



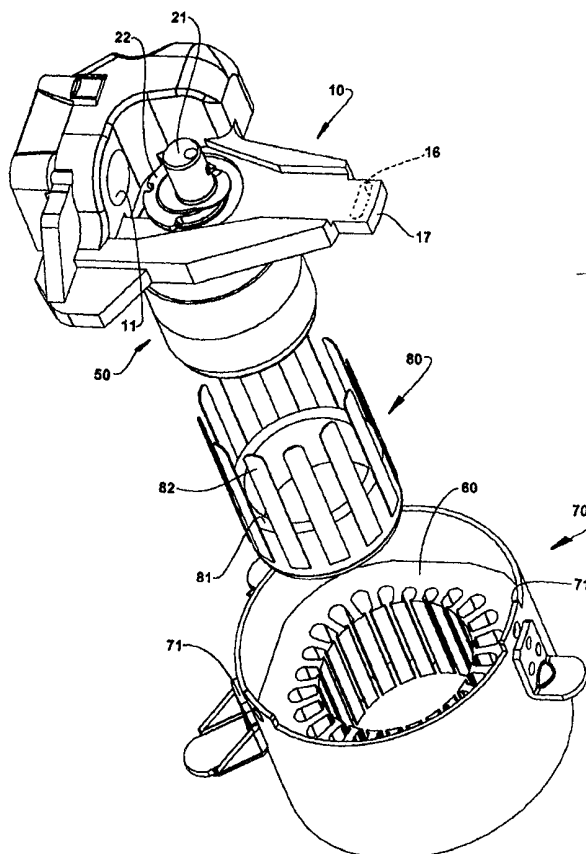
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: A PROCESS FOR MOUNTING AN ELECTRIC MOTOR

(57) Abstract

A process for mounting an electric motor, comprising the steps of: a) mounting a guide means (80) to one of the parts defined by a supporting block (10) having a bearing (13) and by a stator (60) of an electric motor which is affixed inside a motor housing (70) affixed to the supporting block (10); b) slidably fitting the other of said parts into the guide means (80), in order to make the axes of the stator (60) and the bearing (13) of the supporting block (10) coincide with each other, said displacement being limited by seating at least an end portion (71) of the motor housing (70) against the supporting block (10); c) affixing, without applying tension, the motor housing (70) to the supporting block (10) in the seating position; and d) removing the guide means (80) from the part to which it has been mounted.



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## A PROCESS FOR MOUNTING AN ELECTRIC MOTOR

Field of the Invention

The present invention refers to a process for mounting  
5 a rotor and a stator of an electric motor of the type  
used in a hermetic compressor for a refrigeration  
system, with said rotor being carried by a supporting  
block and with the stator already mounted inside a  
motor housing.

10 Background of the Invention

In a known construction of a reciprocating hermetic  
compressor, there is mounted, inside the shell  
thereof, a supporting block journalling a shaft which  
moves, through a connecting rod, a piston  
15 reciprocating inside a cylinder provided in a portion  
of the supporting block, said shaft carrying, with no  
axial gaps, a rotor of an electric motor.

The electric motor has a stator, which is mounted to  
the compressor shell and in whose inside is  
20 concentrically positioned the rotor carried by the  
shaft, being provided, between the rotor and the  
stator, a certain radial gap which is calculated so as  
to avoid the contact between said parts during  
operation of the motor.

25 The shaft of the connecting rod has an annular flange  
which seats onto an axial bearing defined in the  
supporting block concentrically with a throughbore  
provided in the latter and into which the shaft is  
introduced and radially journalled.

30 In this construction of a reciprocating compressor,  
the fixation of the supporting block to the stator is  
achieved by means of fixation screws acting on both  
said parts. For this fixation, the supporting block  
has fixation holes located parallelly to the  
35 throughbore for mounting the shaft, each fixation hole

being aligned with a respective mounting hole provided in the stator and dimensioned as a function of the dimensions of the fixation screw to be used.

