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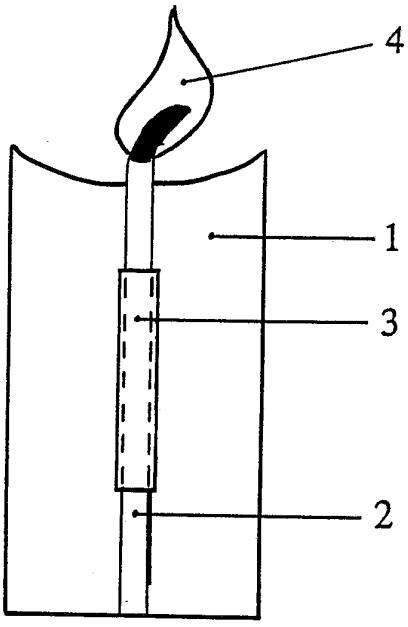
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(54) Title: SELF-EXTINGUISHING CANDLE

(57) Abstract

Self-extinguishing candle comprising a body (1) of candle material having integrated therein a wick (2). Wick is enclosed throughout a portion of its length by a sleeve (3) serving to prevent the candle-flame (4) from continuing to burn down the wick, as well as to drain and convey the molten or liquid candle material accumulated round the sleeve and the wick to the candle-flame (4). The novelty of the invention lies in the fact that the sleeve (3) is placed between the body (1) of the candle material and the wick (2) and that the sleeve (3) is consists of a difficultly inflammable material of good thermal conductivity.



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SELF-EXTINGUISHING CANDLE

BACKGROUND

The background of the development of self-extinguishing candles is primarily one of security. In cases where candles are used together with candle-rings, moss, wooden candle-sticks etc., it is of the greatest importance that the candle is extinguished before it has burnt down to such a level where the surrounding material can be ignited by the candle-flame. Also practical aspects such as the difficulty of removing a fully spent candle from the candle-stick also constitute a background to the invention.

Candles which are self-extinguishing at a predestined point are previously known in different designs. Besides candles with mechanical extinguishing arrangements there are candles which are self-extinguishing due to the fact that the wick or the candle-material is manipulated at a predestined point. It is consequently already known to impregnate the wick with substances which make it less inclined to burn (for example metallic salts, water-glass). It is also known to bring about self-extinction by creating a cavity in the candle-material round the wick and filling this with extinguishing liquid or a gas-producing and choking substance, for example alkali bicarbonate.

This invention is intended to be applied to a candle comprising a body of candle-material with an integral wick. The purpose of the invention is to bring about self-extinction of the candle-flame when it has burnt down to a certain point on the wick. The wick is partially enclosed in a specially designed sleeve. The purpose of this invention is to provide a self-extinguishing candle of reliable function, extinguishing calmly without causing any disadvantages such as spattering or unnecessary emission of fumes. Furthermore the candle shall extinguish at a predestined level, and the wick shall be kept centered in the candle body.

A further purpose of the invention is to provide a self-extinguishing candle of a function/design which is practical to produce. The invention will be described in more detail below with reference to the appended drawings.

DESCRIPTION OF THE SLEEVE

The sleeve (3), Fig. 1, is placed on/around the wick (2), which means that it is located between the body of candle-material (1) and the wick (2). The sleeve is made of a material which is difficult to ignite and which conducts heat sufficiently to liquefy the candle-material in a zone (5) round the sleeve (3) along the whole or part of its length, Figs. 2, 3.

An example of a suitable sleeve material is thin sheet-metal.

The sleeve should be designed in its upper part so that the candle-flame (4) stops there on its progression down the wick. This can, for example, be achieved by the sleeve enclosing the wick so closely that the candle-flame cannot burn along the wick inside the sleeve due to, for example, lack of oxygen. The sleeve should also be of such a design and of such dimensions, or be equipped with a suitable arrangement, to allow the molten/liquid candle-material to be drained round the sleeve/wick and conveyed to the candle-flame by means of the suction force the wick/candle-flame exerts and/or in other ways, for example due to capillary forces (for example by channel/channels in the sleeve).

To ensure that the wick (2) and the sleeve (3) maintain their position in the candle body when a cavity has been formed, Fig. 4, the sleeve is equipped with an anchorage (6) which extends in the candle body in such a way that it is not entirely surrounded by molten or sufficiently softened candle-material. The sleeve can also be designed in such dimensions that its lower part is not surrounded by molten or sufficiently softened candle-material, Fig. 5. Another way of ensuring that such molten candle-material does not appear round the lower part of the sleeve is to manufacture the sleeve in different materials, where the lower part/parts have low thermal conductivity, Fig. 6.

An example of a sleeve design where the wick/candle-flame sucks up molten/liquid candle-material is through aperture/apertures in the sides of the sleeve at a suitable distance from the upper edge of the sleeve, Figs. 7, 8. The wick/candle-flame then sucks up molten/liquid candle-material through the aperture/apertures.

An example of the sleeve design where a channel/channels are formed in the sleeve is shown in Fig. 9. The molten candle-material is here conveyed to the wick/candle-flame by capillary forces prevailing in the channels. The channels may also contain materials with suction capability and thus facilitate the drainage and conveyance of molten/liquid candle-material.

The channel/channels can also be combined with an aperture/apertures in the sleeve, Figs. 10, 11, 12. The sleeve may also be manufactured from materials which have such a structure as to permit the molten candle-material to pass through, for example porosities, and thence on to the wick/candle-flame.

DESCRIPTION OF THE PROCESS OF THE INVENTION

The candle-flame (4) burns in the usual way down the wick (2), Fig. 13, until it reaches the upper part of the sleeve (3), Fig. 14, which is placed on or round the wick (2). The candle-flame is prevented from continuing to burn along the wick (2), here enclosed by the sleeve (3). This enclosure prevents the candle-flame (4) from burning inside the sleeve (3) due to, for example, lack of oxygen. The candle-flame (4) has thus been stopped at that part of the wick (2) which is located at the upper edge of the sleeve (3). However, the wick/candle-flame is still able to absorb and make use of the surrounding molten/liquid candle-material. The candle will not go out by itself until the candle-flame is supplied with an insufficient amount of fuel (candle-material) or until the part of the wick located at the upper edge of the sleeve is consumed (burnt).

Due to its proximity to the candle-flame (4), the sleeve (3) is heated to a temperature above the melting-point of the candle-material. Thermal conductivity, heat transfer, heat radiation etc. cause the candle-material nearest to the sleeve (3) to melt or liquefy, and a zone of molten/liquid candle-material (5) is formed, Fig. 15. By the design of the sleeve, the molten/liquid candle-material is conveyed to the candle-flame which is located at the upper edge of the sleeve, where it is burnt up. In this way, the molten/liquid candle-material (5) is drained around the sleeve and the wick, thus forming a cavity in the candle body, Figs. 16, 17. This causes the candle to become self-extinct, Fig. 18, since the wick/candle-flame is not subsequently supplied with any candle-material. The process is illustrated in more detail in Figs. 19, 20, 21 for one variant of the sleeve. The sleeve can also be designed so that other mechanisms contribute to the drainage effect as well, see below. The wick (2) with the sleeve (3) is kept centered in place by the anchorage (6). Another way of keeping the wick and the sleeve centered is to design the sleeve so that its lower part is constantly surrounded by solid or viscous candle-material, Figs. 22, 23, 24, 25, 26, 27. The process is shown in more detail in Figs. 28, 29, 30.

