a), l'appareil à gaz (1) ayant un corps (2, 3) à l'intérieur duquel est partiellement logé le robinet de gaz (10), le corps (2, 3) de l'appareil à gaz (1) ayant au moins une ouverture (7) au niveau du robinet de gaz (10), et dans lequel la structure de support (21) du dispositif de réglage d'appareil à gaz (20) est sensiblement logée à l'intérieur du corps (2, 3) de l'appareil à gaz (1) avec le moyen de réglage manuel (22) qui fait saillie au moins partiellement à l'extérieur du corps (2, 3) de l'appareil à gaz (1) à travers ladite ouverture (7).

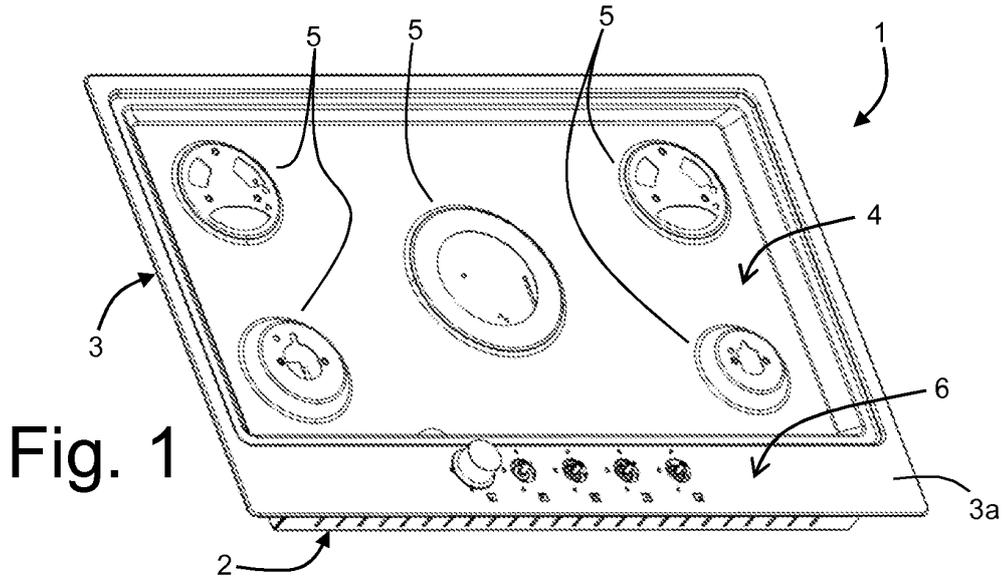


Fig. 2

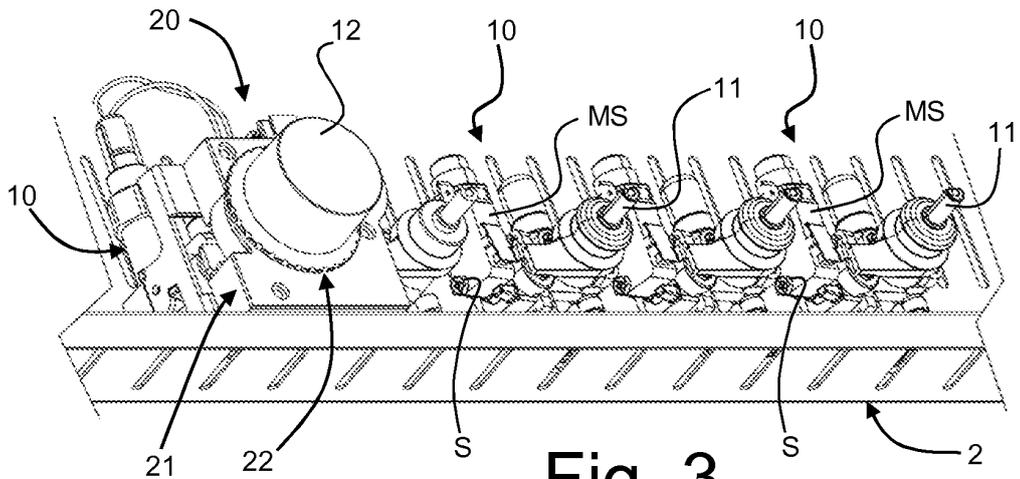
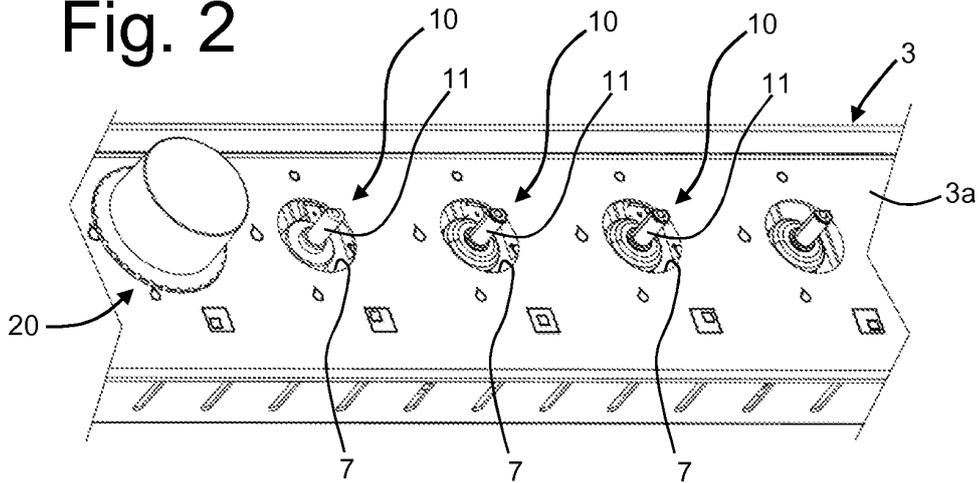


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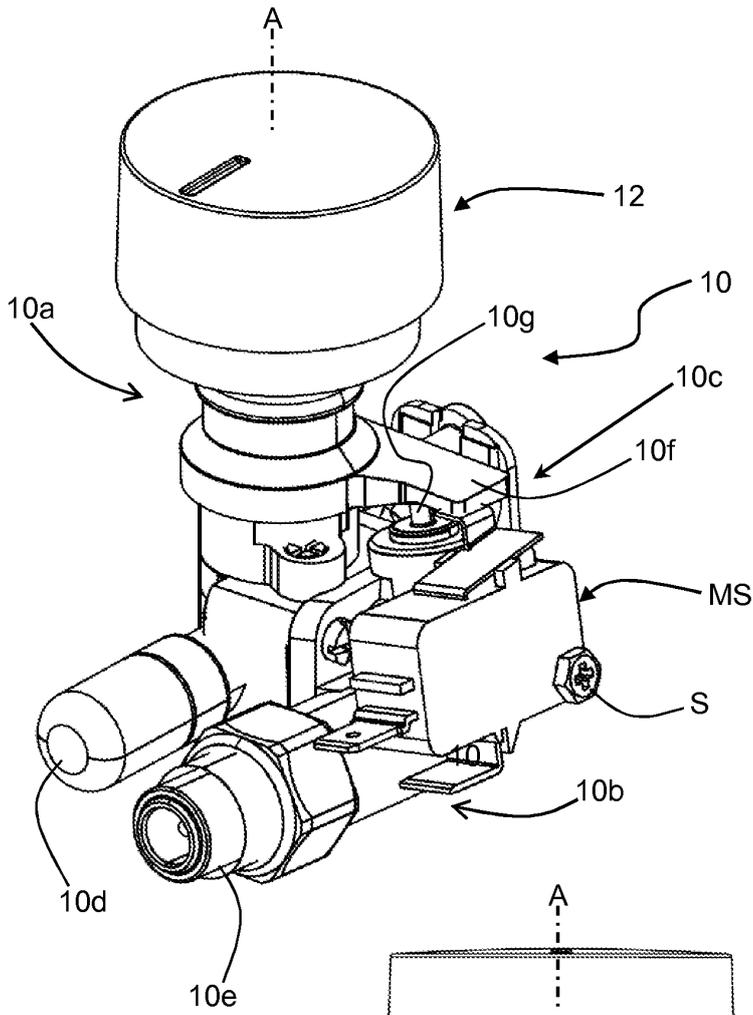
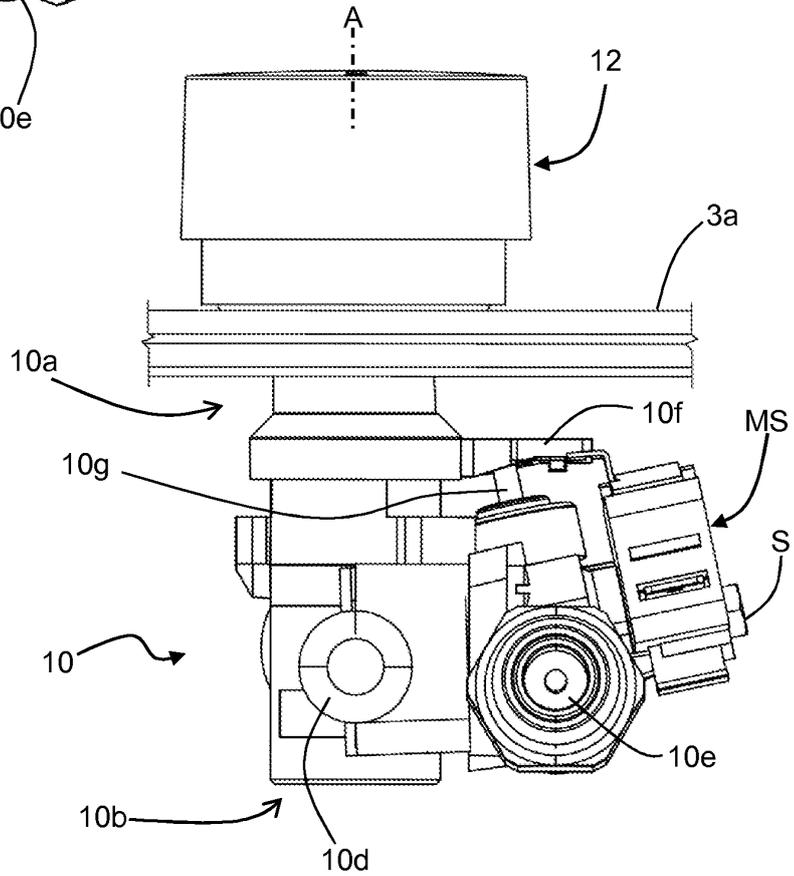


