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(54) ILLUMINATION DEVICE FOR AN INDUCTION HOB

(57) Illumination device for an induction hob comprising at least one induction coil (6) configured for generating a magnetic field (B). The illumination device (1) comprises a flexible support (2) configured for being arranged around the induction coil (6). The support (2) comprises at least one conductor track (3, 4) and a connection circuit (5) in which illumination means are connected. The two ends (20) of the support (2) are connected to one another such that the at least one conductor track (3, 4) forms an induced coil in which a current is generated when the induction coil (6) generates a magnetic field, and the connection circuit (5) is connected to the induced coil.

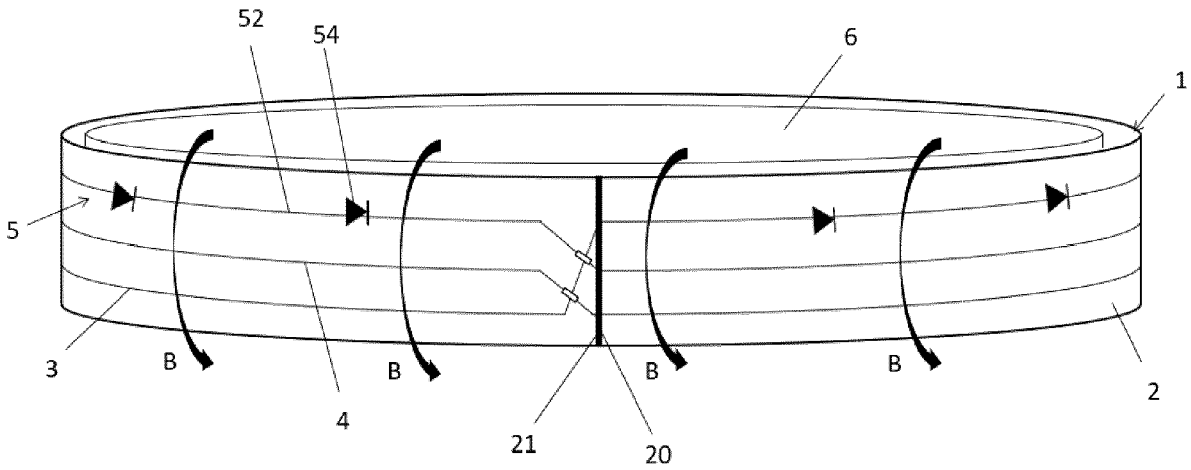

FIG. 3

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Description

TECHNICAL FIELD

[0001] The present invention relates to illumination devices for induction hobs and to induction hobs incorporating said illumination device.

PRIOR ART

[0002] Induction hobs comprising at least one induction coil arranged under an induction cooktop and configured for generating a magnetic field for heating a cooking vessel arranged on the induction cooktop over said induction coil are known. In general, induction cooktops usually comprise visual markings to indicate to the user the cooking areas where the induction coils are arranged. However, said visual markings are usually prone to fade over time, such that the cooking areas are no longer clearly visible for the user.

[0003] Different solutions for achieving a permanent indication of the cooking areas by illumination means arranged under the induction cooktop around each induction coil are known.

[0004] For example, DE19546853A1 relates to a visual indicator for an induction hob comprising at least one induction coil. The visual indicator comprises a wire forming at least one turn around the induction coil such that the magnetic field generated by said induction coil induces a current in said wire. The visual indicator also comprises illumination means, for example LED diodes connected to said cable, said illumination means being arranged around the induction coil.

[0005] In addition, US6828530B2 relates to an illumination apparatus for an induction coil comprising a support comprising a conductor track by way of an induced coil in which a current is induced when the induction coil generates a magnetic field, and illumination means connected to said induced coil. The support is preferably a PCB and shaped in a circular section, with several illumination apparatus being arranged around each induction coil.

DISCLOSURE OF THE INVENTION

[0006] The object of the invention is to provide an illumination device and an induction hob incorporating said illumination device, as defined in the claims.