The candle-flame (4) which is located at the upper edge of the sleeve (3) gives off heat that to some extent continues to melt the remaining solid candle-material at the upper part of the candle body and on the inside of the cavity walls. This flows down and collects in the previously molten candle-material or in the bottom of the cavity.

The drainage/conveyance of molten candle-material (5) to the wick/candle-flame depends on its suction capability and can be achieved by special means, for example apertures or channels in the sleeve (3). Also mechanisms, for example capillary forces, can act to drain molten/liquid candle-material (5) to the wick/candle-flame. This mechanism thus is a result of the shape and design of the sleeve. Fig. 31 illustrates how the combination of the wick/candle-flame suction capability and capillary forces can contribute to the drainage.

When such temperature conditions have been established in the candle that the candle-material cannot be transported to the candle-flame, since it has now become solid or viscous in the proximity of the wick and sleeve, the candle-flame then is extinguished due to lack of fuel (candle-material), Figs. 18, 27.

As mentioned earlier, the sleeve (3), placed on the wick (2), prevents the candle-flame (4) from burning further down the wick than to the upper edge of the sleeve. During the time the candle-flame at this point is supplied with fuel (molten candle-material), the wick is in this part gradually consumed (burnt). If this continues for a sufficiently long time, the candle-flame may be extinguished also for this reason.

The above mentioned causes of extinction may also act together to extinguish the candle-flame. For example, the wick at the upper edge of the sleeve, where the candle-flame is flaming out from the wick, becomes progressively smaller due to the fact that it is being consumed. This also means that the candle-flame becomes smaller and generates less heat,

which in turn leads to the candle-material becoming viscous or solid, so that conveyance of candle-material to the wick/candle-flame is reduced or terminated. Another example of the coaction of these features is the following; When transport of candle-material to the wick/candle-flame is reduced or terminated, the wick is consumed (burnt) more rapidly.

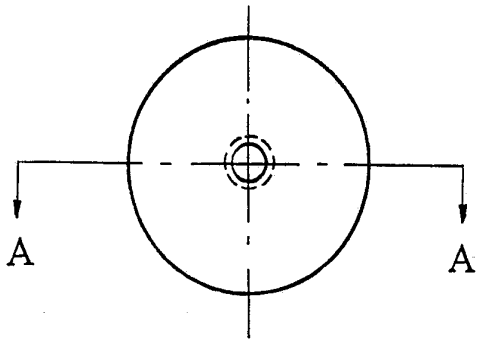
CLAIMS

1. A self-extinguishing candle, comprising a body of candle-material (1) having integrated therein a wick (2) which is enclosed throughout a portion of its length by a sleeve (3), c h a r a c t e r i s e d in that the sleeve (3) is disposed between the body of candle material (1) and the wick (2), and that the sleeve, at least throughout a portion of its length, closely encloses the wick, said sleeve (3) consisting of a difficultly inflammable material of good thermal conductivity and being formed with an aperture/apertures in its lateral face/faces and/or with a channel/channels for conducting molten or liquid candle material to the wick and/or the flame.

2. Candle as claimed in claim 1, c h a r a c t e r i s e d in that the sleeve (3) is so designed that a portion of the sleeve (3) or an element (6) applied to the sleeve (3) is not surrounded by molten or softened candle material, whereby the sleeve (3) is anchored in the candle body (1) and held centered in the candle.

3. Candle as claimed in claim 1, c h a r a c t e r i s e d in that the sleeve (3) is made of a material having such a structural composition as to allow molten or liquid candle material to pass through said material to the wick.

4. Candle as claimed in claim 1, c h a r a c t e r i s e d in that the sleeve (3) is made of a material having such a structural composition as to allow molten or liquid candle material to pass through said material to the flame.



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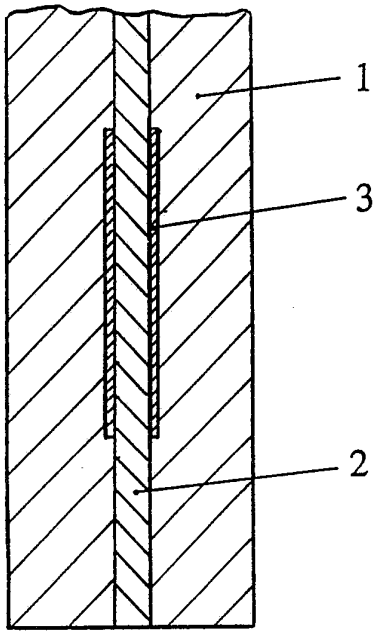


