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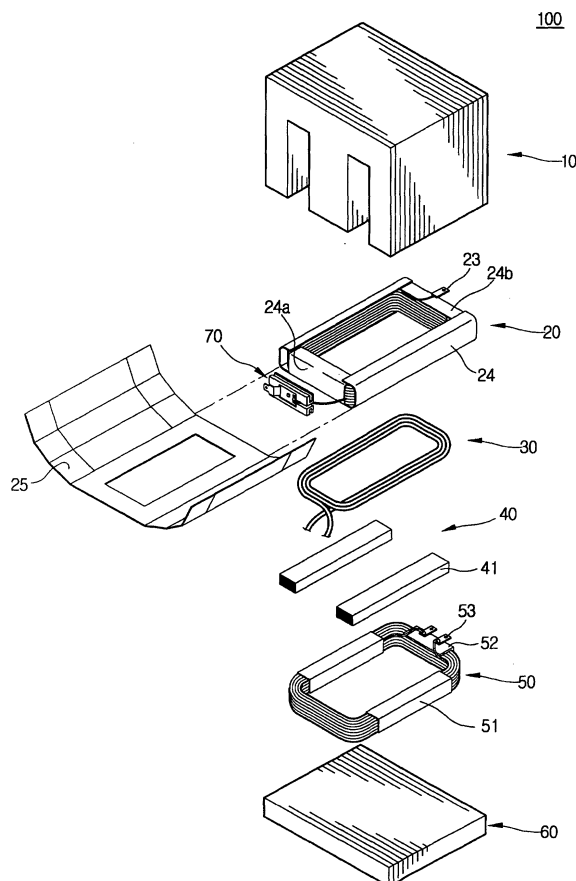
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(54) **High voltage transformer for microwave ovens**

(57) The present invention discloses a high voltage transformer for microwave ovens to output high voltage used to operate a magnetron. The high voltage transformer includes a core (10,60), an output terminal (21), a securing member (70), a terminal block (70), and a high voltage transformer. The core (10,60) accommodates a coil (20) used to generate the high voltage. The output terminal (21) is electrically connected to the coil (20). The securing member (70) secures the output terminal (21). The terminal block (70) is attached to a side of the core (10,60) to insulate the output terminal (21) from the core (10,60).

FIG. 1



## Description

**[0001]** The present invention relates to a high voltage transformer for microwave ovens, having an improved structure to improve insulation performance.

**[0002]** A microwave oven is an apparatus that heats and cooks food using microwaves, which includes a high voltage transformer to boost an input voltage and output the boosted high voltage, and a magnetron to operate at the high voltage output from the high voltage transformer and emit microwaves of high frequency (about 2450 MHz) into a closed cavity containing food.

**[0003]** The high voltage transformer applied to microwave ovens is constructed by combining an E-shaped core and an I-shaped core each formed by stacking a plurality of iron components one on top of another, disposing electric parts, that is, a primary coil, a secondary coil, pass cores and a heater core, between the E-shaped core and the I-shaped core, and insulating the transformer parts by wrapping the transformer parts with insulating paper. Nomex paper is commonly used as the insulating paper.

**[0004]** The high voltage transformer includes an output terminal to output the boosted voltage. This output terminal is electrically connected to both the secondary coil and a high voltage circuit unit that operates the magnetron. That is, the output terminal of the high voltage transformer functions as a connector to supply the boosted voltage to the high voltage circuit unit.

**[0005]** A conventional high voltage transformer should undergo processes of wrapping the electric parts, such as the primary coil and the secondary coil, with insulating paper and dipping the electric parts into varnish as well.

**[0006]** Recently, international standards organizations require increased insulation distances so as to secure insulation performance between the output terminal and the core of the high voltage transformer. That is, it is required that a side distance ranging from the output terminal to the core is increased.

