

(12) PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. **AU 199917563 B2**
(10) Patent No. **740036**

(54) Title
Device for fixing a wheel-alignment gauge to a rim of a wheel of a motor vehicle

(51)⁶ International Patent Classification(s)
G01B 005/255

(21) Application No: 199917563 (22) Application Date: 1998.11.20

(87) WIPO No: WO99/44007

(30) Priority Data

(31) Number	(32) Date	(33) Country
19807829	1998.02.26	DE

(43) Publication Date : 1999.09.15
(43) Publication Journal Date : 1999.11.11
(44) Accepted Journal Date : 2001.10.25

(71) Applicant(s)
HAWEKA Auswuchttechnik Horst Warkotsch GmbH

(72) Inventor(s)
Dirk Warkotsch

(74) Agent/Attorney
F B RICE and CO,605 Darling Street,BALMAIN NSW 2041

(56) Related Art
US 5446967
US 4185917



17563/99

PCT
WELTORGANISATION FÜR GEISTIGES EIGENTUM
Internationales Büro
INTERNATIONALE ANMELDUNG VERÖFFENTLICHT NACH DEM VERTRAG ÜBER DIE
INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES PATENTWESENS (PCT)

(51) Internationale Patentklassifikation ⁶ : G01B 5/255	A1	(11) Internationale Veröffentlichungsnummer: WO 99/44007
		(43) Internationales Veröffentlichungsdatum: 2. September 1999 (02.09.99)
(21) Internationales Aktenzeichen: PCT/EP98/07479	(81) Bestimmungsstaaten: AU, BR, CA, CN, CZ, HU, JP, KR, LT, LV, MX, NO, NZ, PL, RU, SK, TR, US, europäisches Patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).	
(22) Internationales Anmeldedatum: 20. November 1998 (20.11.98)		
(30) Prioritätsdaten: 198 07 829.3 26. Februar 1998 (26.02.98) DE	Veröffentlicht Mit internationalem Recherchenbericht.	
(71) Anmelder (für alle Bestimmungsstaaten ausser US): HAWEKA AUSWUCHTTECHNIK HORST WARKOTSCH GMBH [DE/DE]; Schulze-Delitzsch-Strasse 21, D-30938 Burg- wedel (DE).	IP AUSTRALIA 15 SEP 1999 RECEIVED	
(72) Erfinder; und		
(75) Erfinder/Anmelder (nur für US): WARKOTSCH, Dirk [DE/DE]; Gartenstrasse 29, D-30928 Wettmar (DE).		
(74) Anwälte: LEINE, Sigurd usw.; Burckhardtstrasse 1, D-30163 Hannover (DE).		

(54) Title: DEVICE FOR FIXING A WHEEL-ALIGNMENT GAUGE TO A RIM OF A WHEEL OF A MOTOR VEHICLE

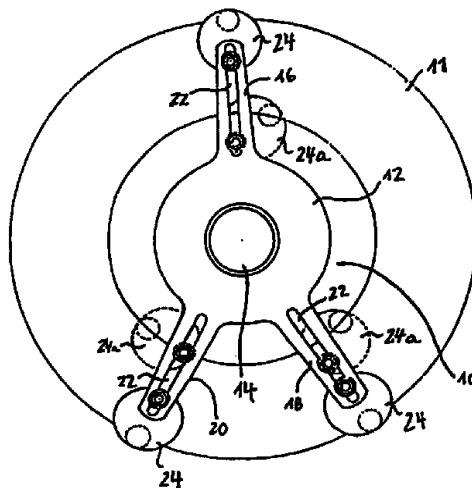
(54) Bezeichnung: VORRICHTUNG ZUR BEFESTIGUNG EINER ACHSMESSEINRICHTUNG AN EINER FELGE EINES RADES AN EINEM KRAFTFAHRZEUG

(57) Abstract

The invention relates to a device for fixing a wheel-alignment gauge to a rim of a wheel of a motor vehicle. According to the invention, a base part has means for fixing the wheel-alignment gauge in a predefined reference direction in relation to the base part. Three supporting arms are arranged on the base body which extend substantially radially in a plane which is perpendicular to the reference direction. Spacing elements are positioned on the supporting arms such that they can be displaced longitudinally in relation to same. The ends of the spacing elements, which serve to ensure a three-point mounting on a wheel rim, lie in a plane which is perpendicular to the reference direction. The invention also provides for means for fixing the base part on the rim. At least one of the spacing elements (24, 54) can be adjusted cross-wise to its supporting arm. In this way it is possible to adjust the position of the spacing elements to different divisions of the wheel mounting nuts.

