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(54) **Headphone**

(57) The invention concerns a headphone with at least one strap (1) and two earphones (2).

The invention is characterized by the fact that a support mechanism is provided between the strap (1) and

each earphone (2) in the form of a kinematic chain having two articulated axes (K1, K2) that run at least essentially parallel to each other in at least one position of the kinematic chain.

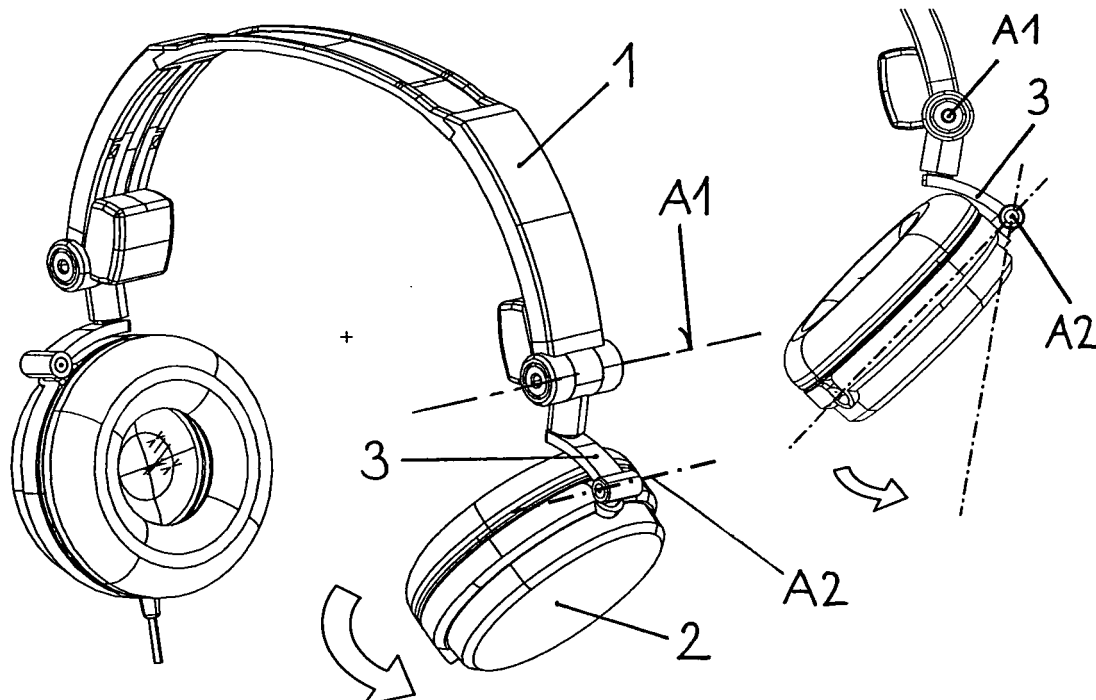


Fig. 3

Description

[0001] The invention concerns a headphone with at least one strap and two earphones.

[0002] Headphones used for a variety of purposes have long been known. On the one hand, they are used to permit secure receiving of acoustic information in noisy surroundings (aircraft, ships, land vehicles, sound recording studios, etc.); they are also used to permit excellent listening quality, especially of pieces of music during the occurrence of background noises, and are used in quiet surroundings to permit listening to music or language without the interference of persons in the surroundings.

[0003] Depending on the area of application, there are different designs of headphones.

[0004] A generic type of headphone has earphones made of a flexible, sound-damping material through which the outer ear is shielded from its surroundings and directly exposed to sound from one or more small loudspeakers accommodated in the interior of the earphone. Another form of headphones are the plug-in earphones that were developed especially for portable playback devices for music and are used there: in this case, a button-like structure made of foam or the like is inserted into the auditory canal and the auditory canal is directly exposed to sound through a loudspeaker arranged in the button.

[0005] There is also a device that is worn on the head; however, in complete contrast to the headphones previously explained, it has loudspeakers that are accommodated in the open surroundings and at a distance from the outer ear so that the listener almost carries his own concert hall along with him. These devices cannot be placed on the ear and are therefore used in quiet surroundings for special listening enjoyment.

