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(54) **THE METHOD OF MANUFACTURING A COMBUSTIBLE CANDLE**

(57) The method of manufacturing a combustible candle consists in that a candle wick (6) is soaked in combustible material (7) and arranged in a guide (5) is inserted into a hydraulic press seat (1). The press seat (1) is then filled with the shredded combustible material (7), and then a press punch (9) is inserted into the press seat (1) at a pressure of 20 bar to 300 bar and a candle (13) of the combustible material (7) with the wick (6) is formed. Then the formed candle (13) is removed from the press seat. After filling the press seat (1) with the combustible material (7) and before inserting the punch (9) into the press seat, a flat element (8) of non-combustible material with a thickness of 0.03 mm to 0.75 mm is placed on the surface of the combustible material (7). In the same pressure forming operation of the candle at least one embossment (11) into the interior of the candle (13) is formed in said flat element (8) of non-combustible material using the punch (9). The flat element (8) of non-combustible material is a metal plate, wherein the press punch (9) cooperating with the plate comprises on the working surface at least one central embossment (10) towards the interior of the candle.

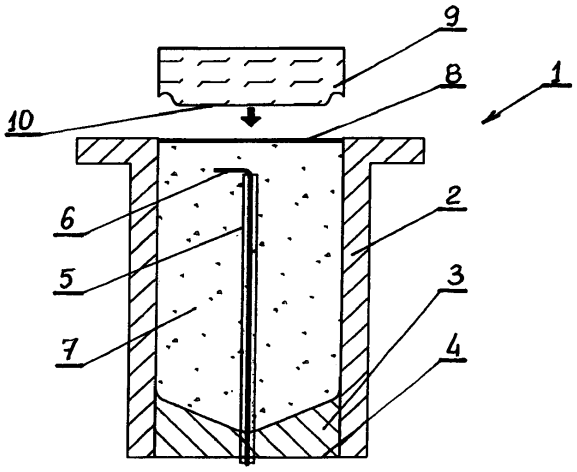

Fig. 2

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Description

[0001] The invention relates to the method of manufacturing a combustible candle intended for lighting purposes and/or for decorative or fragrance purposes.

[0002] A combustible candle is a source of light and usually solid fuel formed into a three-dimensional object, for example into a cylindrical shape with different degrees of slenderness, is used for its manufacture. Inside the object, usually across its entire length, a wick is typically placed centrally. Originally, candles were made from beeswax or animal fats. Currently, the raw material for making candles is most often paraffin or stearin. More and more often fragrances and/or colouring agents are added to the combustible material used to make candles.

[0003] International application WO 2007/088068 discloses a known solution for the design of a candle comprising a wick, a fuel and a candle holder, and also a candle holder to be used with candles. In addition, the invention relates to an attachment device comprising a candle comprising a candle holder and attachment material.

[0004] The candle contains a plate which is arranged in the area of the base of the candle. The plate has a surface which is not larger than the base of the candle, wherein the shape of the plate corresponds to the shape of the surface of the candle, in particular the plate and the base of the candle are round. The candle in this known solution is arranged on a fuel layer on the base of the candle. The plate of the candle is an aluminium plate in this known solution.

[0005] Another solution, known from patent specification PL 215068, discloses a method for manufacturing a block candle by filling a mould with liquid combustible material. According to this known solution, the mould is cooled to a temperature of 6°C to 20°C before the liquid combustible material is poured, and then the heated combustible material heated to a temperature of 30° to 55°, in the form of a dense liquid, is poured into the mould. Then, the raw material undergoes a pressing operation.

[0006] In another solution, known from patent specification US 4614625, prilled wax particles are coated by tumbling and rubbing the particles in a mixture with a scenting and/or a colouring agent in a flexible container, either by hand kneading or with a mechanical agitator. Liquid carriers compatible with the wax particles are included in the colouring and scenting agents to facilitate absorption of the agents into the combustible material particles. A candle is subsequently formed by moulding the coated particles under pressure into a candle with a central wick into either a free standing form or pressed into a surrounding container.