(57) Zusammenfassung

An einem Grundkörper befinden sich Mittel zur Befestigung der Achsmesseinrichtung in einer vorbestimmten Bezugsrichtung in bezug zu dem Grundkörper. An dem Grundkörper sind drei Stützarme angeordnet, die sich in einer Ebene senkrecht zu der Bezugsrichtung im wesentlichen radial erstrecken. An den Stützarmen sind Abstandshalter längsverschieblich dazu angeordnet. Die zur Dreipunktanlage an einer Felge dienenden Enden der Abstandshalter liegen in einer Ebene senkrecht zur Bezugsrichtung. Ausserdem sind Mittel zur Halterung des Grundkörpers an der Felge vorgesehen. Wenigstens einer der Abstandshalter (24, 54) ist quer zu seinem Stützarm verstellbar. Auf diese Weise ist es möglich, die Lage der Abstandshalter an unterschiedliche Teilungen von Radbefestigungsmuttern anzupassen.



ABSTRACT

Means affixing the wheel-alignment sensor are mounted on a main body at a given reference direction to it. Three support arms are mounted on the main body and run substantially radially in a plane which is perpendicular to the reference direction. Spacers are
5 mounted on the support arms in transversely displaceable manner thereto. The spacer ends that will constitute a three-point rest on a wheel rim are situated in a plane which is perpendicular to the reference direction. Means to affix the main body to the wheel rim are provided. At least one of the spacers (24, 54) is adjustable transversely to its mounting arm. In this manner the position of the spacers can be matched to different pitches of wheel affixing
10 nuts.



APPARATUS AFFIXING A WHEEL-ALIGNMENT SENSOR
ON A MOTOR-VEHICLE WHEEL RIM.

5 The invention relates to apparatus defined in the preamble of claim 1.

Apparatus of this kind are widely known. They comprise a main body to which the wheel-alignment sensor is affixed at a predetermined reference direction to said main body. Three coplanar and substantially radial support arms are present on the main body, longitudinally adjusted spacers being
10 mounted on said arms and of which the ends implementing a three-point rest on the wheel rim being situated in a plane perpendicular to said relative direction. Means to keep the apparatus on the rim also are provided. The wheel-alignment sensor held by such apparatus against a motor-vehicle wheel rim illustratively may be a spirit level and/or a laser sensor measuring a
15 wheel's camber, track width, caster and the like.

In order to match the spacer to various rim diameters, it is known to fit the arms with elongated slots allowing clamping a spacer in various positions along the mounting arm to pass a tightening screw allowing clamping a spacer at various sites along the mounting arm. However this design incurs the
20 drawback that because the support arms are fixed in their directions, the spacers cannot always be moved to come to rest between affixation screws of the vehicle wheel because, in different types of vehicles, these affixation screws are at different angular spacings, in other words, they will be present in different numbers. To allow measurement when there are different angular
25 spacings, the state of the art has required keeping a supply of several affixation apparatus matched to different divisions, or numbers of, affixation screws.

US patent 5,446,967 discloses an apparatus defined in the preamble of claim 1, which is based on a wholly different principle than the known ones cited above. In the apparatus of this US patent, the arms are not support arms
30 but adjusting rods mounted in radially displaceable manner in slots in the main body. Moreover the bases are not designed as spacers, rather they are affixation means to directly use one affixation screw each for affixation to the wheel rim. It is critical for this known apparatus that there be four bases which must be screwed onto four affixation screws. The adjusting rods are
35 radially tightened pairwise using opposite threads at a manually driven knurled disk, the main body is made symmetrical relative the wheel axis and



furthermore inevitable play between the adjusting rods and the main body as well as between the adjusting rods and the bases pivotably affixed to them can be eliminated.

Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is solely for the purpose of providing a context for the present invention. It is not to be taken as an admission that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present invention as it existed in Australia before the priority date of each claim of this application.

Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

The objective of the invention is to create apparatus as defined in the preamble of claim 1 to affix a wheel-alignment sensor on a motor-vehicle's wheel rim, where said sensor shall be preferably matchable not only to different wheel diameters but also to different divisions or number of affixation screws, whereby the spacers always can be made to rest between the affixation screws of a rim. Moreover the apparatus shall be preferably simple and economical in design and easy to handle.

According to a first aspect, the present invention is an apparatus to fasten a wheel-alignment sensor to the wheel-rim of a motor vehicle, comprising:

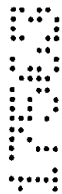
- a main body,
 - means on the main body to affix the wheel-alignment sensor in a predetermined reference direction relative to the main body,
 - three substantially radial arms situated in a plane which is perpendicular to the reference direction,
 - bases associated with the arms and adjustable in the directions of these arms of which the ends are situated in a plane which is perpendicular to the reference direction,
 - means affixing the main body to the motor-vehicle wheel-rim,
- characterized in that



2a

- the means affixing the main body to the wheel are designed as means affixing the main body against the rim,
- the bases are designed as spacers and are each mounted at the ends of three arms designed as support arms,
- 5 -- the ends of the spacers are designed as end faces to rest against the rim between said rim's affixation holes, and
- at least one spacer is transversely adjustable relative to its mounting arm and each can be clamped in the adjusted position.

10



The problem of the invention is solved in that at least one spacer shall be adjustable transversely to its mounting arm.

The basic concept of the invention is to match the position of the
5 spacers to different divisions of wheel fastening nuts. This goal can be achieved already if only one of the spacers shall be transversely adjustable to its mounting arm because frequently two support arms can be made to rest on the rim between the affixation screws on account of the larger angular intervals when there are different spacings between said screws. In that case it
10 suffices to transversely adjust the third spacer relative to its mounting arm in order to preclude it from hitting an affixation screw and instead to come to rest adjacently on the rim.

The basic concept of the invention can be reduced to practice in different ways. In one embodiment of the invention, the spacer is mounted on
15 a pivot arm mounted to its mounting arm and pivotable about a pivot running parallel to the reference direction. By pivoting the pivot arm, the position of the spacer can be changed in simple manner transversely to its mounting arm and accordingly it can be changed along the conceptual graduated circle of affixation screws and be matched to the angular intervals between the
20 particular affixation screws.

As already mentioned above, it may suffice if only one spacer shall be adjustable transversely to its mounting arm. Matchability however shall be enhanced if two of the spacers are adjustable transversely to their support arms. In that case the third mounting arm need not be adjustable.

25 In a variant of the embodiment of the invention of the spacer being mounted on a pivot arm at the mounting arm, said pivot arm comprises a rest surface perpendicular to the reference direction and resting against a surface perpendicular to the said reference direction, tightening means being provided to clamp the pivot arm on the mounting arm. Said rest surfaces always assure
30 accurate alignment relative to the main body and hence also to the reference direction defined relative to it. At the same time this embodiment variant allows easy



adjustment of the spacer along its mounting arm in that, in a further development of this embodiment, the tensioning means consist of tightening screws constituting the pivot and each passing through an elongated slot to enter a mounting arm and each being screwed into a threaded borehole in this pivot arm.

5 In a basically different practical implementation of the concept of the invention, one mounting arm is pivotable about an axis parallel to the reference direction. Pivoting the mounting arm entails a sideways displacement of the spacer mounted on said arm, as a result of which this spacer can be made to reliably rest next to a wheel nut on a wheel rim.

As is the case in the basic design described earlier, only one of the pivot arms need be
10 pivotable in this latter embodiment. Matchability however shall be enhanced if two support arms pivoting about a pivot axis which is a parallel to the reference direction shall be used. In especially advantageous manner, the two pivotable support arms shall be pivotable about a common axis. During the pivoting motion, the spacers affixed to said arms only move sideways, not in the direction of the arms, and as a result radial matching in the sense of
15 adapting to different conceptual graduated circles of affixation screws shall not be required.

Appropriately the pivotable support arms are fork-shaped relative to their pivot bearings and shall closely enclose the disk-shaped main body. As a result they will be connected in practically play-free manner to the main body to which they may furthermore be clamped to eliminate any play.