This fixation system leads to a high number of parts  
5 being returned from the mounting line and reprocessed, which parts need to be dismantled and remounted, after eliminating the problems detected in said parts and which caused the devolution thereof.

One of the problems of mounting the motor to the  
10 supporting block by screwing refers to the requirement of an adequate planing of the contact faces of the stator and the cylinder block, in order to avoid misalignment of the stator axis in relation to the shaft axis, which will lead to a decentralization of  
15 the rotor in relation to the stator and, consequently, of the contact therebetween during operation of the motor. In order to obtain an adequate planing of the contact face of the supporting block, the latter must have a precise machining with adequate tooling.

20 In order that the provision of the mounting holes in the stator does not significantly affect the conducting metallic mass of the stator, the amount of laminations which form said stator and the radial thickness and dimensioning of each lamination are  
25 calculated as a function of the amount of screws needed for each compressor model.

Another problem provided by this fixation system relates to the possibility of occurring screwing tension due to the torque imparted to each screw  
30 during compression of the parts defined by the supporting block and stator. Since the stator is formed by superposed laminations, the tension differential may also modify the planing of the stator and cause the problem of altering the axial gap  
35 mentioned above. Moreover, torque variations may cause

problems of rotor-stator impacts and allow the absorption of screwing tensions.

Disclosure of the Invention

It is an objective of the present invention to provide  
5 a process for mounting an electric motor with a  
precise alignment of the axes of the rotor and the  
stator of the electric motor, without requiring  
precision machining of the supporting block and  
without submitting said supporting block and the  
10 lamination stack of the stator to fixation tensions  
and disalignments caused by the fixation of said  
parts.

Another objective of the present invention is to  
provide a mounting process as cited above, which does  
15 not require modifications in the lamination stack of  
the stator, such as increasing the dimensions as a  
function of material removal or also increasing the  
radial gap upon material being removed from either the  
rotor or the stator of the electric motor.

20 A further objective of the present invention is to  
provide a mounting process with the above cited  
advantages, which does not require planing of the  
adjacent faces of each of the parts defined by the  
supporting block and the stator.

25 These and other objectives are achieved by a process  
for mounting an electric motor comprising a stator,  
which is affixed inside a motor housing affixed to a  
supporting block; and a rotor affixed around a shaft,  
which is axially and radially retained in a bearing  
30 incorporated to the supporting block, said process  
comprising the steps of: a- mounting a guide means to  
one of the parts defined by the stator and the  
supporting block; b- slidably fitting the other of  
said parts into the guide means, in order to make the  
35 axes of the stator and the bearing of the supporting

block coincide with each other, said displacement being limited by seating at least an end portion of the motor housing against the supporting block; c- affixing, without applying tension, the motor housing  
5 to the supporting block in the seating position; and  
d- removing the guide means from the part to which it has been mounted.

#### Brief Description of the Drawings

The invention will be described below, with reference  
10 to the attached drawings, in which:

Figure 1 shows, schematically and in a longitudinal vertical sectional view, a reciprocating compressor having the stator of its electric motor affixed to the supporting block, through a plurality of fixation  
15 screws, according to the prior art;

Figure 2 shows, schematically and in a longitudinal vertical sectional view, a reciprocating compressor having the stator of its electric motor affixed to the supporting block, according to the present invention;

20 Figure 3 shows, schematically and in an exploded perspective view, the supporting block and the stator of the electric motor of the present invention; and

Figure 4 shows, schematically and in a perspective view, a reciprocating compressor having its supporting  
25 block affixed to the motor housing, according to the present invention;

#### Description of the Illustrated Embodiment

The present invention will be described in relation to a process for mounting an electric motor, for example  
30 of the type used in a hermetic compressor with a vertical shaft, such as illustrated in figure 1, and which comprises a hermetic shell 1 defining, in the bottom thereof, a sump 2 of lubricant oil and lodging therewithin a supporting block 10 which has, in an end  
35 portion, a cylinder 11 and which incorporates, in a

median portion, concentrically with a throughbore 12, a bearing 13, axially and radially supporting a shaft 20, which is vertical and has, at an upper portion, an eccentric 21 articulated through a connecting rod 30 to a piston 40 reciprocating inside a cylinder 11, as a function of the rotation of the shaft 20.

