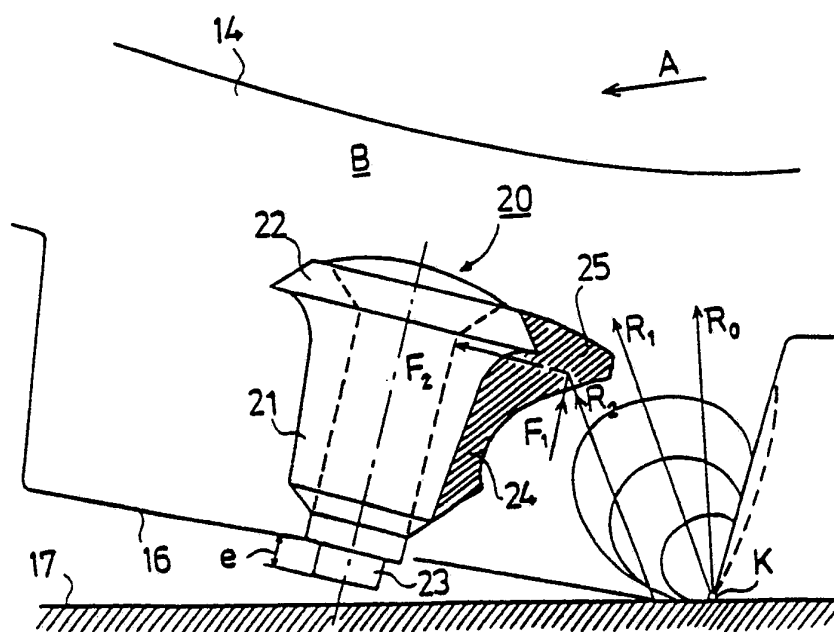




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification⁴ : B60C 11/16</p>	<p>A1</p>	<p>(11) International Publication Number: WO 88/ 01945 (43) International Publication Date: 24 March 1988 (24.03.88)</p>
<p>(21) International Application Number: PCT/FI87/00123 (22) International Filing Date: 18 September 1987 (18.09.87) (31) Priority Application Number: 863801 (32) Priority Date: 19 September 1986 (19.09.86) (33) Priority Country: FI (71) Applicant (for all designated States except US): NESTE OY [FI/FI]; Keilaniemi, SF-02150 Espoo (FI). (72) Inventor; and (75) Inventor/Applicant (for US only) : LINDÉN, Unto [FI/FI]; Vihnekuja 3, SF-13100 Hämeenlinna (FI). (74) Agent: FORSSÉN & SALOMAA OY; Uudenmaankatu 40 A, SF-00120 Helsinki (FI).</p>		<p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK, FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), NO, SE (European patent), SU, US. Published <i>With international search report. In English translation (filed in Finnish).</i></p>

(54) Title: FIXED SPIKE, RESPECTIVELY SLEEVE-MOUNTED SPIKE, FITTED ON A VEHICLE TYRE



(57) Abstract

A fixed spike, respectively a sleeve-mounted spike, fitted on a vehicle tyre. The fixed spike, respectively the sleeve-mounted spike, features an asymmetric region which is disposed to produce a force component (F_2) turning the fixed spike, respectively the sleeve-mounted spike (20) so that the fixed spike, respectively the sleeve-mounted spike (20) is arranged, respectively the sleeve-mounted spike (20) is arranged, at initial contact with the road surface (17), to meet the road surface (17) substantially in vertical position.

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1 Fixed spike, respectively sleeve-mounted spike,
fitted on a vehicle tyre

5 The present invention concerns a fixed spike, respectively a sleeve-
mounted spike, fitted on a vehicle tyre.

10 Increasing traffic load and spike tyres in combination have proved
to be a remarkable road attrition factor. In some countries this has
even led to prohibition of spike tyres, or at least to considerable
restrictions.

15 In Nordic conditions, the beneficial effect of an anti-slip means on
the safety and flexibility of traffic has on the other hand been irre-
futably demonstrated, and this effect should not be sacrificed:
instead, the associated drawbacks should be eliminated. Good results
will be achieved by further developing both the road superstructures
and the anti-slip tyres.

20 As a pneumatic automobile tyre rolls on an even surface, it is con-
siderably flattened radially, owing to its flexibility, whereby in
the contact region longitudinal as well as transversal forces are
generated owing to changes of the rolling radius.

25 The longitudinal forces acting on the spike when the tyre is rolling
are due to bending of the body structure, to longitudinal slipping
and to the stress wave in the rubber.

30 When a spike approaches the point of contact with the road, the tyre
body undergoes bending such that the radius of the bent part is
significantly smaller than that of equivalent parts of the load-free
tyre. This deflects the spike, which has been mounted at right angles
against the surface, to assume a vertical position before contact
35 with the road. Owing to the protrusion of the spike point, however,
the spike is not turned into sufficiently upright position: it meets

1 the road surface in an oblique position. At this stage, the forces
due to slipping tendency also begin to exert their influence.