20 The invention is elucidated below by embodiments shown in the attached drawings.

Fig. 1 is a front view of a first embodiment of the apparatus of the invention,

Fig. 2 is a side view of part of the embodiment of Fig. 1,

Fig. 3 is a topview of the embodiment of Fig. 1,

Fig. 4 is a perspective of the apparatus of Figs. 1 through 3 when resting against a
25 vehicle wheel,

Fig. 5 is a perspective of a second embodiment of the invention, and



Fig. 6 is a perspective of embodiment of Fig. 5 being used in a concrete case.

Fig. 1 shows an embodiment of apparatus 10 of the invention which is applied against a truck's wheel rim 11 indicated in merely schematic manner. The apparatus 10 comprises a main body 12 fitted with a cylindrical seat 14 directed in a reference direction and designed to receive an omitted wheel-alignment sensor.

The main body 12 is fitted with support arms 16, 18, 20 situated in a plane perpendicular to the seat 14. Each mounting arm 16, 18, 20 comprises an elongated slot 22 in which is held a spacer 24. The spacers 24 are displaceable along the slots 22 and simultaneously are pivotable, whereby they can assume arbitrarily shifted and pivoted positions. Illustratively the positions 24a shown in dashed lines may be assumed besides those shown in solid lines.

Fig. 2 shows on a larger scale the spacers 24 with respect to a portion of a mounting arm 16. The spacer 24 comprises a base 26 at the bottom side 28 of which a cylinder 30 dedicated to a substantial portion of the spacer 24 is affixed. The cylinder 30 is mounted excentrically to the lower side 28 of the disk-shaped base 26, the central axis of said base 26 being indicated by a line A. A threaded borehole 32 in the base 26 is situated also excentrically and opposite to the connection site of the cylinder 30 and the base 26. A screw 34 fitted with a knob head 36 passes through the elongated slot 22 and engages the threaded borehole 32. Tightening the screw 34 by means of the knob head 36 compresses and hence affixes a rest surface 38 of the base 26 against a rest surface 40 of the arm 16. The cylinder 30 is fitted at its lower end face 42 with a magnetic insert 44 by means of which the apparatus of the invention is detachably affixed to the rim 1.

Fig. 3 is a topview of the spacer 24, showing the excentric configuration of the cylinder 30 and of the threaded borehole 32 relative to the disk-shaped base 26 which practical constitutes a pivot arm by means of which the cylinder 30 is pivotable about the screw 34, i.e. the threaded borehole 32.



Fig. 4 is a perspective and detailed view the apparatus of Fig. 1 when mounted on the rim 11. The spacers 24 are situated between fastening nuts 46 to the vehicle-rim 11, said spacers 24 being configured in different pivoted positions.

Fig. 5 shows a second embodiment of the invention. A seat 48 receiving an omitted
5 wheel-alignment sensor is situated centrally at and perpendicularly to a disk-shaped main body 50 onto which are mounted support arms 52, 54 and 56 comprising elongated slots 58, 60 and 62 and rest surfaces 64, 66, 68 against which rest. resp. spacers 70, 72, 74, said rest surfaces being clamped by screws which pass through the elongated slots 58, 60, 62 and which are fitted
10 with knob heads 76, 78, 80, as a result of which the spacers 70, 72, 74 assume an accurately defined position relative to the support arms 52, 54, 56 and, by the intermediary of the disk-shaped main body 50, relative to the main body 48 as well.

By means of a fork-shaped end 82, the mounting arm 52 encloses the main body 50 and is rigidly joined to it.

The support arms 54 and 56 also are fitted with fork-shaped ends 84 and 86, which
15 however are not rigidly joined to the disk-shaped main body 50 but instead are pivotable about a central pivot 88. Consequently the circumferential position of the spacers 72 and 74 relative to a conceptual graduated circle will be adjustable, said circle being determined by the radial position of the spacers 70, 72, 74 relative to the pivot 88 and hence also relative to the seat 48.