[0006] Additional distinctions can be encountered in headphones in terms of how the microphones are positioned movable relative to the headphone or the human head. Earphones insertable into the auditory canal, so-called button earphones, require no special mounting and are generally suspended individually on the data feed lines. Headphones with earphones have straps that are adjustable in width and length and, depending on the equipment class, have different suspensions, all the way to complex gimbal suspensions. The latter have the advantage that, regardless of the shape of the head, each of the two earphones lies against the head so that it has no tendency to slide and lies against the head over almost its entire periphery with the same load so that the greatest wear comfort is achieved.

[0007] The aforementioned exceptional case has an adjustable strap, which lies against the head via a special support cushion and supports, on the ends of the strap on each side when wearing, a vertically running axis at a distance from the head on which the loudspeakers are arranged to pivot, which therefore expose not only the ear, but also the head, to sound from a certain distance

and therefore ensure the best possible listening enjoyment.

[0008] There is an entire series of application areas in which the user of the headphones does not want his headphones to close him off acoustically from his surroundings as strongly as the headphones now employed. There are also situations in which, for reasons of wearing comfort, positioning of the headphones on the ear does not seem desirable. However, thus far there have been no headphones capable of being worn both on the ear and at a distance from the ear. Providing the aforementioned, already known loudspeaker support--worn on the head and not designed as an actual headphone--with earphones, and tilting it around its essentially vertically running axis on the ears during use, fails because of the extremely poor wear comfort then present.

[0009] The invention seeks to devise a remedy to this and to provide headphones that can be worn both in the usual position on the ear and also in the frequently desired position with a certain distance to the ear in comfortable fashion and producing acoustically satisfactory results in both positions.

[0010] These objectives are achieved according to the invention in that two articulated axes running essentially parallel to each other in at least one position of the headphone are provided between the strap and the earphones of the headphone, between which at least one component is provided in the kinematic chain that forms each support mechanism of a headphone.

[0011] With this expedient, a situation is achieved in which this one component, if it is brought into one position, causes the headphone to lie against the ear and in the other position ensures a certain distance of the headphone from the ear. Since, as explained above, the suspension of the earphone on the strap can sometimes be designed to be extremely complex, it is quite possible that more than one intermediate part is provided between the two parallel axes and that this varies its geometry as a complex intermediate part by differing movements and pivots. In this case it is only important that pivoting is possible in the position in which the two axes run parallel to each other. In the mentioned complex suspensions, it can also be prescribed that one of the axes provided for suspension, upon reaching the position of the earphone with a certain distance from the ear, will assume the role of one of the two parallel axes. This is advantageously possible in earphones according to the still unpublished European Patent Application No. 04450008.0 and the headphones according to the European Patent Application No. 04450007.2, also unpublished. The content of the two documents and especially the corresponding US Patent applications, whose file numbers are still unknown, are hereby included in the disclosure of this application by reference.

[0012] The invention is further explained below by means of the drawings:

Figure 1 shows a headphone equipped, according

to the invention, in the position in which the earphones lie against the ear,

Figure 2 shows the first step for conversion of the headphone,

Figure 3 shows the second step with an enlarged secondary figure in a slightly different perspective,

Figure 4 shows the final configuration, again with a secondary figure in a view similar to the secondary figure of Figure 3,

Figures 5 and 6 show seating of the headphone in the offset configuration on the head, from the front and rear, and

Figure 7 shows another variant of the invention in a depiction similar to that of Figure 5.

[0013] Figure 1 shows a headphone as essentially described in the still unpublished European Patent Application No. 04450008.0. An earphone 2 is fastened onto a length-adjustable strap 1 on both sides. Fastening occurs via a system of axes that permit a gimbal suspension of earphone 2 without having to provide the usual large-format semicircular straps that are common for such gimbal suspensions. The gimbal suspension essentially consists of the axis of rotation K2 that runs roughly vertical during use of the headphone with the connection part 3 firmly mounted on its lower strap and the articulation around axis of rotation K1 arranged in the edge of the connection part 3 (Figure 2). The axes K1 and K2 intersect each other in the area of the inner plane of the earphone roughly at their center and thus produce a full-fledged gimbal suspension. Another articulation directly on the end of strap 1 with the articulation axis A1 is provided in order to be able to collapse the headphones in a particularly compact state.

[0014] According to the invention, an articulation with articulation axis A2 is added to this headphone (Figure 1) in which this articulation axis A2 runs on the end of the intermediate part 3, on the one hand, on this part, and on the other hand on the end of the articulation around axis K1 away from the earphone.

