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<p>(21) International Application Number: PCT/EP90/01271 (22) International Filing Date: 2 August 1990 (02.08.90) (30) Priority data: 394,599 16 August 1989 (16.08.89) US (71) Applicant: SIEMENS AKTIENGESELLSCHAFT [DE/DE]; Wittelsbacherplatz 2, D-8000 München 2 (DE). (72) Inventor: SHELTON, Randolph, Allen ; 947 Chatsworth Drive, Newport News, VA 23601 (US). (74) Common Representative: SIEMENS AG; Postfach 22 16 34, D-8000 München 22 (DE).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent)*, DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent).</p> <p>Published <i>With international search report.</i></p>	
<p>(54) Title: MAGNETIC RING MOUNTING FIXTURE</p>			
<p>(57) Abstract</p>			
<p>A vehicle wheel speed sensing system comprises a magnetic ring mounted on the wheel hub and a sensor mounted on the spindle. The magnetic ring is polarized at regular circumferential intervals so that as the hub rotates on the spindle, magnetic impulses are detected by the sensor which generates an electrical signal corresponding to the rotational speed of the hub. The radially inner surface of the magnetic ring is non-circular and fits onto a correspondingly non-circular radially outwardly facing surface of a groove in the hub. The groove also comprises an axially inwardly facing shoulder against which the magnetic ring is disposed. A sealing ring that seals the axially inner end of the hub to the spindle also has a portion that radially overlaps the magnetic ring for cooperating with the groove shoulder to axially capture the magnetic ring on the hub. In this way no separate attaching parts are required for mounting the magnetic ring on the hub.</p>			

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MAGNETIC RING MOUNTING FIXTURE

BACKGROUND AND SUMMARY OF THE INVENTION

5 This invention relates to a magnetic ring mounting fixture for the mounting of a magnetic ring on an automotive vehicle wheel hub. The magnetic ring rotates with the hub, and a stationary sensor disposed adjacent the magnetic ring picks up impulses from the magnetic ring
10 to provide an electrical signal representative of wheel speed.

It is known to mount a magnetic ring on the wheel hub of an automotive vehicle. The magnetic ring is polarized at regular intervals so that when the wheel hub rotates,
15 magnetic impulses are detected by an adjacent stationary sensor to provide an electrical signal representative of wheel speed.

The present invention relates to a new and unique means for mounting the magnetic ring on the wheel hub.
20 One of the features of the invention is that the mounting takes advantage of the presence of other parts so that mounting is accomplished without separate attaching parts. As a result, when a wheel speed sensing function is incorporated into an automotive vehicle wheel, the
25 invention enables meaningful cost economies to be achieved in comparison to other means for mounting the magnetic ring on the wheel hub. Further features of the invention will appear in the following detailed description of a presently preferred embodiment of the invention. Drawings
30 accompany the description and illustrate a presently preferred embodiment of the invention in accordance with the best mode contemplated at the present time for carrying out the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a view, partly in cross section, of an automotive vehicle wheel hub and spindle including a wheel speed sensing means depicting principles of the invention.

Fig. 2 is a transverse cross sectional view taken in the direction of arrows 2-2 in Fig. 1.

Fig. 3 is an enlarged view of a portion of Fig. 2.

10 DESCRIPTION OF THE PREFERRED EMBODIMENT

The drawings show a wheel hub 10 that is journaled on a spindle 12 by means of bearings 14, 16 for rotation about the spindle axis 18. The hub has a radial flange 20 against whose axially outer face 22 a wheel (not shown) is adapted to be disposed and fastened by conventional means such as lug nuts. The axially inner end of the spindle has a radial flange 24, and a backing plate 26 is affixed to the axially outer face of flange 24 by any conventional means of attachment.

A sensor 28 is fixedly mounted on backing plate 26 in radially outwardly spaced relation to the spindle and hub. Sensor 28 has a sensing tip 30 that confronts, but is spaced just slightly radially outwardly of, a magnetic ring 32 that is fixedly mounted on the axially inner end of hub 10.

The axially inner end of hub 18 comprises a groove 34 extending around the outside surface of the hub. The groove is defined by an axially inwardly facing shoulder 36 and a non-circular radially outwardly facing surface 38. Magnetic ring 32 has a generally rectangular cross section and fits into groove 34 such that with a radially inner portion of the axially outer face of the ring disposed against the axially inwardly facing shoulder of

the groove, the axially inner face of the ring is substantially flush with the axially innermost surface of the hub.