Shaft 20 is provided, at its upper portion, with a flange portion 22 which seats onto the bearing 13 of the supporting block 10 and, at its lower portion, with an oil pump 23 which takes oil from the sump 2 to the parts with relative movement and needing lubrication. The shaft 20 also carries, between the flange portion 22 and the oil pump 23, a rotor 50, of the electric motor of the compressor, affixed to said shaft 20 with no radial gaps.

In this prior art construction, the supporting block 10 is affixed to an electric motor stator 60 in the form of stack of aligned and superposed laminations, so that the rotor 50 carried by the shaft 20 be located inside and concentrically in relation to the stator 60 and presents a certain previously calculated minimum radial gap in relation to said stator 60.

For this prior art fixation (figure 1), the supporting block 10 is provided with fixation holes 14, each receiving a respective fixation screw 15, which fits into a respective mounting hole provided in the lamination stack of the stator 60, in order to retain to the latter the supporting block 10.

This construction has the disadvantages mentioned above.

According to the present invention, the mounting of the supporting block 10 to the stator 60 of the electric motor is obtained by a mounting process to be described ahead, in which the supporting block 10 is attached to a motor housing 70, for example in the

form of a tubular body with its ends opened and retaining, internally, the stator 60 of the electric motor.

For mounting the stator 60 inside the motor housing 5 70, the latter is previously heated so that, when dilated, presents a diameter which is sufficient to receive the stator 60. In the thermal contraction, the diameter of the motor housing 70 is reduced, surrounding the stator 60 and retaining the latter 10 with no radial gaps.

According to the present invention, to one of the parts defined by the stator 60 and by the supporting block 10, is mounted a guide means 80, which guides the sliding fitting of the other of said parts, so as 15 to make coincide the axes of the stator 60 and the bearing 13 of the supporting block 10, said guide means 80 further determining that, between the stator 60 and the rotor 50 be established a minimum radial distance which results in a desired uniform air gap 20 throughout the whole axial and circumferential extension of the rotor 50. The relative sliding between the supporting block 10 and stator 60 is limited by seating at least an end portion 71 of the motor housing 70 against the supporting block 10. The 25 guide means 80 is removed from the part to which it has been mounted, after the fixation between the supporting block and the motor housing has been obtained.

According to the present invention, the fixation is 30 obtained without applying any tension, for example, by gluing or welding the parts to each other.

In the embodiment illustrated in figures 2-4, the motor housing 70 is provided, from one of its end portions, with axial projections, for example three, 35 each defining an end portion 71 to be fitted into a

respective receiving recess 16 provided in a mounting face 17 of the supporting block 10 and whose depth is calculated as a function of the limitation of the desired relative approximation between the supporting block 10 and the motor housing 70. According to the illustration, the motor housing 70 carries, externally, mounting flanges 71, having for instance an "L" profile and through which the housing affixing the stator 60 is mounted inside the hermetic shell 10 of the compressor.

In a preferred solution, at least one of the parts defined by the end portion 71 and by the receiving recess 16 receives, before the mutual fitting, an amount of adhesive which will be cured afterwards to provide the fixation between the supporting block 10 and the motor housing 70.

In a way of carrying out the present invention, upon mounting the electric motor, the shaft 20 is introduced inside the throughbore 12 provided in the supporting block 10, until its peripheral flange 22 seats onto the bearing 13 of the supporting block 10, before receiving and affixing the rotor 50, before mounting the supporting block 10 to the motor housing 70. In this construction, the guide means 80 has an annular shape and is placed between the stator 60 and the rotor 50, in order to define the radial gap therebetween.

According to the illustrated embodiment, the guide means 80 has a stop portion 81 in the form of a cylindrical hub, which is provided at least partially outside the stator 60, during assembly of the motor, and wherefrom are projected axial blades 82, which are circumferentially disposed from the external surface of the cylindrical hub, for example equally spaced from each other and having a thickness corresponding

to the air gap to be provided between the rotor 50 and stator 60.