[0007] A first aspect relates to an illumination device for an induction hob comprising at least one induction coil configured for generating a magnetic field.

[0008] The illumination device of the invention comprises a support configured for being arranged around the induction coil, said support comprising at least one conductor track, and a connection circuit in which illumination means are connected.

[0009] The support is flexible and comprises a first end and a second end fixed to one another, the support thus delimiting the contour of the induction coil.

[0010] The at least one conductor track and the connection circuit extend from the first end of the support to the second end of the support. The two ends of the support are connected such that the at least one conductor track forms an induced coil in which a current is generated when the induction coil generates a magnetic field, and the connection circuit is connected to the induced coil.

[0011] Arranging the induced coil and the illumination means in a support facilitates assembly of the illumination device, since the operator has to handle a single element.

[0012] Furthermore, being able to encircle the induction coil without having to manufacture a support having a circular ring shape, but rather the fact that said circular ring shape is acquired upon fixing the ends of the support to one another prevents material wastage when manufacturing the support. Since the induction coil is a circular element, the support of the illumination device described in US6828530B2 has a circular ring shape or circular ring segment shape, with a great deal of material being wasted when manufacturing said supports. By manufacturing the support of the illumination device of the invention, better use of the material is achieved since, as discussed above, said support acquires the circular ring shape when fixing its ends to one another and not when cutting the material from which the support is made.

[0013] A second aspect relates to an induction hob.

[0014] The induction hob of the invention comprises an induction cooktop, at least one induction coil arranged below the induction cooktop, and an illumination device such as the one described in the first aspect of the invention arranged around said induction coil. The illumination device is configured for indicating, with the illumination means, the location of the induction coil when said induction coil generates a magnetic field.

[0015] These and other advantages and features of the invention will become apparent in view of the figures and the detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0016]

Figure 1 shows a view of a first embodiment of the illumination device of the invention before fixing the ends of the support to one another.

Figure 2 shows a first perspective view of the illumination device of Figure 1 arranged around an induction coil.

Figure 3 shows a second perspective view of the illumination device of Figure 1 arranged around an induction coil.

Figure 4 shows a view of a second embodiment of the illumination device of the invention before fixing the ends of the support to one another.

Figure 5 shows a view of a third embodiment of the illumination device of the invention before fixing the ends of the support to one another.

Figure 6 shows a schematic view of an embodiment of the induction hob of the invention.

DETAILED DISCLOSURE OF THE INVENTION

[0017] A first aspect of the invention relates to an illumination device 1 for an induction hob 7 comprising at least one induction coil 6 configured for generating a magnetic field B.

[0018] The illumination device 1, 1', 1" comprises a support 2, 2', 2" configured for being arranged around the induction coil 6. The support 2, 2', 2" is flexible and comprises a first end 20, 20', 20" and a second end 21, 21', 21" fixed to one another, the support 2, 2', 2" thus delimiting the contour of the induction coil 6. The first end 20, 20', 20" and the second end 21, 21', 21" of the support 2, 2', 2" are preferably fixed to one another by means of welding. The ends of the support 2, 2', 2" are alternatively fixed to one another by means of an intermediate part, preferably a flat connector.

[0019] The support 2, 2', 2" comprises at least one conductor track 3, 4, 3', 3", 4" and a connection circuit 5, 5', 5" in which illumination means are connected. The at least one conductor track 3, 4, 3', 3", 4" and the connection circuit 5, 5', 5" extend from the first end 20, 20', 20" of the support 2, 2', 2" to the second end 21, 21', 21" of the support 2, 2', 2".

