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(73) Patenthaver: **Cofren S.r.L., Via Pianodardine SNC, 83100 Avellino, Italien**

(72) Opfinder: **De Soccio, Vittorio, Via Antonio Lepore, 3/C, 82100, BENEVENTO, Italien**

(74) Fuldmægtig i Danmark: **Zacco Denmark A/S, Hans Bekkevolds Allé 7, 2900 Hellerup, Danmark**

(54) Benævnelse: **Skivebremse til jernbane- og industrikøretøjer**

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US-A- 5 135 094

Description

[0001] The present invention relates to a railroad and industrial vehicle disk brake .

[0002] As is known, disk brakes undergo severe stress, and optimum braking action depends on effective transmission of the braking force from the pad to the disk.

[0003] Research over the past few years has shown more is to be gained from a number of friction bodies on one pad than from one large friction body.

[0004] European Patent EP 1099061 describes a disk brake pad, in particular for railroad vehicles, comprising a number of friction members fixed to a supporting plate. Each friction member is elongated in shape, is fixed to the supporting plate by two rivets, and is positioned differently from the others with respect to concentric circles of the disk, while still maintaining an angle α of $0°<\alpha\leq 45°$ with respect to the concentric circles of the disk.

[0005] The Applicant has surprisingly discovered that curved elongated friction members, all located along concentric circles of the disk, provide for improving performance in terms of both braking efficiency and noise.

[0006] It is an object of the present invention to provide a railroad and industrial vehicle disk brake with the characteristics indicated in Claim 1, and the preferred characteristics indicated in Claims 2-9.

[0007] Two non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which :

Figure 1 shows a partly transparent plan view of a first embodiment of the pad according to the present invention;

Figure 2 shows a partly transparent plan view of a second embodiment of the pad according to the present invention;

Figure 3 shows a plan view of a detail common to both the Figure 1 and 2 embodiments;

Figure 4 shows a plan view of another detail common to both the Figure 1 and 2 embodiments;

Figure 5 shows a graph of noise test results of a cast iron disk brake;

Figure 6 shows a graph of noise test results of a steel disk brake.

[0008] Number 1 in Figure 1 indicates as a whole a first embodiment of the pad according to the present invention.

[0009] Pad 1 substantially comprises a supporting plate 2; and eight friction members 3, each fixed to supporting plate 2 by one rivet 4.

[0010] Each friction member 3 is elongated in shape, and defined by two parallel curved long sides 5a and 5b.

[0011] Friction members 3 are fixed to supporting plate 2 so that the curves of sides 5a and 5b form an angle of 0° with respective concentric circles X of the disk D on which pad 1 acts.

[0012] In figure 1 the evidence of such a feature is shown only for one friction member 3 for sake of simplicity.

[0013] Each friction member 3 thus has an elongated friction surface defined by two curved long sides located in use along concentric circles X of disk D.

[0014] Given that railroad and industrial vehicle disk brake pads have only one position with respect to the disk, it is the Applicant's opinion that the position of the friction members in the pad is definable, for patent purposes, by defining their position with respect to the disk.

[0015] More specifically, friction members 3 are substantially rectangular, with two curved parallel long sides.

[0016] Each friction member 3 is fitted with a strengthener 6 (Figure 3) incorporated in friction member 3, leaving a fastening surface of the strengthener exposed, i.e. the fastening surface of strengthener 6 is positioned flush with the surface of friction member 3 facing the supporting plate.

[0017] As shown in Figure 3, each strengthener 6 comprises a plate 7, in which are formed a central hole 8 for rivet 4, and two circular teeth 9 extending perpendicularly on opposite sides of central hole 8 and which, as described below, aid in preventing rotation of friction member 3. Each strengthener 6 also comprises two fastening portions 10 located at the two ends of plate 7, and each having two fastening teeth 11 extending inside friction member 3, perpendicularly to plate 7 and on the opposite side to teeth 9.

[0018] Pad 1 comprises a number of antirotation members 12 (one shown in Figure 4), each of which has a first face fitted to supporting plate 2, and a second face fitted to a respective strengthener 6.

[0019] As shown in Figure 4, each antirotation member 12 comprises a plate 13, in which are formed a central hole 14 for rivet 4, and two holes 15 for housing teeth 9 of strengthener 6.

[0020] Each antirotation member 12 has two recesses 16, each formed along a respective side 17 of plate 13, and each housing a respective rotation-lock pin (not shown for the sake of simplicity) extending from supporting plate 2.

