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(54) Abstract Title: **Alternator Housing**

(57) The present invention relates generally to an alternator assembly, more particularly, the present invention is related to a housing arrangement for a motor vehicle alternator. The alternator assembly (10) is powered by a pulley (16) and is made up of an outer housing (20) that contains a stator assembly (14) and a rotor assemblies (12), an inner housing (19,21,23) and a rear cover (34) which is retained by a fastening member (42) that secures the inner housing (19,21,23) and rear cover (34) within the outer housing (20).

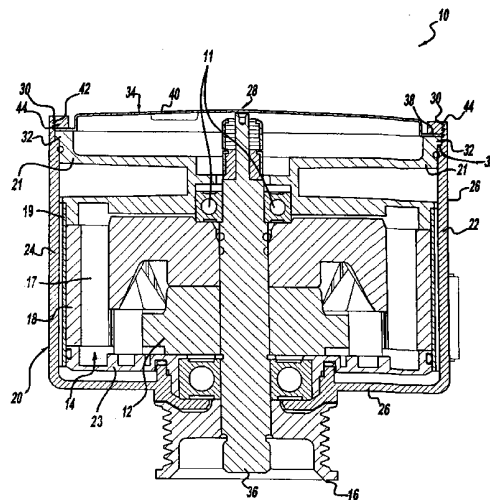


Figure - 1

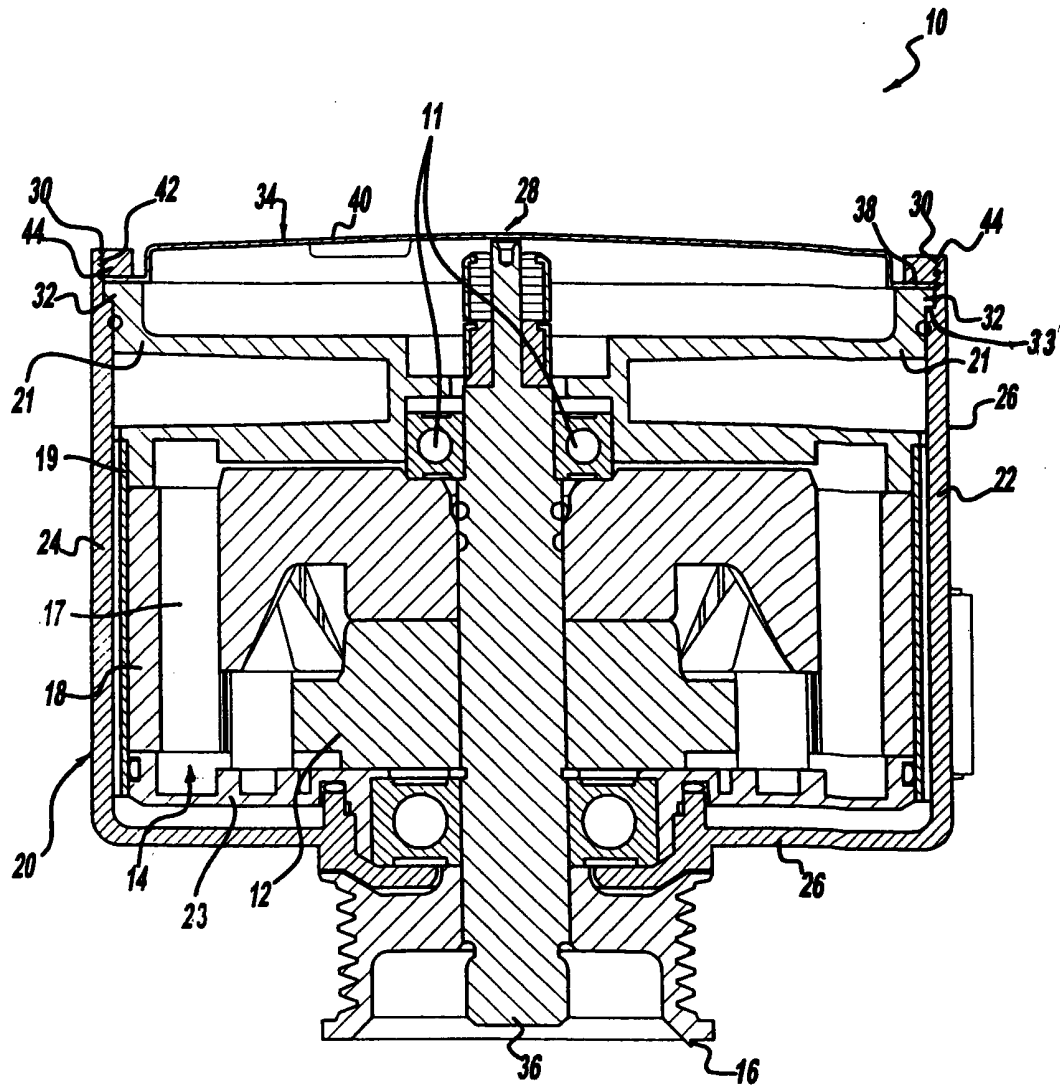


Figure - 1

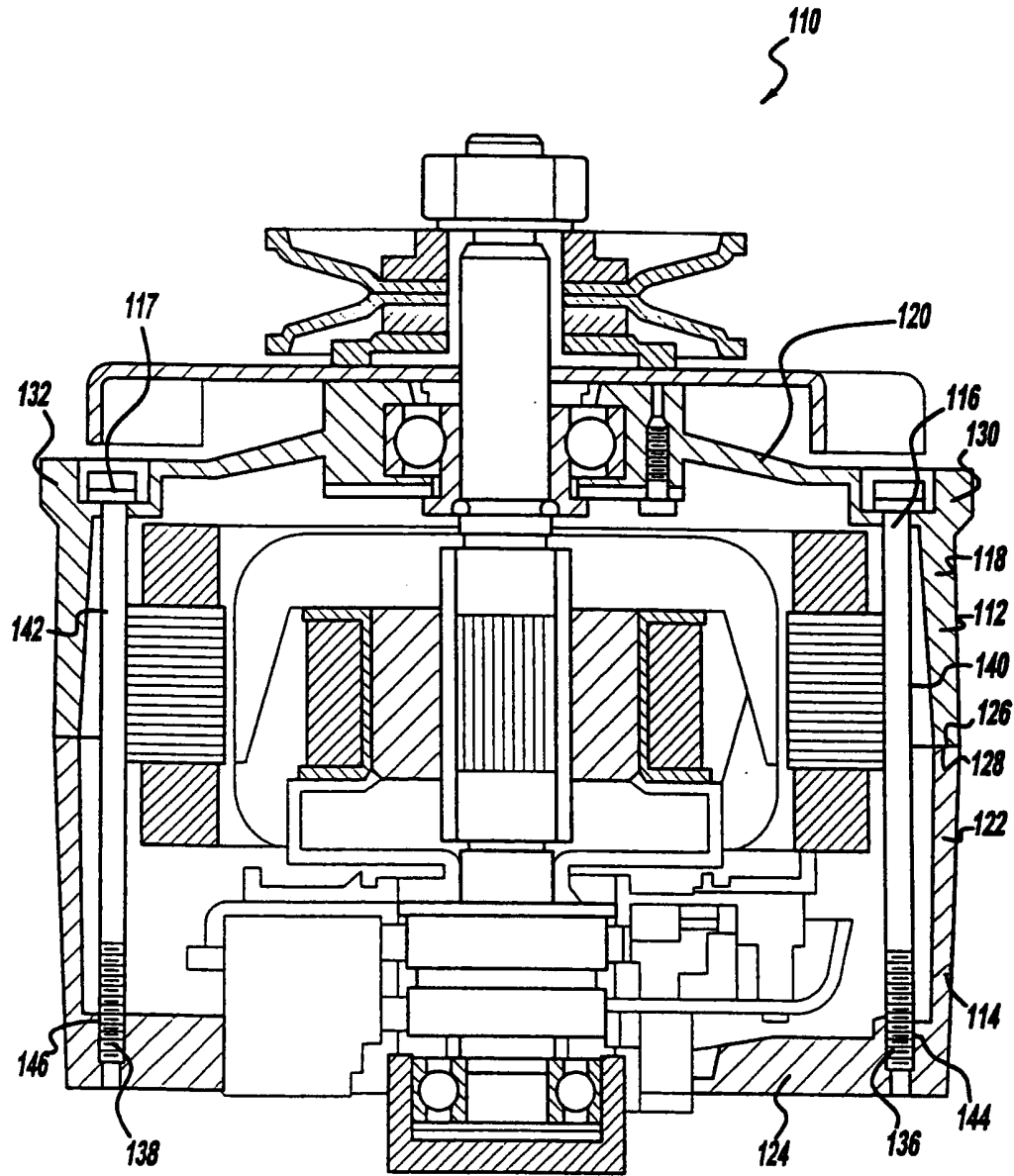


Figure - 2
Prior Art

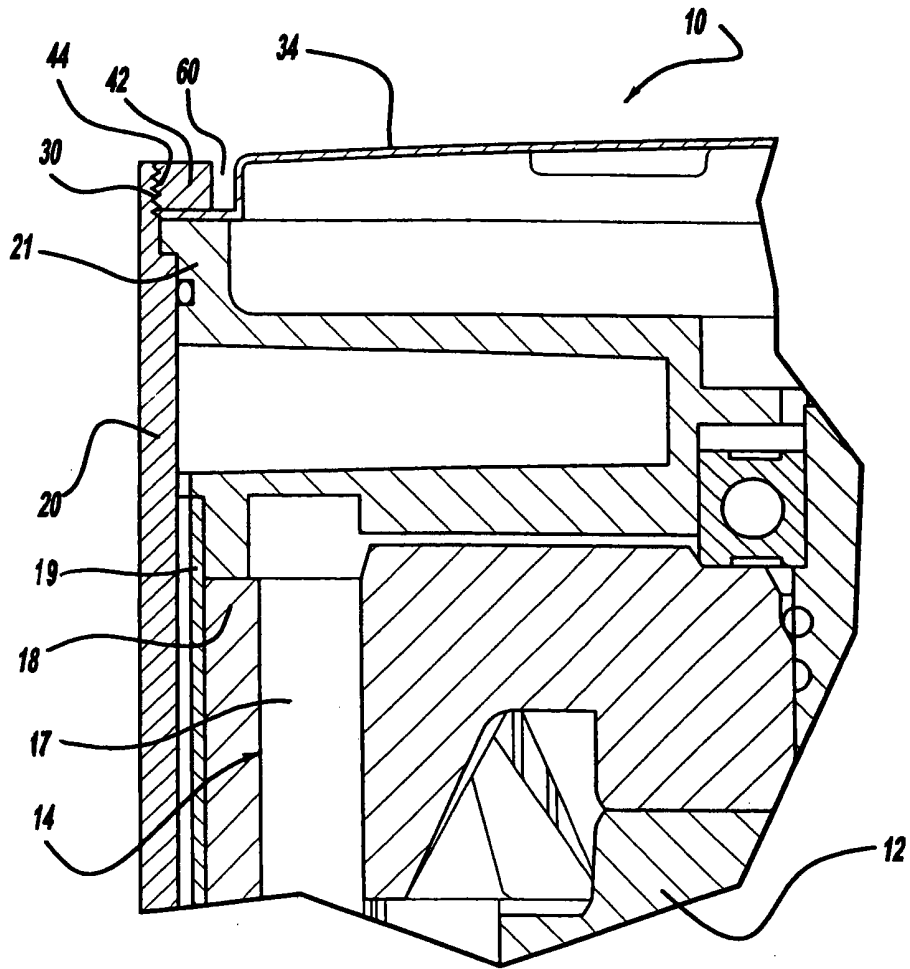


Figure - 3

Alternator Assembly

Field of the Invention

5 The present invention relates generally to an alternator assembly, more particularly, the present invention is related to a housing arrangement for a motor vehicle alternator.

Description of Prior Art

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Alternators are used in many modern-day industries to convert mechanical power to electrical power within an engine. In the motor vehicle industry, in particular, alternators have become a staple item. Alternators are now used in virtually every automobile produced. This translates into a large overall production cost for automotive manufacturers and automotive parts manufacturers.

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Furthermore, the technology boom of the last couple decades has had a significant impact on the automotive industry. As customers demand more gadgets and feedback on their vehicle performance, automobiles now contain a dramatically increased number of electronic devices. This trend has increased the electrical output demanded of the alternators used within the automobiles and has increased their size. With an increased number of components to be packaged and a larger alternator required to power them, the always tight packaging space in a vehicle has become even more of an issue.

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The housing unit is a large component of an alternator unit. Modern alternators generally include a housing comprised of at least two housing pieces. One function of this

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configuration is to contain the inner components of the alternator. The most common way of attaching the two housing pieces is by using a plurality of through-bolts and nuts. In this configuration, the through-bolts are inserted through
5 cavities disposed in the two housing pieces and then threaded into cavities disposed in the other housing, thereby creating a rigid outer housing that retains and protects the internal components of the alternator.