[0020] The two ends 20, 21, 20', 21', 20", 21" of the support 2, 2', 2" are connected such that the at least one conductor track 3, 4, 3', 3", 4" forms an induced coil in which a current is generated when the induction coil 6 generates a magnetic field, and the connection circuit 5, 5', 5" is connected to the induced coil. Therefore, the current induced in the induced coil is what powers the illumination means. Based on the current needed to power the illumination means, the support 2', 2', 2" will comprise a single conductor track 3' or several conductor tracks 3, 4, 3", 4". In the event that the support 2' comprise a single conductor track 3', single conducted turn will be formed by fixing the ends 20, 21, 20", 21" of the support 2' to one another, and the induced coil will therefore comprise a single induced turn. In the event that a higher current is required, the support 2, 2" will comprise several conductor tracks 3, 4, 3", 4" which will form a plurality of induced turns connected in series by fixing the ends 20', 21' of the support 2, 2" to one another, and the induced coil will therefore comprise said plurality of induced turns connected in series.

[0021] The induced coil and the connection circuit 5, 5', 5" have a first terminal 40, 50, 30', 50', 30", 50" arranged at the first end 20, 20', 20" of the support 2, 2', 2" and a second terminal 31, 51, 31', 51', 41", 51" arranged at the second end 21, 21', 21" of the support 2, 2', 2", the second terminal 31, 31', 41" of the induced coil being connected with the first terminal 50, 50', 50" of the connection circuit 5, 5', 5" and the second terminal 51, 51', 51" of the connection circuit 5, 5', 5" being connected with the first terminal 40, 30', 30" of the induced coil when the two ends of the support 2, 2', 2" are fixed to one another.

[0022] The support 2, 2', 2" is preferably a flexible printed circuit, with the at least one conductor track 3, 4, 3', 3", 4" and the circuit connection 5, 5', 5" being printed tracks on said tape. The support can alternatively be produced by subtractive manufacturing (PCB etching) in which a copper-coated sheet is used as the starting material, and in it the at least one conductor track and the connection circuit are generated, removing the excess copper.

[0023] Furthermore, the support 2, 2', 2" is preferably a flexible tape, i.e., the support 2, 2', 2" preferably has an elongated shape before fixing the first end 20, 20', 20" and the second end 21, 21', 21" to one another. Said tape can be manufactured, for example, from PET, PEN, PC, or Kapton.

[0024] The illumination means preferably comprise at least one LED 54, 54', 54", said LED 54, 54', 54" preferably being an SMD LED.

[0025] The connection circuit 5, 5' preferably comprises at least one connection track 52, 52' extending from the first end 20, 20', 20" of the support 2, 2', 2" to the second end 21, 21', 21" of the support 2, 2', 2", and the illumination means comprise a plurality of LEDs 54, 54', said LEDs 54, 54' being arranged in series connected to one another by means of said at least one connection track 52, 52'.

[0026] The connection circuit 5" alternatively comprises a connection track 52" extending from the first end 20" of the support 2", an additional connection track 53" extending from the second end 21" of the support 2", and a plurality of parallel branches 55", each parallel branch 55" comprising a first terminal connected to the connection track 52" and a second terminal connected to the additional connection track 53". Furthermore, the illumination means comprise a plurality of LEDs 54", arranging each LED 54" in a respective parallel branch 55". Each parallel branch can optionally comprise an impedance to limit the current circulating through the LED of the corresponding parallel branch.

[0027] A second aspect relates to an induction hob 7.

[0028] The induction hob 7 of the invention comprises an induction cooktop 70, at least one induction coil 6 arranged below the induction cooktop, and an illumination device 1, 1', 1" such as the one described above arranged around said induction coil 6. The illumination device 1, 1', 1" is configured for indicating, with the illumination means, the location of the induction coil 6 when said induction coil 6 generates a magnetic field B.

[0029] The induction hob preferably comprises a ring arranged around the induction coil 6, with the support 2, 2', 2" being fixed to said ring.

[0030] The induction hob preferably comprises a light

guide arranged on the illumination device 1, 1', 1".

[0031] Figures 1 to 3 show a first embodiment of the illumination device 1 of the invention.

[0032] The illumination device 1 of the first embodiment comprises a flexible support 2 configured for being arranged around an induction coil 6.

[0033] The support 2 of this first embodiment has a rectangular shape and comprises a first end 20 and a second end 21, as shown in Figure 1, wherein the support 2 is shown before fixing its ends 20, 21 to one another.

