



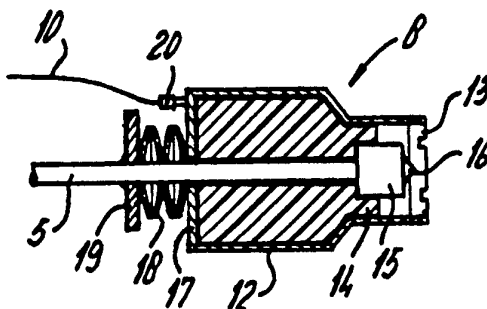
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<p>(21) International Application Number: PCT/NL96/00342</p> <p>(22) International Filing Date: 29 August 1996 (29.08.96)</p> <p>(30) Priority Data: 1001121 1 September 1995 (01.09.95) NL</p> <p>(71) Applicant (for all designated States except US): RAILPRO B.V. [NL/NL]; Nieuwe Crailoseweg 8, P.O. Box 888, NL-1200 AW Hilversum (NL).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): TIECKEN, Jacques [NL/NL]; Poppelenburgerstraat 11, NL-4191 ZS Geldermalsen (NL).</p> <p>(74) Agent: DE BRUIJN, Leendert, C.; Nederlandsch Octrooibureau, Scheveningseweg 82, P.O. Box 29720, NL-2502 LS The Hague (NL).</p>	<p>(81) Designated States: HU, NO, PL, RO, RU, TR, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).</p> <p>Published <i>With international search report.</i></p>	

(54) Title: CONTACT HEAD FOR MAKING MULTIPLE ELECTRICAL CONTACT WITH A CONDUCTING ARTICLE, AND MEANS PROVIDED WITH SUCH A CONTACT HEAD

(57) Abstract

Contact head for making multiple electrical contact with an electrically conducting article, which contact head is provided with at least a first contact (15; 26) and a second contact (12; 27), which are electrically separated from one another, wherein at least the second contact (12; 27) is provided with a contact edge (13; 29) which has the shape of at least a part of a first arc of a circle.



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Contact head for making multiple electrical contact with a conducting article, and means provided with such a contact head

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A method and device for making a shunt between, for example, two rails of a railway track are proposed in Netherlands Patent Application 1 000 713 in the name of the present Applicant, which has not previously been published. Two electrical contact points are arranged on each of the two rails. One of the two contact points on each rail is connected via a shunt to a corresponding contact point on the other rail. The two remaining contact points are connected to an ohmmeter. If all four contact points make good electrical contact with the respective rails, the ohmmeter will measure a shunt. The shunt produced can be monitored in the sense that an alarm signal is given as soon as the shunt is broken for any reason whatsoever. In practice, shunts of this type are deliberately applied between two rails of a track in the rail network if said track must not be used by trains. Specifically, making a shunt between the rails causes the signal associated with that track to change to red. Optionally, a facility can be provided for a shunt of this type automatically to apply the brakes of a train which drives onto the track without authority (automatic fail-safe feature for trains).

However, means which enable such a four-point shunting method to be realised in an adequate manner are not described in more detail in the said patent application.

Previously it was customary to produce a shunt between two rails of a track using a shunt bar, which was originally developed by Pouyet. Said shunt bar is made up of two bars, which lie in the extension of one another, and a handle. The distance between the ends of the two bars is sufficiently large that the shunt bar can be placed precisely perpendicularly between two rails of the rail network. On operation of the handle, the two bars are pushed away from one another, such that the pointed ends thereof are pressed against the rails. Providing the ends with a sharp point makes it possible for them to be pressed through rust and dirt onto the rails if the force exerted is sufficiently high. If electrical contact with the rails is not produced, the bars can be turned with the aid of the handle so that the points thereof penetrate through the rust and dirt. However, with this shunt bar only one electrical contact can be produced on

each rail, with the result that said shunt bar is suitable only for making a shunt between two rails of a track, but not for connection to the above-mentioned ohmmeter. In order to check whether a shunt had actually been produced using a shunt bar of this type it was customary for an operator to
5 have to walk to the start of the track concerned to see whether the signal had actually changed to red. Once it had been established that the light had changed to red, this was not subsequently checked because of the associated inconvenience of walking backwards and forwards. As a shunt bar of this type can vibrate loose for diverse reasons, safety of, for example,
10 railway workers on the track is not guaranteed. The aim of the above-mentioned four-point method is to provide a solution to this problem, but said method stands or falls with the availability of means with which four electrical contact points with two rails can be produced reliably and simply. The aim of the present invention is to provide such means.

