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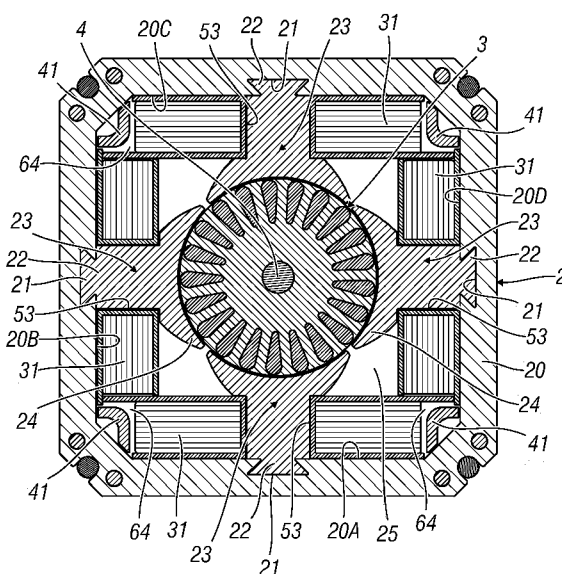


Fig. 3

(57) Abstract: A monophasic electric induction motor with projecting poles (1) comprises a stator (2) defined by an annular set of plates (20), from the inner perimeter (P) of which there project, towards the cavity (25) of this annular set of plates (20), four polar expansions (23) which pass into corresponding holes (53) in cartouches (30A-30D) each supporting a respective winding of conductive wire (31), inside said stator (2) there being present a rotor (3) which rotates frontally relative to said polar expansions (23). A first pair of cartouches (30A, 30C) has dimensions different from the second pair of cartouches, such as to be able to support corresponding windings of conductive wire (31) with greater density than the windings of conductive wire (31) associated with the cartouches (30B, 30D) of the second pair of cartouches.

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IMPROVED MONOPHASE ELECTRIC MOTOR WITH A PLURALITY
OF SPEEDS

The subject of the present invention is a monophase electric induction motor with projecting poles and with a plurality of speeds, according to the preamble of the main claim.

As is known, motors of the monophasic electric induction type have various uses; their use is widespread inside kitchen extractor hoods, and in particular in the extractor fan of these hoods which can extract fumes, vapours and grease which are generated on a cooking hob of a kitchen during the preparation of food. This is because said electric motors can operate with different speeds such as to allow the corresponding extractor fans to operate at different rates which can be selected by the users according to the needs.

A conventional electric induction motor comprises a stator and a rotor which rotates inside it. The stator is defined by an annular set of plates, from the inner perimeter of which there project four poles or polar expansions which are connected to the set of plates at a first end thereof, and face the rotor with their second, free

end.

The polar expansions pass through corresponding supports of a winding of an electrical conductor, which is usually made of copper, said supports usually being indicated by the term "cartouche", which will be used hereinafter in order to indicate the supports themselves. Each cartouche comprises a body with two flat opposite faces, between which there is present an intermediate element, which, together with these faces, defines a notch on which the winding of the electrical conductor is present. This body is usually polygonal, and comprises an axial hole in which a corresponding polar expansion is present, through which hole it passes.

The cartouches are then positioned around the inner perimeter of the set of plates in a manner which is consecutive and adjacent to one another. The cartouches normally define two identical pairs for the electrical windings, which pairs are placed opposite and in quadrature with one another, such as to define a first pair of stator windings defined as the "main" pair, and a second pair of stator windings defined as the "auxiliary" pair. The first pair is connected directly to the network, whereas the second is connected indirectly to the network by

means of interposition of an offset capacitor, connected in series.

Each pair of windings (or coils) is positioned within the stator, after insertion of the corresponding polar expansions into the cartouches.

Although the known solutions for motors of the aforementioned type permit desired variation of the speed of operation of the corresponding extractor fans, they nevertheless have room for improvement.

In particular, the objective of the present invention is to provide an induction motor with projecting poles which has improved efficiency compared with the corresponding known motors, in particular at low and average speeds.

Another objective is to provide a motor of the aforementioned type which makes possible an increase in the energy efficiency, and consequent saving of energy during use.

A further objective is to provide a motor of the aforementioned type which makes possible better electrical insulation between the windings.

These objectives and others, which will become apparent to persons skilled in the art, are achieved by an electric induction motor with projecting poles according to the appended claims.