The guide means 80 in this solution may be mounted to the stator 60, in such a way as to receive the sliding  
5 fitting of the rotor 50 mounted to the shaft 20 which is journalled to the supporting block 10, or it may be mounted around the rotor 50 already affixed to said shaft 30 which is journalled to the supporting block 10.

10 In another possible solution, the guide means 80 has the shape of a cylindrical hub dimensioned so as to occupy the entire radial space between the stator 60 and the shaft 20. In this construction, the guide means 80 may be mounted to the stator 60, in order to  
15 receive the sliding fitting of the shaft 30 which is journalled to the supporting block 10, or be mounted around the shaft 30 which is journalled to the supporting block 10, in order to be slidably fitted into the stator 60.

20 In this constructive alternative, after removing the guide means 80 from the part to which it has been mounted, the rotor 50 is affixed around the shaft 20 which is already journalled to the supporting block 10, in an initial step of the mounting process of the  
25 motor according to the present invention, prior to a seating step of the supporting block 10 to the motor housing 70.

In another construction of the present invention, the guide means 80 is in the form of a hub which is  
30 dimensioned to occupy the whole internal diametral space of the stator, having a radius corresponding to the sum of the air gap, of the radial thickness of the rotor 50 and of the shaft 20 and which is placed between the stator 60 and the bearing 13 of the  
35 supporting block 10. In this construction, the guide

means 80 may be mounted to the stator 60, so as to be slidingly fitted in the bearing 13 of the supporting block 10 or mounted to the bearing, in order to receive the sliding fitting of the stator 60 of the supporting block 10.

In this solution, after removing the guide means 80 from the part to which it has been mounted, the shaft 20 is mounted to the bearing 13 of the supporting block 10 and receives posteriorly the rotor 50, which is affixed around a portion of the longitudinal extension of said shaft 20 which is already journalled to the supporting block 10.

CLAIMS

1. A process for mounting an electric motor, comprising a stator (60), which is affixed inside a motor housing (70) affixed to a supporting block (10);  
5 and a rotor (50) affixed around a shaft (20), which is axially and radially retained in a bearing (13) incorporated to the supporting block (10), characterized in that it comprises the steps of: a-  
10 mounting a guide means (80) to one of the parts defined by the stator (60) and the supporting block (10): b- slidingly fitting the other of said parts into the guide means (80), in order to make the axes of the stator (60) and the bearing (13) of the  
15 supporting block (10) coincide with each other, said displacement being limited by seating at least an end portion (71) of the motor housing (70) against the supporting block (10); c- affixing, without applying tension, the motor housing (70) to the supporting  
20 block (10) in the seating position; and d- removing the guide means (80) from the part to which it has been mounted.

2. Process, as in claim 1, characterized in that it includes, before step "a", the initial steps of:  
25 mounting the shaft (20) to the bearing (13) of the supporting block (10); and affixing the rotor (50) around the shaft (20) which is already journalled to the supporting block (10).

3. Process, as in claim 2, characterized in that the  
30 guide means (80) is annular and placed between the stator (60) and the rotor (50), in order to define the radial gap therebetween.

4. Process, as in claim 3, characterized in that the  
35 guide means (80) is mounted to the stator (60), in order to receive the sliding fitting of the rotor (50)

mounted to the shaft (20) which is journalled to the supporting block (10).

5. Process, as in claim 4, characterized in that the guide means (80) is mounted around the rotor (50) already affixed to the shaft (20) which is journalled to the supporting block (10).

6. Process, as in claim 1, characterized in that the guide means (80) is in the form of a hub incorporating the rotor (50) and placed between the stator (60) and the shaft (20), in order to define the radial gap between the stator (60) and the rotor (50).

7. Process, as in claim 6, characterized in that it comprises, after step "d", the step of mounting the rotor (50) to the shaft (20) which is already journalled to the supporting block (10).