The radially inner face of ring 32 is made non-circular in the same manner as surface 38. In this way the magnetic ring is keyed to the hub for rotation therewith. An especially advantageous pattern for the non-circularity is to have the respective surfaces circular, except for two flats 40, 42 on diametrically opposite sides. Such flats can be readily incorporated into the magnetic ring and machined into the hub. The flats have limited circumferential extent about axis 18.

A sealing ring 44 fitted to the axially inner end of the hub performs the double function of forming a grease seal for the axially inner end of the interior of the hub and of cooperating with shoulder 36 to axially capture magnetic ring 32. Ring 44 comprises an axial wall 46 that is press-fitted into the axially inner end of the hub, a radial wall 48 that extends radially outwardly from the axially inner end of wall 46 to radially overlap magnetic ring 32, and a lip 50 that curls radially inwardly and axially outwardly from the junction of walls 46 and 48 to form a wiper-type seal against spindle 12.

The magnetic ring is magnetically polarized at regular intervals so that as the hub rotates on the spindle, the magnetic impulses are detected by sensor 28 which then provides an electrical signal representing the instantaneous rotational velocity of the wheel hub. By way of example, sensor 28 may be a Hall sensor.

Because of the non-circular fitting of the magnetic ring onto the hub and the use of the sealing member for axially capturing the magnetic ring on the hub, no separate parts are required for mounting the magnetic ring on the hub.

While a preferred embodiment of the invention has been described, it should be understood that principles of the invention are applicable to other embodiments.

WHAT IS CLAIMED IS:

1 1. An automotive vehicle wheel spindle and hub
2 assembly wherein a wheel-carrying hub is journaled on a
3 spindle for rotation about an axis and a speed sensing
4 means is associated with the assembly for providing an
5 electrical signal corresponding to the rotational speed of
6 the hub on the spindle, said speed sensing means
7 comprising a magnetic ring that is fixedly mounted on said
8 hub concentric with the axis and that is magnetically
9 polarized at regular circumferential intervals about the
10 axis, a speed sensor, and means for mounting said speed
11 sensor in stationary relation to said spindle and
12 proximate said magnetic ring such that said speed sensor
13 detects the passage of said regular polarized intervals
14 past the sensor as said hub and magnetic ring rotate past
15 the speed sensor, the improvement which comprises said hub
16 having groove comprising a shoulder that faces axially
17 inwardly and a non-circular surface that faces radially
18 outwardly, said magnetic ring having a non-circular
19 radially inwardly facing surface matching said
20 non-circular surface of said groove in said hub, said
21 magnetic ring fitting onto said non-circular surface of
22 said groove in said hub and against said shoulder so that
23 said magnetic ring is thereby keyed to said hub, and a
24 sealing ring fitted to the axially inner end of said hub
25 to seal between said hub and spindle, said sealing ring
26 comprising a radially inwardly disposed circular sealing
27 lip in wiping contact with said spindle and a radially
28 outwardly disposed portion that cooperates with said
29 shoulder in axially capturing said magnetic ring on said
30 hub.

1 2. The improvement set forth in claim 1 in which
2 said radially outwardly disposed portion of said sealing
3 ring is the radially outer terminus of a radial wall of
4 said sealing ring.

1 3. The improvement set forth in claim 2 in which
2 said sealing ring also has an axial wall extending axially
3 outwardly from said radial wall of said sealing ring and
4 disposed against a radially inner wall surface of said
5 hub, said circular sealing lip extending from the junction
6 of said radial and axial walls of said sealing ring.

1 4. The improvement set forth in claim 3 in which
2 said circular sealing lip curls axially outwardly in the
3 radially inward direction.

1 5. The improvement set forth in claim 1 in which the
2 non-circularities of the radially inner surface of said
3 magnetic ring and of said radially outwardly facing
4 surface of said groove are formed by one or more flats.

1 6. The improvement set forth in claim 5 in which the
2 non-circularities of the radially inner surface of said
3 magnetic ring and of said radially outwardly facing
4 surface of said groove are formed by a pair of flats
5 arranged diametrically opposite each other.