[0034] Figures 2 and 3 show the support 2 once the first end 20 and the second end 21 have been fixed to one another, with the support 2 being arranged around an induction coil 6 configured for generating a magnetic field B.

[0035] The support 2 of this first embodiment comprises a first conductor track 3, a second conductor track 4, and a connection circuit 5 in which illumination means are connected. In this first embodiment, the illumination means comprise a plurality of SMD LEDs. The first conductor track 3, the second conductor track 4, and the connection circuit 5 extend from the first end 20 of the support 2 to the second end 21 of the support 2.

[0036] The support 2 of this first embodiment is a flexible printed circuit, with the first conductor track 3, the second conductor track 4, and the circuit connection 5 being printed tracks.

[0037] In this first embodiment, the two ends 20, 21 of the support 2 are fixed to one another, preferably by means of welding, such that the first conductor track 3 forms a first induced turn and the second conductor track 4 forms a second induced turn, said induced turns being connected in series such that they form an induced coil in which a current is generated when the induction coil 6 generates a magnetic field B. Furthermore, by connecting the two ends 20, 21 of the support 2, the connection circuit 5 is connected to the induced coil. Therefore, the current induced in the induced coil is what powers the illumination means.

[0038] In this first embodiment, the first conductor track 3 comprises a first terminal 30 arranged at the first end 20 of the support 2 and a second terminal 31 arranged at the second end 21 of the support 2. Likewise, the second conductor track 4 comprises a first terminal 40 arranged at the first end 20 of the support 2 and a second terminal 41 arranged at the second end 21 of the support 2. As discussed above, by fixing the two ends 20, 21 of the support 2 to one another, the induced turns generated by the first conductor track 3 and the second conductor track 4 are connected in series since the second terminal 41 of the second conductor track 4 is connected to the first terminal 30 of the first conductor track 3, forming the induced coil comprising a first terminal 40 at the first end 20 of the support and a second terminal 31 at the second end 21 of the support 2.

[0039] Furthermore, in this first embodiment, the connection circuit 5 comprises a connection track 52 extending from the first end 20 of the support 2 to the second end 21 of the support 2, such that the connection track 52 comprises a first terminal 50 arranged at the first end 20 of the support 2 and a second terminal 51 arranged at the second end 21 of the support 2. The plurality of LEDs of the illumination means are connected in series by means of the connection track 52.

[0040] Therefore, in this first embodiment, by fixing the two ends 20, 21 of the support to one another, the second terminal 31 of the induced coil is connected with the first terminal 50 of the connection circuit 5, and the second terminal 51 of the connection circuit 5 is connected with the first terminal 40 of the induced coil, as observed in Figure 3. In order to make these connections between the different printed tracks in the support 2, the first conductor track 3 overlaps the second conductor track 4 at one point and the connection track 52 at another point. The second conductor track 4 and the connection track 52 comprise a low ohmic value resistor arranged on said overlap points such that electrical contact with the conductor track 3 at said overlap points is prevented.

[0041] Figure 4 shows a second embodiment of the illumination device 1' of the invention.

[0042] The illumination device 1' of this second embodiment differs from the illumination device 1 of the first embodiment in that the support 2' comprises a single conductor track 3', such that a single induced turn is formed by fixing the ends 20', 21' of the support 2' to one another, and therefore the induced coil comprises a single induced turn.

[0043] The remaining features are similar to those of the first embodiment; therefore, it is not considered necessary to describe them again.

[0044] Figure 5 shows a third embodiment of the illumination device 1" of the invention.

[0045] The illumination device 1" of this third embodiment differs from the illumination device 1 of the first embodiment in that the connection circuit 5" comprises a connection track 52" extending from the first end 20" of the support 2", an additional connection track 53" extending from the second end 21" of the support 2", and a plurality of parallel branches 55", each parallel branch 55" comprising a first terminal connected to the connection track 52" and a second terminal connected to the additional connection track 53". Therefore, the illumination means comprise a plurality of LEDs 54", arranging each LED 54" in a respective parallel branch 55".