8. Process, as in claim 7, characterized in that the guide means (80) is mounted to the stator (60), in order to receive the sliding fitting of the shaft (20) which is journalled to the supporting block (10).

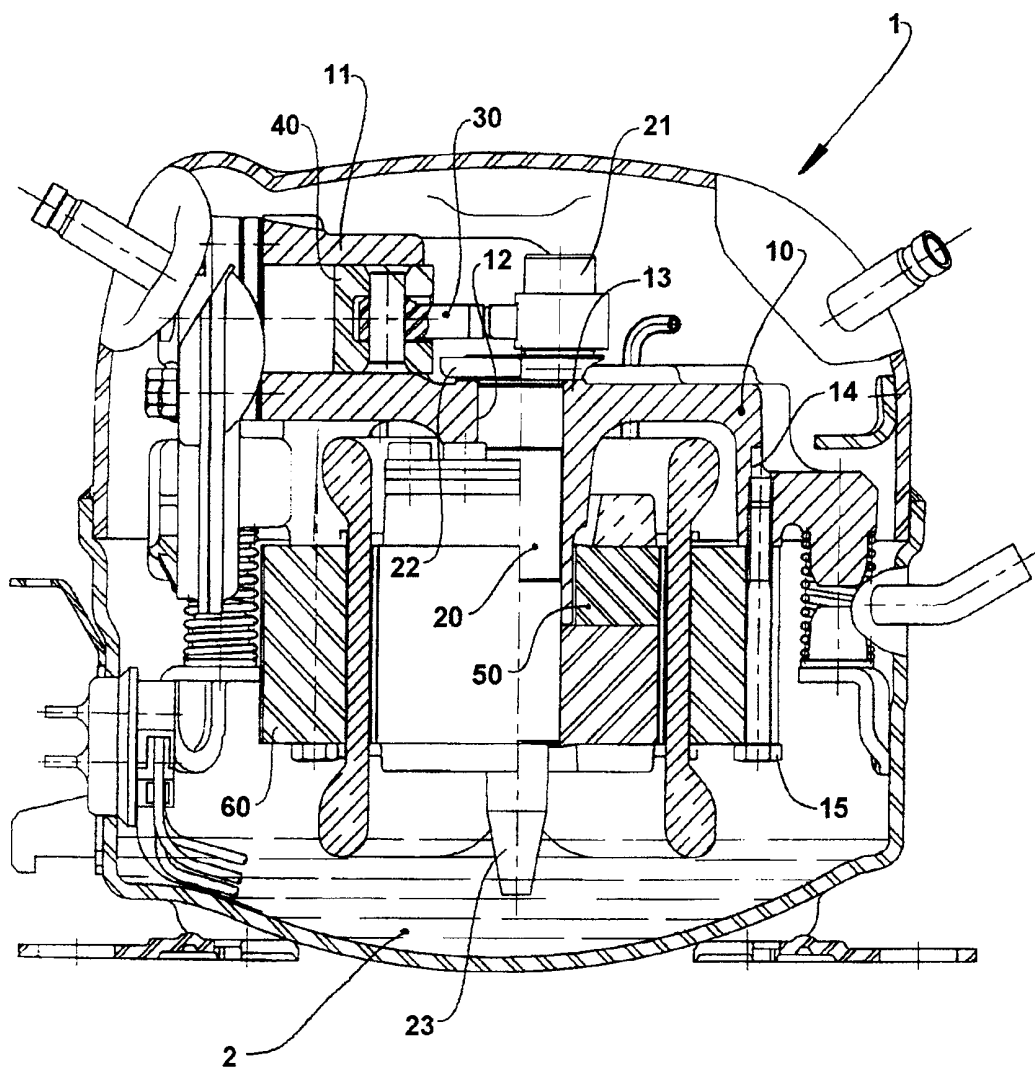
9. Process, as in claim 8, characterized in that the guide means (80) is mounted around the shaft (20) which is journalled to the supporting block (10).