**[0007]** To fulfill the requirements of the international standards organizations, there may be considered a scheme of thickening the terminal block on which the output terminal is mounted and which is made of insulating paper. However, as the terminal block becomes thicker to increase the insulation distance, work efficiency in securing the terminal block to the secondary coil is reduced. The terminal block is secured to a side of the secondary coil, so that the thickness of the terminal block is limited. Moreover, a disadvantage arises in that miniaturization of a product is difficult because a total size of the product is increased due to the thickened terminal block.

**[0008]** It is an aim of the present invention to provide a high voltage transformer for microwave ovens, in which a structure of a terminal block to secure an output terminal thereto is improved, thus allowing an insulation distance to be easily increased and securing of the ter-

minal block to be conveniently performed.

**[0009]** Other aims and/or advantages of the invention will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the invention.

**[0010]** According to the present invention there is provided an apparatus and method as set forth in the appended claims. Preferred features of the invention will be apparent from the dependent claims, and the description which follows.

**[0011]** In one aspect of the present invention there is provided a high voltage transformer for microwave ovens to output high voltage used to operate a magnetron including a core to accommodate a coil used to generate the high voltage, an output terminal electrically connected to the coil, a securing member to secure the output terminal, and a terminal block attached to a side of the core to insulate the output terminal from the core.

**[0012]** Preferably, the terminal block is made of a resin having an electrical insulation property and heat resistance.

**[0013]** The securing member includes a body, a securing hole formed on an upper part of the body to accommodate the output terminal, a protrusion to be inserting into a hole of the output terminal, and channels formed along sides of the body.

**[0014]** The channels each have a width, the width being proportional to an insulation distance.

**[0015]** The terminal block includes a guide way to guide a coil wire of the coil.

**[0016]** The guide way is formed to be inclined.

**[0017]** For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

Figure 1 is an exploded perspective view of a high voltage transformer for microwave ovens, according to an embodiment of the present invention;

Figure 2 is a terminal block having an improved structure, which is applied to the high voltage transformer of Figure 1;

Figure 3 is a view of an assembled high voltage transformer for microwave ovens, according to the embodiment of the present invention; and

Figure 4 is an enlarged view of portion A of Figure 3.

**[0018]** Figure 1 is an exploded perspective view of a high voltage transformer 100 for microwave ovens, according to an embodiment of the present invention. Figure 2 is a view of a terminal block having an improved structure, which is applied to the high voltage transformer of Figure 1. The high voltage transformer 100 includes an E-shaped core 10 and an I-shaped core 60.

The E-shaped core 10 and the I-shaped core 60 are each formed by stacking a plurality of iron components one on top of another.

**[0019]** Electric parts, such as a secondary coil 20, a heater coil 30, pass cores 40 and a primary coil 50, are inserted between the E-shaped core 10 and the I-shaped core 60, and generate high voltage.

**[0020]** Both side surfaces, a front surface, and a back surface of the secondary coil 20 are wrapped with insulating paper 24, 24a and 24b, respectively.

**[0021]** A ground terminal 23 is attached to the E-shaped core 10.

**[0022]** Outside insulating paper 25 covers the insulating paper 24 to wrap the secondary coil 20 again, and is inserted between the secondary coil 20 and the heater coil 30.

**[0023]** The heater coil 30 is disposed under the outside insulating paper 25. The pass cores 40 are disposed under the heater coil 30, and are wrapped with insulating paper 41. The primary coil 50 is disposed under the pass cores 40, and is wrapped with insulating paper 51. A terminal block 52 for the primary coil 50 is provided to secure the input terminal 53. The terminal block 52 is made of insulating paper. Alternating Current (AC) voltage is input through the input terminal 53.

**[0024]** The high voltage transformer of the present invention includes a terminal block 70 having an improved structure to mount an output terminal 21 thereon to output the boosted high voltage while connecting to the secondary coil 20.

**[0025]** The terminal block 70 is made of a resin that has an electrical insulation property and resistance.

**[0026]** The terminal block 70 includes a body 71, a securing hole 72 formed on an upper part of the body 71 to accommodate the output terminal 21, a protrusion 74 inserting into a hole 21a of the output terminal, and channels 73 formed on sides of the body 71.