[0046] In this third embodiment, the second terminal 41" of the induced coil is connected with the first terminal 50" of the connection circuit 5 and the second terminal 51" of the connection circuit 5" is connected with the first terminal 30" of the induced coil by fixing the two ends 20", 21" of the support 2" to one another.

[0047] The remaining features are similar to those of the first embodiment; therefore, it is not considered necessary to describe them again.

[0048] Figure 6 shows an embodiment of an induction hob 7 according to the invention.

[0049] The induction hob 7 of this embodiment com-

prises an induction cooktop 70, a first induction coil 6, a second induction coil, and a third induction coil arranged below the induction cooktop, and an illumination device 1 such as the one described above arranged around each of said induction coils 6. As observed in Figure 6, the illumination device 1 arranged on the first induction coil 6 is configured for indicating, with the illumination means, the location of the induction coil 6 when said induction coil 6 generates a magnetic field B. In Figure 6, the second induction coil and the third induction coil would not be generating a magnetic field, so the illumination devices associated with said induction coils would be shut off.

Claims

1. Illumination device for an induction hob comprising at least one induction coil (6) configured for generating a magnetic field (B), the illumination device (1, 1', 1") comprising a support (2, 2', 2") configured for being arranged around the induction coil (6), said support (2, 2', 2") comprising

   - at least one conductor track (3, 4, 3', 3", 4"), and
   - a connection circuit (5, 5', 5") in which illumination means are connected,

   characterized in that

   - the support (2, 2', 2") is flexible and comprises a first end (20, 20', 20") and a second end (21, 21', 21") fixed to one another, the support (2, 2', 2") thus delimiting the contour of the induction coil (6),
   - the at least one conductor track (3, 4, 3', 3", 4") and the connection circuit (5, 5', 5") extending from the first end (20, 20', 20") of the support (2, 2', 2") to the second end (21, 21', 21") of the support (2, 2', 2"), and the two ends (20, 21, 20', 21', 20", 21") of the support (2, 2', 2") being connected such that

     ◦ the at least one conductor track (3, 4, 3', 3", 4") forms an induced coil in which a current is generated when the induction coil (6) generates a magnetic field, and
     ◦ the connection circuit (5, 5', 5") is connected to the induced coil.

2. Illumination device according to claim 1, wherein the induced coil and the connection circuit (5, 5', 5") have a first terminal (40, 50, 30', 50', 30", 50") arranged at the first end (20, 20', 20") of the support (2, 2', 2") and a second terminal (31, 51, 31', 51', 41", 51") arranged at the second end (21, 21', 21") of the support (2, 2', 2"), the second terminal (31, 31', 41") of the induced coil being connected with the first terminal (50, 50', 50") of the connection circuit (5, 5', 5") and the second terminal (51, 51', 51") of the connection circuit (5, 5', 5") being connected with the first terminal (40, 30', 30") of the induced coil when the two ends of the support (2, 2', 2") are fixed to one another.

3. Illumination device according to claim 1 or 2, wherein the support (2, 2', 2") is a flexible printed circuit, with the conductor track (3, 4, 3', 3", 4") and the connection circuit (52, 52', 52", 53") being printed tracks.

4. Illumination device according to any of claims 1 to 3, wherein the support (2, 2', 2") is a flexible tape.

5. illumination device according to claim 4, wherein the support (2, 2', 2") is substantially rectangular.

6. illumination device according to any of claims 1 to 5, wherein the support is manufactured from PET, PEN, PC, or Kapton.

7. Illumination device according to any of claims 1 to 6, wherein the ends (20, 21, 20', 21', 20", 21") of the support (2, 2', 2") are fixed to one another by means of welding.

8. Illumination device according to any of claims 1 to 7, wherein the ends of the support are fixed to one another by means of an intermediate part, preferably a flat connector.

9. Illumination device according to any of claims 1 to 8, wherein the illumination means comprise at least one LED (54, 54', 54"), said LED (54, 54', 54") preferably being an SMD LED.