10. Process, as in claim 1, characterized in that the guide means (80) is in the form of a hub incorporating the shaft (20) and placed between the stator (60) and the bearing (13) of the supporting block (10), in order to define therebetween the radial gap between the stator (60) and the rotor (50).

11. Process, as in claim 10, characterized in that it includes, after step "d", the steps of: mounting the shaft (20) to the bearing (13) of the supporting block (10); and affixing the rotor (50) around the shaft (20) which is already journalled to the supporting block (10).

12. Process, as in claim 11, characterized in that the guide means (80) is mounted to the stator (60), in order to receive the sliding fitting of the bearing (13) of the supporting block (10).
- 5 13. Process, as in claim 12, characterized in that the guide means (80) is mounted to the bearing (13), in order to receive the sliding fitting of the stator (60) of the supporting block (10).
- 10 14. Process, as in claim 1, characterized in that step "c" is obtained from one of the gluing and welding conditions of at least the end portion (71) of the motor housing seated onto the supporting block (10).
- 15 15. Process, as in claim 14, characterized in that it includes the additional step of providing at least one of the parts defined by the end portion (71) of the motor housing (70) and by the supporting block (10) with an adhesive element.
- 20 16. Process, as in claim 1, characterized in that it provides the motor housing (70) with end portions (71) axially projecting from a peripheral edge (72) of said motor housing (70).

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**FIG.1**  
PRIOR ART

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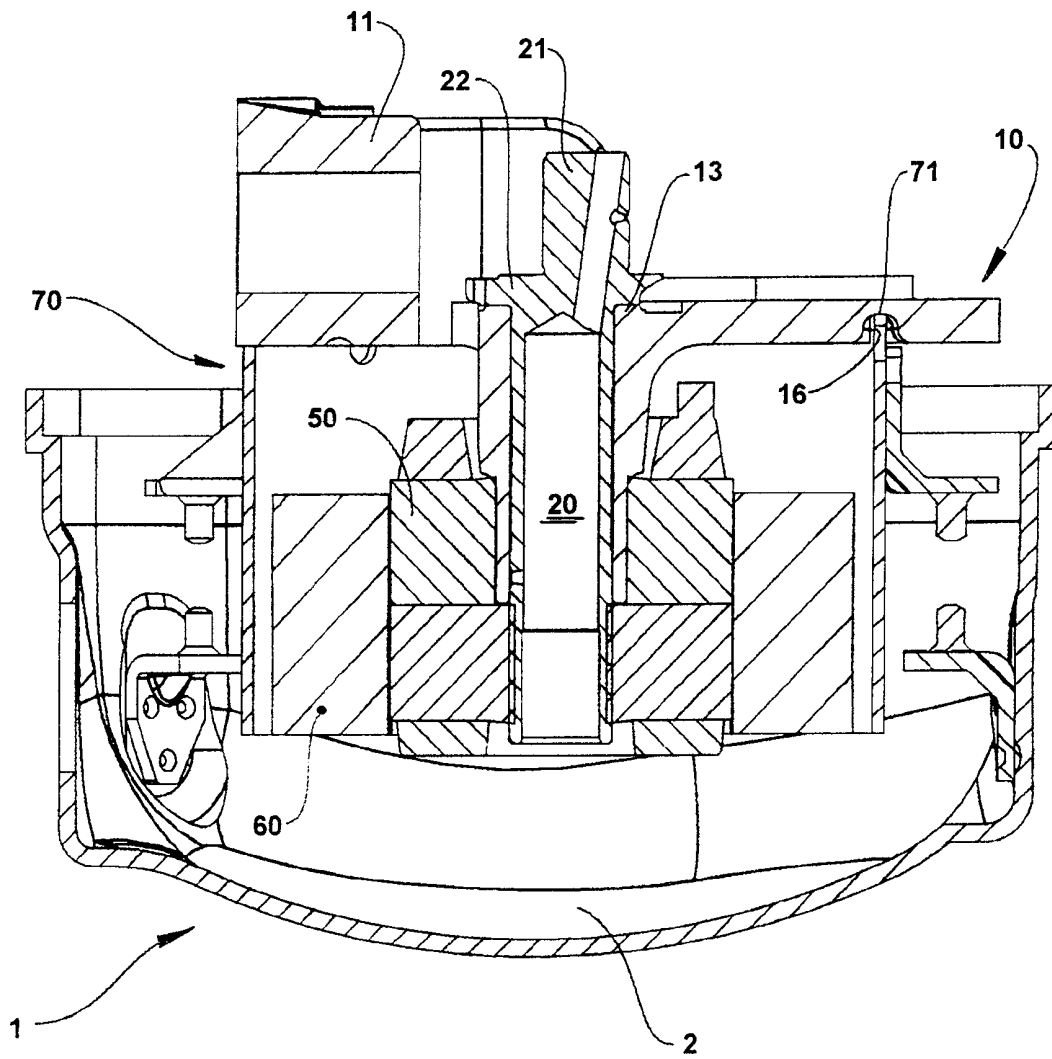