[0015] If the positioning depicted in Figure 1 of the individual articulations is present in this configuration, by pressure exerted by the strap via the gimbal suspension through axis K1 and K2, the earphones 2 are forced against the ear of the user with a predetermined pressure. The axis A2 is then fixed, for example, by an ordinary snap mechanism and injection-molded plastic parts, or by another fastening in the depicted position, and neither participates in the gimbal suspension nor disturbs it.

[0016] By tilting the earphone, first around axis K2, then around K1, the position depicted in Figure 3 is reached, from which tilting up of the earphone 2 around axis A2 finally reaches the position depicted in Figure 4. In this position, the axis K1 runs parallel to axis K2 and the gimbal suspension of the earphone is raised. When the earphone is used in this position, cushions 5, which are arranged in the interior of strap 2 on its end, come in contact with the side of the head of the user above his

ear so that, as is apparent from Figures 5 and 6, the earphones 2 are held at a slight distance from the ear, the so-called "offset position".

[0017] It is easy to apply the invention to a headphone of simple design, it is only necessary, as is readily apparent from Figure 7 in comparison with Figure 5, to provide in a simply designed headphone, in which the axis A1 and the gimbal suspension ordinarily are not present, an axis A3 essentially parallel to axis A2 in the area of the end of strap 1 so that the connection part 3 can be pivoted directly between a position that roughly follows the contour of the head and the depicted position.

[0018] By different length adjustment of strap 1, the correspondingly correct positioning can be achieved despite the altered distance from the center of the earphone to the end of the strap, in which naturally no gimbal suspension is achieved during positioning of the earphone on the ear in a headphone simplified in this way.

[0019] In similar fashion it is possible, in a wide variety of headphone types, to achieve the objective according to the invention in which either two axes expressly provided for this are used, or it is ensured that two existing axes are brought into a position parallel to each other or to a position parallel to an existing axis provided for this.

[0020] Positioning of the two axes in space then scarcely plays a role. Thus, it is easily possible for the two axes in the position of use of the headphone to run in roughly the vertical direction, with a component situated between them insuring a certain distance relative to the head. It is also not necessary for the two axes to run parallel to each other in the "offset position", although this is advantageous in most cases, since in the contact position at least one of the two axes can be used for the gimbal suspension or otherwise.

[0021] In nearly all cases it is appropriate or even essential, for long-term wearing, to provide a special support on the inside of the strap in the area of each end in order to ensure proper seating and wear comfort. This support can consist of a foam material or another material, for example, that of the earphones, and can be coated with a skin-friendly material (leather).

Claims

1. Headphone with at least one strap (1) and two earphones (2), **characterized by** the fact that a support mechanism is provided between strap (1) and each earphone (2) in the form of a kinematic chain having two articulated axes (K1, K2; A2, A3) that run essentially parallel to each other in at least one position of the kinematic chain.
2. Headphone according to Claim 1, **characterized by** the fact that the two articulation axes (K1, K2) assume their parallel positions in the offset position of the headphone.

3. Headphone according to Claim 2, **characterized by** the fact that at least one of the two articulation axes (K1, K2) is part of a gimbal suspension of earphones (2) in the position of the headphone lying against the ear. 5
4. Headphone according to Claim 2, **characterized by** the fact that the two articulation axes (A2, A3) always run parallel to each other. 10
5. Headphone according to one of the preceding claims, **characterized by** the fact that cushions (5) or the like are applied in the area of the ends of strap (1) on its inside, which lie against the head of the user during use of the headphone in the offset position of earphones (2). 15