[0007] Another known solution is presented in patent specification EP 0265976. This known solution provides a composition of matter, which is suitable for manufacturing candles by extruding, which is based on stearic or palmitic acid. According to this known solution, the matter comprises 0.2-10% of a crystal modifier and optionally 0.5-15% of another, as to carbon chain length adjacent, natural fatty acid or such fatty acid derivative. Preferably the stearic/palmitic acid, according to this known solution, is a mixture of stearic acid and palmitic acid in the weight range of 20:80 - 80:20. The crystal modifier is of the ester type and is derived from a polyol with 2-4 hydroxyl groups and higher fatty acid and/or dimeric fatty acid.

[0008] In another solution, known from patent specification US 2004197722, a candle is provided which is formed of combustible material in the form of wax and has a wick. The candle body may be contained in a jar or container formed of non-combustible material. The candle has a bottom adapted to rest on a flat surface. A thermal barrier disc of thermally insulating material is secured to the bottom of the candle for insulating the surface from the candle. The thermal barrier in this known solution is a disc of cork that is coextensive with the bottom of the candle or jar and is secured to the bottom of the candle by a pressure-sensitive adhesive.

[0009] Another known solution of a candle is described in patent specification US 2013252187, also previously published as international application No. WO 2011133055. According to this known solution, a layer candle made of the granulated product is provided with the outer hardened layer. The candle inside is filled with the loose granulated product. The method of layer candle manufacturing consists in the preliminary heating of the outer layer of the candle and its further forming in the process of pressing.

[0010] The problem with the use of candles is the stage of burning out the remains of the candle. During use, when the flame is at a certain distance from the base, the problem of heat transfer to the base does not exist due to the layer of unburned and unmelted combustible material separating the flame from the base of the candle. When this layer gradually disappears, and the candle flame reaches the base, the temperature at the base of the candle increases rapidly and in extreme cases this state of the burning candle can lead to the ignition of the surface on which the candle is placed. The invention solves this problem by designing a manufacturing technology during which, in a single pressure operation of solidifying the combustible material of the candle, known from the prior art, the base of the candle is additionally equipped with a profiled element of non-combustible material.

[0011] The method of manufacturing a combustible candle according to the invention is disclosed in claim 1 and in subsequent claims.

[0012] The method of manufacturing a combustible candle consists in that a candle wick is soaked in combustible material and then at least one soaked wick arranged in a guide is inserted into at least one hydraulic press seat, where the interior of said hydraulic press seat is in the shape of a candle turned upside down. The press seat is then filled with the shredded combustible material, and then a press punch is inserted into the press seat at a pressure of 20 bar to 300 bar and a candle of the com-

bustible material with the wick inside the combustible material is formed under pressure for a period of 0,025 seconds to 20 seconds.

[0013] The method according to the invention is characterised in that after filling the press seat with the combustible material and before inserting the punch into the press seat to form a candle, a flat element of non-combustible material with a thickness of 0.03 mm to 0.75 mm is placed on the surface of the combustible material which, after the manufacture of the candle, forms the base of the candle. The shape of the flat element of non-combustible material is adapted to the shape of the candle base and fits into the opening of the press seat. In the same pressure forming operation of the candle at least one embossment into the interior of the candle is formed in said flat element of non-combustible material.

[0014] In a preferred embodiment of the invention, a metal plate is used as the flat element of non-combustible material, wherein the press punch cooperating with the metal plate comprises on the working surface at least one embossment towards the interior of the candle.

[0015] In another preferred embodiment of the invention, a flat element of non-combustible material may be metal mesh.

[0016] In another embodiment of the solution according to the invention, non-combustible fabric mesh is preferably used as a flat element of non-combustible material.

[0017] It is preferable that the combustible material be subjected to granulation in a rotary drum drier at a temperature of 44°C to 70°C before being inserted into the seat.