Fig. 6 is a perspective of the embodiment of Fig. 5 with the apparatus resting against
20 a vehicle wheel-rim 90. Because the support arms 54, 56 have been pivoted, the spacers 70, 72, 74 are configured freely between the fastening nuts 92. By pivoting the support arms, the apparatus can be matched to the most diverse angular arrays of fastening nuts.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. Apparatus to fasten a wheel-alignment sensor to the wheel-rim of a motor vehicle, comprising:
 - a main body,
 - 5 -- means on the main body to affix the wheel-alignment sensor in a predetermined reference direction relative to the main body,
 - three substantially radial arms situated in a plane which is perpendicular to the reference direction,
 - bases associated with the arms and adjustable in the directions of these
 - 10 arms of which the ends are situated in a plane which is perpendicular to the reference direction,
 - means affixing the main body to the motor-vehicle wheel-rim, characterized in that
 - the means affixing the main body to the wheel are designed as means
 - 15 affixing the main body against the rim,
 - the bases are designed as spacers and are each mounted at the ends of three arms designed as support arms,
 - the ends of the spacers are designed as end faces to rest against the rim between said rim's affixation holes, and
 - 20 -- at least one spacer is transversely adjustable relative to its mounting arm and each can be clamped in the adjusted position.
2. Apparatus as claimed in claim 1, characterized in that the spacer is situated in each case at a pivot arm mounted at its mounting arm and pivotable
- 25 about a pivot.
3. Apparatus as claimed in claim 2, characterized in that the pivot arm comprises a rest surface which is perpendicular to the reference direction and which rests against a rest surface perpendicular to the reference direction at the mounting arm, and in that tightening means clamp the pivot arm to the
- 30 mounting arm.
4. Apparatus as claimed in claim 3, characterized in that the tightening means consist of screws constituting the pivots and passing through an elongated slot to enter the mounting arm and being screwed into a threaded borehole in the mounting arm.
- 35 5. Apparatus as claimed in claim 1, characterized in that one mounting arm is pivotable about a pivot axis perpendicular to the reference direction.



6. Apparatus as claimed in claim 5, characterized in that two of the support arms are pivotable about a pivot axis parallel to the reference direction.
7. Apparatus as claimed in claim 6, characterized in that the two pivotable support arms are pivotable about one common pivot.
- 5 8. Apparatus as claimed in claim 5, characterized in that the mounting arm comprises a forked end in the direction of its pivot bearing and thereby tightly encloses the disk-shaped main body.
9. Apparatus to fasten a wheel-alignment sensor to the wheel-rim of a motor vehicle substantially as described with reference to the accompanying
- 10 drawings.