15 The Applicant is aware that means have already been designed for the same purpose. Said known means, from which the claims make a distinction, comprise a foldable shunt bar which has two bars foldable with respect to one another. Said foldable shunt bar has two instead of one pointed contact points at both ends of each of the bars. One of the two contact points is
20 in electrical contact with the bar itself and is intended for shunting with a corresponding contact point at the end of the other bar, which is electrically short-circuited with the first mentioned bar. The two remaining contact points can be connected via suitable cables to the ohmmeter. On operation of the shunt bar, two pointed contact points at both ends must be
25 pushed through rust and dirt on the rails in order to guarantee a good electrical contact. It is found that a force calculated to be equivalent to about 360 kg is needed for this purpose. In contrast to the original Pouyet bar, it is not possible with said last-mentioned shunt bar to improve the intended electrical contact by turning the bar as a whole. During use, two
30 sharp points, each outside the centre line of the bars of the shunt bar, on the two ends of the shunt bar are pushed so forcefully against the rails that any turning to scrape away rust and dirt results in mechanical dislocation or breakage of the shunt bar. Therefore, with this device, if good electrical contact has not been produced, the electrical contact can be
35 improved only by removing the shunt bar as a whole and refitting it, possibly in a different location.

The aim of the present invention is to provide improved means for multiple electrical contact with electrically conducting articles, for

example rails of a railway track, which means can advantageously be used in the said four-point method.

The invention therefore provides a contact head for making multiple electrical contact with an electrically conducting article, which contact head is provided with at least a first contact and a second contact, which contacts are electrically separated from one another, characterised in that at least the second contact is provided with a contact edge which has the shape of at least a part of a first arc of a circle. Using a contact head of this type, a multiple electrical contact with an electrically conducting article can be produced, it being possible to improve the contact, if necessary, by turning the contact head, which is possible because at least the second contact has a circular contact edge which is able to rotate around the centre of the circular shape. Using a prototype it has been found that electrical contact with severely rusted and dirty rails could be produced with a resistance value of less than 15 mΩ by applying a force of about and in the region of 70 kg.

The first contact can be provided with a sharp point which is located in the centre of the said first arc of a circle. In an embodiment of this type, the second contact can be turned simply about the first contact, whilst at the same time, as a result of turning the first contact, the sharp point thereof will penetrate better through rust and dirt.

Alternatively, the first contact can, however, be provided with a contact edge which has the shape of at least a part of a second arc of a circle, which second arc of a circle is concentric with the first arc of a circle. In this case, the second arc of a circle can have the same radius as the first arc of a circle.

Both the first and the second contact can be covered with synthetic diamond, which is hard but nevertheless electrically conducting.

Preferably, the second contact is resiliently supported with respect to the first contact, with the aid of resilient means.

The invention also relates to means for making a multiple electrical contact with an electrically conducting article, which means are provided with at least one contact head according to the invention and with pressure means for exerting pressing force on the at least one contact head in the direction of the article.

Advantageously, said pressure means can comprise a shunt bar, provided with a first bar having a first contact head, a second bar which is in line with the first bar and has a second contact head, and a handle for

moving the first bar and the second bar away from one another.

Alternatively, however, said pressure means can comprise a first magnet and a second magnet, which first magnet is in magnetic contact with the first contact and which second magnet is in magnetic contact with the
5 second contact and is electrically separated from the first magnet.

The invention also relates to the use of at least one diamond drill head for the production of a contact head according to the invention. This is highly advantageous because it is then not necessary to design separate contacts, for example for the said second contact, but is possible to use
10 standard components for this purpose.

Finally, the invention relates to a method for the production of means for making a multiple electrical contact with an electrically conducting article, as defined above, comprising the following steps:

a. provision of the said shunt bar, the end of the first bar being
15 provided with a first contact located on the centre line of the first bar and the end of the second bar being provided with a third contact located on the centre line of the second bar, which third contact is in electrical contact with the first contact;

b. the production of the second contact with the aid of a first dia-
20 mond drill head concentrically around the first contact;

c. the production of a fourth contact with the aid of a second dia-
mond drill head concentrically around the third contact.