As the rotating tyre surface and the protruding body (the spike)
5 attached thereto meet the road surface, a dynamically caused impact
against the road surface is produced. The attrition of the road can
be significantly reduced if said impact can be eliminated or reduced.

The impact has been found to be due to the kinetic energy of the
10 spike, in other words, to the mass of the spike and its velocity in
the direction against the road surface. The effective mass is influ-
enced by the spike mass itself and, in addition, by a friction force,
its magnitude depending, in its turn, on the spike design in that
15 the friction of a spike body mounted in a sleeve results from sliding
between the sleeve and the metallic body, while the friction force
of a fixed spike is active between the spike body and the rubber.
The mass of a fixed spike is influenced, owing to its shaping, partly
also by the mass of the surrounding rubber.

20 Prior designs have not eliminated the abrasion effect from the dynamic
impact in any other way than by reducing the mass of the spike, and
it is believed that the practical minimum limit has already been
reached in this respect. As taught by the new invention, certain
design features are suggested for the spike and the tyre with the
25 express aim to reduce the dynamic initial contact peak and the ulti-
mate scratch.

Traditionally, the shape of the spike has been symmetric and it has
been mounted in a hole, perpendicular against the wear surface of
30 the tyre, whereby it meets the road in a slightly oblique position
as the forces mentioned affect its position. The oblique contact of
the spike with the road, as well as its being pushed deeper into the
tyre in oblique position during the initial part of road contact,
cause damage to the rubber and to the spike which impairs the friction
35 properties of the spike, detract from the durability of the spike
and increase its road attrition properties.

1 The aim of the invention is to achieve an improvement in currently
known fixed spike designs, respectively sleeve-mounted spike designs.
The more specific aim of the invention is to provide a fixed spike,
respectively a sleeve-mounted spike, in which the drawbacks embarrass-
5 ing designs of prior art have been avoided.

The aims of the invention are achieved by means of a fixed spike,
respectively a sleeve-mounted spike, which is mainly characterized
in that the fixed spike, respectively the sleeve-mounted spike,
10 features an asymmetric region which has been disposed to produce a
force component turning the fixed spike, respectively the sleeve
mounted spike, in such manner that the fixed spike, respectively the
sleeve-mounted spike, has been arranged to meet the road surface, at
initial contact with the road surface, in a position which is sub-
15 stantially perpendicular.

The rest of the characteristic features of the fixed spike, respect-
ively sleeve-mounted spike, of the invention are presented in claims
2-8.

20 As taught by the invention, the dynamic impact force is reduced by
exerting an effect on the spike just before the onset of road contact
in that its movement is stopped by directing a lifting force component
thereon. In addition, the road contact is made less abrasive on the
road when the spike is lifted to a more nearly vertical position in
25 relation to the road surface; the more upright position of the spike
also reduces the scratching wear in the terminal part of the road
contact area and increases the durability of the spike in the tyre.

30 When an asymmetric spike is mounted in a conventional spike hole, it
becomes so positioned at installation already that its road contact
will take place with the spike in a position which is substantially
more upright against the road surface than that of an equivalent
symmetric spike. By designing the configuration of the asymmetric
35 beak and of the region generating the counterforce, and by the extent
to which the spike projects, the position of the spike at the moment

1 immediately before road contact is adjusted to be optimal.

The invention is described in the following more in detail by refer-
ring to some advantageous embodiments of the invention, presented in
5 the figures of the drawing attached, yet to which the invention is
not meant to be exclusively confined.

Fig. 1 presents an advantageous embodiment of the fixed spike of the
invention.

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Fig. 2 presents an advantageous embodiment of the sleeve-mounted
spike of the invention.

In Fig. 1 the fixed spike of the invention in general is indicated
15 by reference numeral 10. The fixed spike 10 is composed of a body
part 11, a flange part 12 and a point 13. The rubber of the vehicle
tyre is indicated by reference numeral 14, and the wear surface of
the tyre by reference numeral 16.

20 As described by the basic idea of the invention, the fixed spike 10
is made asymmetric. In the present embodiment, asymmetry has been
implemented by designing the flange 12 to be asymmetric on one margin
15. The asymmetric part 15 need not necessarily occur on the flange
12: a similar asymmetric part 15 may also be provided on the body
25 part 11. In the most advantageous embodiment, the asymmetric part 15
constitutes a kind of beak disposed to take up the resultant of the
road contact force, indicated in Fig. 1 by arrows R_0 - R_2 . In Fig. 1,
the driving direction is indicated by arrow A and the road surface,
30 by reference numeral 17.