10 As a result of the well-known method and apparatus discussed above, the cost-efficiency as well as the space-efficiency of contemporary alternators is not optimized. More specifically, the use of through-bolts adds unnecessary weight to the assembly and consumes excessive space within and around the
15 assembly. Furthermore, the space consumed by the through-bolt and nut combination frequently interferes with the placement of other engine components.

Therefore, there is a need in the automotive industry, as
20 well as in other industries, for a smaller and improved housing assembly for retaining and protecting the internal components of an alternator.

Brief Summary of the Invention

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According to the invention, there is provided an alternator assembly comprising:

an outer housing of a hollow generally cylindrical shape with a generally closed first end and a generally open second
30 end

a rotor located within said outer housing and mounted to a shaft, said shaft being rotatably mounted within said outer

housing and having an distal end protruding through said generally closed first end of said outer housing;

a pulley secured to said distal end of said shaft;

a stator located generally about said rotor and within
5 said outer housing;

a rear cover adjacent said generally open end of said outer housing; and

retainer means for engaging said generally open end of said outer housing and securing said rear cover to said outer
10 housing.

The retainer means may be a retaining member.

Preferably, the assembly further comprises an inner housing
15 located between the outer housing and the stator. The inner housing may then comprise a stator cover that extends radially around the stator.

The inner housing may then further comprise a rear inner
20 housing that extends radially inwards from the stator cover towards a rotor shaft, said rear inner housing being located between, on the one hand, the rotor and the stator and, on the other hand, the cover.

25 In a preferred embodiment of the invention, the rear inner housing has a circumferentially extending flange that abuts the outer housing and on which flange the cover seated. The flange may also be seated on an inner shoulder of the outer housing.

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Also in a preferred embodiment of the invention, the inner housing further comprises a front inner housing that extends

radially inwards from the stator cover towards a rotor shaft, said front inner housing being located between, on the one hand, the rotor and the stator and, on the other hand, the closed first end of the outer housing.

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For ease of assembly, it is preferred if said stator cover has rounded sides. For example, the stator cover may have a cylindrical outer surface that conforms with an inner cylindrical surface of the outer housing.

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In accordance with the present invention, a housing means is provided to retain the internal components of an alternator without the use of through-bolts to hold the front and rear housing together. An inner and outer housing is used where an
15 internal thread is cut into the top of the outer alternator housing. The internal thread is capable of receiving an externally threaded packing nut. When the packing nut is tightened the inner housing is seated on a machined surface on the outer housing. The packing nut is tightened with a
20 device such as a spanner wrench.

The packing nut and housing combination replaces the commonly used through-bolts, which require a boss on the exterior of the alternator and increase the packaging space in the
25 vehicle required for the alternator.

The packing nut retention of the can may be improved by a number of methods. An anaerobic locking compound can be added to the external threads on the packing nut prior to
30 installation to improve retention. A mechanical crimp of the exterior of the outer housing can be made locking the outer housing to the fastener also to improve retention.

Also according to the invention, there is provided a method for assembling an alternator comprising the steps of:

- providing a rotor;
- 5 locating said rotor within a stator;
- surrounding the rotor and stator with a housing;
- placing a cover adjacent to the housing;
- securing the cover to the housing by a threaded engagement.

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Additional benefits and advantages of the present invention will become apparent to those skilled in the art to which the present invention relates from the subsequent description of the preferred embodiments and the appended claims, taken in
15 conjunction with the accompanying drawings.

Brief Description of the Drawings

The invention will now be further described, by way of
20 example only, and with reference to the accompanying drawings, in which:

Figure 1 is a side view of a section through the alternator assembly of the present invention;

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Figure 2 is a side view of a section through a prior art design of an alternator assembly; and

Figure 3 is a side view of an enlarged section through
30 the alternator assembly of the present invention.

Detailed Description

The foregoing discussion discloses and describes the preferred embodiment of the invention. One skilled in the art will readily recognize from such discussion, and from the accompanying drawings and claims, that changes and modifications can be made to the invention without departing from the scope of the invention as defined in the following claims.

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Referring now to Figure 1, an alternator assembly 10 is shown. The alternator assembly 10 includes a rotor 12 that is attached to a pulley 16 by a shaft 36 rotatably mounted within the assembly 10 on bearings 11. As the vehicle engine runs a belt (not shown) coupled to the pulley 16, the belt causes rotation of the pulley 16 and therefore the rotor 12. Rotation of the rotor 12 produces a magnetic field in the rotor 12. The rotor 12 is surrounded by a stator 14 that includes a set of coils 17 and an iron core 18. The stator 14 is stationary in the alternator assembly 10. As the magnetic field from the rotor 12 sweeps through the stator 14, it produces electrical current for use in the vehicle. Enclosing the coils 17 and core 18 of stator 14 is an inner housing comprising a stator cover 19. The stator cover 19 is in turn enclosed at one end by and is fixed, possibly by a press fit, to a rear inner housing 21. Rear inner housing 21 fits inside an outer housing 20.