Fig. 1

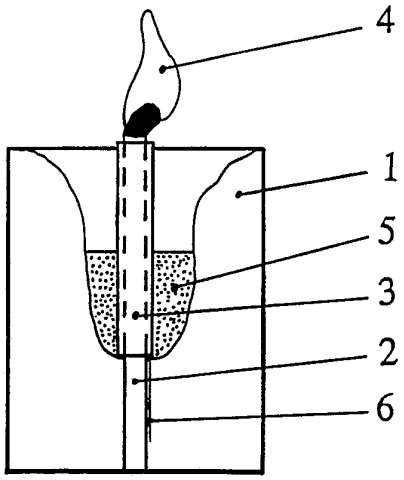


Fig. 2

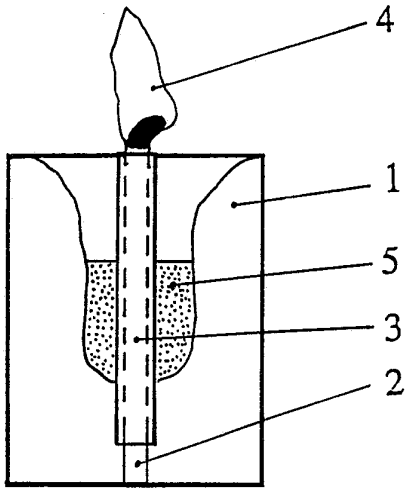


Fig. 3

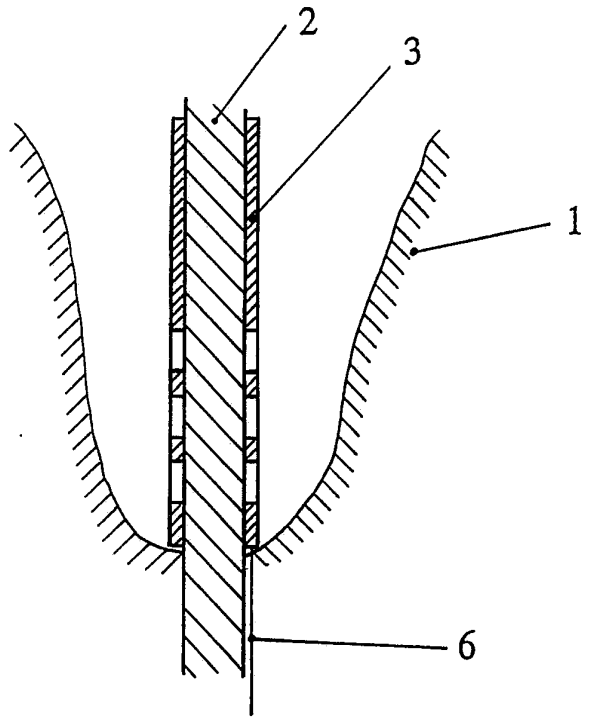


Fig. 4

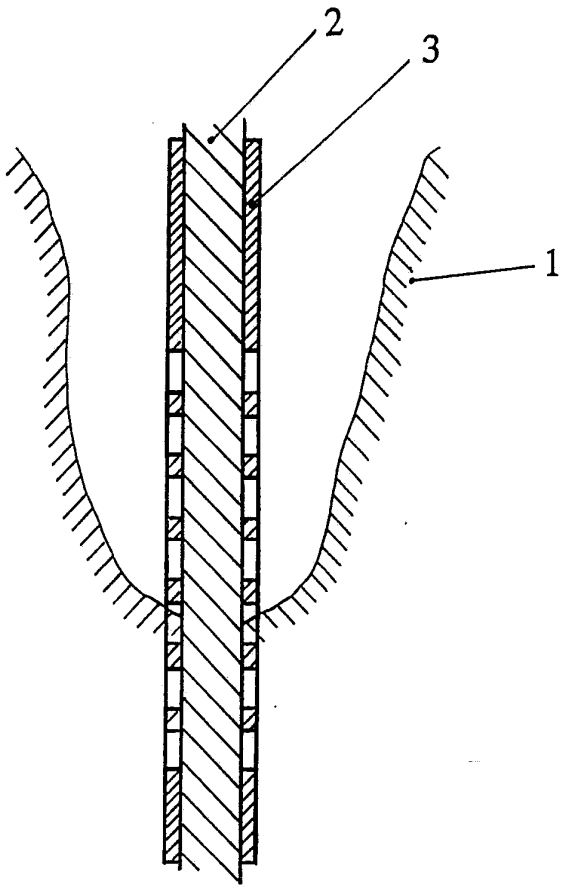


Fig. 5

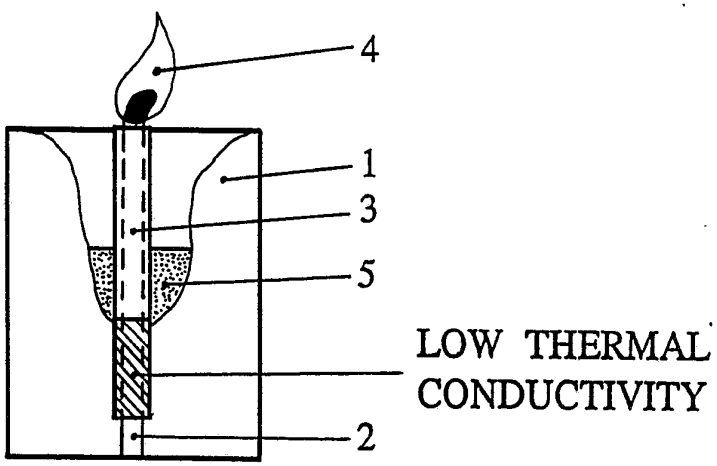


Fig. 6

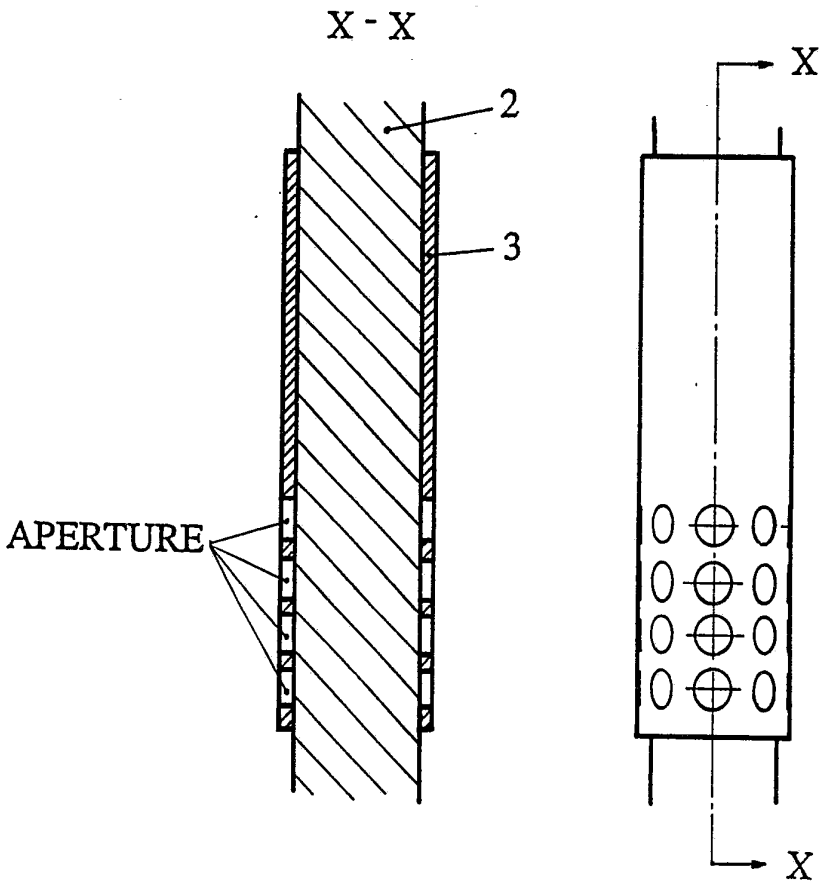