[0018] According to the invention, in the pressing operation of the combustible material of the candle, at the same time, a layer of non-combustible material which may be in the form of a plate or mesh, is attached under pressure. The layer is of such thickness that due to the operation of the press punch it is formed in the same operation in the manner described above. The press punch contains a central embossment, which in the pressure operation of solidifying the combustible material of the candle, forms a central embossment in said non-combustible layer, which eliminates the thermal contact between the tip of the burning wick and the surface. The wick burns out only to the embossment of said plate, under which there is an air gap, and goes out naturally. At the same time, the combustible material around the embossment remains unburned, because the candle wick does not reach there. The candle structure described thus solves the problem of securing the surface of the candle against fire and against the negative effects of the prolonged influence of increased temperature on the surface. Additional embossments in the form of circumferential channels and/or protrusions around the central embossment catching the tip of the burning wick are also preferable in the case where the wick tip could move beyond the outline of the non-combustible layer, if the candle burns on an uneven base. In a number of cases, users burn candles on decorations arranged by themselves, often in conditions of incorrect levelling of the candle.

[0019] The subject of the invention is shown in the following embodiment and is additionally illustrated in the attached drawing, in which the following figures show:

Fig. 1 - a cross-section of the press seat filled with combustible material and a flat element of non-combustible material,
Fig. 2 - a cross-section of the press seat prepared to receive the press seat,
Fig. 3 - a cross-section of the press seat after removal of the punch,
Fig. 4 - a cross-section of a candle with a wick after removal from the press seat,
Fig. 5 - a cross-section of a candle with a wick in another embodiment.

[0020] The accompanying Figs. 1, 2 and 3 show a press seat 1 for manufacturing a combustible candle for explaining the method of manufacturing a combustible candle according to the invention. Usually, multi-cavity moulds are used for this purpose, where in one technological process as many candles are made as there are seats in this type of a mould.

[0021] The press seat 1 comprises a cylindrical portion 2 closed from the bottom by a conical portion 3 with a seat bottom 4. The press seat 1 also comprises a candle wick 6 guide 5. The wick 6 guide 5 is usually a tube through which subsequent sections of the wick 6 are taken out of a reel not shown in the figures as the next formed candles are removed from the seat 1, after subsequent pressing operations.

[0022] Fig. 1 shows the press seat 1 filled with granulated combustible material 7. The upper surface of the granulated combustible material 7 is prepared for laying a flat element 8 of non-combustible material on it.

[0023] The combustible material is subjected in this embodiment to a known granulation process in a rotary drum dryer at a temperature of 57°C before being inserted into the seat 1. In other embodiments, loose combustible material 7 is used to fill the press seat 1. In this embodiment, the combustible material 7 is granulated paraffin with a pour point of 56°C to 60°C, for example with a pour point of 58°C. In other embodiments, the combustible material 7 may be microwaxes with a pour point of 56°C to 60°C, vegetable or animal fats with an iodine value from 0.025 to 70, preferably from 1 to 30, palm and/or soy and/or rapeseed and/or sunflower fats, fat derivatives in the form of fatty acids and palmitic and/or stearic acid fatty alcohols, or fatty alcohols, e.g. cetyl alcohol.

[0024] The candle wick 6 in this embodiment has the form - known from the prior art - of a cotton string with a diameter of 2 mm . In other embodiments, the wick 6 may be in the form of a string partly or entirely made of artificial fibres or cellulose fibres with diameters ranging from 0.5

mm to 7 mm. The candle wick 6 is soaked in combustible material before being put into the guide 5.

[0025] Fig. 2 shows the seat 1 with the combustible material 7 arranged in the seat 1 and covered with the flat element 8 of non-combustible material. In this embodiment, the flat element 8 is a 0.5 mm thick aluminium metal plate. The plate has a shape corresponding to the shape of the charging opening of the seat 1 and fits into the opening. The flat element 8 is arranged on the surface of the combustible material 7, i.e. on the surface of the base of the future combustible candle. This is shown in Fig. 2.

[0026] Fig. 1, Fig. 2 and Fig. 3 show that the flat element 8 of non-combustible material forms the basis of the future combustible candle. The above-mentioned Fig. 2 also shows a press punch 9, ready to start the pressing operation of the combustible material 7 of the candle, along with the flat element 8 of combustible material arranged on the surface of the combustible material.