Fig. 4

Fig. 5



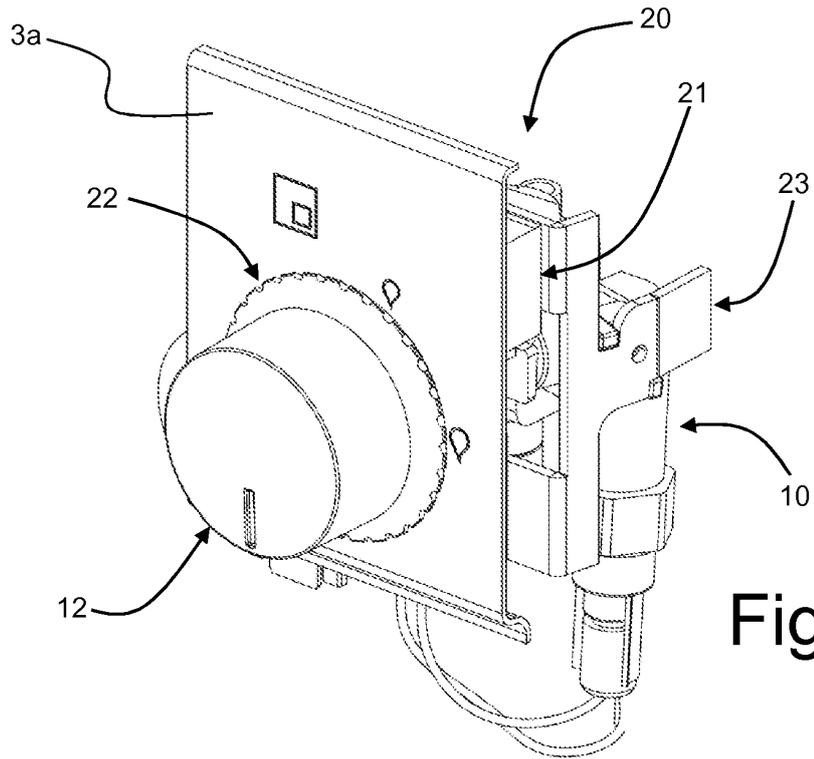


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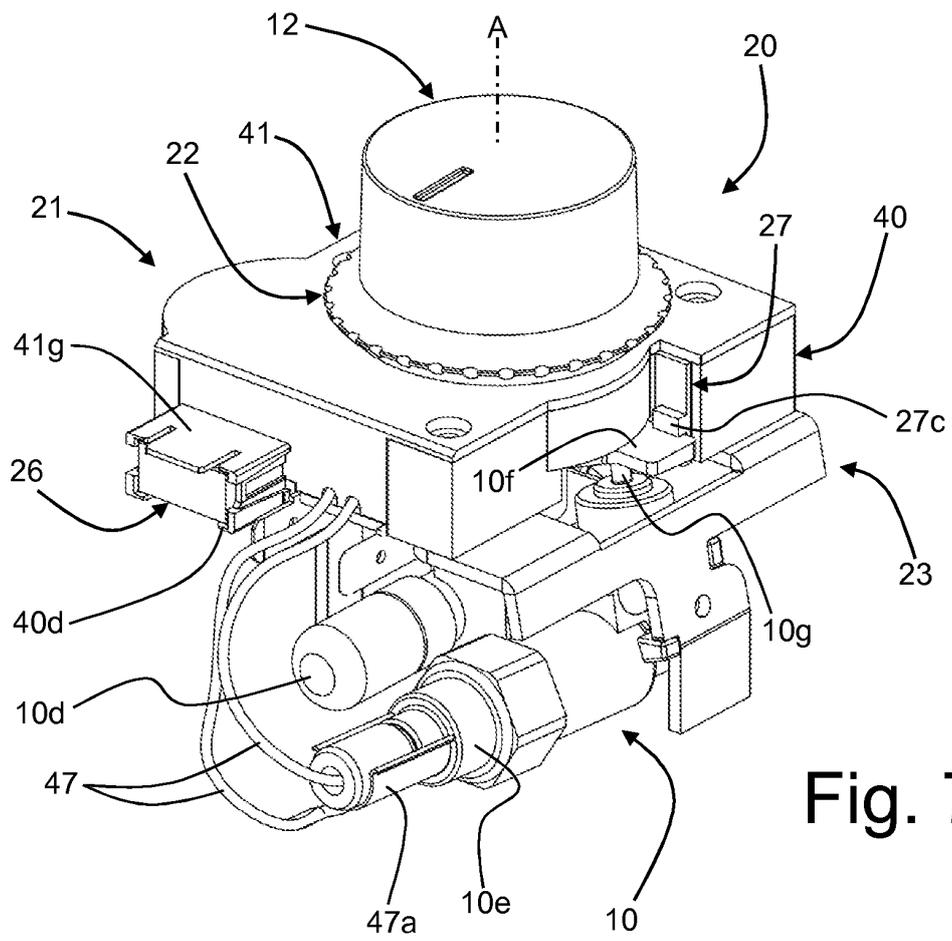


