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(54) Highly reliable thermostat for adjusting temperature in electric apparatus

(57) The invention relates to a thermostat for adjusting temperature in electric apparatus comprising, inside a box-like body, a membrane, coupled to a liquid holding probe varying its volume as the temperature changes. The thermostat comprises a rocking member supporting a non conductive material pad, affecting a metal blade, depending on the volume variation, in turn depending on the temperature transmitted to the membrane. The blade is driven from a first position, providing an electrical connection between an input terminal and a first output terminal, to a second position, in which the blade is electrically connected to a second output terminal. The blade can be resiliently recovered to the first position thereof by a resilient fork element, the legs of which bear on an insulating diaphragm, provided with a hole for allowing the pad to pass therethrough.

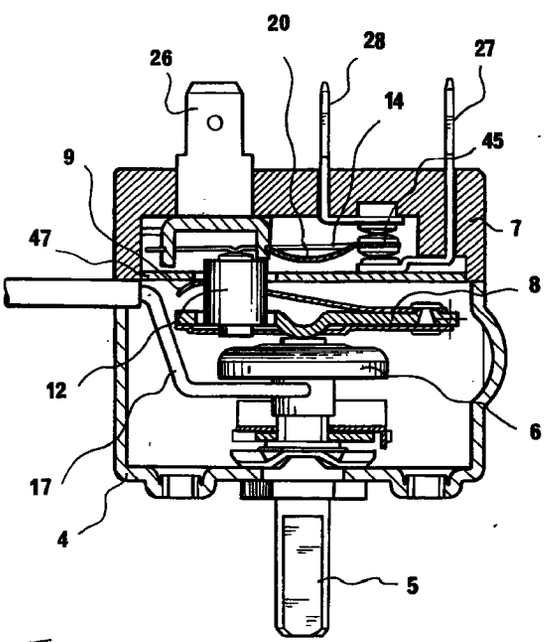

FIG. 3

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Description

BACKGROUND OF THE INVENTION

[0001] The present invention relates to a thermostat for adjusting temperature in electric apparatus or appliances.

[0002] Thermostat for adjusting temperature in apparatus in general and, in particular, in electric apparatus or appliances, provided with a temperature measurement probe for adjusting or controlling the thermostat elements are already known.

[0003] In particular, said probe holds a liquid therein, which changes its volume depending on the temperature being measured.

[0004] A capillary element is in turn coupled to a membrane, usually arranged inside the thermostat and affecting, through suitable volume variation transmitting means, the thermostat electric contacts.

[0005] The above mentioned prior thermostats, however, have a comparatively large size and are scarcely reliable and accurate in operation.

SUMMARY OF THE INVENTION

[0006] Accordingly, the aim of the present invention is to provide a thermostat for adjusting temperature in electric apparatus and appliances which is very reliable in operation and has a very small size.

[0007] Within the scope of the above mentioned aim, a main object of the present invention is to provide such a thermostat assuring a perfect insulation of the mechanical parts and electrical parts thereof.

[0008] Another object of the present invention is to provide such a thermostat which can be adjusted on a desired operating temperature in a very easy and accurate manner.

[0009] Yet another object of the present invention is to provide such a thermostat comprising reduced cost thermostat components.

[0010] According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by a thermostat for controlling temperature in electric apparatus of the type including, inside a box-like body, a membrane, coupled to a liquid holding probe which changes the volume thereof as the temperature changes, characterized in that said thermostat comprises moreover a rocking element supporting transmitting means for transmitting the volume variation of said membrane to a metal blade element, thereby resiliently driving, depending on said temperature depending volume variation, said blade element from a first position, in which an input terminal and an output terminal are electrically connected to one another, to a second position, in which said blade element is not electrically coupled to said first terminal.

[0011] According to a preferred embodiment of the present invention, in said second position, said blade element provides an electrical connection between said input terminal and a second output terminal.

[0012] According to a further preferred embodiment of the present invention, the means for transmitting the volume variation of the membrane to said metal blade comprise a non electrically conductive material pad, rigid with said rocking element, said rocking element being directly pivoted to said box-like body.