Using a method of this type existing Pouyet-type shunt bars can easily be modified to shunt bars according to the invention, which are suit-
25 able for the four-point shunt method.

The invention will be explained in more detail below with reference to a few figures, which show examples of the invention but which are not intended to imply any restriction with respect to the scope of the inven-
tion.

30 Figure 1 shows a diagrammatic view of a first set-up according to the invention, in which use is made of a modified shunt bar;

Figure 2 shows a diagrammatic front view of a contact head of a shunt bar as shown in Figure 1;

Figure 3 shows a diagrammatic cross-section through a contact head of
35 a shunt bar according to Figure 1;

Figure 4 shows a diagrammatic contact head which can be pressed with the aid of magnetic means onto, for example, a rail;

Figure 5 shows a front view of a contact head according to Figure 4.

In the figures the same reference numerals always relate to the same components.

Figure 1 shows two parallel rails 1 and 2 within a specific track of the railway network. In this context it is pointed out that the invention is explained with reference to an application for railways, but it will be clear that it can also be applied to other conducting articles with which two (or multiple) contacts have to be produced, which are made more difficult by, for example, rust and dirt.

The two rails 1, 2 are customarily a predetermined distance apart and are, for example, fixed on sleepers, which are not shown. If desired, a shunt between the two rails 1, 2 is produced using a shunt bar 3. The shunt bar 3 shown comprises two bars 4, 5, lying in the extension of one another, and a handle 6. The handle 6 and the bars 4, 5 are mechanically connected to one another at a connection point 7, which is equipped such that the bars 4 and 5 are moved towards one another if the handle 6 is brought parallel to the bars 4 and 5. Conversely, the bars 4 and 5 move apart if the handle is brought into the position perpendicular to the bars 4 and 5. In the first-mentioned situation, the shunt bar 3 fits precisely between the rails 1 and 2 in a direction perpendicular thereto. In the second situation, contact heads 8, 8', which are located at the ends of the bars 4 and 5, are pushed with a predetermined force against the sides of the rails 1 and 2 in order thus to make electrical contact. Each of the contact heads 8, 8' is equipped to make two electrical contacts with the respective rail 1, 2. One of the two contacts in the contact heads 8, 8' is connected to the associated bar 4, 5, whilst the other contact is connected to a cable 9, 10 which leads to an ohmmeter 11.

Figure 2 shows a front view of a first embodiment of a contact head 8 with which the desired two electrical contacts can be produced, whilst Figure 3 shows a cross-section thereof.

The contact head 8 comprises a first contact 15, which is located on the centre line of the bar 5 and is provided with a sharp point 16 projecting outwards. The contact 15 is made of electrically conducting material and is electrically connected to the bar 5. The contact 15 can, for example, have been made integral with bar 5.

A second contact 12 is arranged coaxially around the first contact 15. The second contact 12 is likewise made of electrically conducting material. The contact 12 is provided with an electrically conducting contact edge 13 which covers at least part of the circular outer edge of con-

tact 12. The contact edge 13 is made of hard, conducting material, for example synthetic diamond. The contact point 16 can also be made of, or be covered by, this material. The contact 12, including contact edge 13, can advantageously have a structure such as is already employed as a diamond drill head. Shunt bars for the two-point method which are known from the prior art can be modified with the aid of such known diamond drill heads to provide a contact head according to the invention.

Insulating material 14 is present between, on one side, the bar 5 and the contact 15 connected thereto and, on the other side, the contact 12.

The contact 12 is, for example, provided with a terminal 20 for connection to the cable 10, which leads to the ohmmeter 11 (Figure 1)

There is a fixed stop 19 on the bar 5. Resilient means 18, for example a cupped spring washer, are preferably arranged between the stop 19 and the contact 12, so that the two contacts 15 and 12 can be moved somewhat with respect to one another in the direction of the centre line, which makes the two electrical contacts simpler and more reliable.