Fig. 7

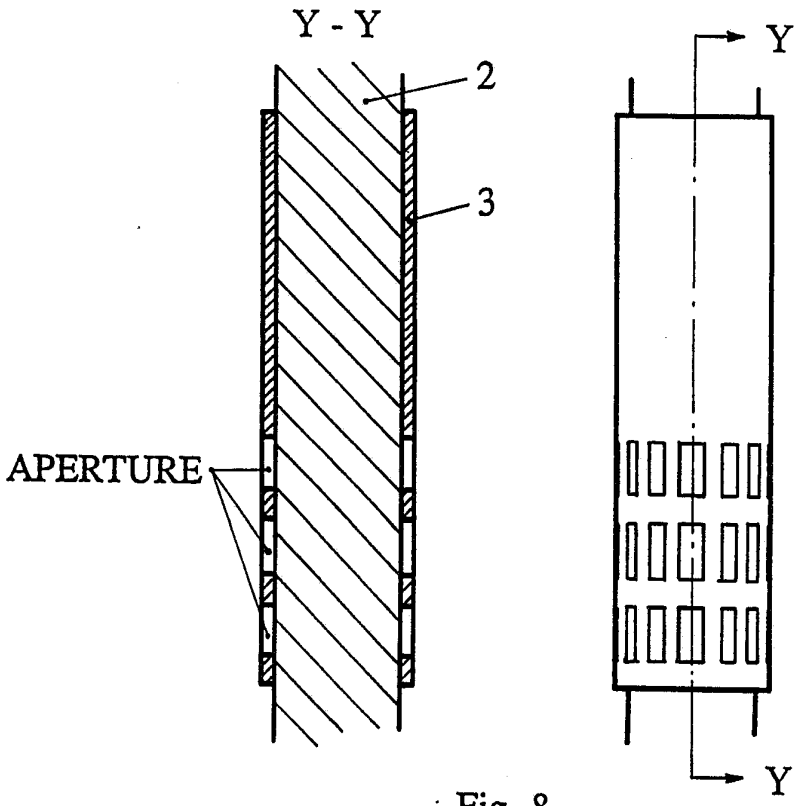


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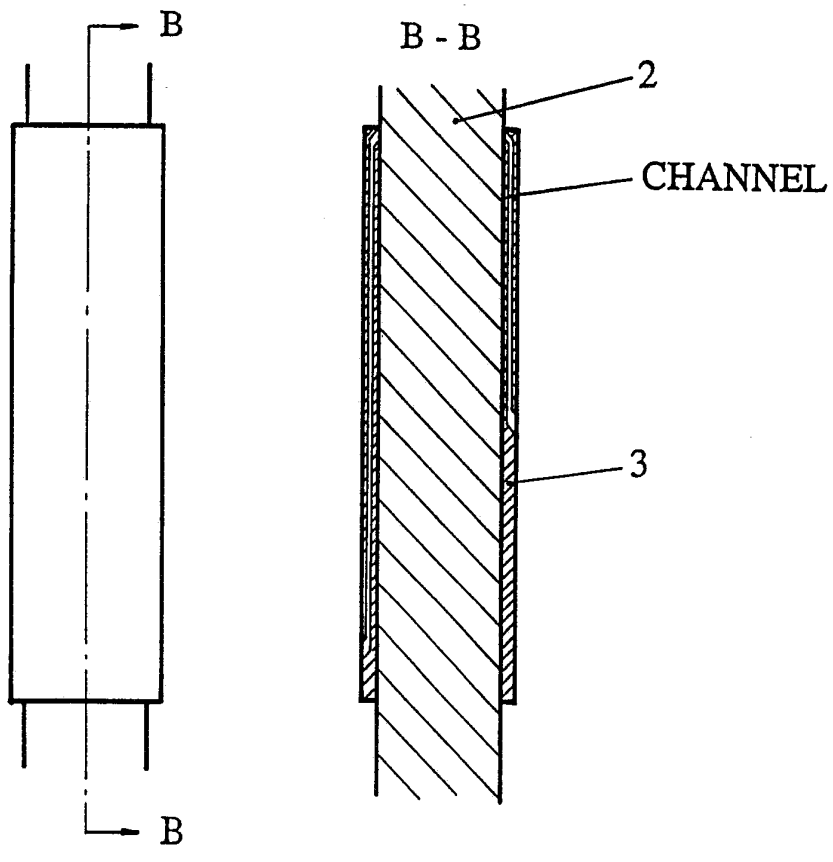


Fig. 9

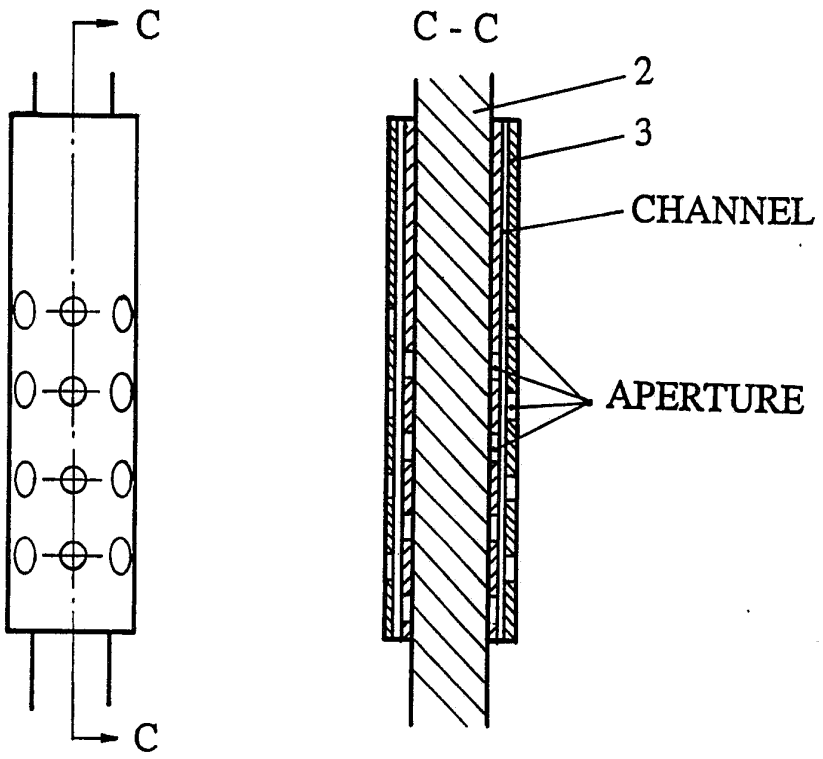


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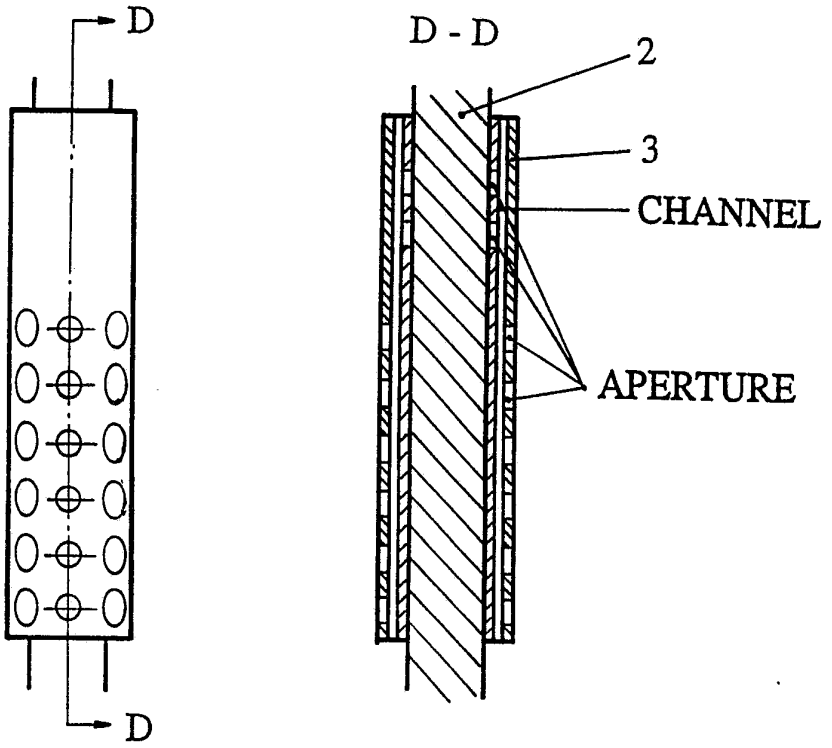