[0027] The press punch 9 comprises a central embossment 10 on the working surface, in the symmetry axis of the future candle. As shown in the attached drawings, the press seat 1 in this embodiment is cylindrical, with a conically shaped top of the future candle and a flat base of the future candle. The candle wick 6 is positioned in this embodiment in the axis of symmetry of the cylindrical candle seat 1. In other embodiments, the dimensional proportions of the candle may be different, but typically the wick 6 is positioned in the symmetry axis of the combustible candle.

[0028] Fig. 3 shows the candle seat 1 after removal of the punch 9, after the pressure forming operation of the candle. As can be seen in this figure, the flat element 8 in the form of an aluminium plate was connected with the candle base by pressing and at the same time in the same operation in this element 8 in the form of a plate an embossment 11 was formed. The finished candle can be removed from the mould upwards by pulling the next section of the wick 6 behind it in the guide 5 to produce another candle in the next technological cycle in the same seat 1.

[0029] The finished candle 13, after cutting off the excess wick 6, is shown in a cross-section in Fig. 4. The candle 13 in this figure is shown in the working position placed on the base, with the conical portion ended with the wick 6 directed upwards. It is shown here that, in the flat element 8, simultaneously with the pressure forming of the combustible material 7 of the candle, an embossment 11 in the flat element 8 of non-combustible material was made. The embossment 11 has a round shape in this embodiment. The embossment 11 provides an air gap under the candle base, which protects against direct contact of the burning out wick 6 with the surface on which the candle 13 is placed.

[0030] In other embodiments of the solution according to the invention, the embossment 11 may have a different shape, according to the shape of the punch 9 embossment 10. In other embodiments, the punch 9 may be provided with other forms on a working surface, shaping other forms of embossments of the flat element 8. Fig. 5 shows an example of a candle 13, where the round, flat aluminium element 8 comprises on the surface around the central embossment 11, an additional circumferential embossment 12, which additionally protects from overheating or from fire other fragments of the surface on which the candle 13 can be placed. The circumferential embossment 12 additionally prevents the burning out wick 6 from moving to the circumferential edge of the candle 13, which can occur in the liquid combustible material near the bottom of the burning out candle 13 when placed on a sloping surface.

[0031] In other embodiments, the punch 9 may have other forms of embossments on the working surface, including, for example, radial embossments or combinations of circumferential and radial embossments. Such combinations of embossments can also prevent the situation when the candle 13 placed diagonally causes the burning end of the wick to flow down from the central embossment 11 towards the edge of the candle base during the burning out phase. The described combinations of embossments stop the flowing burning wick 6 and prevent unfavourable temperature phenomena at the contact with the surface of the outer zones of the candle 13 base. After the pressure forming of the candle according to the invention, the finished candle 13 can be subjected to further technological operations, such as coating with an outer coloured layer.

List of designations in the figure.

[0032]

1. Press seat.
2. Cylindrical portion of the seat.
3. Conical portion of the seat.
4. Seat bottom.
5. Wick guide.
6. Wick.
7. Combustible material.
8. Flat element.
9. Punch.
10. Punch embossment.
11. Flat element central embossment.
12. Flat element circumferential embossment.
13. Candle.

Claims

1. The method of manufacturing a combustible candle consisting in that a candle wick (6) is soaked in combustible material (7) and then the soaked wick (6) arranged in a guide (5) is inserted into a hydraulic press seat (1), where the interior of said press seat (1) is in the shape of a candle turned upside down, and the press seat (1) is then filled with the shredded

combustible material (7), and then a press punch (9) is inserted into the press seat (1) at a pressure of 20 bar to 300 bar and a candle (13) of the combustible material (7) with the wick (6) inside the combustible material (7) is formed under pressure for a period of 0,025 seconds to 20 seconds, and then the formed candle (13) is removed from the press seat,
characterised in that
after filling the press seat (1) with the combustible material (7) and before inserting the punch (9) into the press seat to form a candle, a flat element (8) of non-combustible material with a thickness of 0.03 mm to 0.75 mm is placed on the surface of the combustible material (7), wherein the shape of said flat element (8) of non-combustible material is adapted to the shape of the candle (13) base and fits into the opening of the press seat (1), wherein in the same pressure forming operation of the candle at least one embossment (11) into the interior of the candle (13) is formed in said flat element (8) of non-combustible material.