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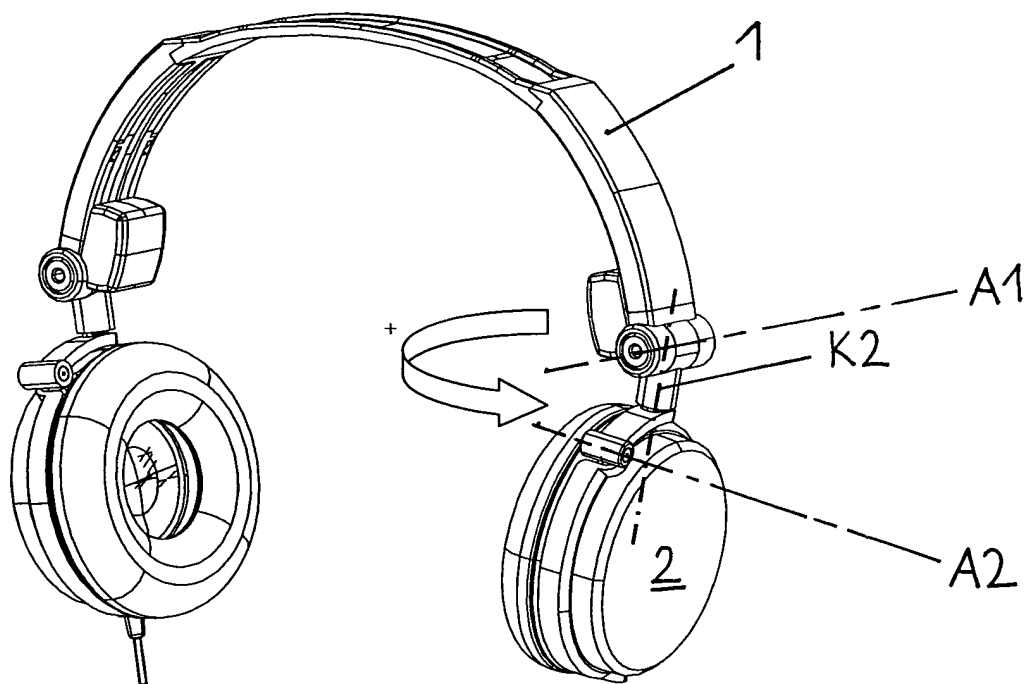