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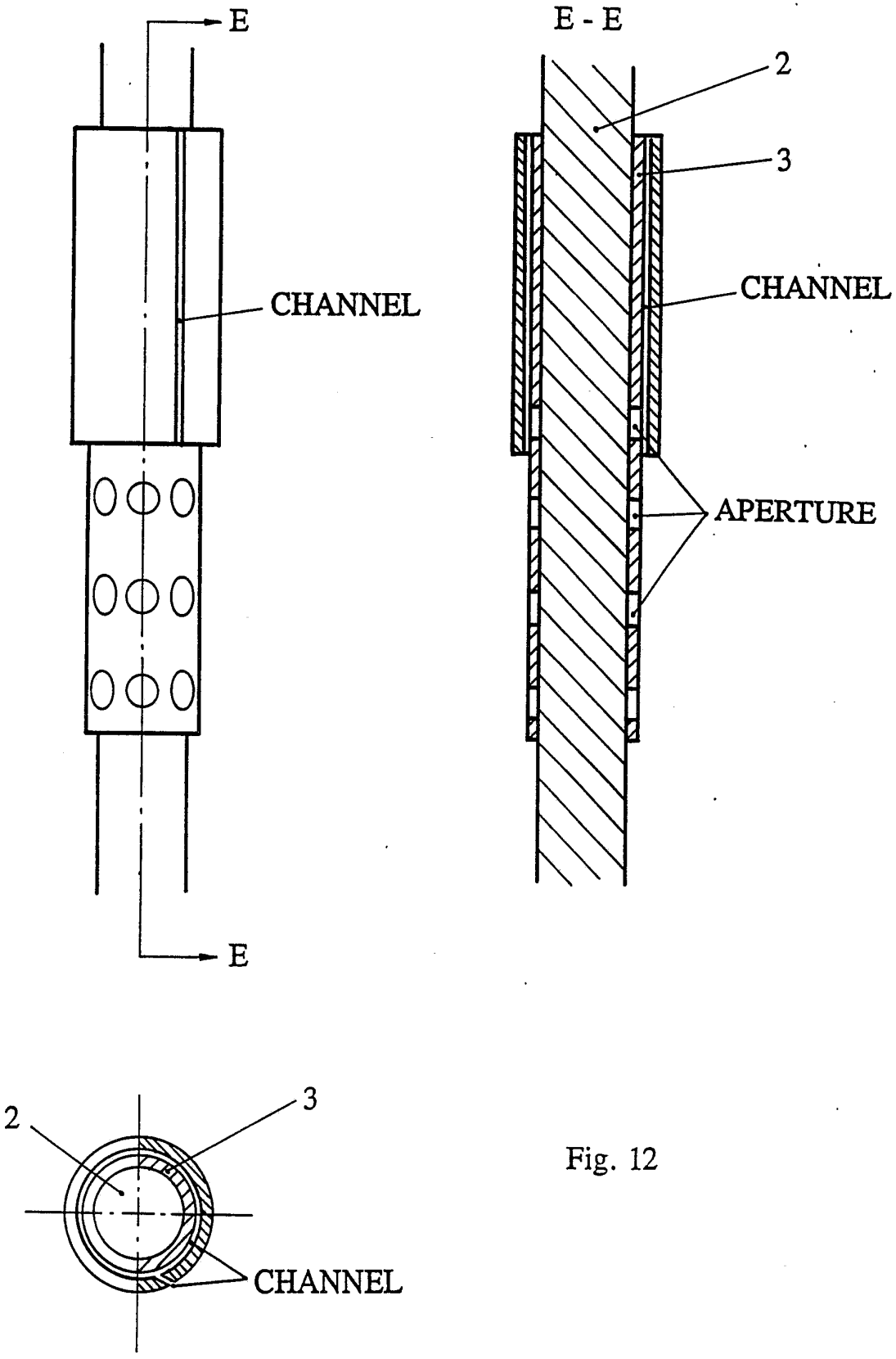


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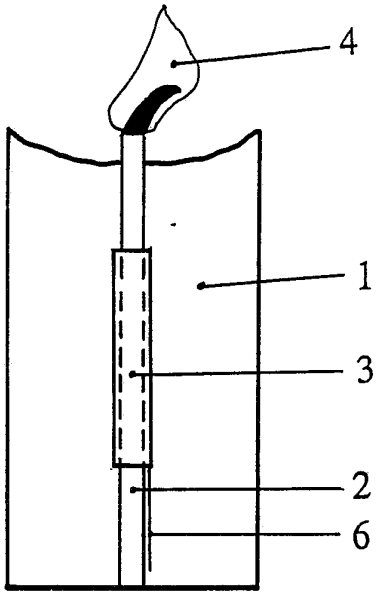


Fig. 13

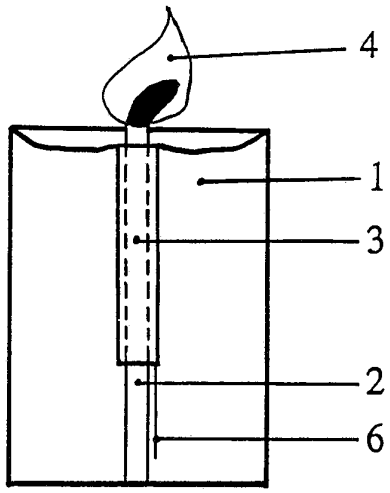


Fig. 14

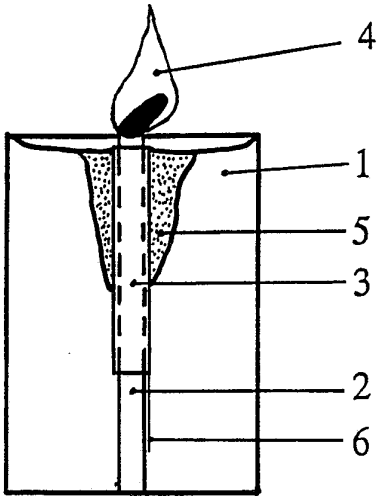


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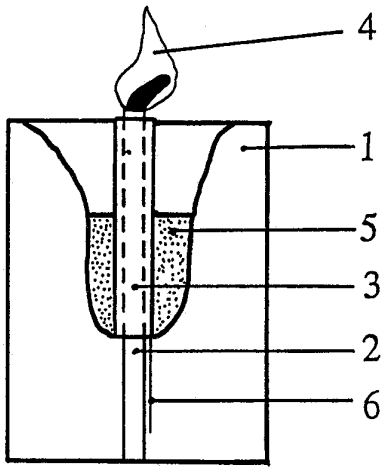