For better understanding of the present invention, purely by way of non-limiting example, the following drawings are appended, in which:

figure 1 shows a view in perspective of a motor produced according to the invention;

figure 2 shows an exploded view in perspective of the motor in figure 1;

figure 3 shows a view in transverse cross-section of the motor in figure 1;

figure 4 shows a view in perspective of the motor in figure 1 with some parts omitted for the sake of greater clarity; and

figure 5 shows an exploded view in perspective of what is represented in figure 4.

With reference to the aforementioned figures, an electric induction motor with projecting poles is generally indicated as 1, and comprises a stator 2 and a rotor 3 keyed onto output shaft 4. The stator and the rotor are enclosed by external closure elements defined by a bottom 5 and a cover 6 which are connected by means of screws 7; this bottom and cover have respective openings 10 and 11 for passage of the output shaft 4 where bearings or bushes 12 and 13 are placed.

A board 26 with a printed circuit 17 permits the

supply and connection between the various outlets of the windings.

More particularly, the stator 2 comprises an annular set of plates 20 with a polygonal shape, having an inner perimeter P which is defined by consecutive sides 20A, 20B, 20C and 20D. The sides contain a slot (in the form of a dovetail, for example) 21 which can contain and retain a first end 22 of a corresponding polar expansion 23 which projects from the respective side of the perimeter P towards the inside of the stator. Each polar expansion has a second, free end 24, placed in the cavity 25 of the stator frontally relative to the rotor 3.

Along the sides 20A-D of the perimeter P of the annular set of plates 20, there are placed cartouches 30A, 30B, 30C, 30D which can support conductor windings 31 defined by a copper wire wound around an intermediate element 33 of a respective cartouche. More particularly, each cartouche 30A-D (made of any insulating material) comprises a body 34 defined by opposite and spaced flat faces 35, 36, between which the intermediate element 33 is present. Between these faces a slot is present, in which slot the winding 31 is present.

Opposite cartouches are the same as one another, but are different from the adjacent and consecutive cartouches. In particular, the cartouches indicated as 30A and 30C in the figures, defining a first pair of cartouches, have larger dimensions than the cartouches 30B, 30D of a second pair of cartouches present inside the cavity 25 of the set of plates 20, and contain a quantity (and density) of conductive material which is greater than that present between the cartouches 30B, 30D of the second pair of cartouches. This greater quantity can be obtained by means of a larger number of turns of the windings made of conductive material present on the intermediate element 33 of the cartouches 30A, 30D, or, the windings 31 which are present on this intermediate element can be obtained by means of wires with a larger cross-section than the wires of the windings present on the intermediate elements of the cartouches 30B, 30D of the second pair of cartouches.

In addition, the cartouches 30A, 30C have their flat face 35 with a larger area than the opposite and spaced face 36, said flat face 35 being the face of the cartouche which is furthest inside the cavity 25. The face 36 is supported on the respective side

20A-D of the inner perimeter P of the annular set of plates 20. The presence of the flat faces 35 with a larger area makes it possible to close the adjacent intermediate elements 33 of the cartouches 30B and 30D laterally (see figure 3) thus insulating the windings which are present thereon against those of the cartouches.

On the other hand, the elements 33 inside the cartouches 30A and 30C are closed laterally by projecting angular arms 41 which rise from the bottom 5 at corners thereof. These arms penetrate inside the lateral ends 64 of the cartouches 30A and 30C of the first pair of cartouches, thus insulating the winding present therein.

The cartouches 30A-D have a through-hole 53 which accommodates a corresponding polar expansion.

Since the pair of cartouches 30A, 30C have different dimensions (transverse length, measured parallel to the corresponding sides of the annular stator set 20, of their intermediate elements) from the other pair of cartouches 30B, 30D, it is possible to position inside the cartouches 30A, 30C a different density of windings (a larger number or with an increased cross-section) from that of the other two cartouches 30B, 30D, thus making it

possible to obtain greater efficiency and control of the minimum and average speed of rotation of the rotor 3 (and therefore of the extractor fan with which the motor 1 is associated) than that which can be obtained with the known motors of the prior art.

A description has been provided of a preferred embodiment of the invention. It will be appreciated that others are also possible (such as the one where the faces 35 and 36 of the cartouches 30A, 30C are the same, and larger than the corresponding faces of the remaining cartouches 30B, 30D), and must be considered as included in the scope of the invention as defined by the following claims.