2. The method of manufacturing according to claim 1, **characterised in that** a metal plate is used as the flat element (8) of non-combustible material, wherein the press punch (9) cooperating with the plate comprises on the working surface at least one central embossment (10) towards the interior of the candle (13).

3. The method of manufacturing according to claim 1 or 2, **characterised in that** metal mesh is used as the flat element (8) of non-combustible material.

4. The method of manufacturing according to claim 1 or 2, **characterised in that** non-combustible fabric mesh is used as the flat element (8) of non-combustible material.

5. The method of manufacturing according to claim **1,characterised in that** the combustible material (7) is subjected to granulation at a temperature of 44°C to 70°C before being inserted into the seat (1).

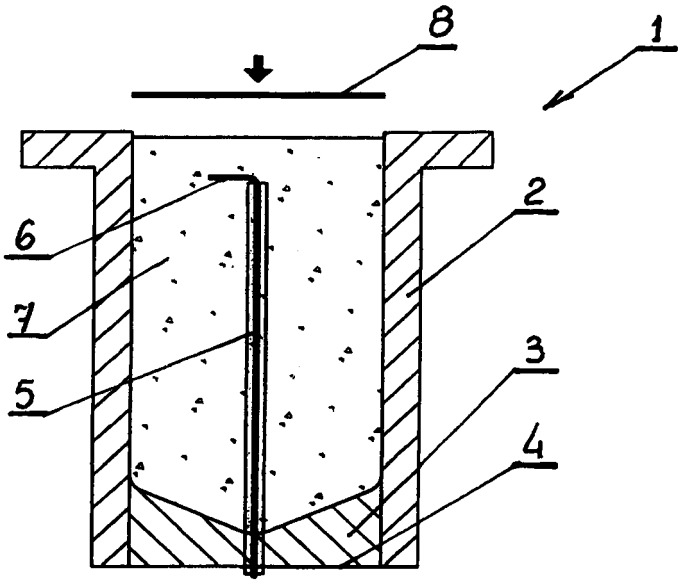