[0013] According to a further preferred embodiment of the present invention, the thermostat comprises an insulating diaphragm separating, inside said box-like body, the electric parts from the mechanical part thereof, and being provided with a hole for allowing said non conductive material pad to pass therethrough, said rocking element including moreover a resilient fork element, the legs of which bear on said diaphragm, in order to cause it to be resiliently recovered.

[0014] Preferably, the thermostat further comprises a small driving shaft, to which said membrane is pivoted, and which can be operated in order to adjust the thermostat operating temperature, by changing the position of said membrane with respect to said rocking element.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Further characteristics, details and advantages of the present invention will become more apparent hereinafter from the following detailed disclosure, given by way of an illustrative, but not limitative, example, with reference to the accompanying drawings, where:

Figure 1 is a top plan view of the thermostat according to the present invention;

Figure 2 is a bottom view of the thermostat according to the invention, this view also showing a temperature measurement probe;

Figure 3 is a cross-sectional view of the thermostat according to the invention, provided with terminals allowing said thermostat to also operate as a switching element;

Figure 4 is a further cross-sectional view of the thermostat shown in Figure 3; and

Figure 5 is a partially cross-sectioned view of the thermostat according to the invention, provided with a single output terminal, and which, accordingly, operates as a simple-switch thermostat.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] In the following disclosure, reference will be made to some preferred embodiments of the present invention, which are illustrated as not limiting examples

of possible variations of the invention.

[0017] More specifically, as it will become more apparent hereinafter, the thermostat according to the present invention can be made both as a simple thermostat, i.e. a thermostat designed for switching on and off an electric connection to an electric apparatus, as the temperature being monitored exceeds a threshold temperature value, and as a switching or commutating element, adapted to actuate an alternative device.

[0018] The thermostat according to the invention generally indicated by the reference number 1 comprises a box-like body, including a box element 4 and a base element 7, coupled to one another by coupling screws or other like coupling means, and holding in its inside a membrane 6.

[0019] As shown, said membrane 6 is provided with a capillary transmitting tube 17, and being moreover coupled to a temperature sensing or detecting probe 3, said probe holding therein a liquid the volume of which changes depending on the temperature.

[0020] The membrane 6 contacts a rocking element 8, which can perform a rocking movement, since it is pivoted to the body of the box element 4 at one of the end portions thereof, without any additional pivot pin.

[0021] More specifically, the rocking element 8 comprises two side wings, operating as fulcrum elements, and which are engaged, with a plug-in type of connection, in corresponding contoured slots formed in the body of the box element 4.

[0022] This solution allows to omit a pivot pin, thereby allowing a remarkable material saving as well as an easier assembling.

[0023] The rocking element 8 supports a pad 12, made of a non conductive material, which is provided for contacting a resilient metal blade element 14, allowing the input terminal 26 to be connected to at least one of the output terminals 27, 28.

[0024] Preferably, said blade element 14 is provided, at one end portion thereof, with a double contact 45; two output electric contacts, rigid with said terminals 27 and 28 being moreover provided.

[0025] To said rocking element 8 a fork 9 is moreover connected, said fork comprising two metal elements, having resilient properties, contacting a diaphragm 47, departing the box-like element 4 and base 7 holding the electric parts.

[0026] The diaphragm 47 is moreover provided with a hole 48 allowing the pad 12 to pass therethrough, in order to allow it to contact said blade element 14.

[0027] The thermostat according to the present invention operates as follows.

[0028] As the temperature of the fluid being monitored increases, the liquid held inside said probe will cause the membrane 6 volume to increase.

[0029] Thus, the membrane 6, upon expanding, will push the rocking element 8 to cause the pad 12 to press against the blade element 14.

[0030] As the temperature increases, the pressure provided by the pad 12 on the blade element 14 will cause the input terminal 26 to snap disengage from the output terminal 27.

[0031] If the thermostat is provided to operate as a switching or commutating element, then the blade element 14 will contact the second output terminal 28, thereby operating a second device, such as a fan or the like.