10. Illumination device according to claim 9, wherein the connection circuit (5, 5') comprises at least one connection track (52, 52') extending from the first end (20, 20', 20") of the support (2, 2', 2") to the second end (21, 21', 21") of the support (2, 2', 2"), and the illumination means comprise a plurality of LEDs (54, 54'), said LEDs (54, 54') being arranged in series connected to one another by means of said at least one connection track (52, 52').

11. Illumination device according to claim 9, wherein the connection circuit (5") comprises a connection track (52") extending from the first end (20") of the support (2"), an additional connection track (53") extending from the second end (21") of the support (2"), and a plurality of parallel branches (55"), each parallel branch (55") comprising a first terminal connected to the connection track (52") and a second terminal connected to the additional connection track (53"), and the illumination means comprise a plurality of LEDs (54"), arranging each LED (54") in a respective parallel branch (55").

12. Illumination device according to any of claims 1 to 11, comprising a plurality of conductor tracks (3, 4, 3", 4"), each conductor track forming an induced turn and said induced turns being connected in series such that they form the induced coil when the two ends (20, 21, 20', 21', 20", 21") of the support (2, 2', 2") are fixed to one another.

13. Induction hob comprising

- an induction cooktop (70),
- at least one induction coil (6) arranged below the induction cooktop (70), and
- an illumination device (1, 1', 1") according to any of the preceding claims arranged around said induction coil (6), the illumination device (1, 1', 1") being configured for indicating, with the illumination means, the location of the induction coil (6) when said induction coil (6) generates a magnetic field (B).

14. Induction hob according to claim 13, comprising a ring arranged around the induction coil (6), with the support (2, 2', 2") being fixed to said ring.