The stator cover 19 is also enclosed at the other end to a front inner housing 23 that extends radially inwards from the stator cover 19 towards the rotor shaft 36. The stator cover 19 and rear and front inner housings 21 and 23 together form

the inner housing.

The outer housing 20 is generally cylindrical in shape and is composed of sides 22 and 24, a closed end 26 and an open end 28. The closed end 26 is open near its middle and shaft 36 extends therethrough locating the pulley 16 outside the housing 20. On the open end 28 of the outer housing 20 are internal threads 30 and inboard of the internal threads 30 is a machined shoulder 33. The shoulder 33 operates as a seat where flange 32 of the rear inner housing 21 is received. A rear cover 34 encloses the open end 28 of the outer housing 20. The rear cover 34 is a generally flat component with a flat surface 40 with a stepped flange 38 that is bent downward then extends outward from the flat surface 40. The stepped flange 38 sits atop the flange 32 and the rear inner housing 21.

The rotor 12 and stator 14 and all other internal components of the alternator assembly 10 are thus enclosed within the outer housing 20.

Retaining rear cover 34 and inner housing 21 within outer housing 20 is a packing nut 42. The packing nut 42 is generally a ring shape and fits atop the stepped flange 38 of the rear cover 34. The packing nut 42 is provided with external threads 44 that matingly engage the internal threads 30 of the outer housing 20.

Now referring to Figure 2, an alternator assembly 110 of the prior art is shown. The internal components of the alternator assembly 110 are surrounded by an outboard or top housing 112 and an inboard or bottom housing 114. Outboard housing 112 is

generally cylindrical in shape and consists of a closed top end 120, and an open end 126. Inboard housing 114 is also generally cylindrical in shape and consists of a closed end 124 and open end 128. Outboard housing 112 meets inboard housing 114 at open end 126 and open end 128, respectively.

Housing 112 also contains bosses 130 and 132 on the outer edges of top end 120. Through-bolts 116 and 117 fit into bosses 130 and 132. Through-bolts 116 and 117 contain threaded portions 136 and 138 at their ends, respectively. Through-bolts 116 and 117 fit through top housing 112 at through-holes 140 and 142 threaded end portions 136 and 138 of through-bolts 116 and 117, respectively, engage threaded bores 144 and 146 of inboard housing 114. The upper housing 112 and lower housing 114 are thus fastened together, thus securing the internal components of the alternator assembly 10.

Referring to Figure 3, the alternator assembly 10 is shown after the installation of the packing nut 42 in a close-up sectional view. The stator core 18 is positioned within rear inner housing 21. The rear cover 34 sits atop the rear inner housing 21. The packing nut 42 secures the rear cover 34 as well as the rear inner housing 21 and the stator assembly 14 to the outer housing 20.

The packing nut 42 preferably includes multiple spanner slots 60 such that a spanner wrench may engage the spanner slots 60 to rotate or tighten packing nut 42. As a result of being tightened, external threads 44 are in contact with the internal threads 30 of outer housing 20 and rotor 12 and stator 14 are secured within the outer housing 20, rear inner

housing 21 and rear cover 34.

5 A retaining compound may be applied between external threads
44 and internal threads 30. The retaining compound is
preferably a liquid that is applied to one or both of
external threads 44 and internal threads 30 before packing
nut 42 is tightened. The retaining compound functions to
prevent movement of packing nut 42 and outer housing 20
relative to one another. Multiple suitable retaining
10 compounds will be known to persons of ordinary skill in the
art.

As an alternative to the retaining compound, a mechanical
stake may be used to secure packing nut 42 and outer housing
15 20. For example, once packing nut 34 has been tightened,
external threads 44 and internal threads 30 may be deformed
in corresponding locations to prevent relative rotation
between packing nut 42 and outer housing 20. Alternatively,
other suitable methods of forming a mechanical stake known to
20 persons of ordinary skill in the art may be used.

While the above description constitutes the preferred
embodiments of the present invention, it will be appreciated
that the invention is susceptible to modification, variation
25 and change without departing from the proper scope and fair
meaning of the accompanying claims.