Fig. 7

Fig. 8

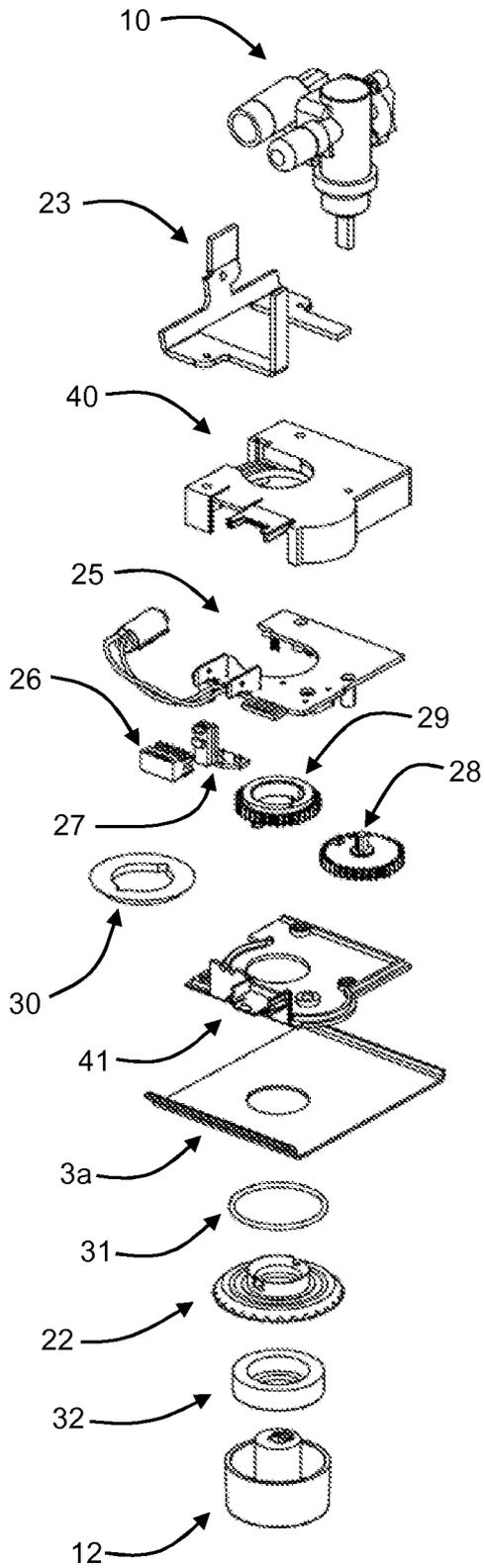


Fig. 9

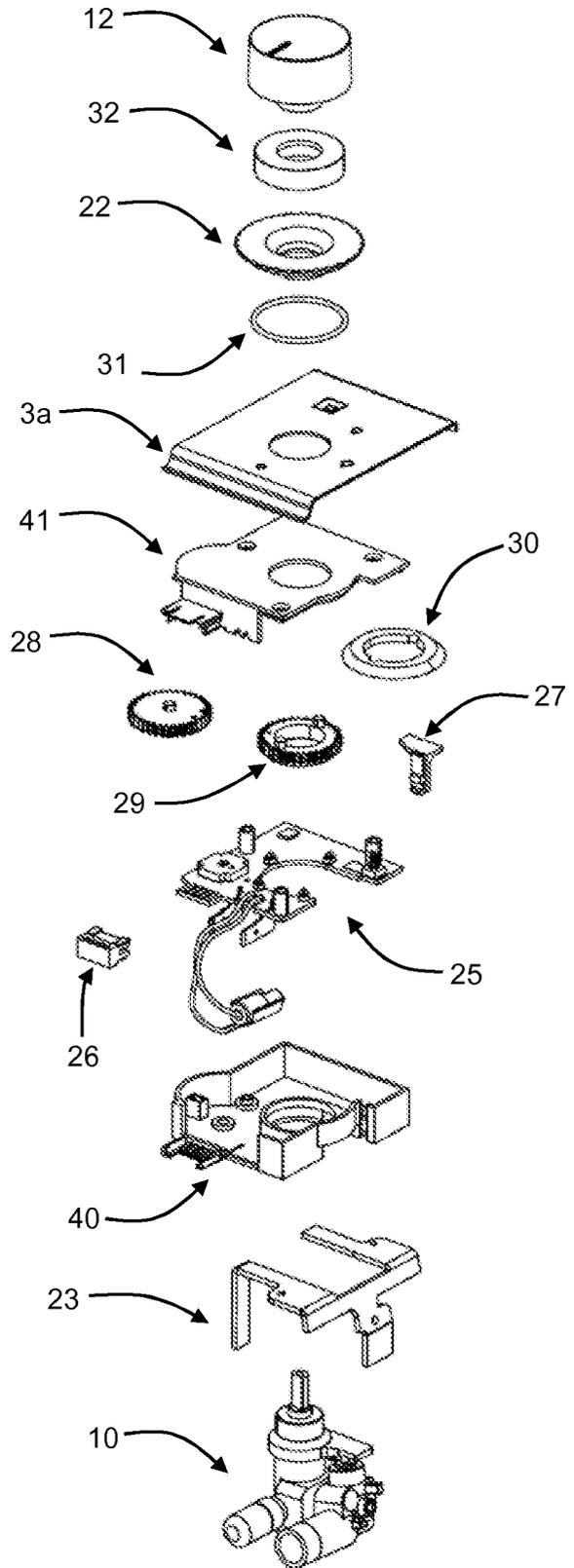


Fig. 10

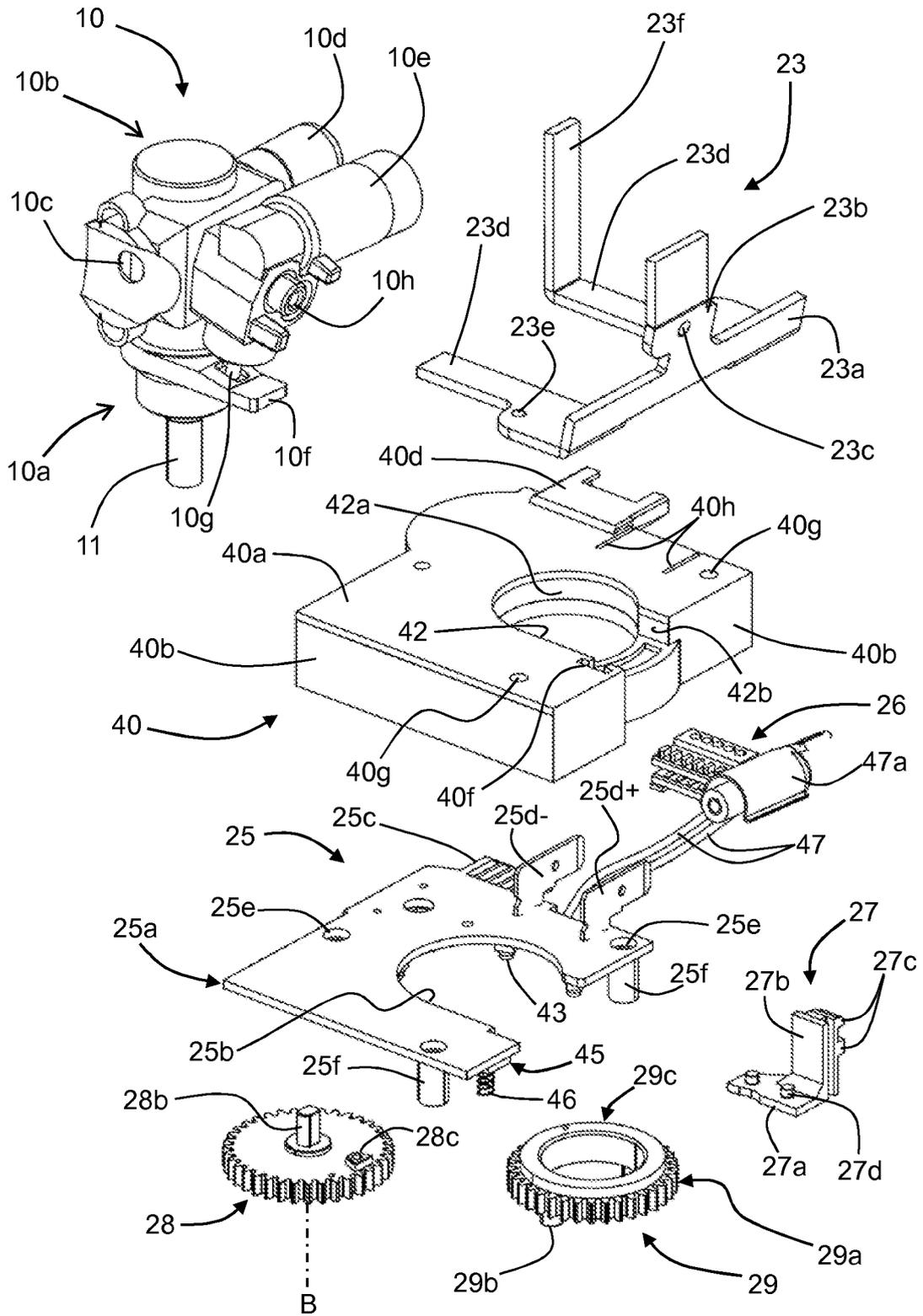


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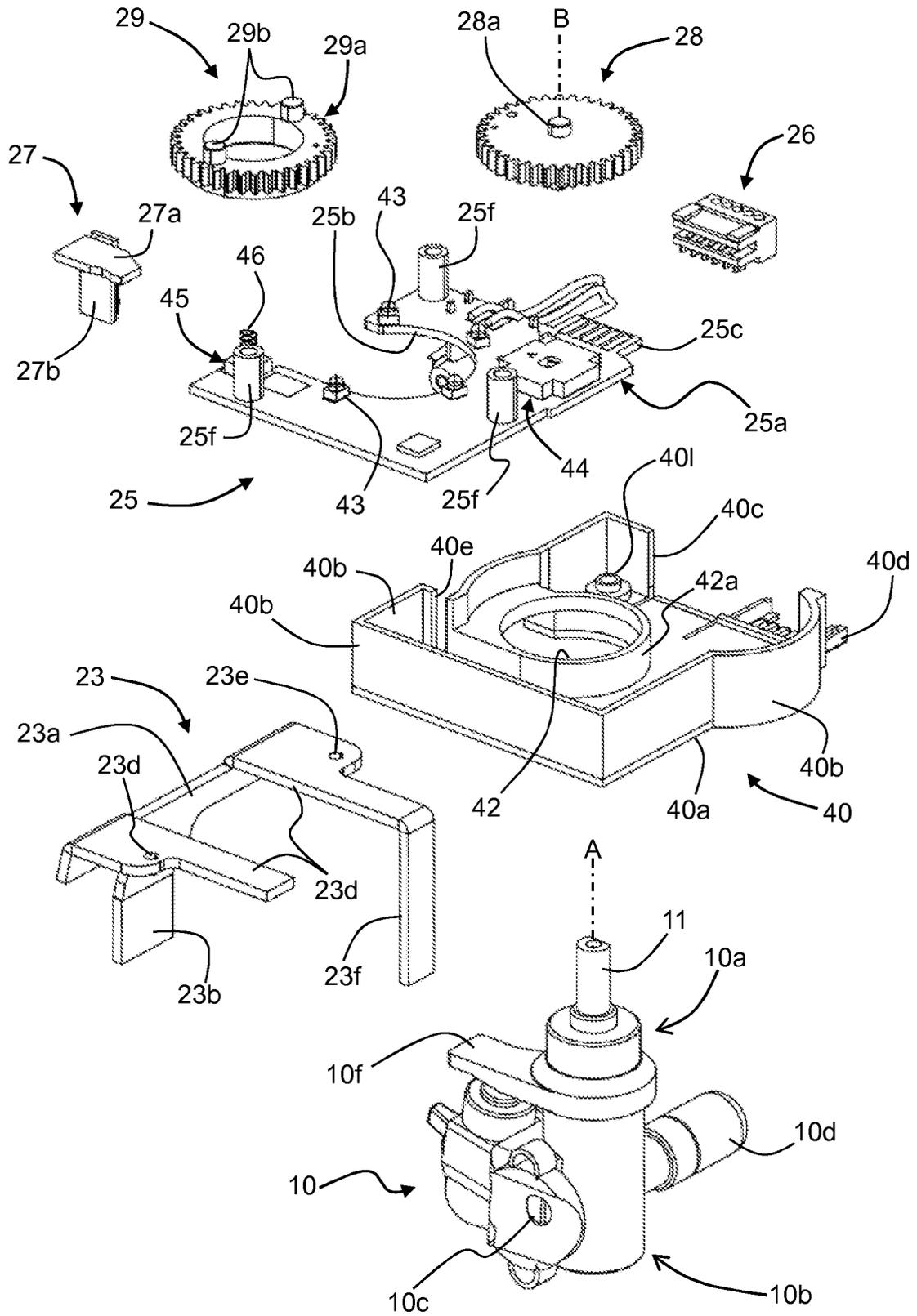