During operation, the force with which contact point 16 can be pressed against rail 2 is determined by the resilient force of the connection point 7, as is known to a person skilled in the art. The force with which the contact edge 13 of the contact 12 is pressed against the rail 2 also depends on the resilient means 18, if employed. Because contact point 16 is located on the centre line of the bar 5 and contact edge 13 is located coaxially around contact point 16, the entire contact head 8 can be turned without too much force about the centre line when the contact head 8 has already been pressed against the rail 2. By this means rust and dirt at the contact locations are removed and two electrical contacts are ensured. With a prototype it has been found that even with very severely contaminated and rusted rails two electrical contacts could be achieved with a contact force of about 70 kg. In order to achieve this it was necessary to turn the complete shunt bar 3 according to the invention only once through about a quarter turn, after said shunt bar had been clamped between two rails 1, 2 by bringing the handle 6 into the contact pressure position.

Figure 5 shows an alternative embodiment of a contact head according to the invention. The contact head shown in this figure is a modification of already existing contact heads for making a shunt between, for example, two rails. An existing contact head of this type (not shown) consists of a strongly magnetic, conducting material which is connected by a cable to another identical contact head. An existing contact head of this type is

intended to be fitted on the top of regularly used rails. There is hardly any corrosion on the top of regularly used rails and electrical contact with a rail can therefore be produced without too much difficulty using a magnetic contact head of this type. The cable is long enough to bridge the gap between two adjacent rails. Devices of this type provided with two such contact heads, connected by a cable, are carried by virtually all trains in the driver's cab. In practice, however, it is found that making a reliable electrical contact nevertheless leaves something to be desired, as a result of which these devices are not used everywhere where they would be needed.

Figure 4 shows a cross-section of a contact head with which contact with a rail can be obtained in a more reliable manner and which is suitable for use in the abovementioned four-point contact method. The contact head shown comprises a first contact 15, located on the centre line of the contact head. Once again, a sharp point 16 can have been made on the contact 15. However, since this contact head is intended to make contact with a virtually non-corroded top section of a rail, the sharp point 16 can also be omitted.

A second contact 12, which is preferably provided with a hard, sharp contact edge 13, is located coaxially around the centre line. A first magnet 22 is arranged in contact with the first contact 15, whilst a second, concentric magnet 21 is arranged in contact with the second contact 12. The first and second magnets 22, 21 and the first and second contacts 15, 12 are separated from one another by a suitable electric insulation 14.

A cable 25 is attached to the first magnet 22, and leads to a corresponding magnet of another identical contact head, which must be attached to the other rail. Cable 9 is attached to the second magnet 21 and leads to ohmmeter 11 (Figure 1). Of course, the function of the cables 9, 25 can be reversed.

Because magnets 21, 22 are strongly magnetic and because they have a predetermined weight, the contacts 12 and 15 are pressed against the rail 1. If the electrical contact of one of the two with rail 1 is unsatisfactory, rotating the entire contact head about its centre line can produce the desired contact because this rotation has the effect of scraping away rust and dirt.

If desired, the contact 12 can, just as in the embodiment according to the previous figures, be supported resiliently with respect to contact 15, for example by means of a cupped spring washer (not shown).

Figure 5 shows a front view of an alternative embodiment of a contact

head according to the invention. Compared with Figure 2, the centrally located contact 15 has been removed. In place of this, the outermost contact, which in the previous figures was designated by 12, has been split into two contacts 26, 27, one of which is electrically connected to a similar contact of another contact head and the other of which is connected to ohmmeter 11. Contacts 26, 27 have a contact edge 28, 29, which is made of hard, conducting material. They can, for example, be covered by electrically conducting, synthetic diamond. The contacts are electrically insulated from one another by means of insulation 23, 24.

10 The contact edges 28, 29 can be pressed by suitable pressure means against a rail, after which good electrical contact is ensured by some rotation about the centre line. The pressure means can consist of bars 4, 5 and lever 6 of a shunt bar 3, as shown in Figure 1. Alternatively, however, they can also consist of magnets in a manner similar to that shown in Figure 4 (although the shape of the magnets must, of course, be adapted to the shape of contacts 26, 27).

The invention is not restricted to the embodiments shown. A further alternative is, for example, that in the embodiment according to Figures 2, 3 and 4 not all, but only part, of the contact edge 13 is electrically conducting and possibly even that only a point section thereof is electrically conducting. Similarly, the centrally located contact 15 in said embodiment can be replaced by a circular contact which is supported concentrically with contact 12 and, just like contact 12, is provided with a sharp, hard, at least partly conducting edge. A contact 15 of this type could, for example, also be made from a diamond drill head, although of a smaller diameter than contact 12.