FIG. 2

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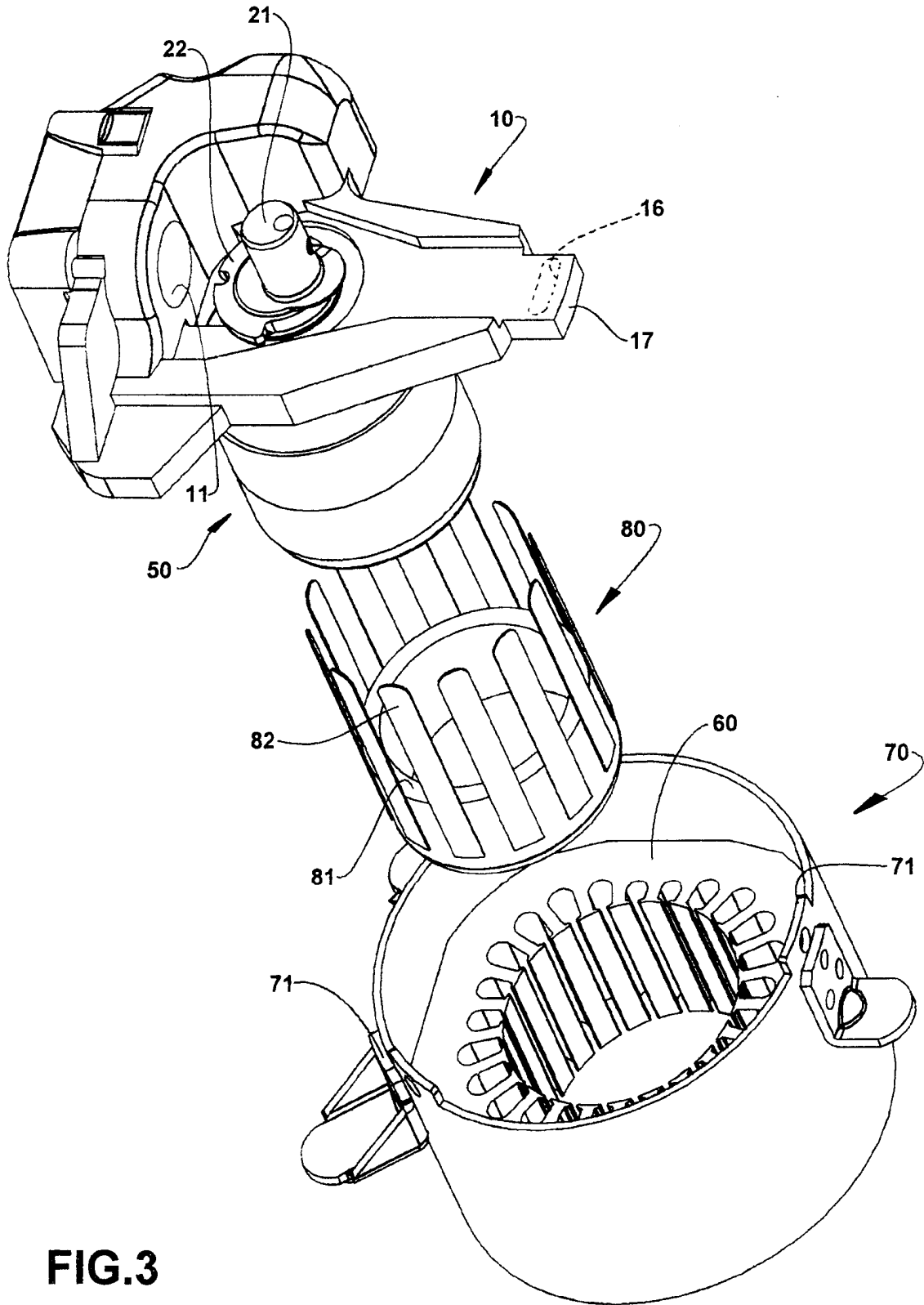