[0032] If, upon operation of the thermostat, the temperature being monitored decreases, then the membrane 6 size will also decrease; in this case, the rocking element 8 will be driven toward the membrane 6, under the force provided by the resilient fork 9.

[0033] Thus, the pad 12 will be disengaged from the blade element 14 which, because of a curved portion 20 thereof operating as a resilient spring, will snap recover to its position on the output terminal 26, thereby actuating the previously switched off electric apparatus and possibly switching off, in the case of a commutator operation, the second output terminal and the apparatus connected to the latter.

[0034] In fact, said blade element 14 is provided, at a middle portion thereof, with the mentioned curved portion 20, the concavity thereof faces the terminals 26, 27 and 28, and being rigidly connected to the input terminal 26 by one of its end portions, thereby allowing said blade element to resiliently return to its starting position.

[0035] The thermostat according to the invention is moreover provided with a driving small shaft 5 to which said membrane 6 is pivoted, and which will allow to manually adjust the spacing of the membrane 6 from the rocking element 8.

[0036] By this adjustment, it will be possible to accurately calibrate the thermostat on a desired operating temperature.

[0037] Furthermore, the input terminal 26 and support of the blade element 14 are made as a single-piece.

[0038] This solution would allow a better electric continuity between the blade element 14 and terminal 26, in addition to providing a less cost for the involved materials and assembling requirements.

[0039] Finally, the disclosed thermostat, owing to its small size and constructional simplicity, can be made with a very high constructional precision, thereby providing a very reliable operation.

Claims

1. A thermostat for controlling temperature in electric apparatus of the type including, inside a box-like body, a membrane, coupled to a liquid holding probe which changes the volume thereof as the temperature changes, characterized in that said thermostat comprises moreover a rocking element supporting transmitting means for transmitting the volume variation of said membrane to a metal blade element, thereby resiliently driving, depending on said temperature depending volume variation, said

blade element from a first position, in which an input terminal and an output terminal are electrically connected to one another, to a second position, in which said blade element is not electrically coupled to said first terminal.

2. A thermostat for adjusting temperature in electric apparatus according to Claim 1, characterized in that, in said second position, said blade element provides an electric connection between said input terminal and a second output terminal.

3. A thermostat for adjusting temperature in electric apparatus according to Claims 1 or 2, characterized in that said means for transmitting the volume variation of said membrane to said metal blade element comprise a non conductive material pad, rigid with said rocking element.

4. A thermostat for adjusting temperature in electric apparatus according to Claim 3, characterized in that said rocking element is directly pivoted to said box-like body.

5. A thermostat for adjusting temperature in electric apparatus according to one or more of the preceding claims, characterized in that said thermostat comprises an insulating diaphragm separating, inside said box-like body, said electric parts from said mechanical part, said diaphragm being provided with a hole for allowing said pad to pass therethrough.

6. A thermostat for adjusting temperature in electric apparatus according to Claim 5, characterized in that said rocking element comprises a resilient fork, the leg of which bear on said diaphragm, to allow said rocking element to be resiliently recovered.

7. A thermostat for adjusting temperature in electric apparatus according to one or more of the preceding claims, characterized in that said thermostat comprises moreover a driving small shaft, to which said membrane is pivoted, said driving small shaft being adapted to operate for adjusting the operation temperature of the thermostat, by changing the position of said membrane with respect to said rocking element.

8. A thermostat for adjusting temperature in electric apparatus according to one or more of the preceding claims, characterized in that said box-like body comprises a box element including in its inside said membrane and a base, supporting said input and output terminals as well as a seat for housing therein said diaphragm and being coupled to said box element by coupling screws or other suitable coupling means.

9. A thermostat for adjusting temperature in electric apparatus according to one or more of the preceding claims, characterized in that said metal blade element is provided, at a middle portion thereof, with a curved portion having an end thereof rigidly coupled to said base, for aiding the resilient recovering of said blade element from said second position to said first position thereof.