In the embodiment according to Figure 5, the conducting contact edges 28, 29 do not have to cover almost a semicircular arc. The distance covered can also be a smaller part of an arc of a circle. Equally, the two contact edges 28, 29 do not have to lie on parts of the same circle: one of the two can lie on an arc of a circle with a smaller radius than the other. The essential feature is only that the two contacts 12, 15 and 26, 27, respectively, are formed in such a way that they can be turned together without too great a force around the centre line of the contact head in order thus to remove rust and dirt from, for example, a rail.

35 Finally, it is also pointed out that the contact head has been described above in an embodiment which is suitable for making two electrical contacts. The basic concept of the invention can, however, also be

extended to contact heads which are equipped for multiple contacts in general. For example, three or more concentric contacts can be arranged in the contact head.

Claims

1. Contact head for making multiple electrical contact with an electrically conducting article, which contact head is provided with at least a first contact (15; 26) and a second contact (12; 27), which contacts are electrically separated from one another, characterised in that at least the second contact (12; 27) is provided with a contact edge (13; 29) which has the shape of at least a part of a first arc of a circle.

2. Contact head according to Claim 1, characterised in that the first contact (15) is provided with a sharp point (16), which is located in the centre of the said first arc of a circle.

3. Contact head according to Claim 1, characterised in that the first contact (26) is provided with a contact edge (28), which has the shape of at least a part of a second arc of a circle, which second arc of a circle is concentric with the first arc of a circle.

4. Contact head according to Claim 3, characterised in that the second arc of a circle has the same radius as the first arc of a circle.

5. Contact head according to one of the preceding claims, characterised in that the first contact (15; 26) is covered with synthetic diamond.

6. Contact head according to one of the preceding claims, characterised in that the second contact (12; 27) is covered with synthetic diamond.

7. Contact head according to one of the preceding claims, characterised in that the second contact (12) is resiliently supported with respect to the first contact (15), with the aid of resilient means (18).

8. Means for making a multiple electrical contact with an electrically conducting article, which means are provided with at least one contact head according to one of the preceding claims and with pressure means (4, 5, 6; 21, 22) for exerting a pressing force on the at least one contact head in the direction of the article.

9. Means according to Claim 8, characterised in that the pressure means comprise a shunt bar (3), provided with a first bar (4) having a first contact head (8), a second bar (5) which is in line with the first bar (4) and has a second contact head (8'), and a handle (6) for moving the
5 first bar (4) and the second bar (5) away from one another.

10. Means according to Claim 8, characterised in that the pressure means comprise a first magnet (22) and a second magnet (21), which first magnet (22) is in magnetic contact with the first contact (15) and which
10 second magnet (21) is in magnetic contact with the second contact (12) and is electrically separated from the first magnet.

11. Use of at least one diamond drill head for the production of a contact head according to one of Claims 1 to 7.
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12. Method for the production of means according to Claim 9, comprising the following steps:

a. provision of the said shunt bar (3), the end of the first bar (4) being provided with a first contact (15) located on the centre line of the
20 first bar (4) and the end of the second bar (5) being provided with a third contact located on the centre line of the second bar (5), which third contact is in electrical contact with the first contact (15);

b. the production of the second contact (12) with the aid of a first diamond drill head concentrically around the first contact (15);

25 c. the production of a fourth contact (12) with the aid of a second diamond drill head concentrically around the third contact (15).