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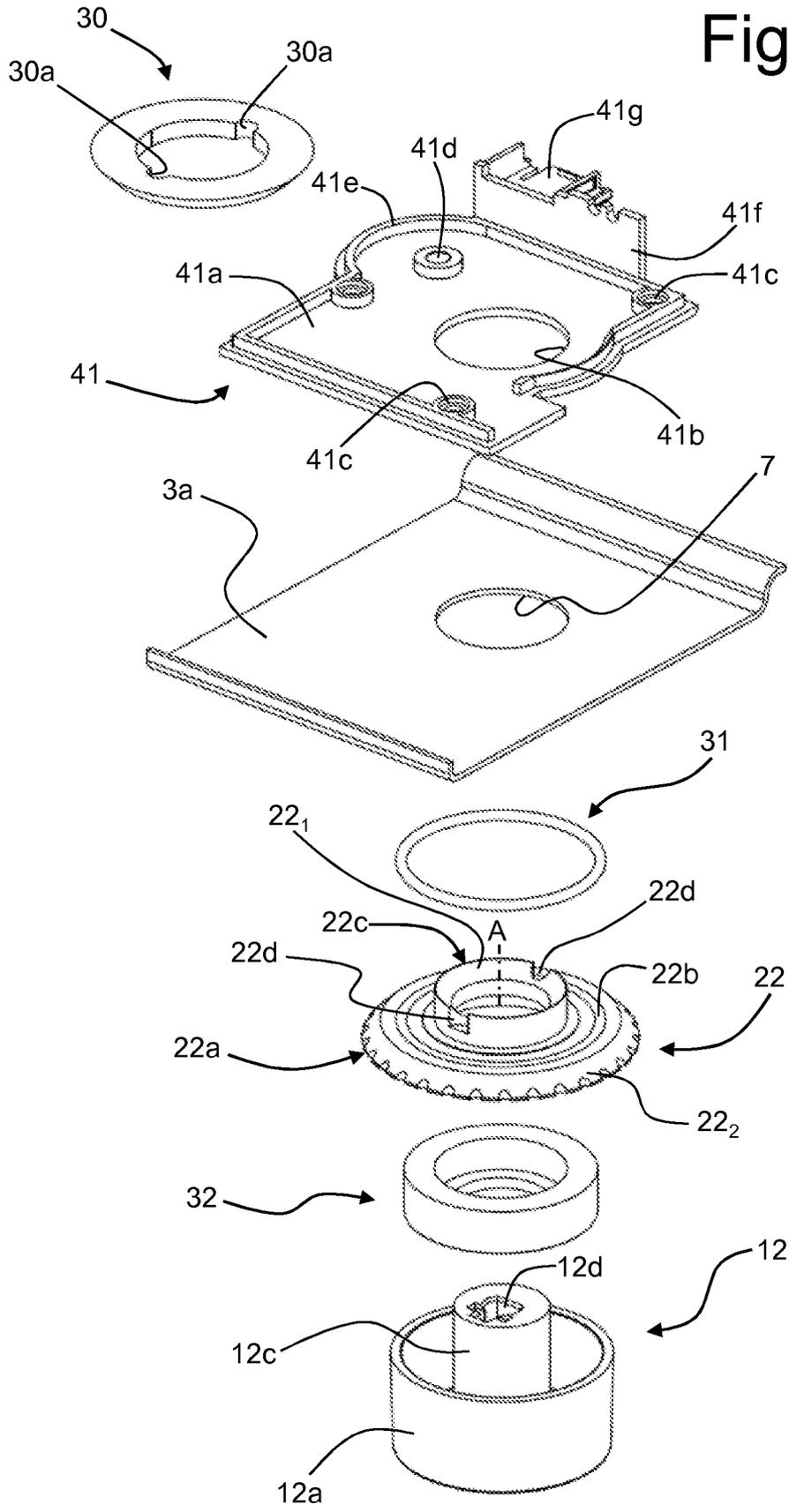