10. A thermostat for adjusting temperature in electric apparatus according to one or more of the preceding claims, characterized in that said metal blade element is provided, at one end portion thereof, with a double contact and that output electric contacts are rigid with said terminals.

11. A thermostat for adjusting temperature in electric apparatus according to one or more of the preceding claims, characterized in that said input terminal and said support of said metal blade element are made as a single piece.

12. A thermostat for adjusting temperature in electric apparatus according to one or more of the preceding claims, characterized in that said rocking element comprises two side wings, operating as fulcrum means, and engaging, with a plug-in type of engagement, in corresponding contoured slot formed on the body of said box element.

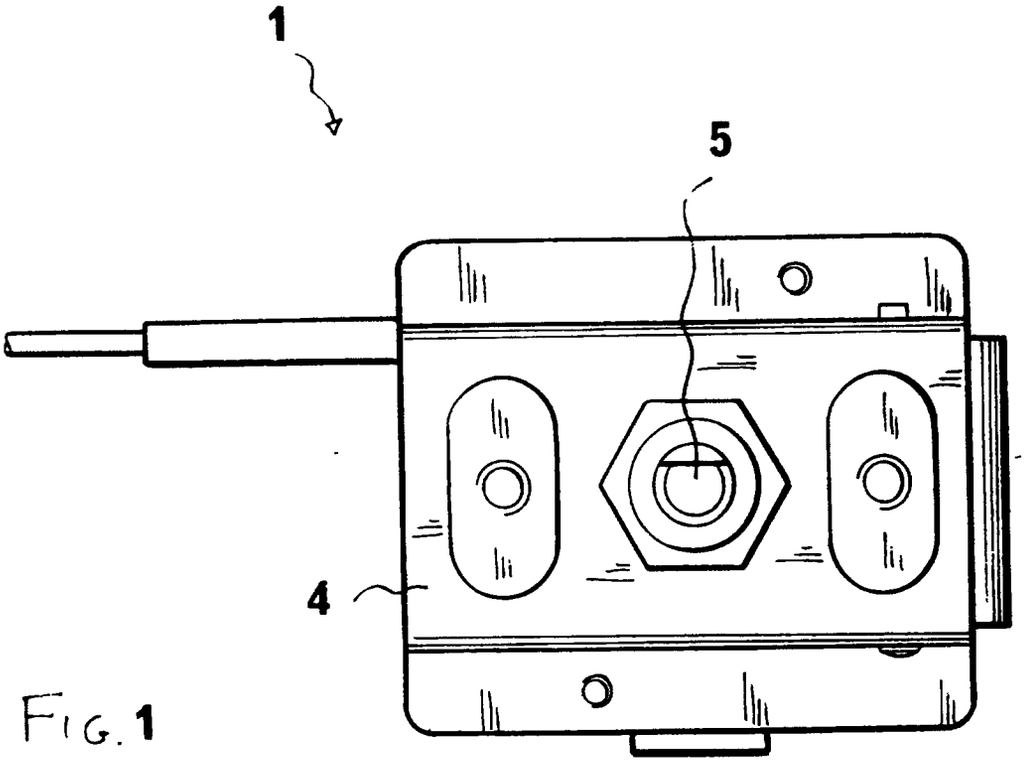

FIG. 1

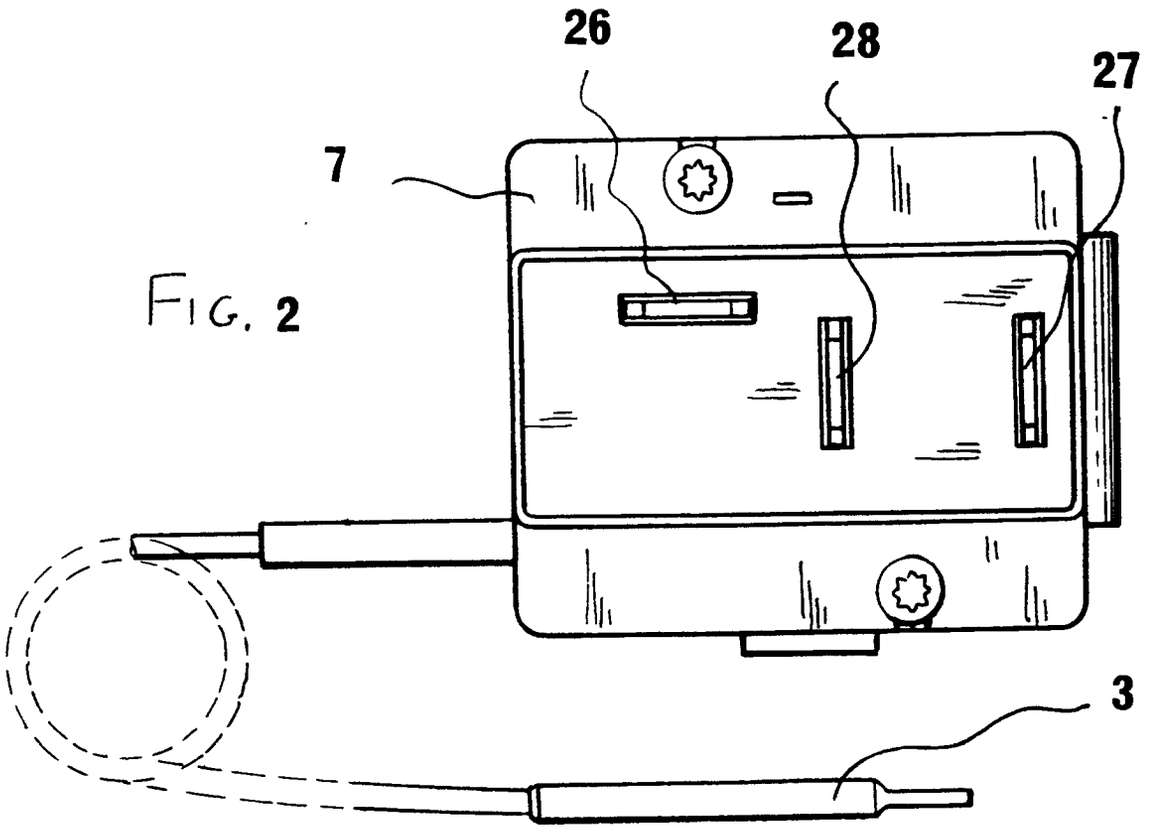

FIG. 2

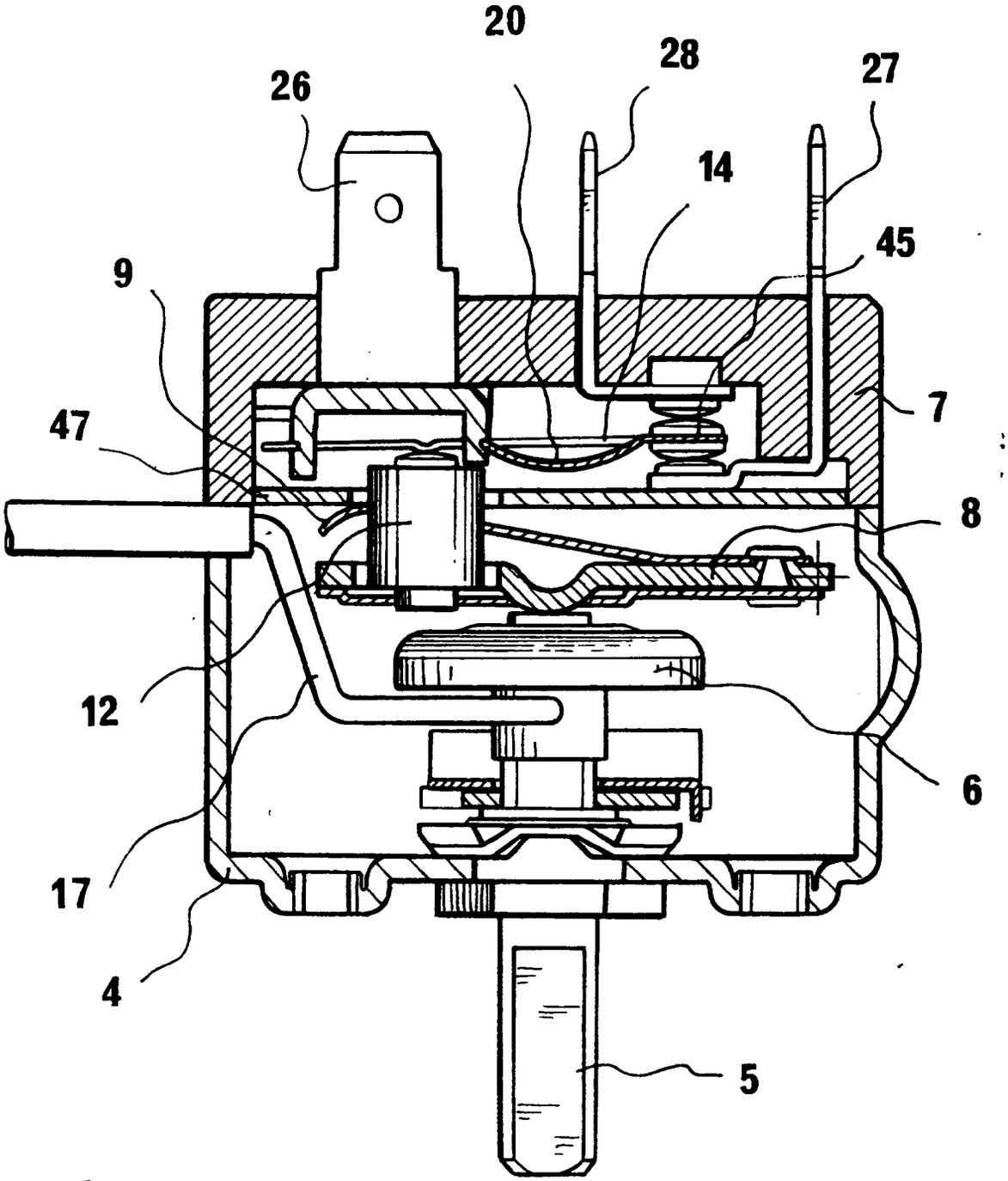

FIG. 3

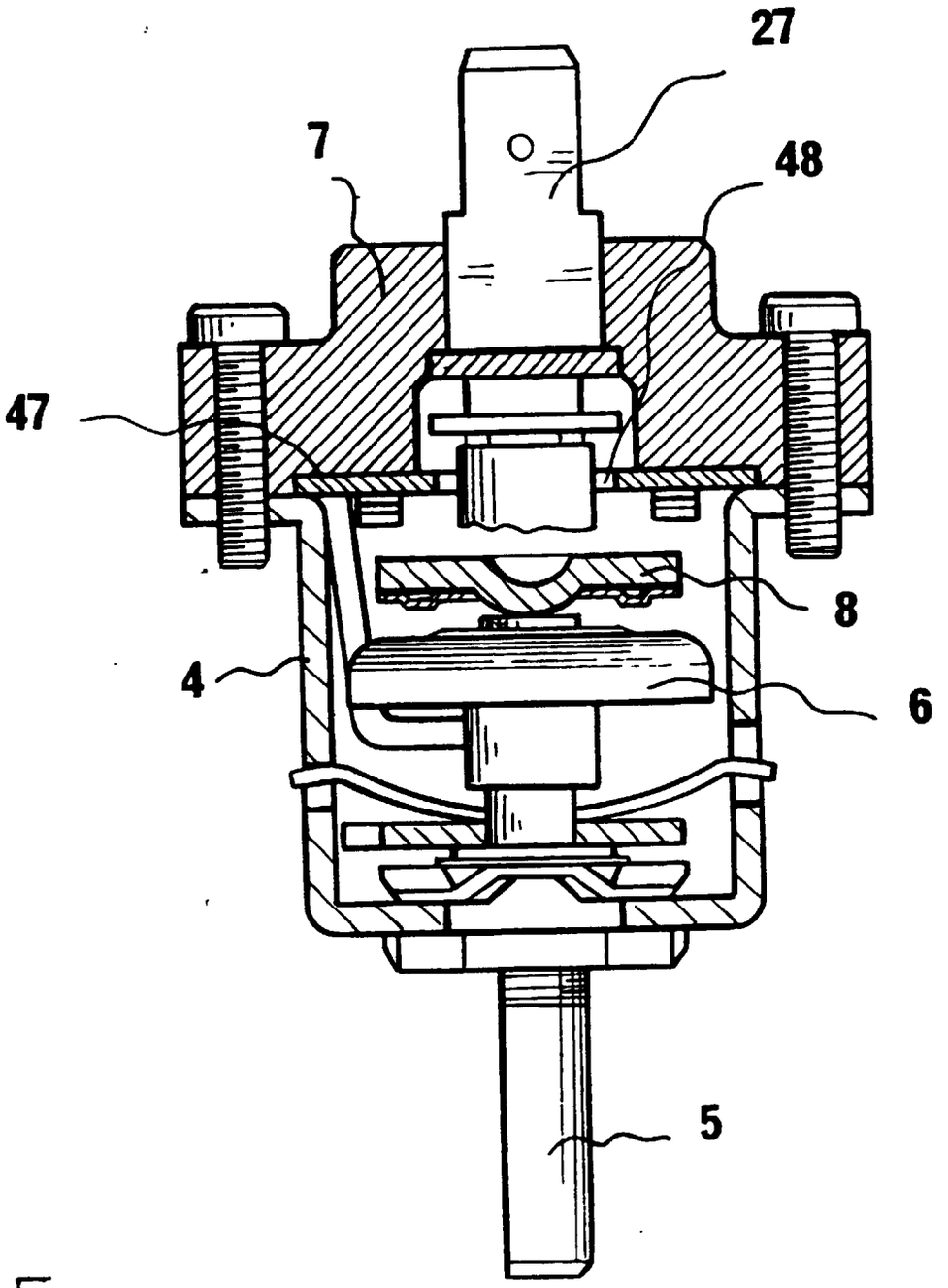

FIG. 4

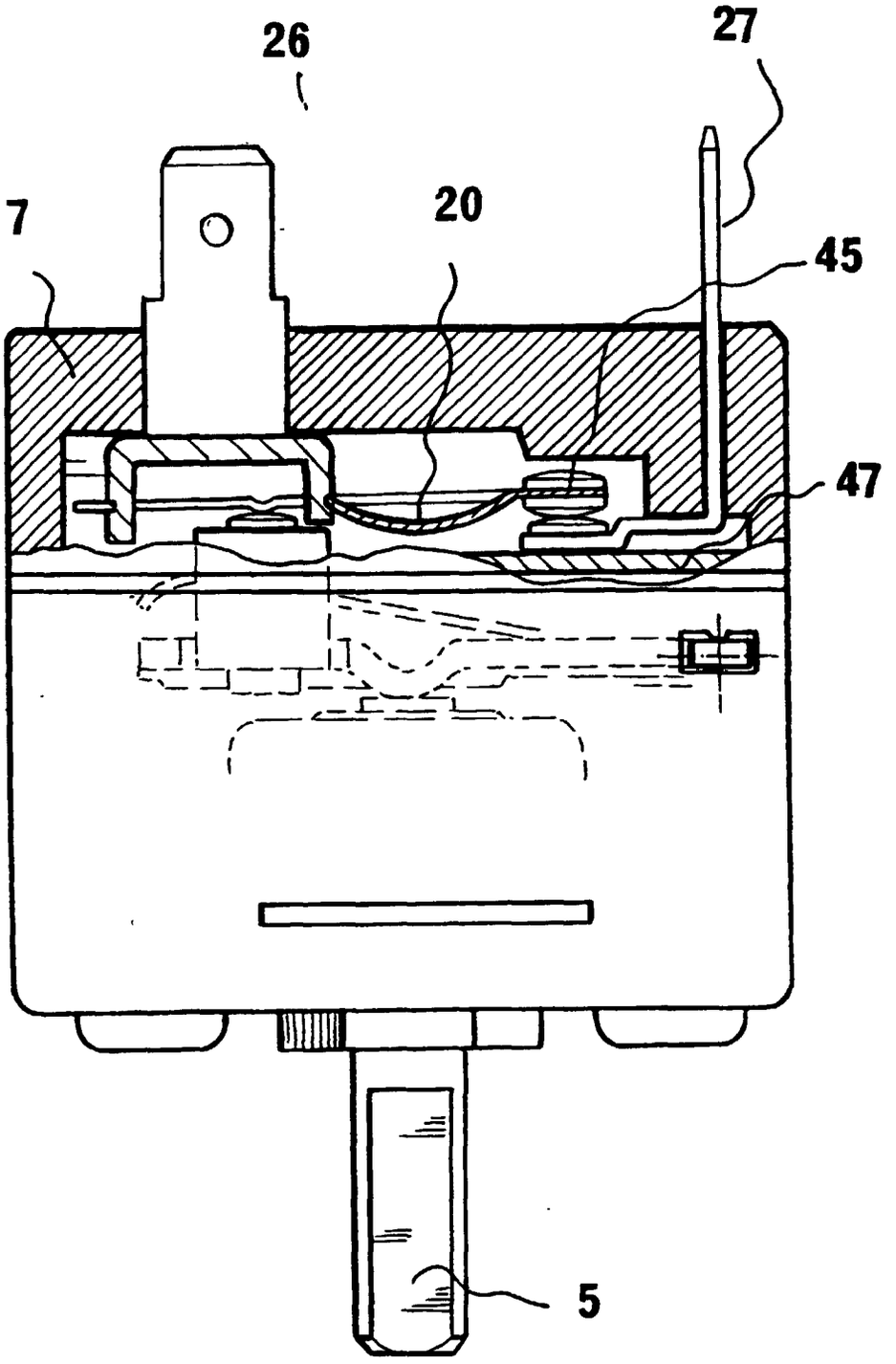