Fig. 1

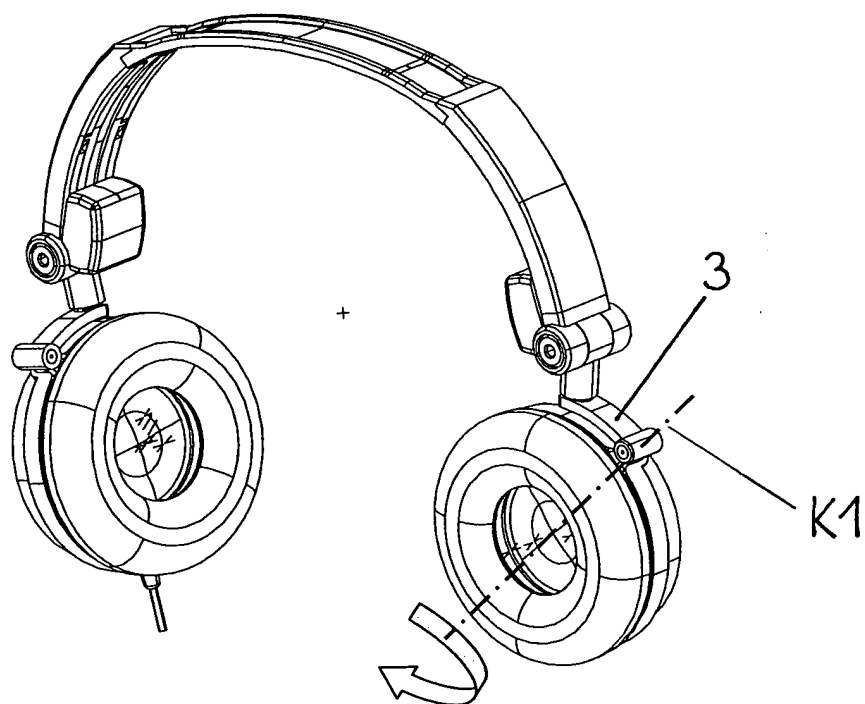
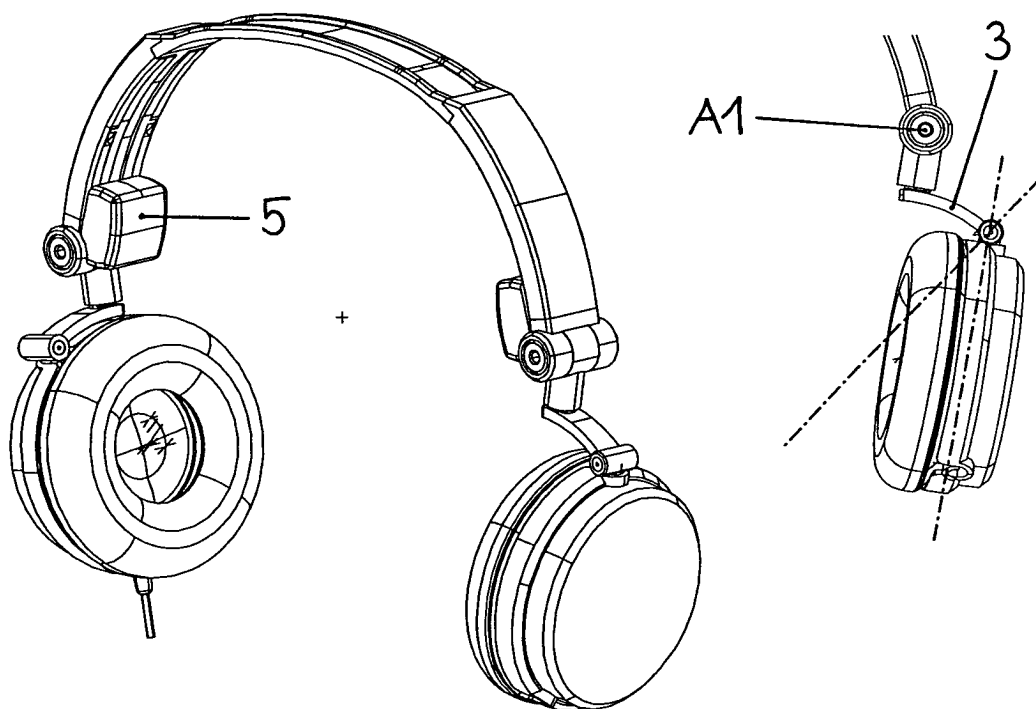
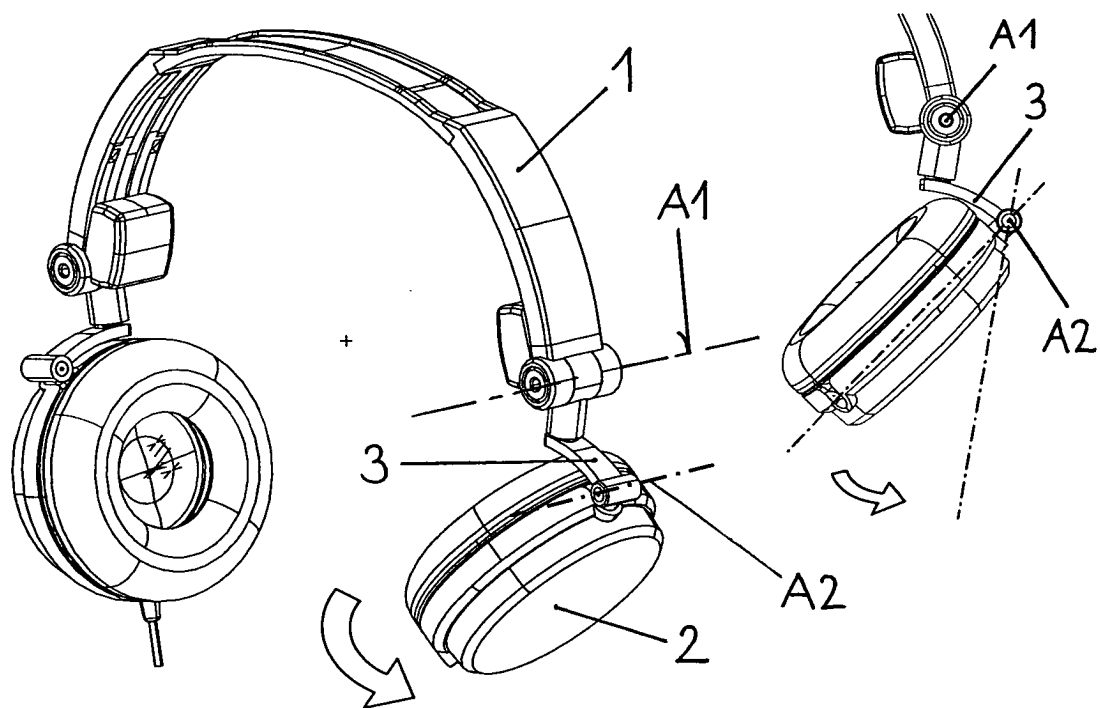