Fig. 13

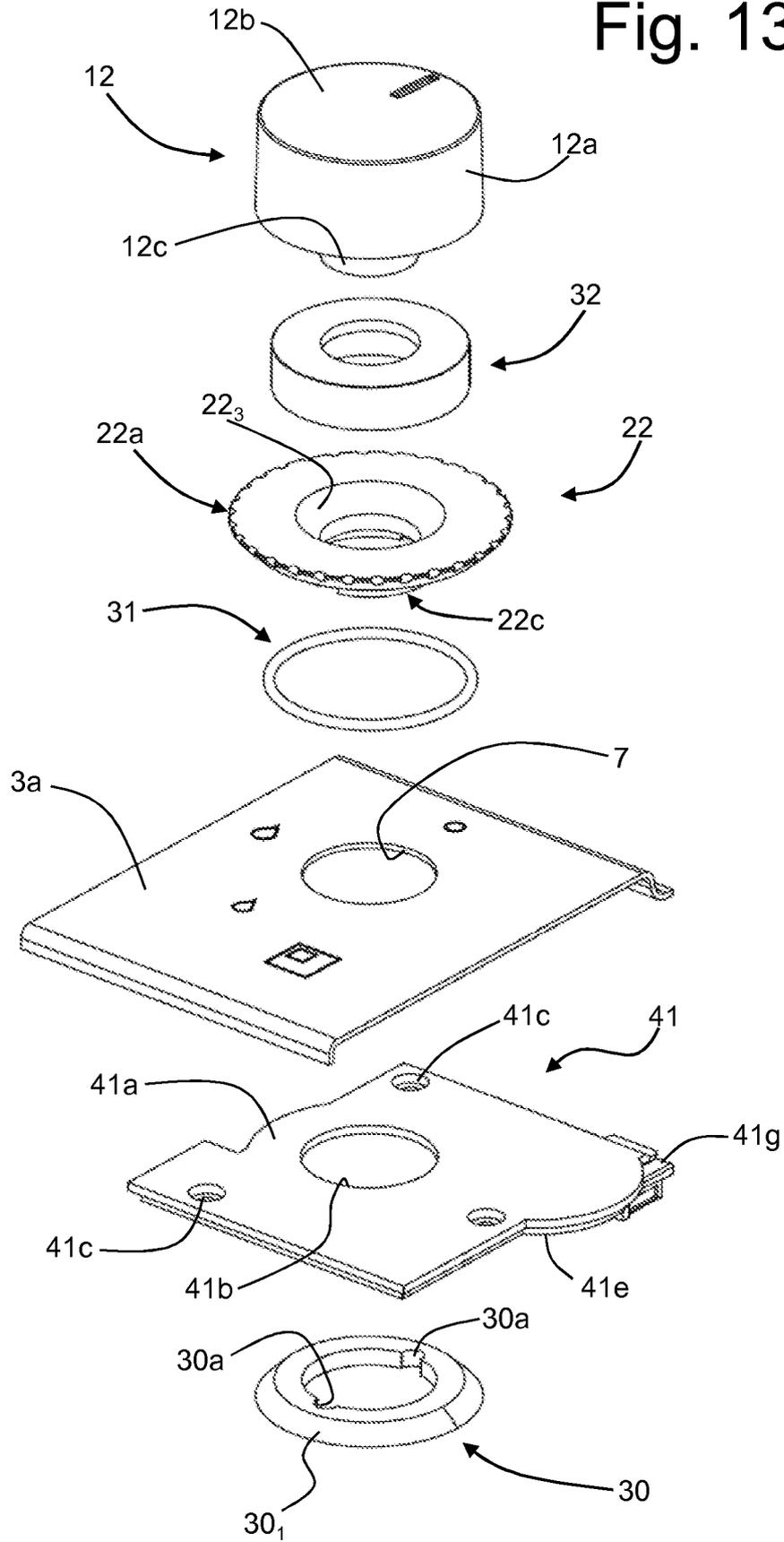


Fig. 14

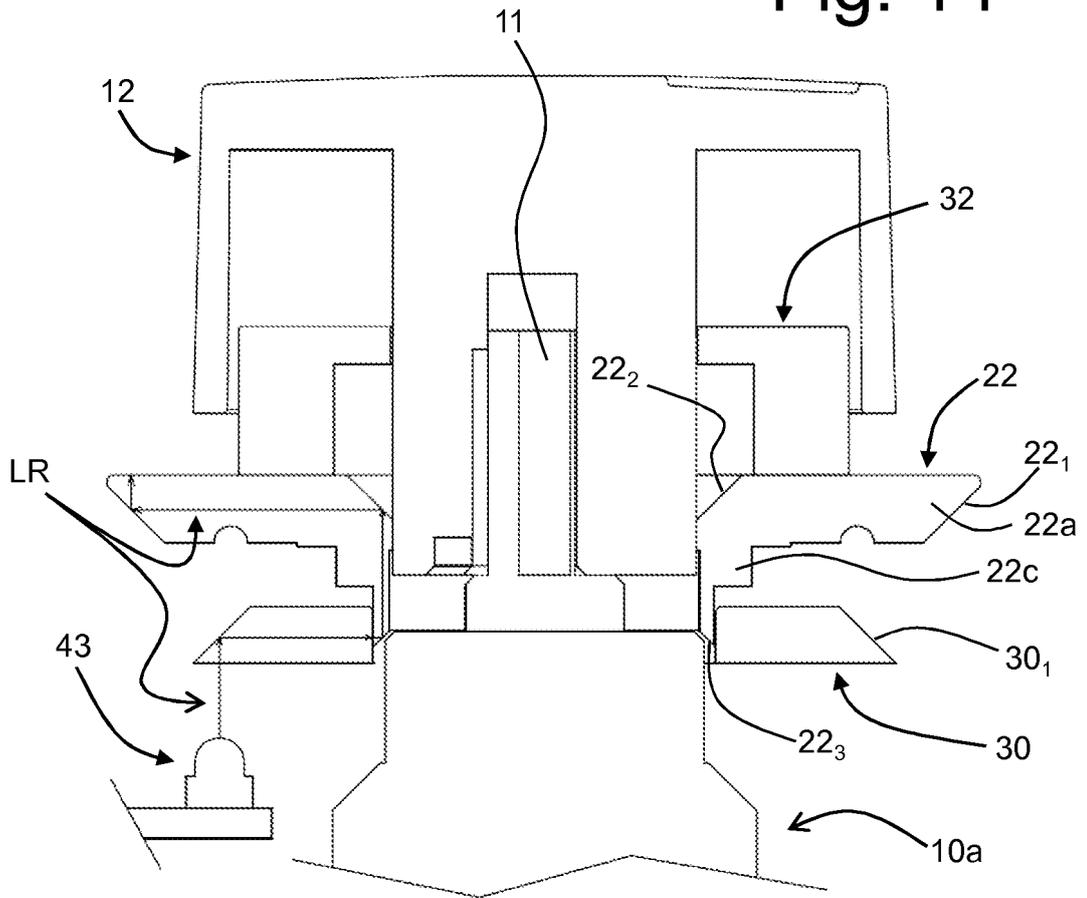


Fig. 15

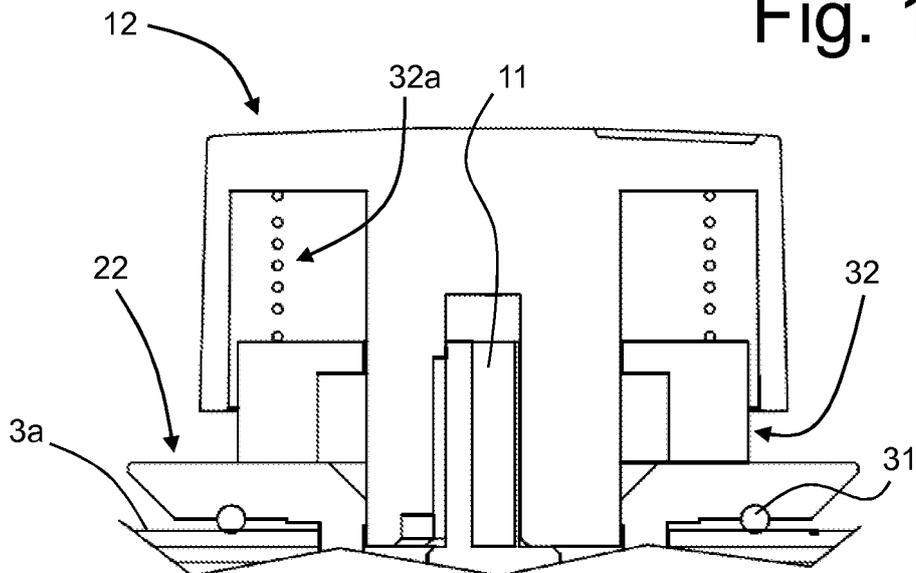


Fig. 16

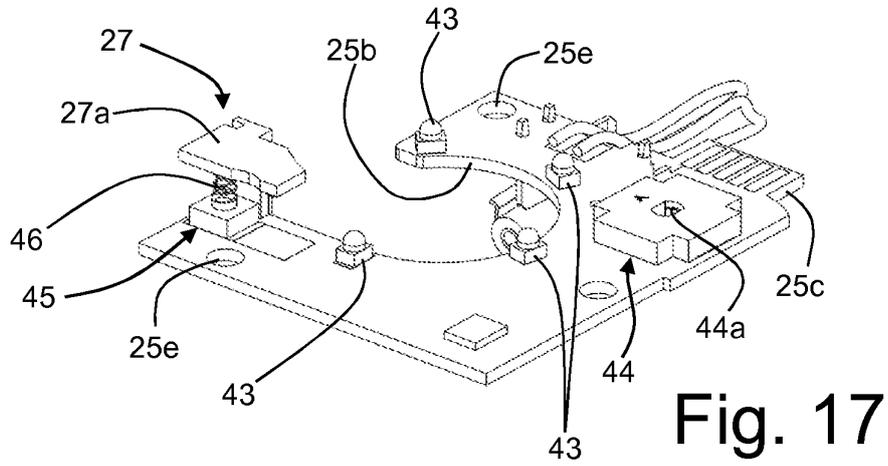
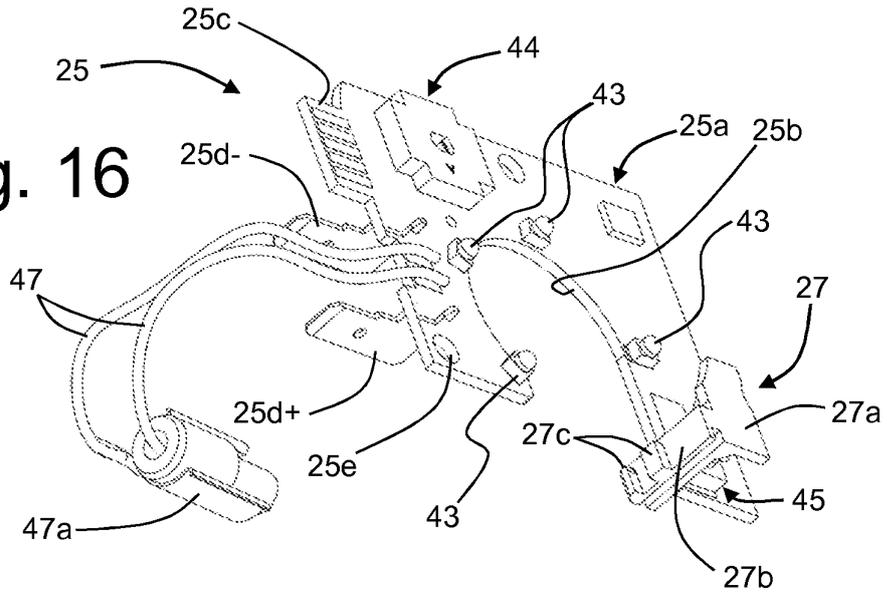


Fig. 17

Fig. 18

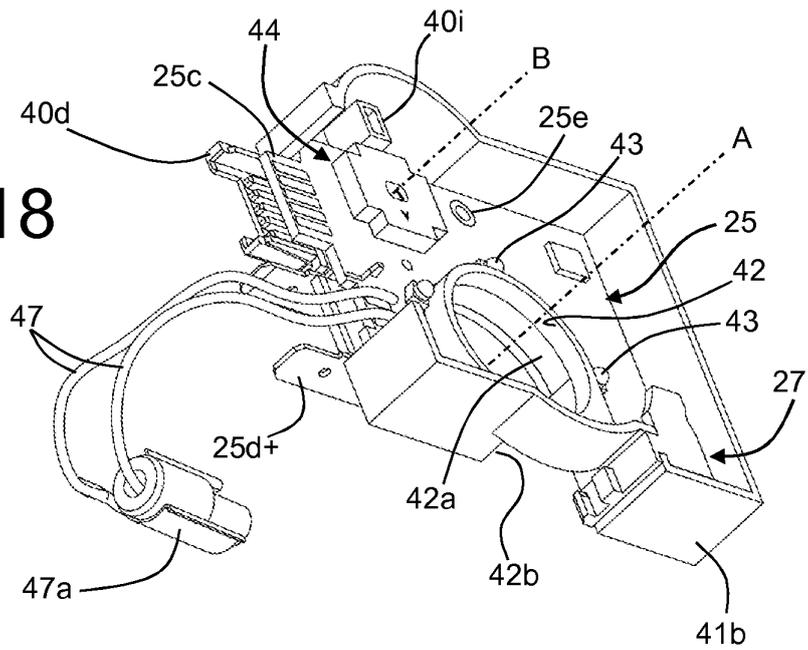


Fig. 19

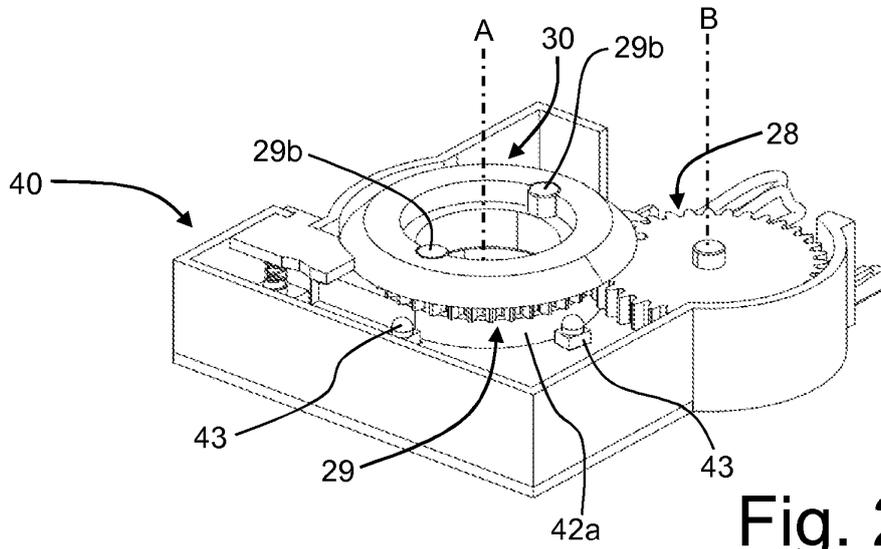
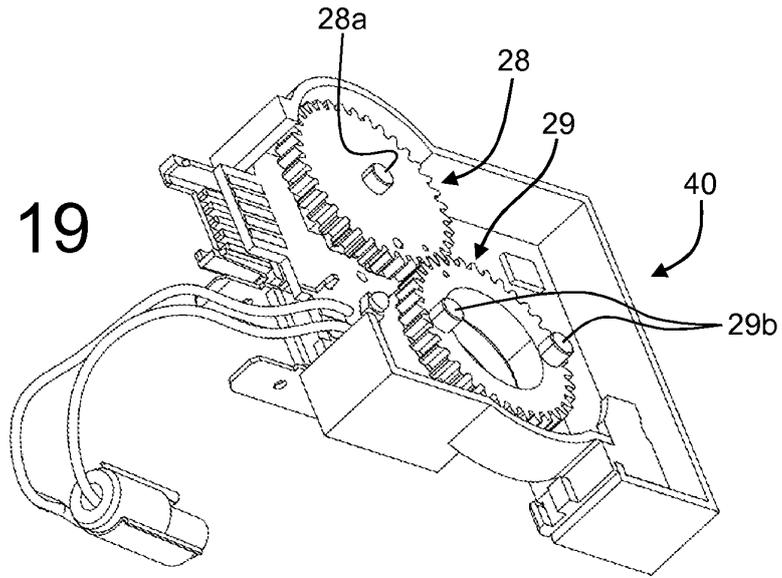