Fig. 16

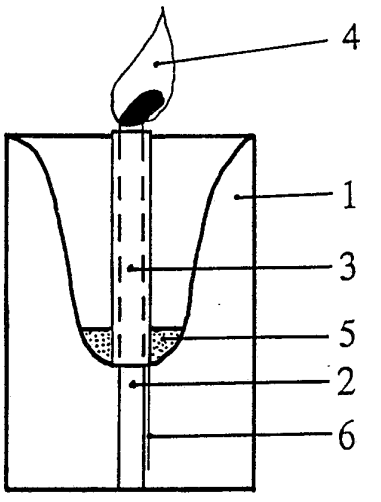


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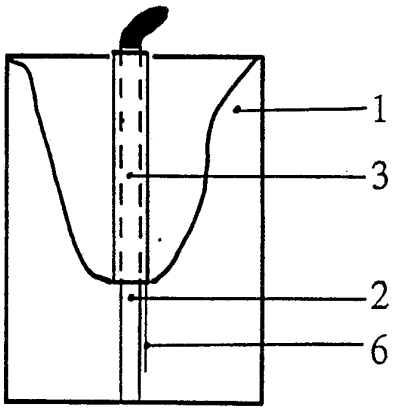


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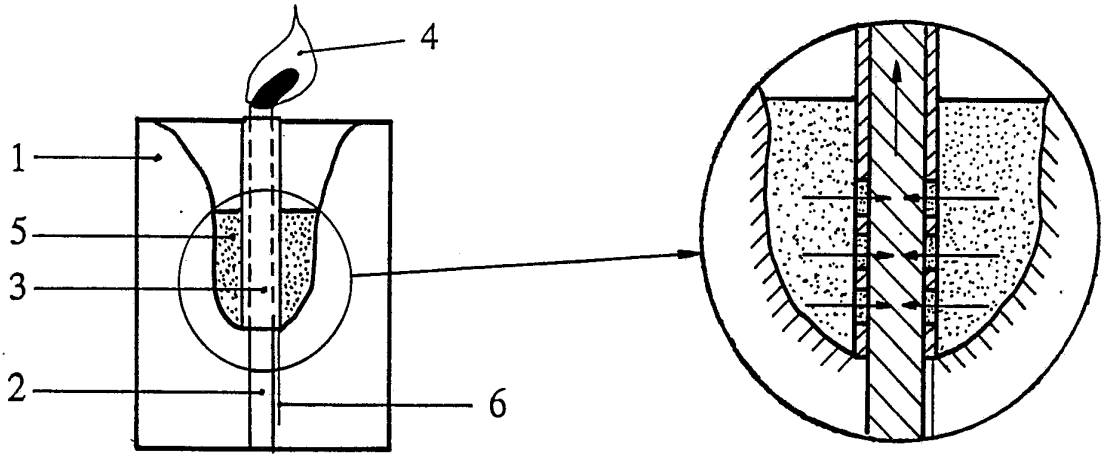


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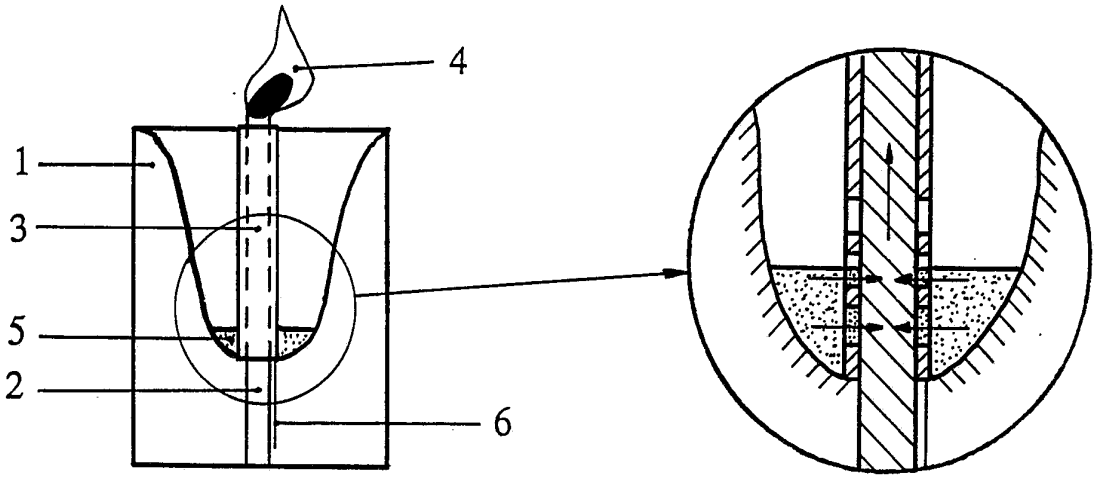


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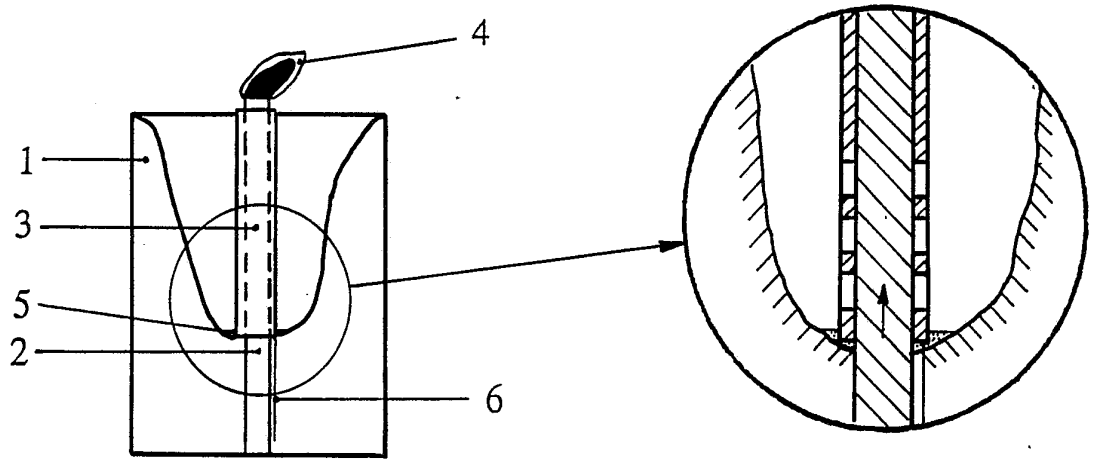


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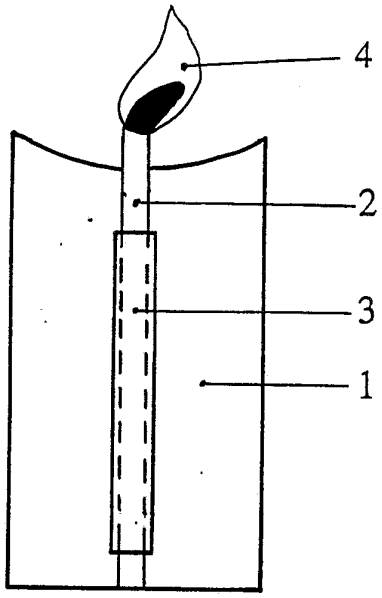