CLAIMS

1. Monophase electric induction motor with projecting poles (1) comprising a stator (2) defined by an annular set of plates (20), from the inner perimeter (P) of which there project, towards the cavity (25) of this annular set of plates (20), four polar expansions (23) which pass into corresponding holes (53) in cartouches (30A, 30B, 30C, 30D) each supporting a respective winding of conductive wire (31), inside said stator (2) there being present a rotor (3) which rotates frontally relative to said polar expansions (23), characterised in that a first pair of cartouches (30A, 30C) has dimensions different from the second pair of cartouches, such as to be able to support corresponding windings of conductive wire (31) with greater density than the windings of conductive wire (31) associated with the cartouches (30B, 30D) of the second pair of cartouches.

2. Motor according to claim 1, characterised in that each pair of cartouches (30A, 30C; 30B, 30D) is defined by cartouches placed at the opposite sides (20A, 20C; 20B, 20D) defining the cavity (25) of the annular set of plates (20).

3. Motor according to claim 1, characterised in

that each cartouche (30A-D) comprises a body (34) with two opposite and spaced flat faces (35, 36) which are connected by an intermediate element (33) on which the winding of conductive wire (31) is present, the opposite and spaced flat faces (35, 36) of the first pair of cartouches (30A, 30C) being larger than the opposite and spaced flat faces (35, 36) of the second pair of cartouches (30B, 30D).

4. Motor according to claim 1, characterised in that the first pair of cartouches (30A, 30C) has the intermediate element with dimensions which are larger than the intermediate element of the second pair of cartouches (30B, 30D).

5. Motor according to claim 3, characterised in that a first flat face (35) of the cartouches of the first pair of cartouches (30A, 30C) has a larger area than the second flat face (36) of these cartouches.

6. Motor according to claim 5, characterised in that said first flat face (35) is inside the cavity (25) of the annular set of plates (20), the second face (36) being supported against a respective side (20A, 20C) of the inner perimeter (P) of the annular set of plates (20).

7. Motor according to claim 5, characterised in

that said first flat face (35) of the cartouches of the first pair of cartouches (30A, 30C) is positioned on the flank of the intermediate element (33) of the cartouches of the second pair of cartouches (30B, 30D) and closes this intermediate element (33) laterally.

8. Motor according to claim 4, characterised in that it comprises an external closure element (5) with projecting angular arms (41) positioned inside lateral ends (64) of the cartouches of the first pair of cartouches (30A, 30C), such as to close the respective intermediate elements (33) laterally.

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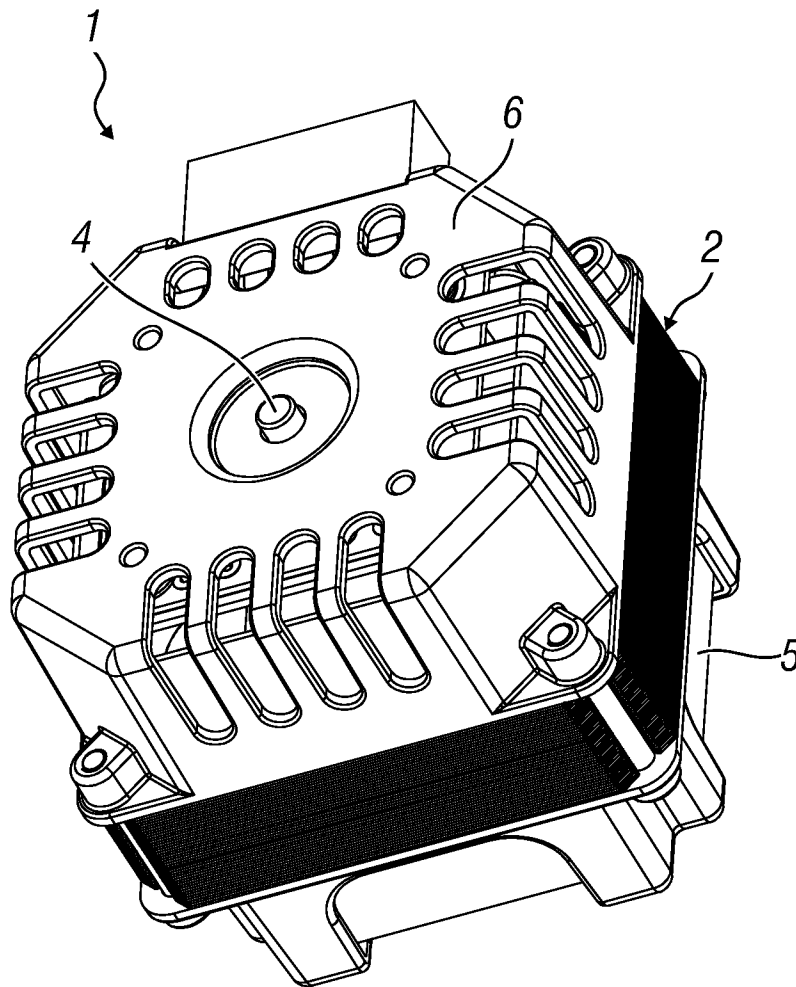