1 7. An automotive vehicle wheel spindle and hub
2 assembly wherein a wheel-carrying hub is journaled on a
3 spindle for rotation about an axis and a speed sensing
4 means is associated with the assembly for providing an
5 electrical signal corresponding to the rotational speed of
6 the hub on the spindle, said speed sensing means
7 comprising a ring that is fixedly mounted on said hub

8 concentric with the axis and that cooperates with a speed
9 sensor that is mounted in stationary relation to said
10 spindle and proximate said ring such that said speed
11 sensor detects the passage of regular intervals of said
12 ring past the sensor as said hub and ring rotate past the
13 speed sensor, the improvement which comprises said hub
14 having a groove comprising a shoulder that faces axially
15 inwardly and a non-circular surface that faces radially
16 outwardly, said ring having a non-circular radially
17 inwardly facing surface matching said non-circular surface
18 of said groove in said hub, said ring fitting onto said
19 non-circular surface of said groove in said hub and
20 against said shoulder so that said ring is thereby keyed
21 to said hub, and a sealing ring fitted to the axially
22 inner end of said hub to seal between said hub and
23 spindle, said sealing ring comprising a radially inwardly
24 disposed circular sealing lip in wiping contact with said
25 spindle and a radially outwardly disposed portion that
26 cooperates with said shoulder in axially capturing said
27 first-mentioned ring on said hub.

1 8. The improvement set forth in claim 7 in which
2 said radially outwardly disposed portion of said sealing
3 ring is the radially outer terminus of a radial wall of
4 said sealing ring.

1 9. The improvement set forth in claim 8 in which
2 said sealing ring also has an axial wall extending axially
3 outwardly from said radial wall of said sealing ring and
4 disposed against a radially inner wall surface of said
5 hub, said circular sealing lip extending from the junction
6 of said radial and axial walls of said sealing ring.

1 10. The improvement set forth in claim 9 in which
2 said circular sealing lip curls axially outwardly in the
3 radially inwardly direction.

1 11. The improvement set forth in claim 7 in which
2 the non-circularities of the radially inner surface of
3 said magnetic ring and of said radially outwardly facing
4 surface of said groove are formed by one or more flats.

1 12. The improvement set forth in claim 11 in which
2 the non-circularities of the radially inner surface of
3 said magnetic ring and of said radially outwardly facing
4 surface of said groove are formed by a pair of flats
5 arranged diametrically opposite each other.