Fig. 20

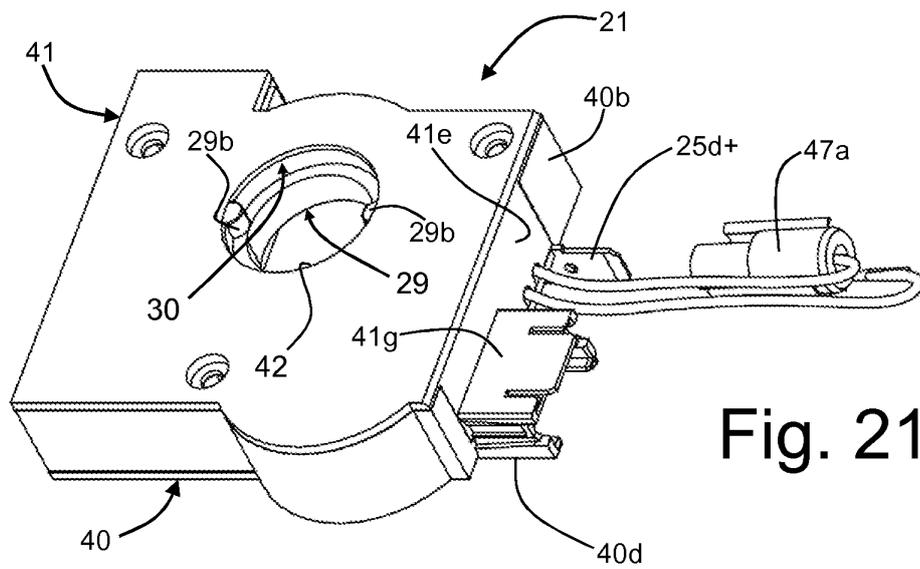


Fig. 21

Fig. 22

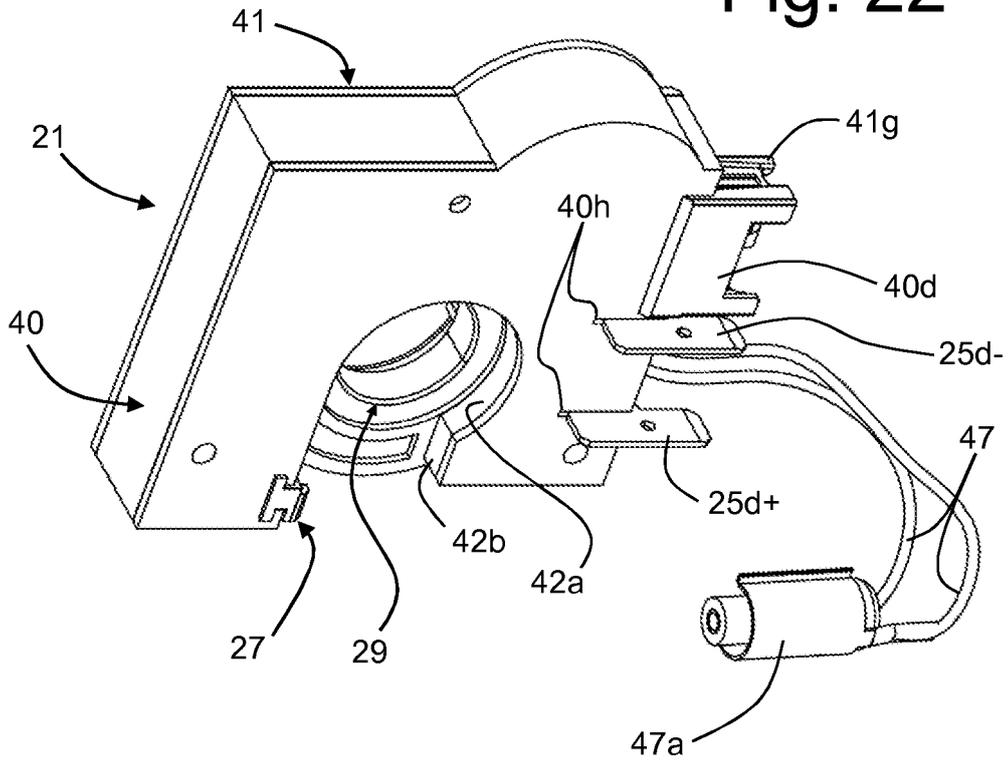


Fig. 23

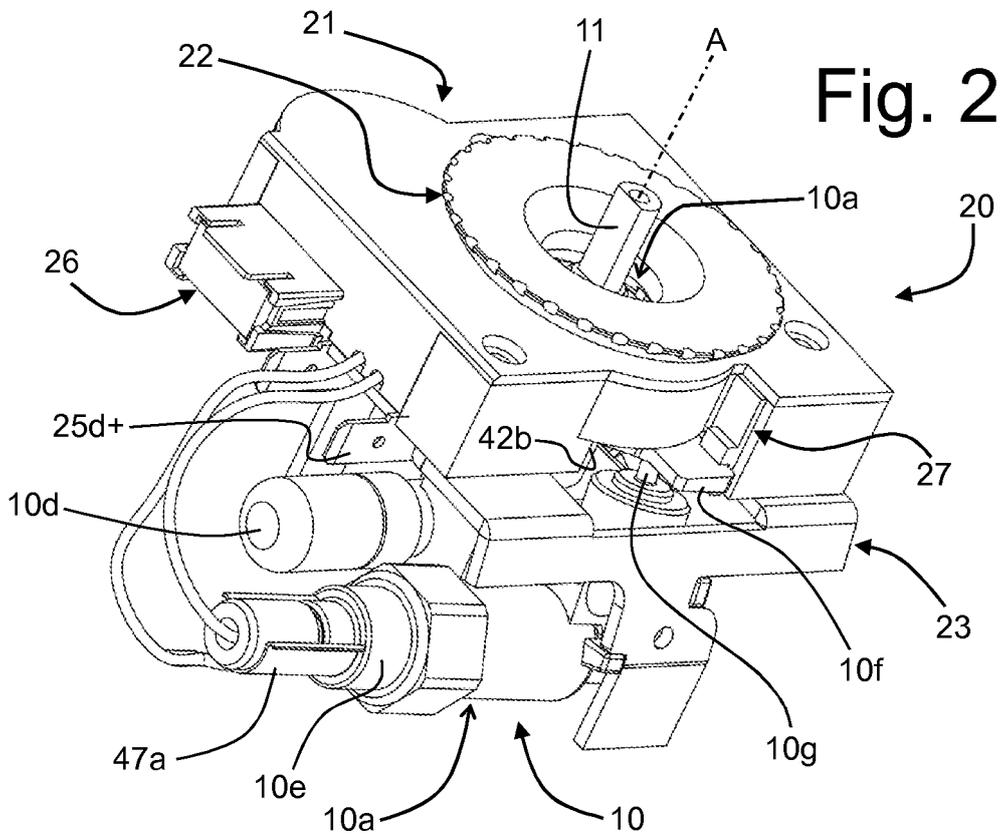
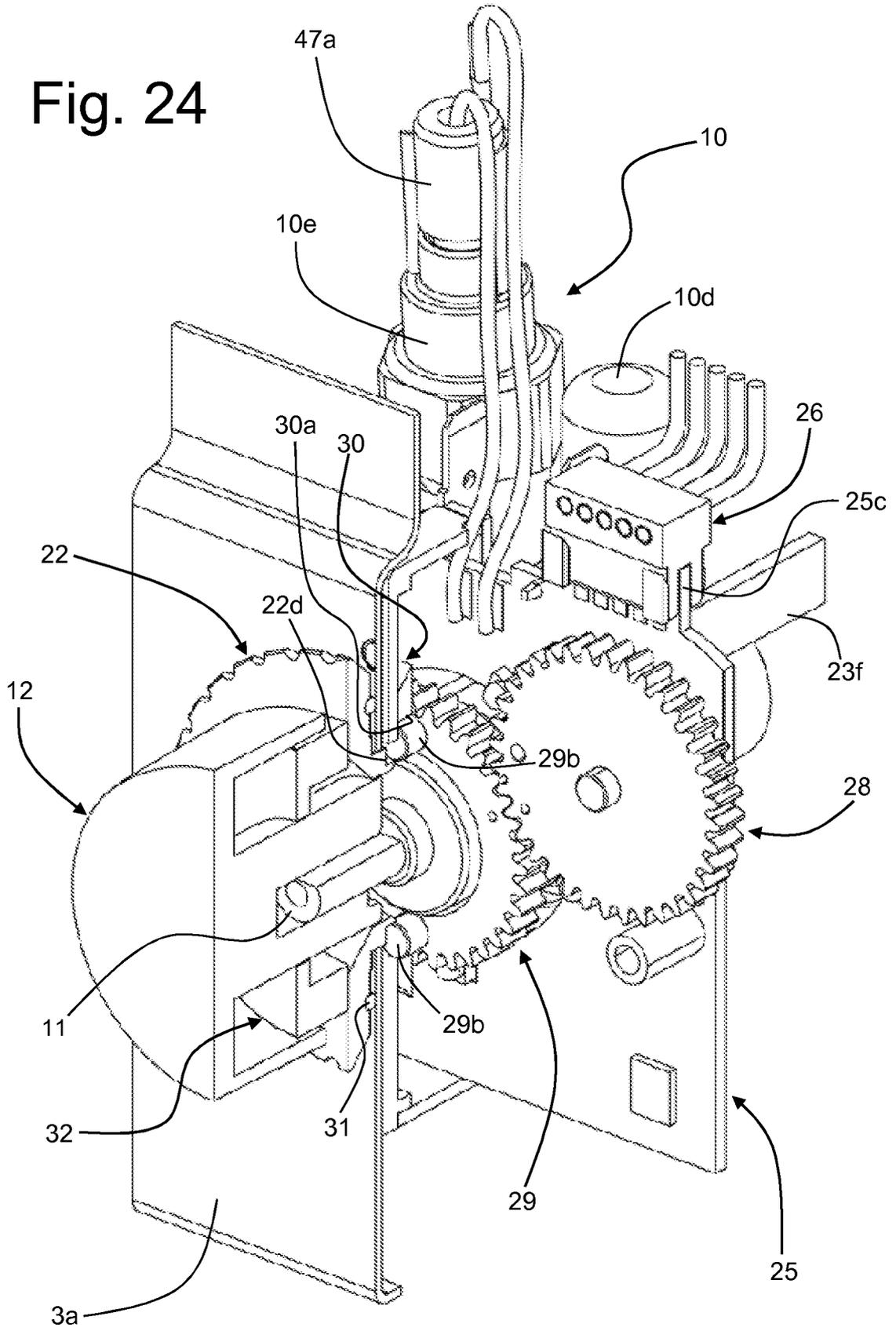