**[0027]** The channels 73 each have a certain width H. As the width H of the channel 73 is increased, an insulation distance, that is, an insulation distance between the output terminal and the E-shaped core 10, is increased. If the width H of the channel 73 is increased, a distance ranging from the output terminal 21 to the E-shaped core 10 is increased. Accordingly, the insulation distance is increased, so that high electrical insulation performance is assured.

**[0028]** The terminal block 70 includes a guide way 75 formed to be inclined from an upper portion of the body 71 to a lower portion of the body 71 to guide a coil wire 22 of the secondary coil 20 attached to the output terminal 21 by soldering. This guide way 75 is inclined to prevent damage to the coil wire 22 of the secondary coil 20 in a case where the terminal block 70 is disposed on the insulating paper 24a.

**[0029]** After the output terminal 21 is mounted on the terminal block 70, the terminal block 70 is attached to insulating paper 24a by winding an adhesive tape 80 around the terminal block 70 and the insulating paper

24a several times.

**[0030]** When required insulation distances are different according to models of high voltage transformers applied to microwave ovens, it is preferable to select a terminal block in which the width H of the channel 73 corresponding to an insulation distance required by a relevant model is set.

**[0031]** As apparent from the above description, in accordance with the present invention, the structure of the terminal block applied to the high voltage transformer is improved, so that the insulation distance between the output terminal of the secondary coil and the core may be increased. Additionally, the insulation distance may be easily increased because the width of the channel of the terminal block may be set according to a required insulating structure of the high voltage transformer.

**[0032]** Furthermore, the high voltage transformer of the present invention prevents the thickness of the terminal block from being excessively increased, so that securing of the terminal block to insulating paper can be conveniently performed, and an occupation space of the terminal block can be reduced, thus preventing a total size of the high voltage transformer from being increased.

**[0033]** Although a few preferred embodiments have been shown and described, it will be appreciated by those skilled in the art that various changes and modifications might be made without departing from the scope of the invention, as defined in the appended claims.

**[0034]** Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

**[0035]** All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

**[0036]** Each feature disclosed in this specification (including any accompanying claims, abstract and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

**[0037]** The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

**Claims**

1. A high voltage transformer for microwave ovens to output high voltage used to operate a magnetron, comprising:
  - a core (10,60) to accommodate a coil (20) used to generate the high voltage;
  - an output terminal (21) electrically connected to the coil (20);
  - a securing member (70) to secure the output terminal (21) ; and
  - a terminal block (70) attached to a side of the core (10,60) to insulate the output terminal (21) from the core (10,60).
2. The high voltage transformer according to claim 1, wherein the terminal block (70) is made of a resin having an electrical insulation property and heat resistance.
3. The high voltage transformer for microwave ovens according to claim 1 or 2, wherein the securing member (70) comprises:
  - a body (71);
  - a securing hole (72) formed on an upper part of the body (71) to accommodate the output terminal (21);
  - a protrusion (74) to be inserted into a hole (21a) of the output terminal (21); and
  - channels (73) formed along sides of the body (71).
4. The high voltage transformer according to claim 3, wherein the channels (73) each have a width, the width being proportional to an insulation distance.
5. The high voltage transformer according to any preceding claim, wherein the terminal block (70) comprises a guide way (75) to guide a coil wire (22) of the coil (20) .
6. The high voltage transformer according to claim 5, wherein the guide way (75) is formed to be inclined.