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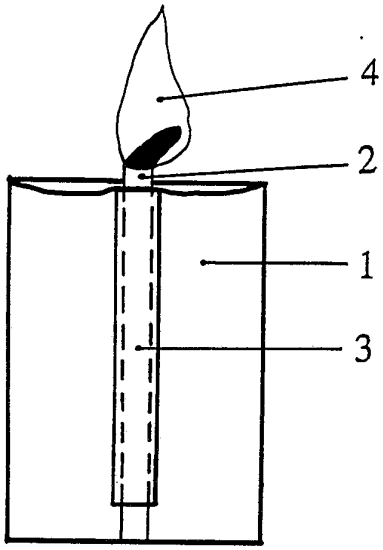


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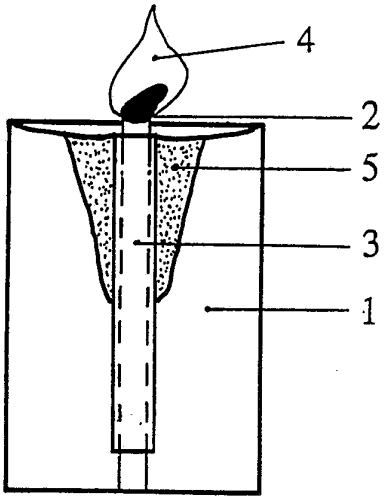


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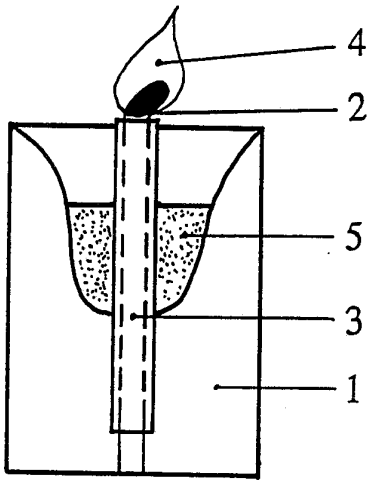


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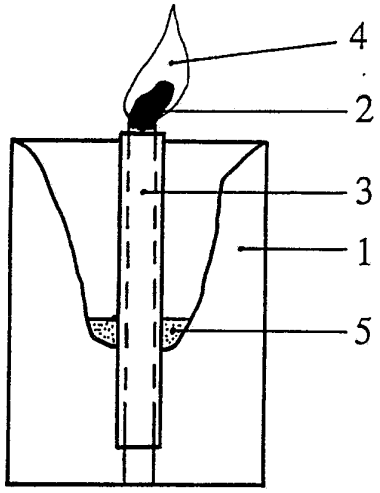


Fig. 26

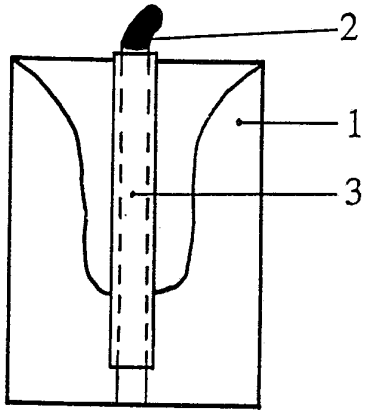


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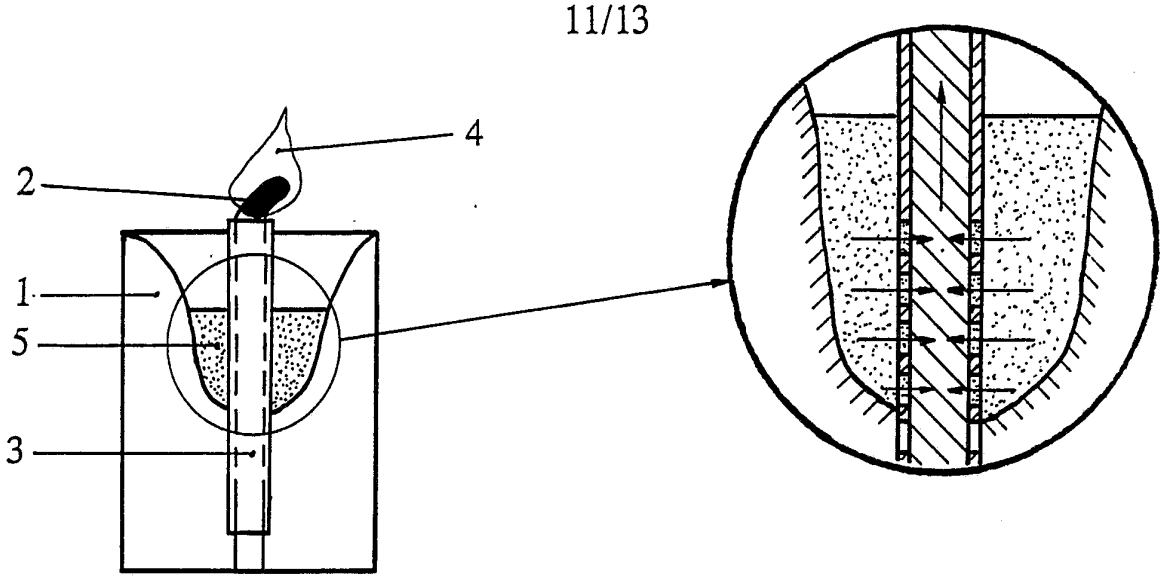