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In the embodiment of Fig. 2, the sleeve-mounted spike of the invention
in general is indicated by reference numeral 20. The sleeve-mounted
spike 20 consists of a rivet 21, of the flange 22 of the rivet 21,
of a point 23 and of a sleeve 24. The protrusion of the spike from
35 the wear surface 16 is indicated by e.

1 As taught by the basic idea of the invention, the sleeve 24 is pro-
vided with an asymmetric region 25 disposed to take up the resultant
2 R_0-R_2 of the road contact force in a way similar to that in the
embodiment of Fig. 1. In this embodiment, the asymmetric region is
5 provided on the sleeve at a height which is substantially consistent
with the location of the flange 22 of the rivet 21. The asymmetric
region 25 is a claw-like region. The asymmetric region 25 may, of
course, equally be located slightly lower on the sleeve, that is,
10 similarly as in the embodiment of Fig. 1, in other words, in the
sleeve region at the height corresponding to the upper part of the
rivet 21. The other reference numerals correspond to those in the
embodiment of Fig. 1.

When the spike of the invention is installed in the hole, the spike
15 causes a static stress region in the surrounding rubber. When the
stress wave caused by compression of the tyre meets the stress region
of the spike asymmetrically, and exceeds it, the spike turns owing
to the compressed state of the rubber. At the same time, the spike
is influenced by forces arising from the rotation of the tyre. The
20 situation is illustrated by Figs 1 and 2.

In a static situation and at low speeds, the pressure effect orig-
inating from the contact angle K of the rubber is uniform and its
resultant R_0 is very close to vertical. The rear margin of the rubber
25 piece bulges out rearwards and the contact surface, forward against
the road. With higher speed, the pressure resultant turns forward in
the direction R_1 , and the pressure pattern becomes more pronouncedly
oval. The pressure resultant is also turned forward because in the
region B the pressure in the rubber is lower since no compressive
30 force is present there. Owing to the rotation of the tyre and the
compression of the rubber, the pressure resultant also moves forward
to the point R_2 , whereby it encounters the spike flange and imparts
to it an upward acceleration, with the component F_1 , and at the same
time turns it from the position as installed to a position more
35 nearly perpendicular against the road surface, with the component
 F_2 . The spike is enabled to turn because there is no compression

1 forward of it. It is possible to influence the utilization of said
forces by the mode of installing the spike and by its shape features.
A shaped structure also creates on the side where said pressure
resultants act, a wider local pressure region on which the pressure
5 resultant from the compressed rubber exerts an even more powerful
effect.

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1 Claims

- 5 1. A fixed spike, respectively a sleeve-mounted spike, fitted on a vehicle tyre, characterized in that the fixed spike, respectively the sleeve-mounted spike, presents an asymmetric region disposed to produce a force component (F_2) turning the fixed spike (10), respectively the sleeve-mounted spike (20), so that the fixed spike (10), respectively the sleeve-mounted spike (20), is arranged, at initial contact with the road surface (17), to meet the road surface (17) in a substantially perpendicular position.
- 10 2. Fixed spike according to claim 1, characterized in that the fixed spike (10) is asymmetric.
- 15 3. Sleeve-mounted spike according to claim 1, characterized in that the sleeve (20) of the sleeve-mounted spike is asymmetric.
- 20 4. Fixed spike according to claim 1 or 2, characterized in that the flange (12) of the fixed spike (10) has an asymmetric region (15).
5. Fixed spike according to claim 1 or 2, characterized in that the body part (11) of the fixed spike (10) has an asymmetric region (15).
- 25 6. Sleeve-mounted spike according to claim 1 or 3, characterized in that the sleeve (24) of the sleeve-mounted spike (20) is asymmetric in the region corresponding to the flange (22) of the rivet (21).
- 30 7. Sleeve-mounted spike according to claim 1 or 3, characterized in that the asymmetric region (25) of the sleeve (24) is located substantially in the region of the upper part of the rivet (21).
- 35 8. Fixed spike, respectively sleeve-mounted spike, according to any one of claims 1-7, characterized in that the asymmetric region (15,25) is at the same time disposed to produce a force component (F_1) lifting the fixed spike (10), respectively the sleeve-mounted spike (20), whereby the velocity, due to rotation of the tyre, at which the

1 spike and the road meet has at the same time been arranged to be
substantially reduced.