Fig. 24





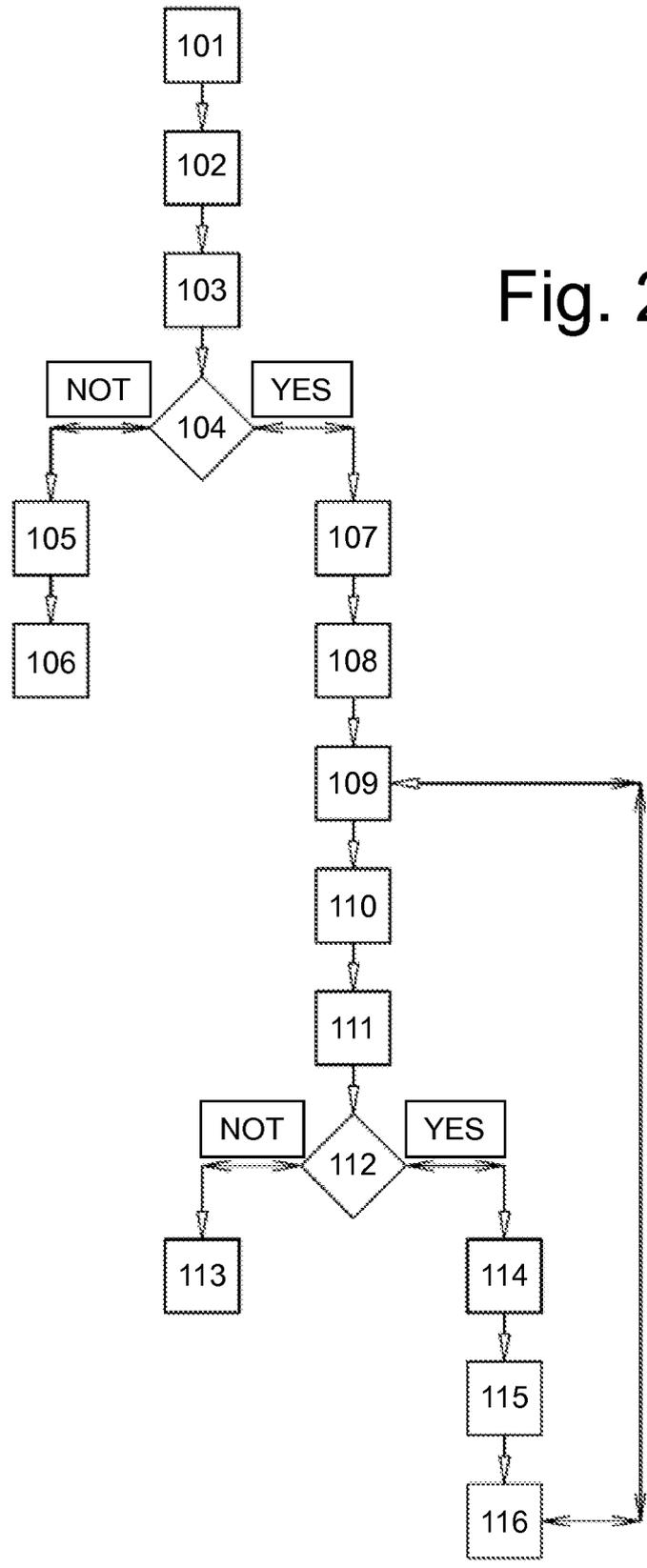
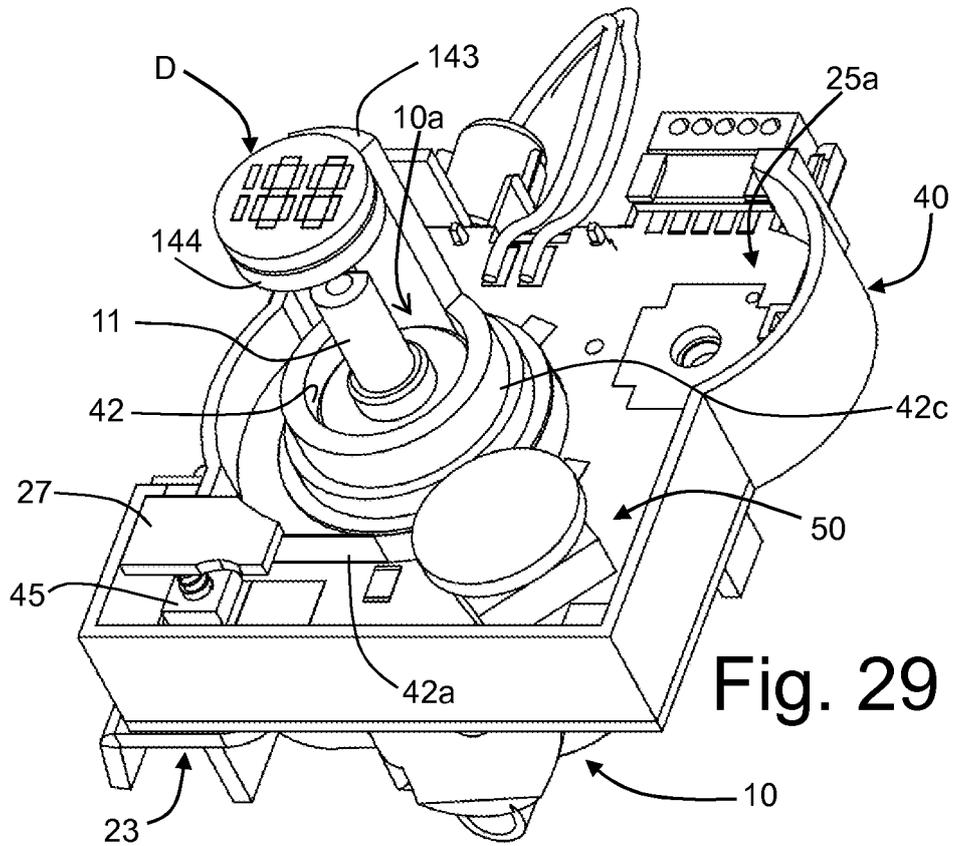
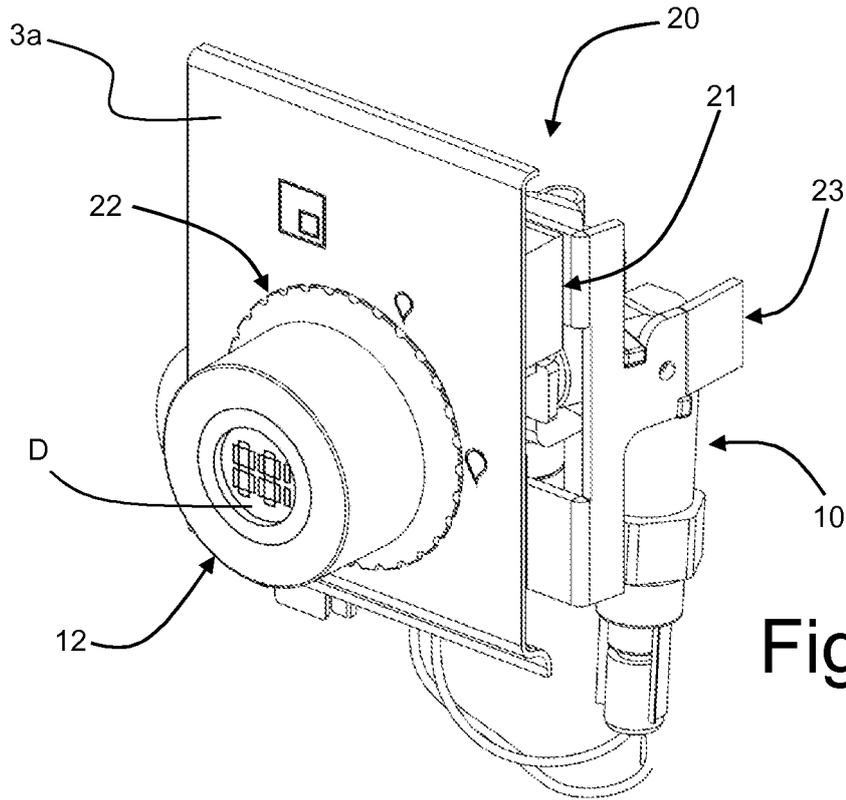