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 8378

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
P,X	EP 0 822 567 A (FIRT S.R.L.) 4 February 1998 * column 2, line 28 - column 3, line 31; figures 1-4 *	1-4,7,8,10	H01H37/36 H01H35/26
X	US 4 565 989 A (LOTTER ET AL.) 21 January 1986 * abstract * * column 3, line 6 - column 5, line 8; figures 1,2 *	1-3,5-11	
X	US 4 163 129 A (ROSSI ET AL.) 31 July 1979 * column 4, line 20-52 * * column 5, line 24 - column 6, line 40; figures 1-3 *	1,3,4,9,12	
X	US 5 029 303 A (KICHERER ET AL.) 2 July 1991 * abstract * * column 3, line 22 - column 4, line 25 * * column 5, line 15 - column 6, line 57; figures 1-5 *	1-4,9,10,12	
A	EP 0 274 459 A (PRODIGY ITALIANA S.R.L.) 13 July 1988 * column 2, line 44 - column 3, line 27; figures 1-4 *	1-3,7,9-11	
A	FR 2 490 003 A (THOMSON-BRANDT (SA)) 12 March 1982 * page 4, line 11-22 * * page 5, line 18-26 * * page 6, line 21-33 * * page 8, line 14-22; figures 1,2 *	1,4,9,12	

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TECHNICAL FIELDS SEARCHED (Int.Cl.6)
H01H G05D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	8 January 1999	Beitner, M

CATEGORY OF CITED DOCUMENTS

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EUROPEAN SEARCH REPORT

Application Number
EP 98 11 8378

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	GB 2 034 522 A (RANCO INCORPORATED) 4 June 1980 * abstract * * page 1, line 127 - page 2, line 12; figure 1 *	4,12	
A	US 3 729 605 A (ANDRESEN) 24 April 1973 * column 2, line 17-51; figures 1,2 *	4,12	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)

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