FIG.3

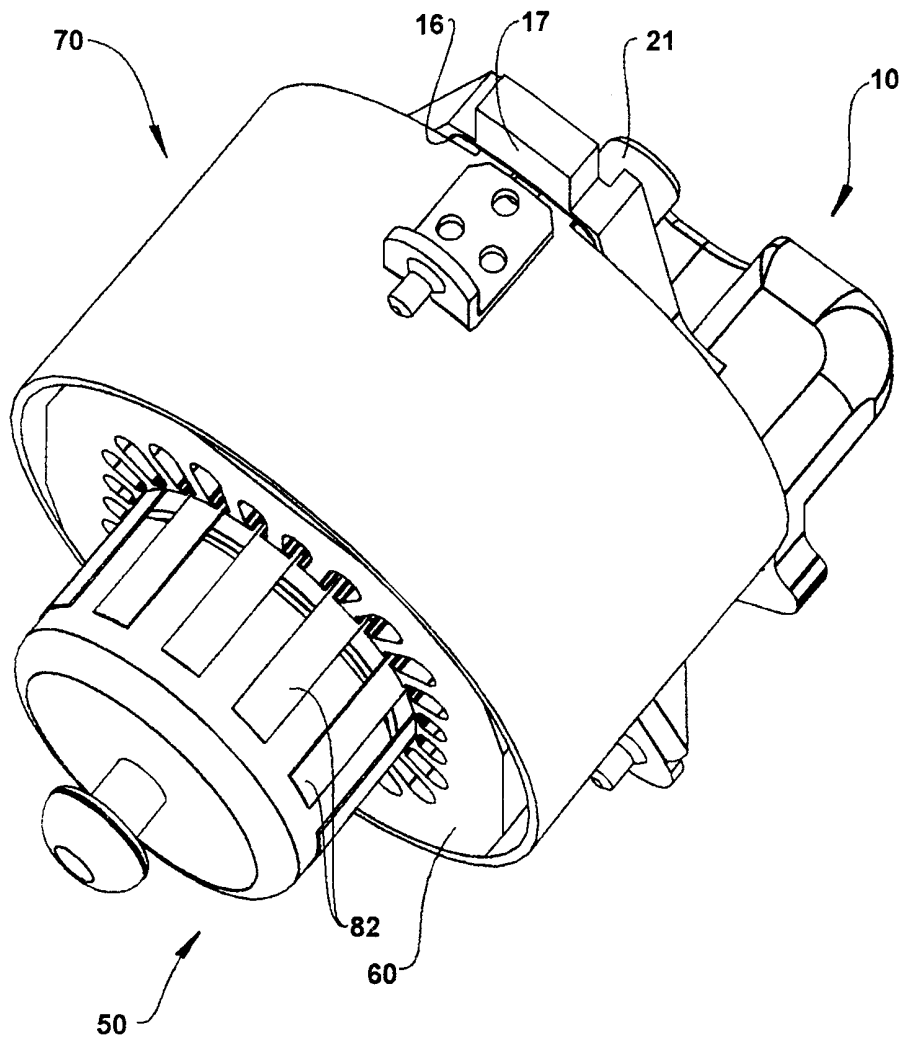


FIG.4