Fig. 2



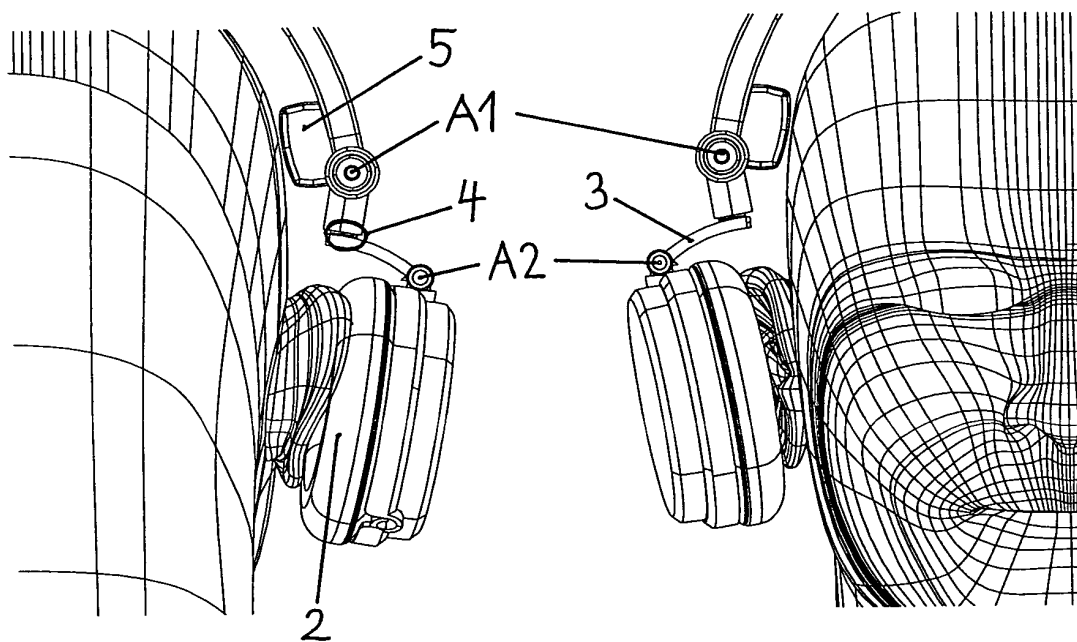


Fig. 5

Fig. 6

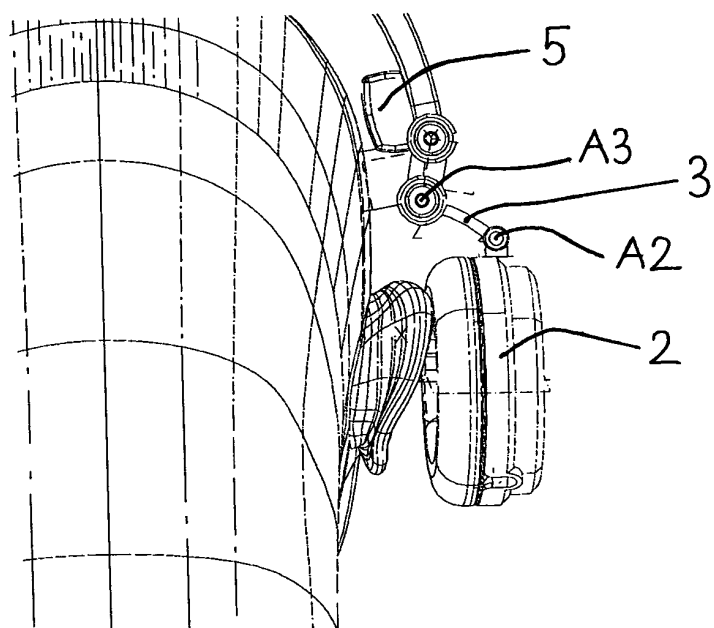


Fig. 7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 45 0156

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	US 5 293 647 A (MIRMILSHTEYN ET AL) 15 March 1994 (1994-03-15) * column 1, line 5 - column 2, line 64 * * column 3, line 16 - column 4, line 62 *	1-4	H04R5/033 H04R1/10
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A	GB 2 299 234 A (NICHOLAS PAUL * ROBINSON) 25 September 1996 (1996-09-25) * page 4, paragraph 1 - page 5, paragraph 2 *	3	
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7) H04R
Place of search Munich		Date of completion of the search 18 April 2005	Examiner Peirs, K
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 04 45 0156

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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18-04-2005

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