FIG. 1

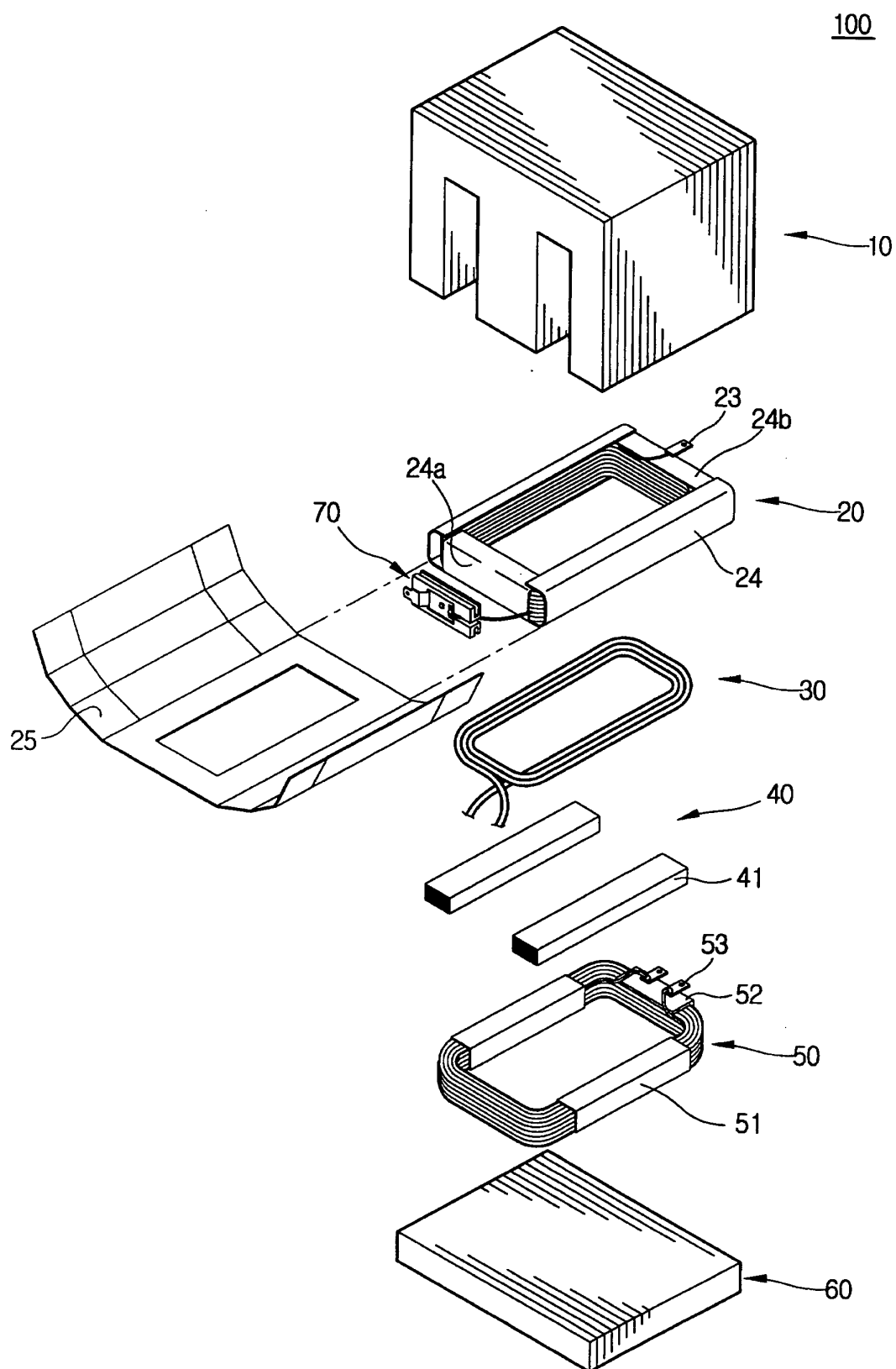


FIG. 2

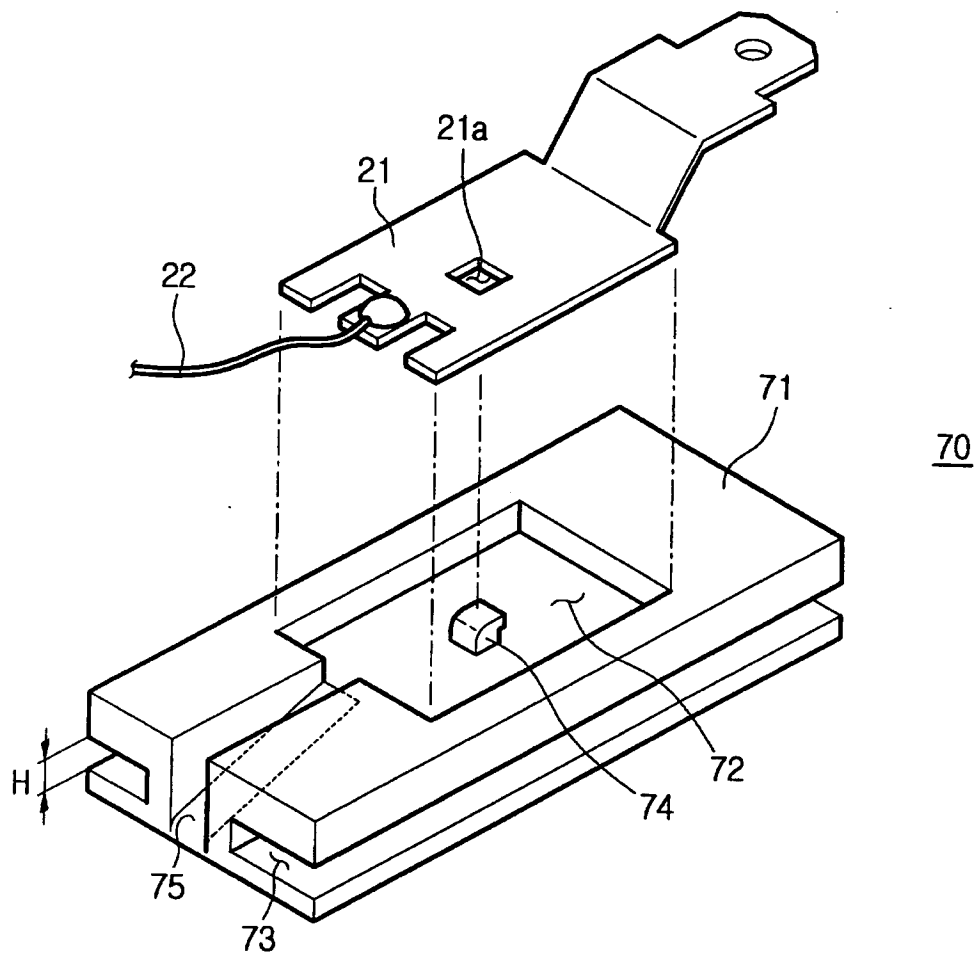


FIG. 3

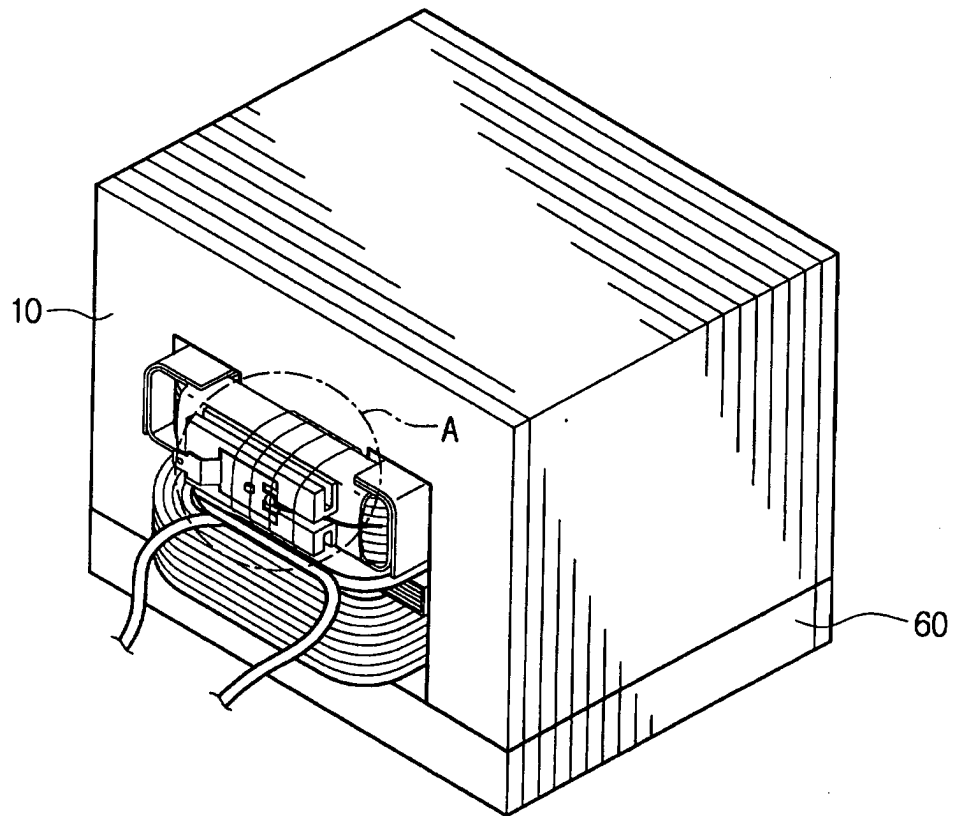
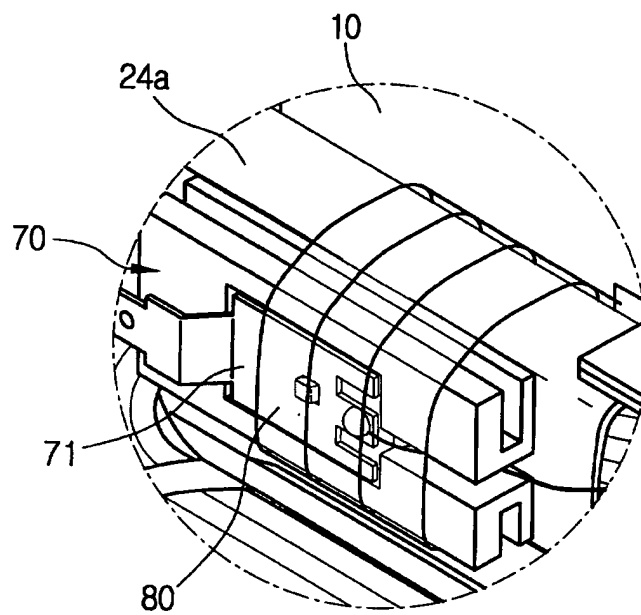


FIG. 4





European Patent  
Office

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Application Number  
EP 03 25 7145

| 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.7) |
| Y                                                                                                                                                                                                                                                      | US 3 766 506 A (GATY T)<br>16 October 1973 (1973-10-16)                                                                   | 1,2,5                                                                                                                                                                                                                                                                        | H01F27/28                                    |
| A                                                                                                                                                                                                                                                      | * abstract *<br>* column 1, line 65 - column 2, line 9 *<br>* column 3, line 54 - column 4, line 37;<br>figures 5,14,15 * | 3                                                                                                                                                                                                                                                                            | H01F27/32<br>H05B6/64                        |
| Y                                                                                                                                                                                                                                                      | US 2002/089085 A1 (KIM CHEOL-JIN)<br>11 July 2002 (2002-07-11)<br>* paragraph '0034! - paragraph '0041!;<br>figures 2,3 * | 1,2,5                                                                                                                                                                                                                                                                        |                                              |
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| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                           |                                                                                                                                                                                                                                                                              |                                              |
| Place of search<br>The Hague                                                                                                                                                                                                                           |                                                                                                                           | Date of completion of the search<br>22 November 2004                                                                                                                                                                                                                         | Examiner<br>Marti Almeda, R                  |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                           | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>& : member of the same patent family, corresponding document |                                              |

EPC FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 03 25 7145

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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