Fig. 28

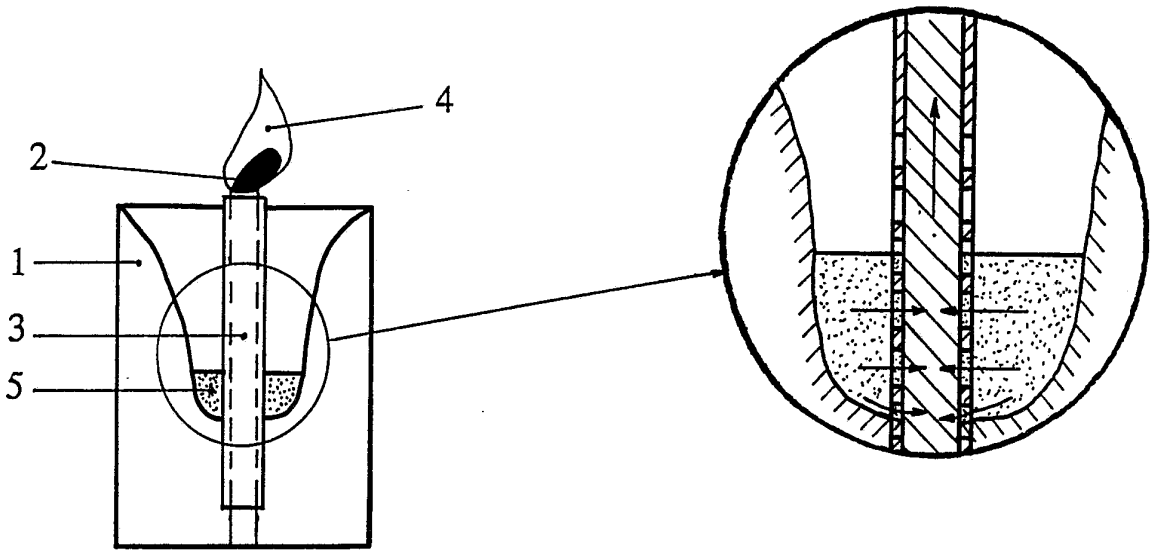


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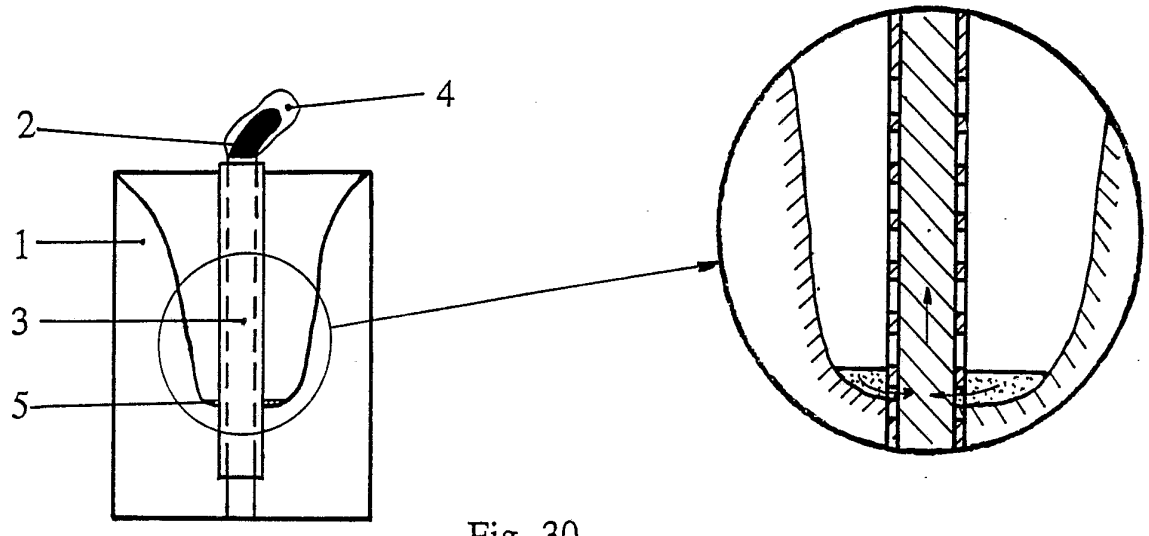


Fig. 30

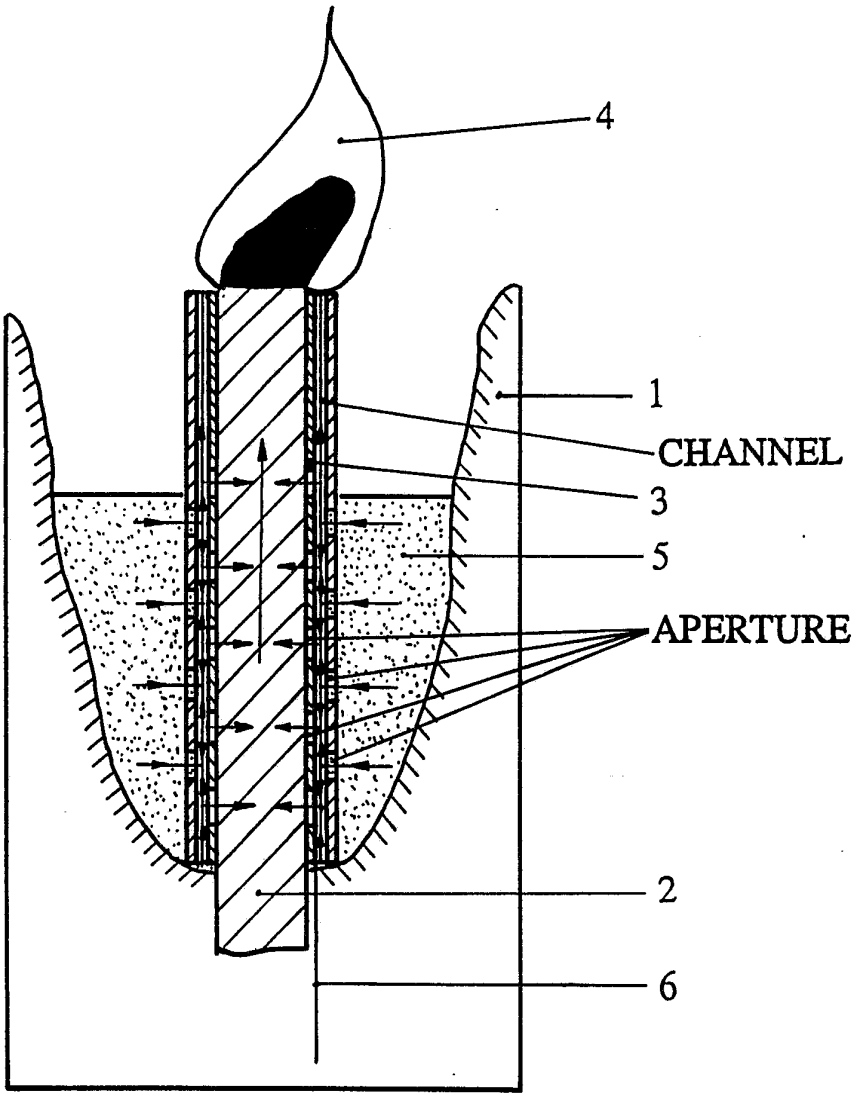


Fig. 31

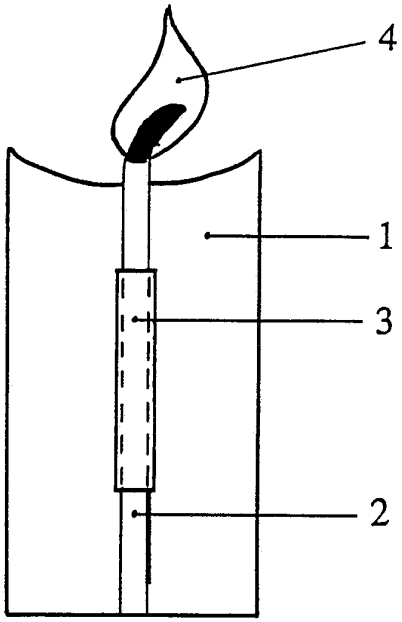


Fig.32

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 91/00757

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: C 11 C 5/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	C 11 C; F 23 Q

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
A	GB, A, 16986/1891 (G.E. FARROW) 14 November 1891, see page 1, line 24 - line 35 --	1-4
A	EP, A1, 0018839 (KENT, F.M.J.) 12 November 1980, see page 4, line 23 - line 30 --	1-4
A	FR, A, 1423888 (KAMEYAMA ROSOKU KABUSHIKI KAISHA) 29 November 1965, see Résumé --	1-4

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* Special categories of cited documents:[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
5th February 1992	1992 -02- 07
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Anders Bruun

Form PCT/ISA/210 (second sheet) (January 1985)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 91/00757

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 30/11/91
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A1- 0018839	80-11-12	GB-A- 2048300	80-12-10
		JP-A- 55152797	80-11-28
FR-A- 1423888	65-11-29	NONE	