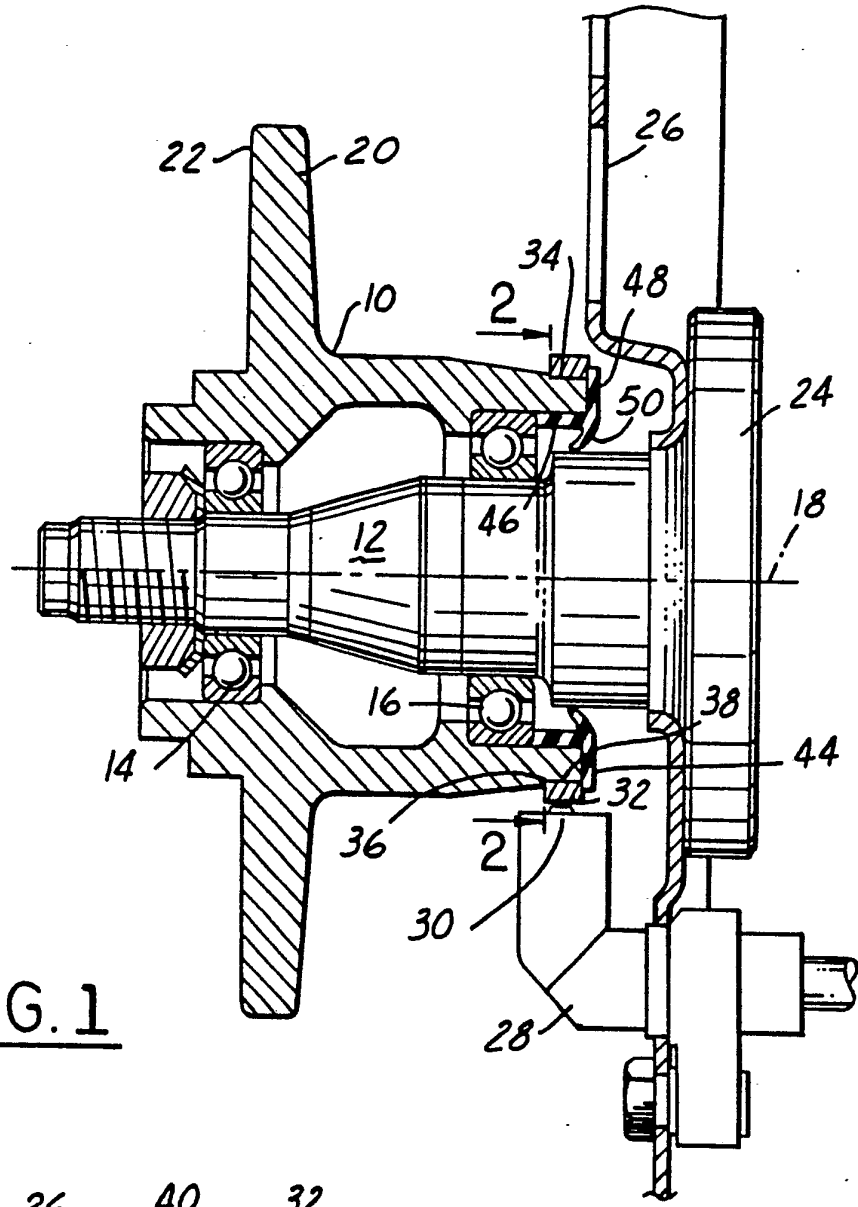


FIG. 1

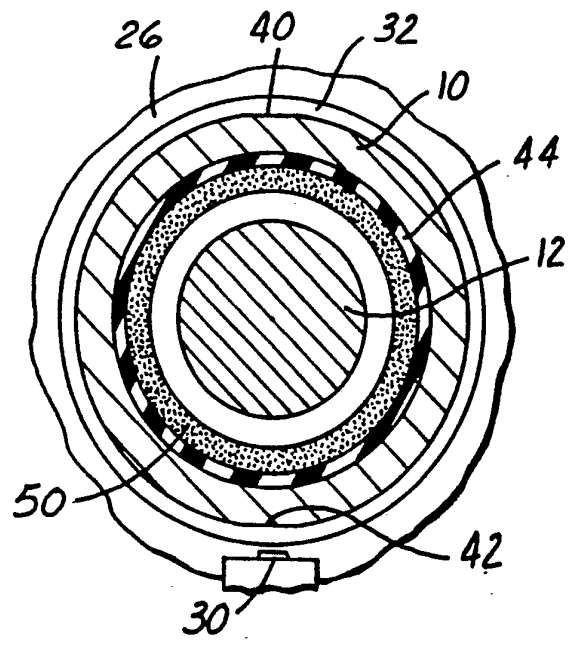


FIG. 2

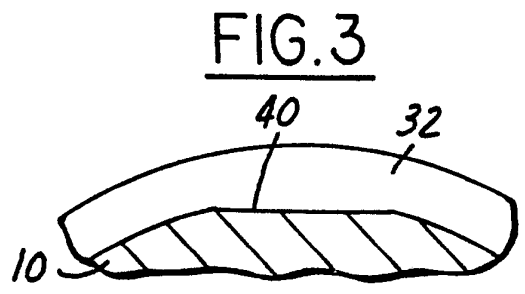


FIG. 3

INTERNATIONAL SEARCH REPORT

International Application No PCT/EP 90/01271

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: G 01 P 3/481				
II. FIELDS SEARCHED				
Minimum Documentation Searched ⁷				
Classification System	Classification Symbols			
IPC5	G 01 P, G 01 D			
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched ⁸				
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹				
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³		
A	US, A, 4161120 (J-C. CLOAREC) 17 July 1979, see column 4, line 5 - line 34 --	1-12		
A	US, A, 4667156 (T. MACHINO ET AL) 19 May 1987, see column 4, line 62 - column 6, line 9 -- -----	1-12		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; border: none;"> <p>* Special categories of cited documents:¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%; vertical-align: top; border: none;"> <p>"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</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&" document member of the same patent family</p> </td> </tr> </table>			<p>* Special categories of cited documents:¹⁰</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"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)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"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</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"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.</p> <p>"&" document member of the same patent family</p>
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IV. CERTIFICATION				
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report			
31st October 1990	11. 12. 90			
International Searching Authority	Signature of Authorized Officer			
EUROPEAN PATENT OFFICE	miss T. MORTENSEN			

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/EP 90/01271**

SA 39396

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4161120	17/07/79	NONE	
US-A- 4667156	19/05/87	FR-A- 2570143 JP-A- 61018190	14/03/86 27/01/86

For more details about this annex : see Official Journal of the European patent Office, No. 12/82