15. Induction hob according to claim 13 or 14, comprising a light guide arranged on the illumination device (1).

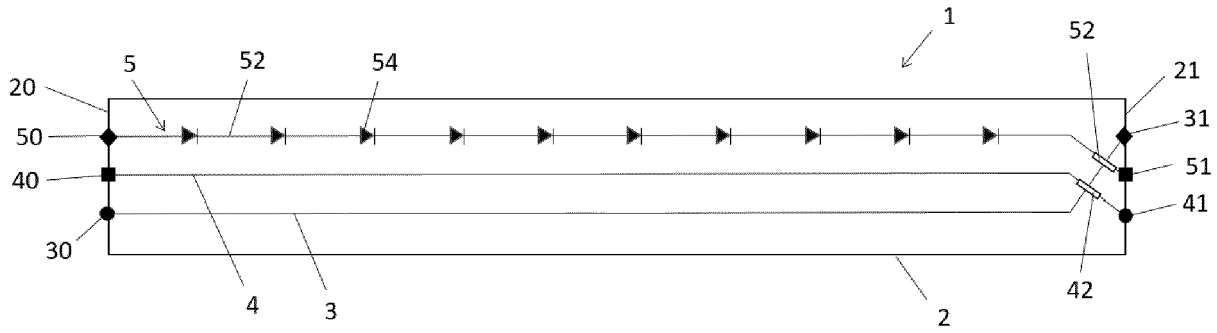

FIG. 1

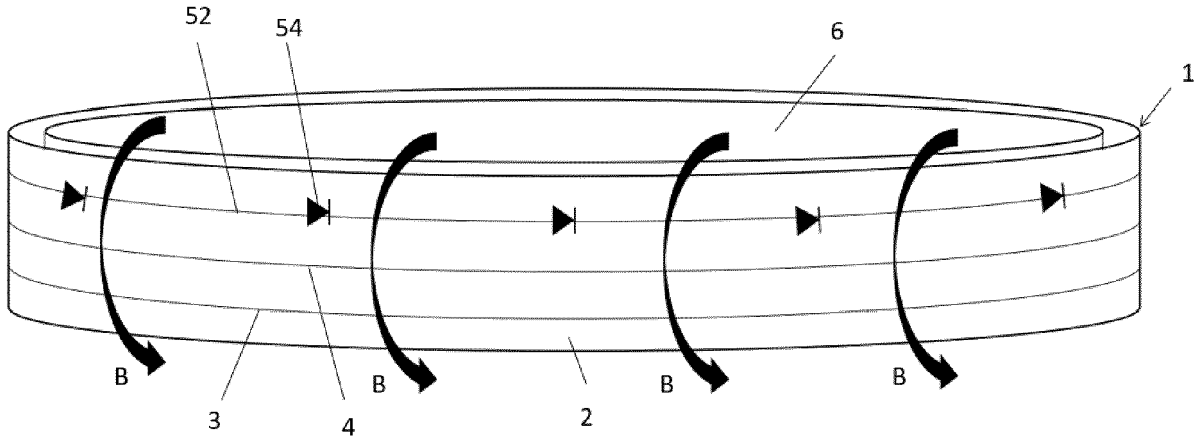

FIG. 2

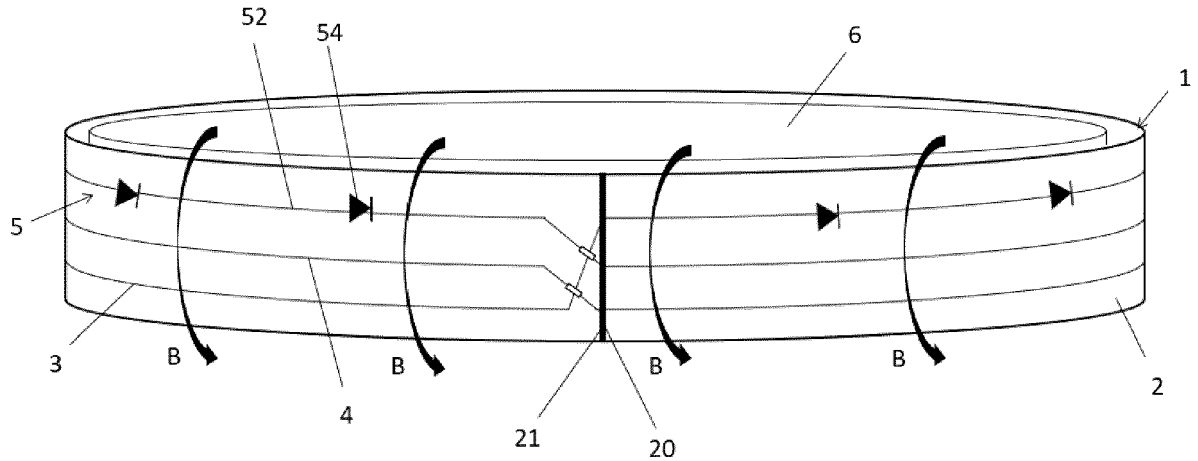

FIG. 3

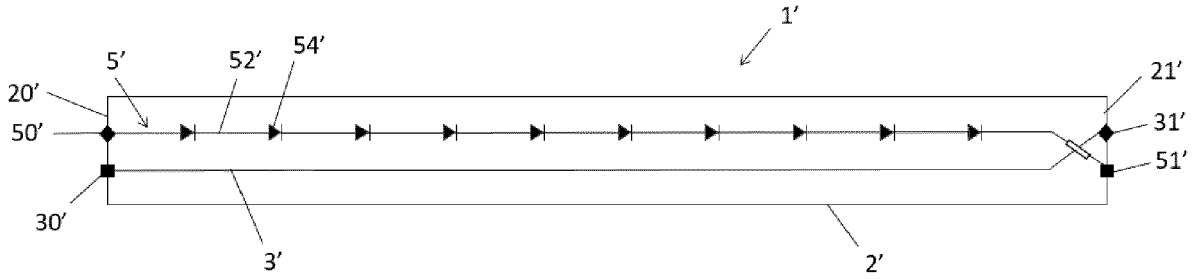

FIG. 4

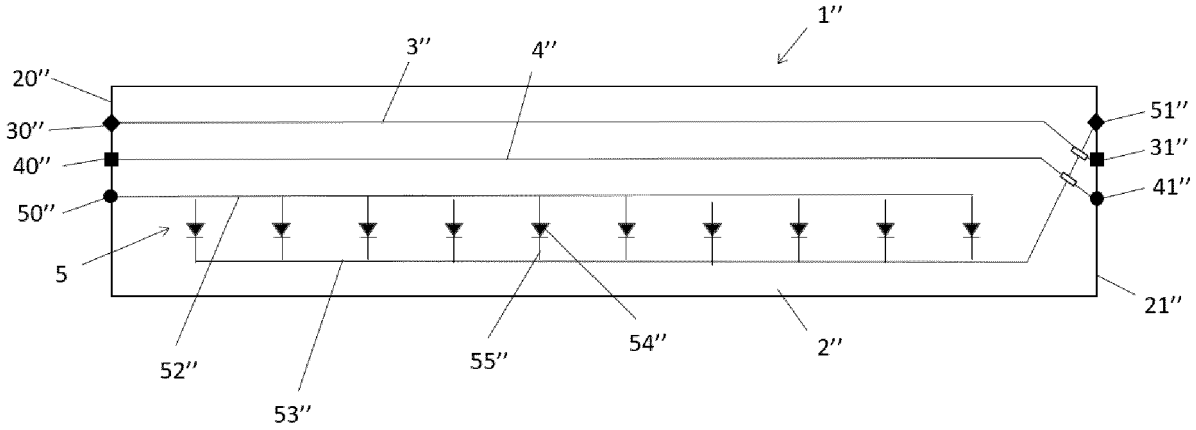

FIG. 5

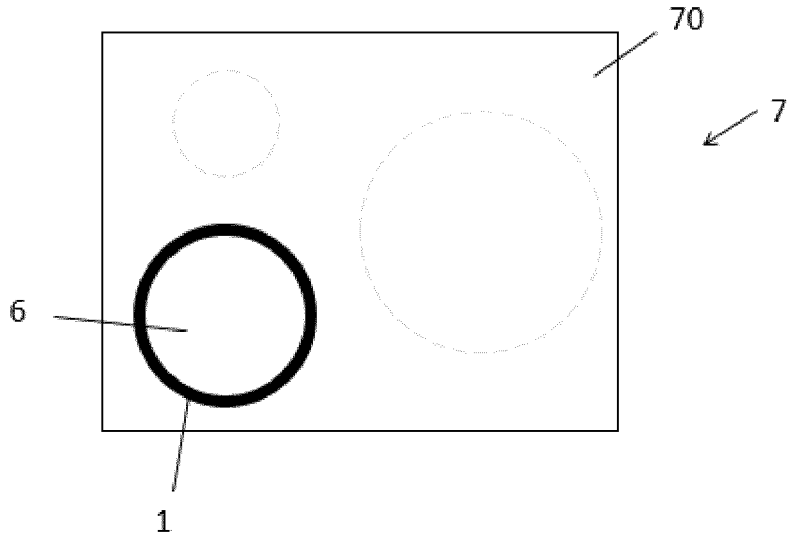

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 21 38 3171

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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Y	* column 1, lines 46-53, 57-58, 64-66 * * column 2, lines 14-17,50-51 * * column 3, lines 6-9; figures 1-2 * * column 4, lines 39-40 *	15	
X	KR 102 030 666 B1 (AMICORN CO LTD [KR]; BAE HAN HEE [KR] ET AL.) 10 October 2019 (2019-10-10)	1-14	
Y	* paragraphs [0015] - [0017]; figures 2-4 *	15	
Y	JP 2001 196155 A (MATSUSHITA ELECTRIC IND CO LTD) 19 July 2001 (2001-07-19)	15	
A	* figure 5 *	1-14	

TECHNICAL FIELDS SEARCHED (IPC)

H05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 May 2022	Pierron, Christophe

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

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