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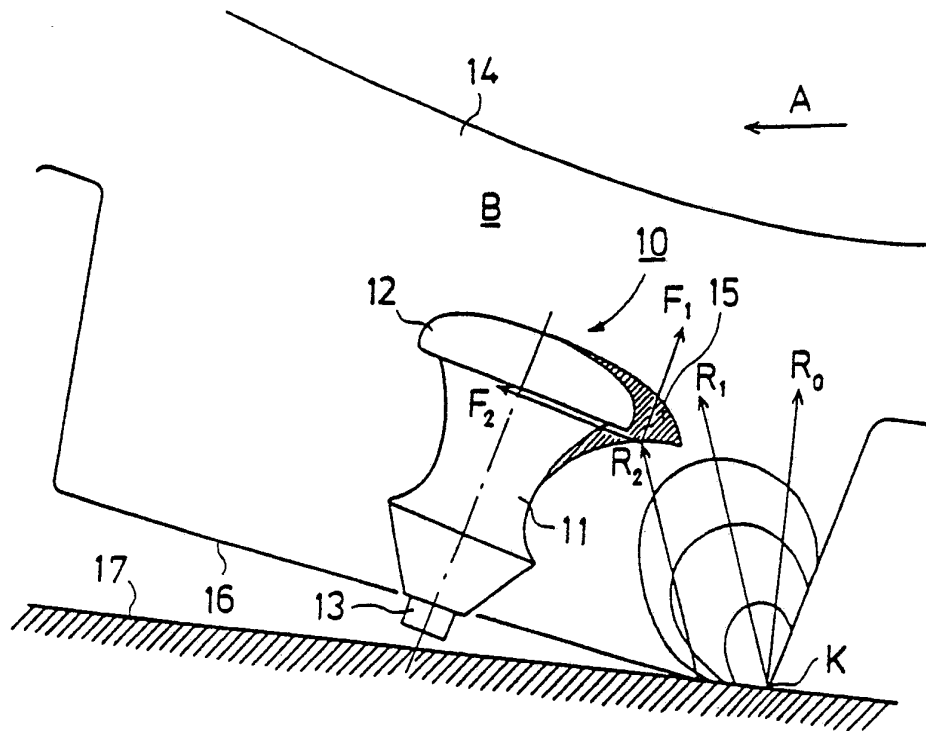


FIG. 1

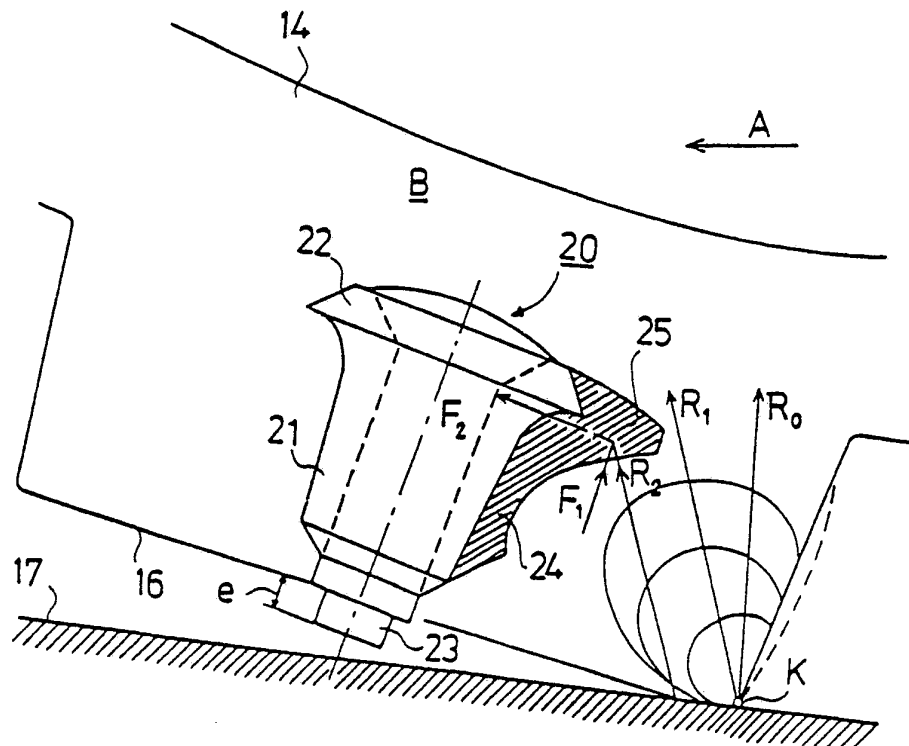


FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No PCT/FI87/00123

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 ⁴		
B 60 C 11/16		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC 4	B 60 C 11/00, /14, /16	
Nat cl	63e:19/02	
US Cl	152:167, 168, 169, 208-212; 156:114	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
SE, NO, DK, FI classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	Patent Abstracts of Japan, Vol 9, No 70, M-367, abstract of JP 59-202912, publ 1984-11-16	1-7
A	CH, A, 524 487 (DR ING H-U NEIDHARDT) 15 August 1972	
<p>¹⁰ * Special categories of cited documents:</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>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
1987-12-22		1987 -12- 28
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