Fig. 1

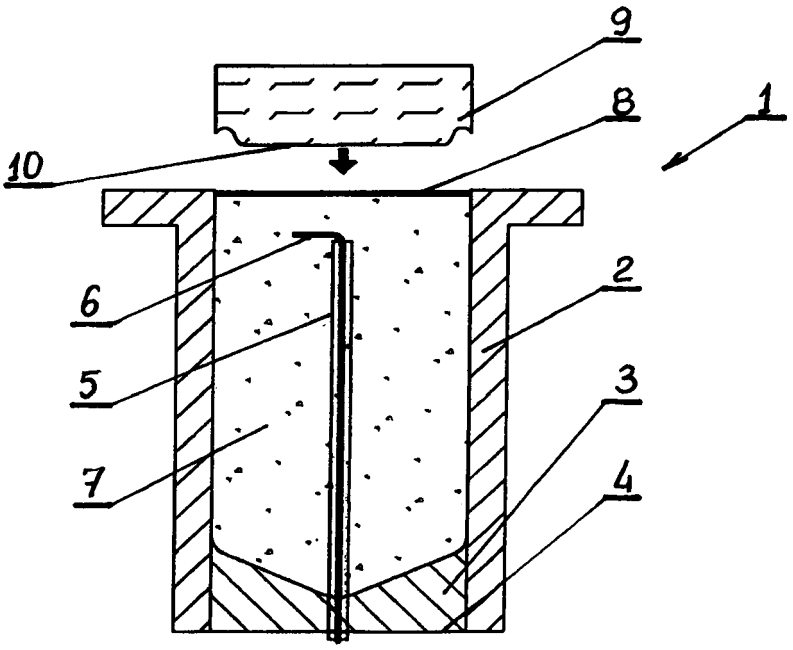

Fig. 2

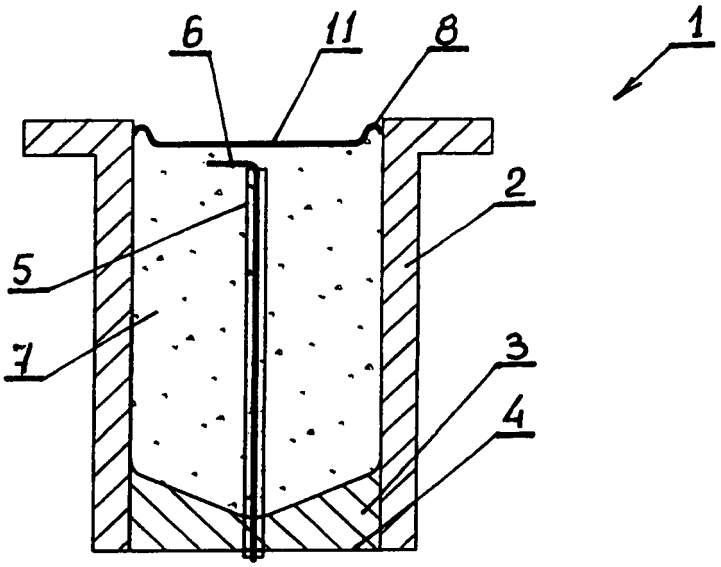

Fig. 3

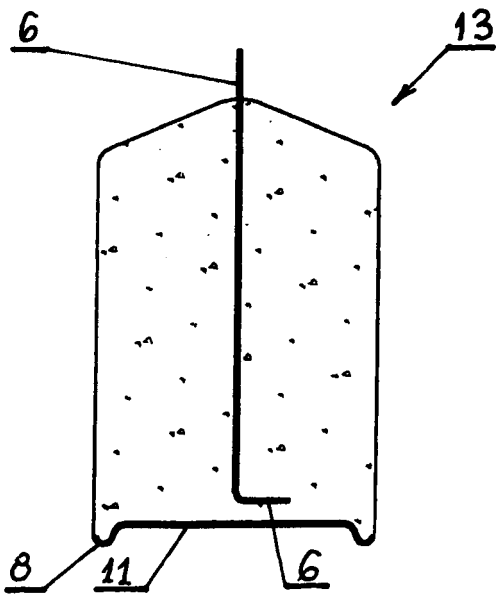

Fig. 4

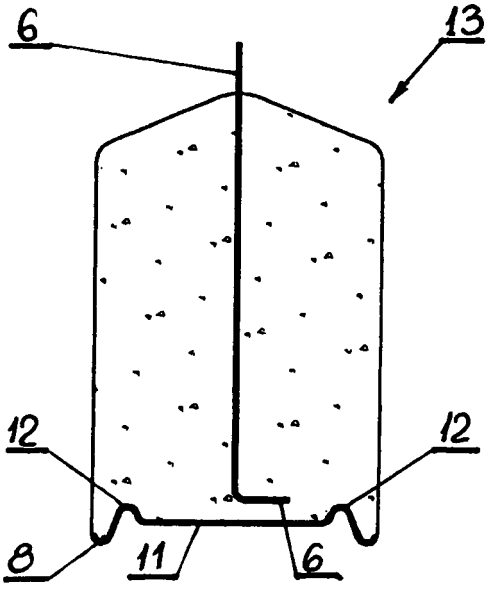

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 18 46 0065

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	DE 20 2016 000545 U1 (KLEWE HERBERT [DE]) 21 April 2016 (2016-04-21) * paragraphs [0019], [0068], [0069] * * figures 1,3,6 * * the whole document *	1-5	INV. C11C5/02
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TECHNICAL FIELDS SEARCHED (IPC)
C11C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	30 April 2019	Rooney, Kevin

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- PL 215068 **[0005]**
- US 4614625 A **[0006]**
- EP 0265976 A **[0007]**
- US 2004197722 A **[0008]**
- US 2013252187 A **[0009]**
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