fig-1

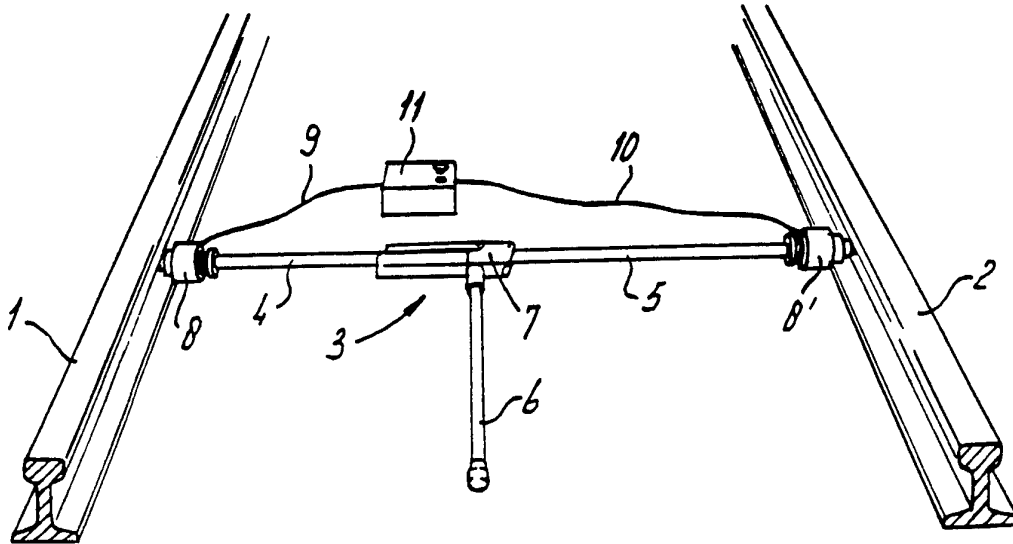


fig-2

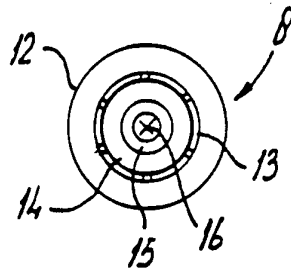


fig-3

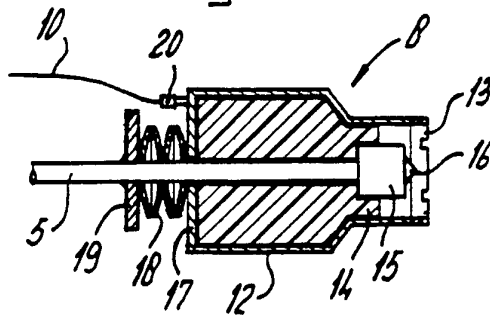


fig-4

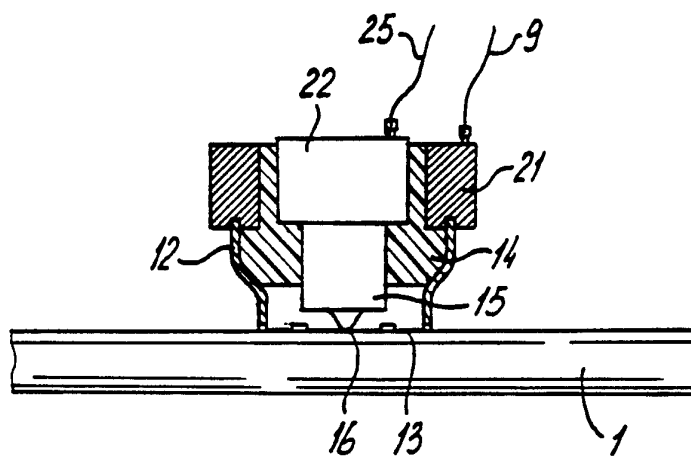
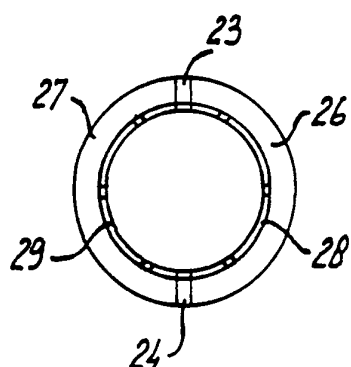


fig-5



INTERNATIONAL SEARCH REPORT

International Application No
PCT/NL 96/00342

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B60M1/02 H01R11/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 B60M H01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR,A,2 506 235 (SOCIÉTÉ LYONNAISE DE TRANSPORTS EN COMMUN TCL) 26 November 1982 see page 2, line 21 - page 3, line 6; figure 1	1,8,10
A	---	
A	DE,C,405 128 (SIEMENS-SCHUCKERTWERKE GMBH) 30 October 1924 see the whole document -----	1,8,9

Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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<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 when the document is taken alone</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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Date of the actual completion of the international search 2 December 1996	Date of mailing of the international search report 04.12.96
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/NL 96/00342

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A-2506235	26-11-82	BE-A- 893228	18-11-82
		DE-A- 3218558	09-12-82
		GB-A- 2100209	22-12-82

DE-C-405128		NONE	