Fig. 1

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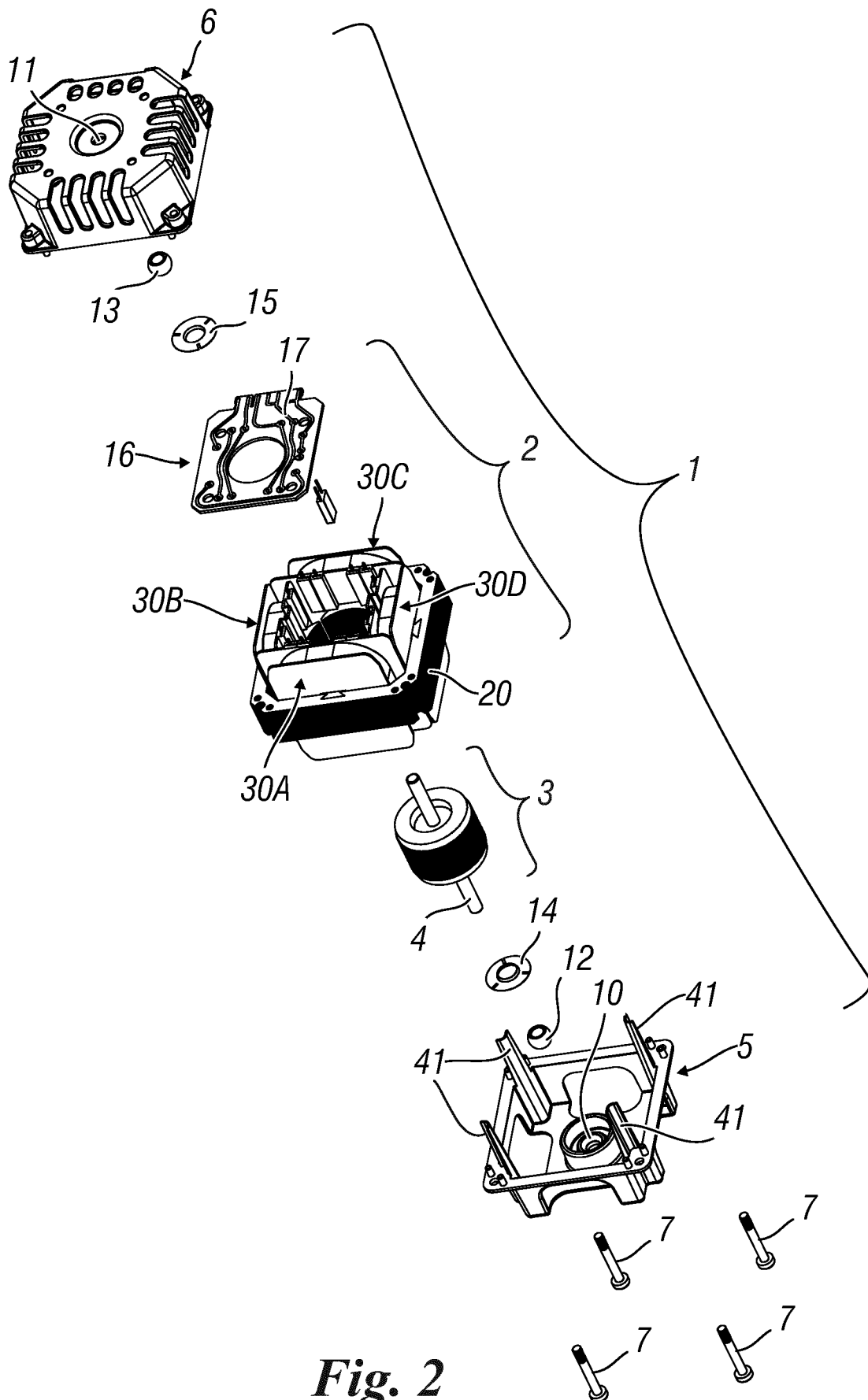
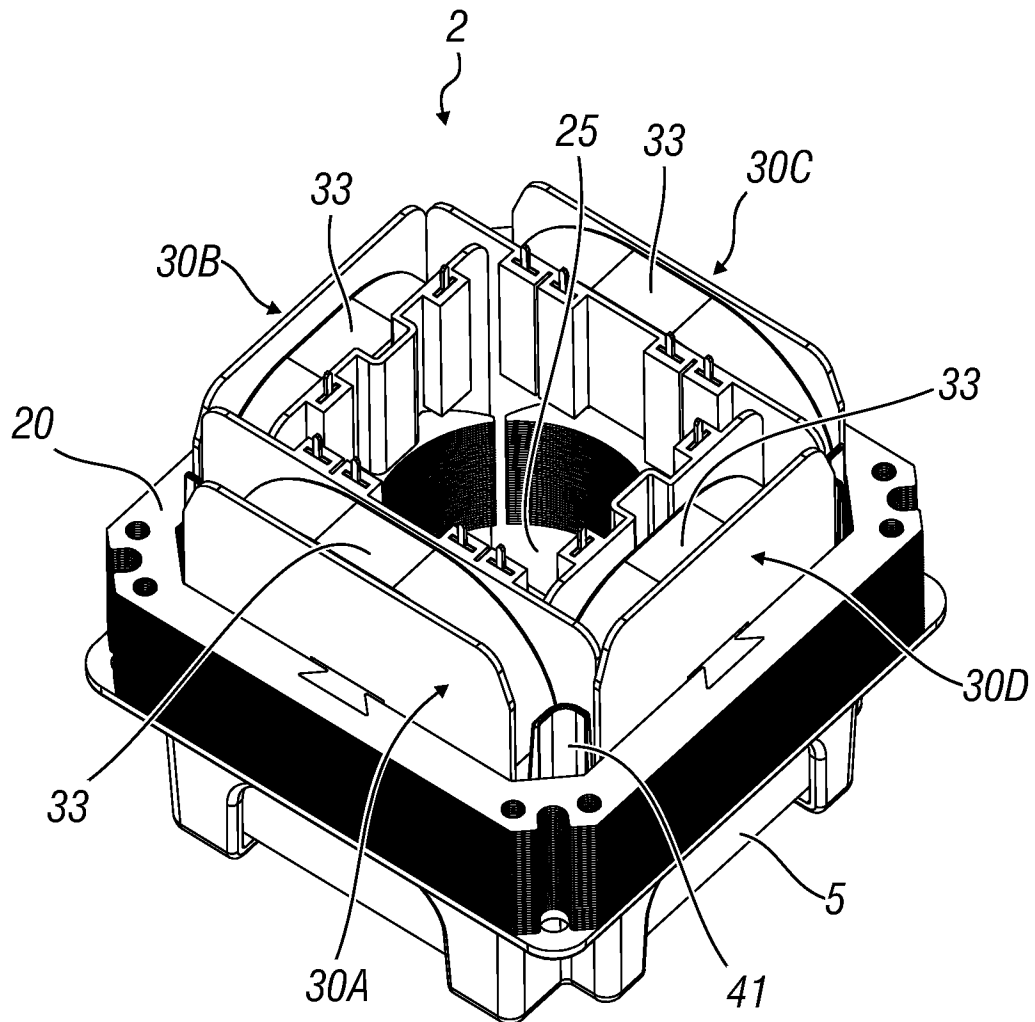
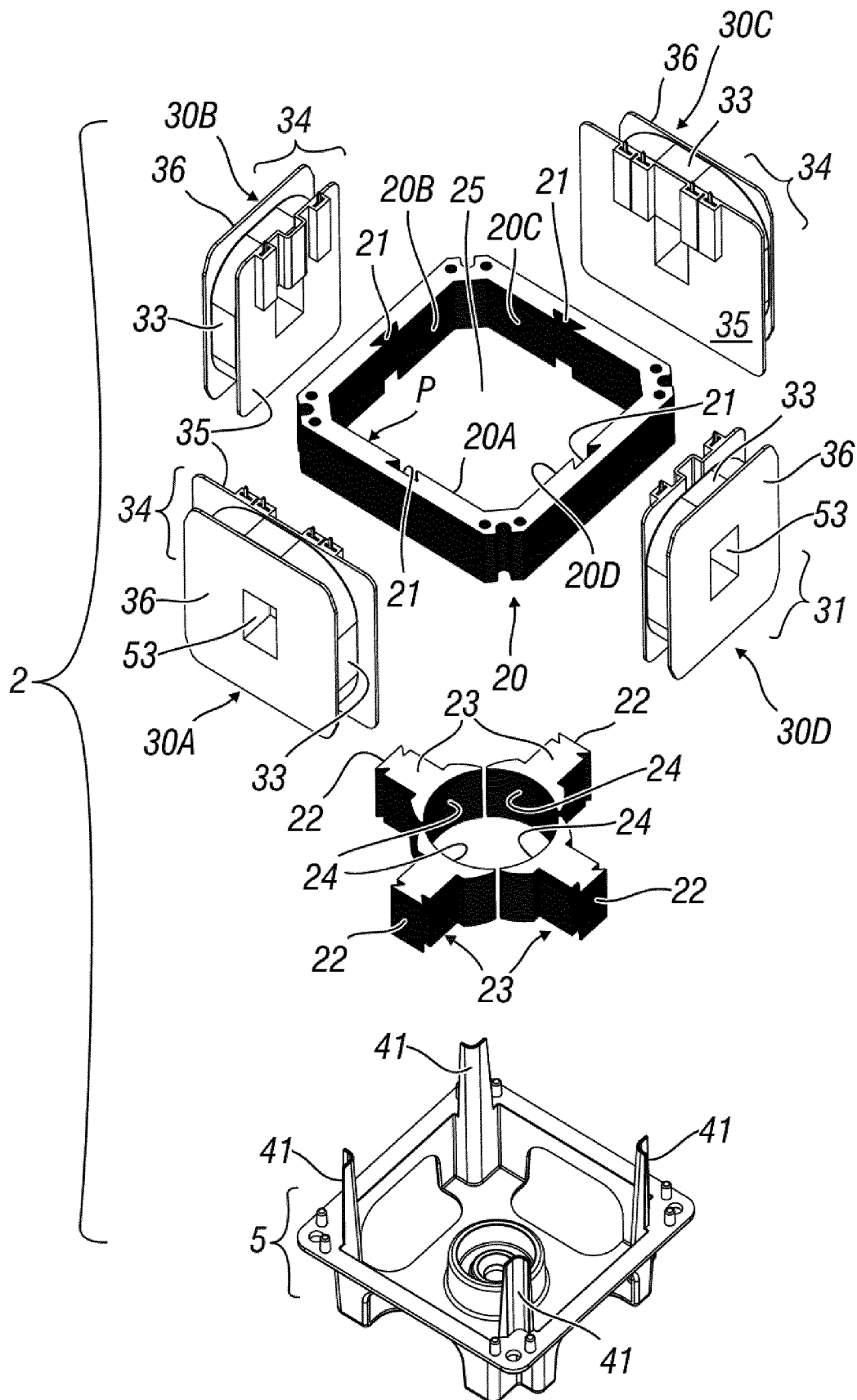


Fig. 2

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*Fig. 4*

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**Fig. 5**

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER INV. H02K3/18 H02K3/32 H02K3/52 H02K17/08 ADD. H02K17/06		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) H02K		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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A	paragraph [0014] - paragraph [0015]; figure 2	5-8

A	GB 2 362 268 A (NOTETRY LTD [GB]; DYSON LTD [GB]) 14 November 2001 (2001-11-14) page 5, line 18 - page 7, line 7; figures 3-5C	3, 5, 6

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☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "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 when the document is taken alone "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		
Date of the actual completion of the international search 22 November 2022		Date of mailing of the international search report 05/12/2022
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Zanichelli, Franco

INTERNATIONAL SEARCH REPORT

International application No

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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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