Claims:

1. An alternator assembly comprising:

an outer housing of a hollow generally cylindrical shape
5 with a generally closed first end and a generally open second
end

a rotor located within said outer housing and mounted to
a shaft, said shaft being rotatably mounted within said outer
housing and having an distal end protruding through said
10 generally closed first end of said outer housing;

a pulley secured to said distal end of said shaft;

a stator located generally about said rotor and within
said outer housing;

a rear cover adjacent said generally open end of said
15 outer housing; and

retainer means for engaging said generally open end of
said outer housing and securing said rear cover to said outer
housing.

20 2. The alternator assembly of Claim 1, wherein said
retainer means is a retaining member.

3. The alternator assembly of Claim 1 or Claim 2, wherein
the assembly further comprises an inner housing located
25 between the outer housing and the stator.

4. The alternator assembly of Claim 3, wherein the inner
housing comprises a stator cover that extends radially around
the stator.

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5. The alternator assembly of Claim 4, wherein the inner
housing further comprises a rear inner housing that extends

radially inwards from the stator cover towards a rotor shaft, said rear inner housing being located between, on the one hand, the rotor and the stator and, on the other hand, the cover.

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6. The alternator assembly of Claim 5, wherein the rear inner housing has a circumferentially extending flange that abuts the outer housing and on which flange the cover seated.

10 7. The alternator assembly of Claim 6, wherein the flange is seated on an inner shoulder of the outer housing.

15 8. The alternator assembly of any of Claims 4 to 7, wherein the inner housing further comprises a front inner housing that extends radially inwards from the stator cover towards a rotor shaft, said front inner housing being located between, on the one hand, the rotor and the stator and, on the other hand, the closed first end of the outer housing.

20 9. The alternator assembly of any of Claims 4 to 8, wherein said stator cover has rounded sides.

25 10. The alternator assembly of Claim 9, wherein said stator cover has a cylindrical outer surface that conforms with an inner cylindrical surface of the outer housing.

11. The alternator assembly of any preceding claim, wherein said generally open end of said outer housing is provided with internal threads.

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12. The alternator assembly of Claim 11, wherein said retainer is provided with external threads, said external

threads matingly engaging said internal threads.

13. The alternator assembly of Claim 12, further comprising
a retaining compound located between said outer threads of
5 said retaining member and said external threads of said outer
housing.

14. The alternator assembly of any preceding claim, further
comprising a retaining compound located between said
10 retaining member and said outer housing.

15. The alternator assembly of any preceding claim, wherein
an engaging means is provided on said retaining means to
facilitate engaging said retaining means with said outer
15 housing.

16. The alternator assembly of Claim 15, wherein said
engaging means are slots formed in said retaining means.

20 17. The alternator assembly of any preceding claim, wherein
said retaining means is staked to said outer housing.

18. The alternator assembly of any preceding claim, wherein
said retaining means is a nut.

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19. A method for assembling an alternator comprising the
steps of:

providing a rotor;

locating said rotor within a stator;

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surrounding the rotor and stator with a housing;

placing a cover adjacent to the housing;

securing the cover to the housing by a threaded

engagement.

20. The method of Claim 19, wherein said securing step is performed by engaging an externally threaded nut to an
5 internally threaded portion of the housing.

21. An alternator assembly, substantially as herein described, with reference to or as shown in Figures 1 and 3 of the accompanying drawings.

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22. A method for assembling an alternator, substantially as herein described, with reference to or as shown in Figures 1 and 3 of the accompanying drawings.



INVESTOR IN PEOPLE

Application No: GB0325869.6

Examiner: Mr John Cockitt

Claims searched: 1-22

Date of search: 25 May 2004

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular reference
X,E	1-6,9,10 at least	GB2391398 A VISTEON - see figs 1,2
X	1,2,9 at least	US4286186 A BOSCH - see fig 1
X	1,2,9,10	GB2004423 A PARIS - see figs
X	1,2,9,10	US4017964 A SCHULTE - see figs - endcap press fitted or riveted though lugs
X,A	1,2,19 at least	US5296770 A BOSCH - see endcap secured to frame end by bolts
X,A	19 at least	US5210453 A FORD - see external bolts securing end cover to housing.

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^W :

H2A

Worldwide search of patent documents classified in the following areas of the IPC⁰⁷

H02K

The following online and other databases have been used in the preparation of this search report

ONLINE: WPI,EPODOC,JAPIO