Fig. 27



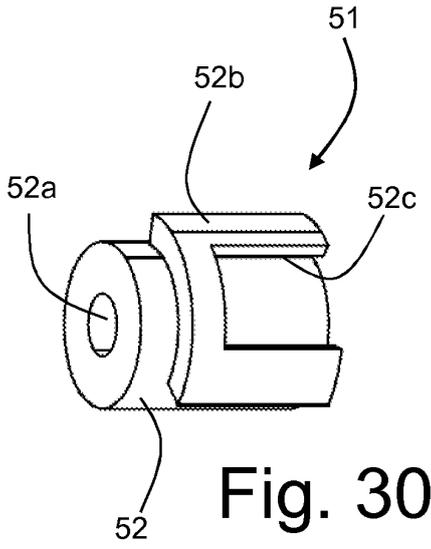


Fig. 30

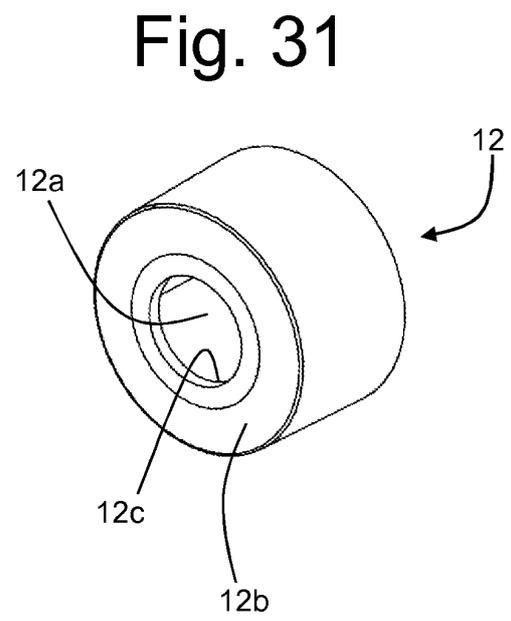


Fig. 31

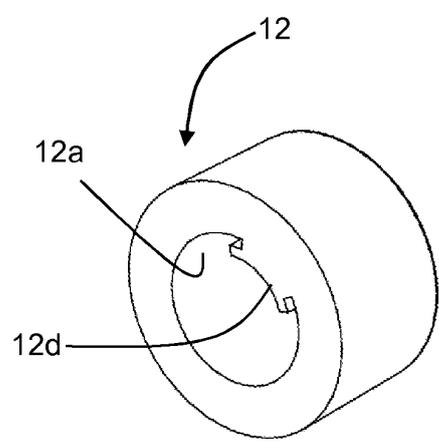


Fig. 32

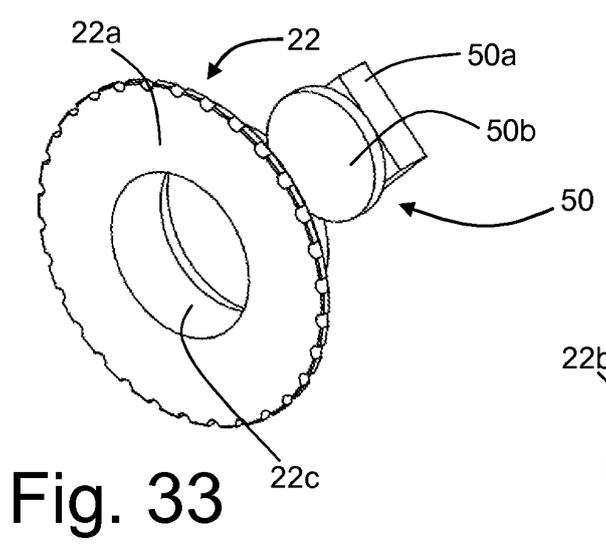


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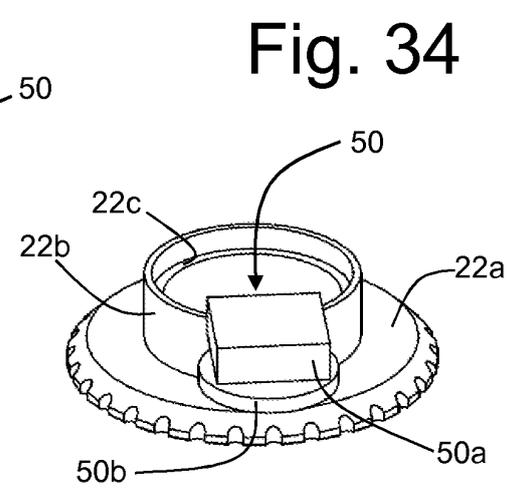


Fig. 34

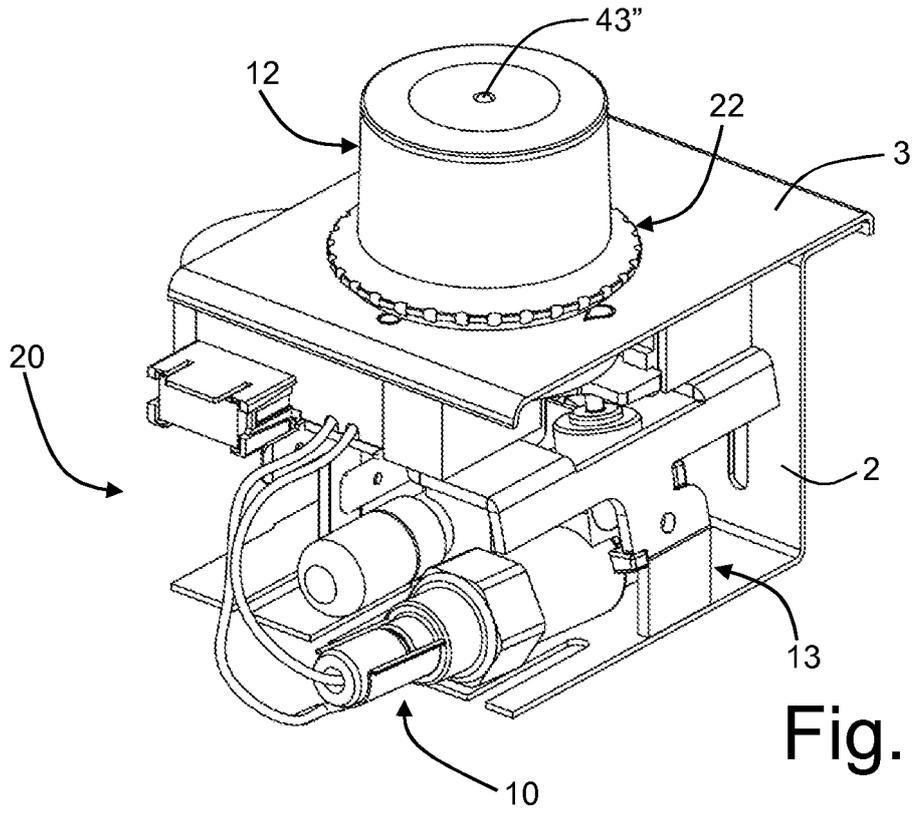


Fig. 35

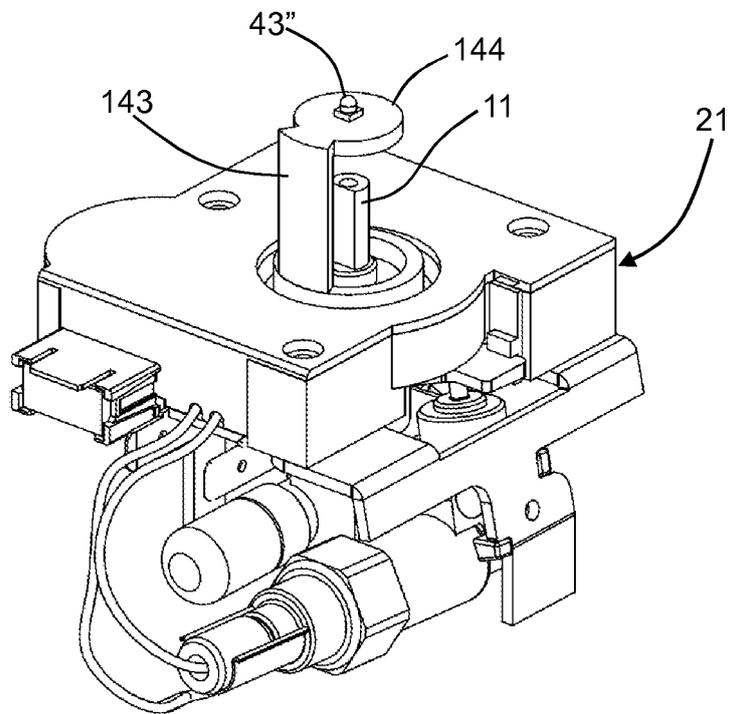


Fig. 36

**REFERENCES CITED IN THE DESCRIPTION**

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