3
2
1

7
6
5
4
3
2
1



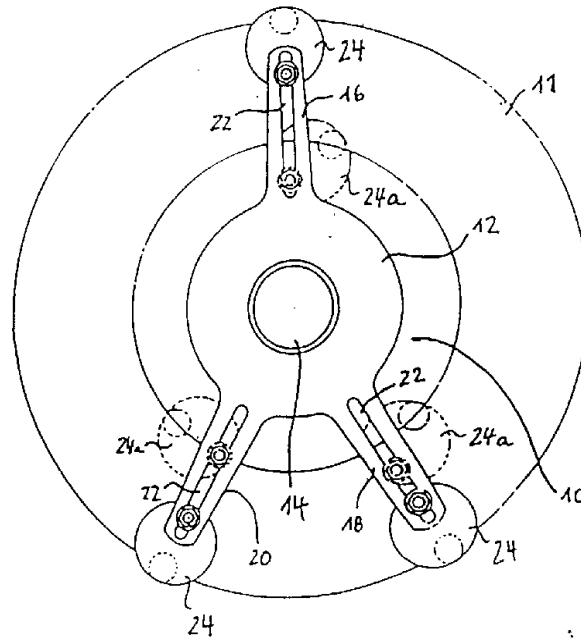


FIG. 1

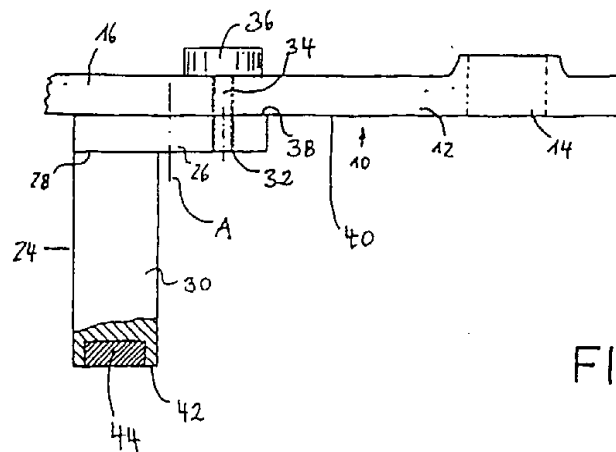


FIG. 2

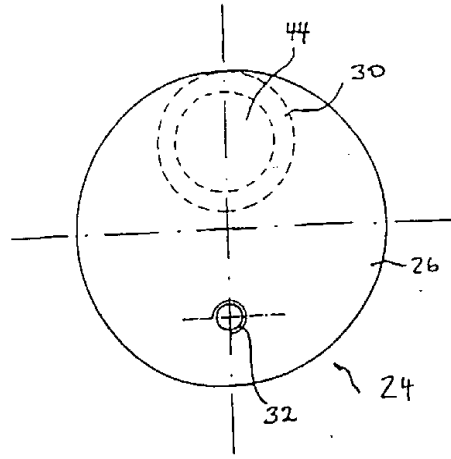


FIG. 3

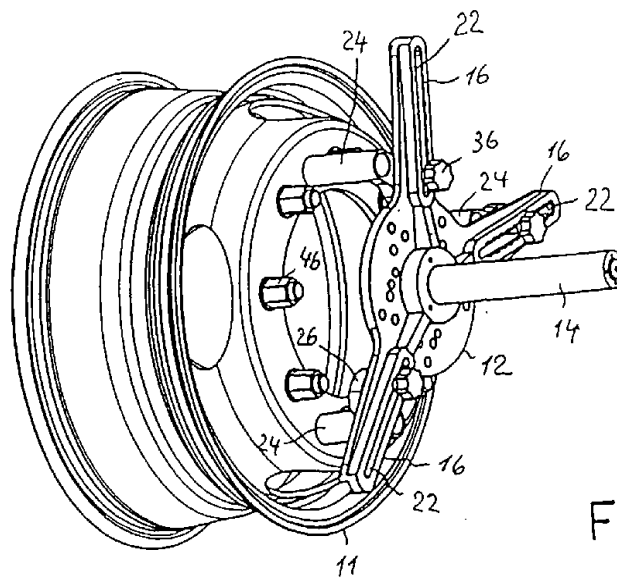


FIG. 4

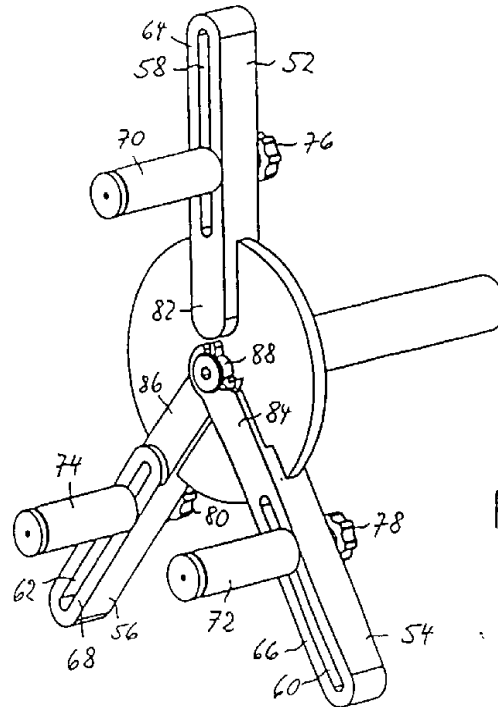


FIG. 5

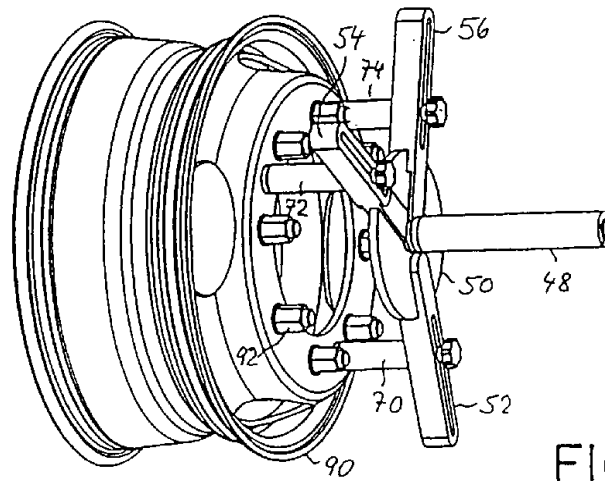


FIG. 6