[0021] As will be clear from the above description, the arrangement of the friction members is an essential characteristic of the present invention and must therefore be maintained during operation of the brake. Hence the need for antirotation members, which are even more necessary in view of the fact that each friction member is only fixed to the supporting plate 2, by one rivet 4, about which it can therefore rotate.

[0022] The fact that strengthener 6 is integral with, i.e. incorporated in, friction member 3 and locked by teeth 9 cooperating with holes 15 in antirotation member 12, in turn locked to supporting plate 2 by recesses 16, ensures friction members 3 are held in position on the pad during operation.

[0023] Antirotation members 12 also serve as spacers to allow air to circulate between friction members 3 and supporting plate 2.

[0024] Despite this further advantage of antirotation members 12, the wider protective scope of the pad according to the present invention also covers different antirotation means, provided they are equally capable of maintaining the position of the friction members during operation.

[0025] Number 21 in Figure 2 indicates as a whole a second embodiment of the disk brake pad according to the present invention.

[0026] Identical parts of pads 21 and 1 are indicated using the same reference numbers, with no further description.

[0027] Pad 21 substantially differs from pad 1 as to the shape of the friction members. Pad 21 comprises eight substantially trapezoidal friction members 22, the major and minor base sides of which are curved to achieve the required angle with respect to the concentric circles X of disk D.

[0028] In this case, too, friction members 22 are elongated in shape and defined by two parallel curved long sides 23a, 23b, but, unlike friction members 3, have two long sides of different lengths, despite both defining the elongated shape.

[0029] In figure 2 the evidence of such a feature is shown only for one friction member 22 for sake of simplicity.

[0030] Friction members 22 have a possible further advantage over friction members 3, by having a longer side, and so providing greater friction, where circumferential speed is greater.

[0031] Figures 5 and 6 show the noise test results of a 640x110 mm cast iron disk and steel disk respectively.

[0032] Noise testing was conducted under the same conditions using pad 1 as described above, and a typical known control pad. More specifically, the control pad comprised

triangular friction members positioned differently with respect to the concentric circles of the disk and made of the same material as the friction members of pad 1.

[0033] Noise was recorded over three sets of braking operations (from 1 to 9, from 10 to 18, and from 19 to 27) at different pressures. Each set comprised three braking operations at a disk speed of 50 km/h, three at a disk speed of 70 km/h, and three at a disk speed of 100 km/h. These speeds were chosen to simulate train speed nearing or entering a station, i.e. where noise level is most important.

[0034] As shown by the results in decibels in the Figure 5 and 6 graphs, the pads according to the present invention have a much lower noise level than the control pads, with no impairment in braking efficiency.

Patentkrav

1. Skivebremse til jernbane- og industrikøretøjer, omfattende en bremseskive (D) og en skivebremseklods (1; 21), som omfatter en støtteplade (2) og et antal af friktionselementer (3; 22), som er fastgjort til støttepladen (2) med indsætningen af antirotationsmidler (6, 12); hvilken skivebremse er **kendetegnet ved**, at hvert friktionselement (3; 22) har en aflang form med to bueformede parallelle lange sider (5a, 5b); at hvert friktionselement (3; 22) er fastgjort til støttepladen (2), således at buerne af de lange sider (5a, 5b) danner en i det væsentlige 0°-vinkel med respektive koncentriske cirkler (X) af skiven (D), hvortil klodsen (1) overfører en bremsekraft.

2. Skivebremse til jernbane- og industrikøretøjer ifølge krav 1, **kendetegnet ved**, at hvert af friktionselementerne (3; 22) er fikseret til støttepladen (2) ved hjælp af en nitte (4).

3. Skivebremse til jernbane- og industrikøretøjer ifølge krav 1 eller 2, **kendetegnet ved**, at antirotationsmidlerne omfatter et forstærkningselement (6), der er inkorporeret i friktionselementet (3; 22); og et antirotationselement (12) som på den ene side er fikseret til støttepladen (2) og på den anden side samvirker med forstærkningselementet (6) på en antirotationsmåde.

4. Skivebremse til jernbane- og industrikøretøjer ifølge krav 3, **kendetegnet ved**, at hvert forstærkningselement (6) omfatter en plade (7), i hvilken der er udformet et midterhul (8) til nitten (4) og to låsetænder (9).

5. Skivebremse til jernbane- og industrikøretøjer ifølge krav 4, **kendetegnet ved**, at hvert forstærkningselement (6) omfatter to fastgøringsdele (10) anbragt ved de to ender af pladen (7), og som hver især har to tænder (11), der strækker sig ind i friktionselementet (3) vinkelret på pladen (7) og på den modstående side til låsetænderne (9).

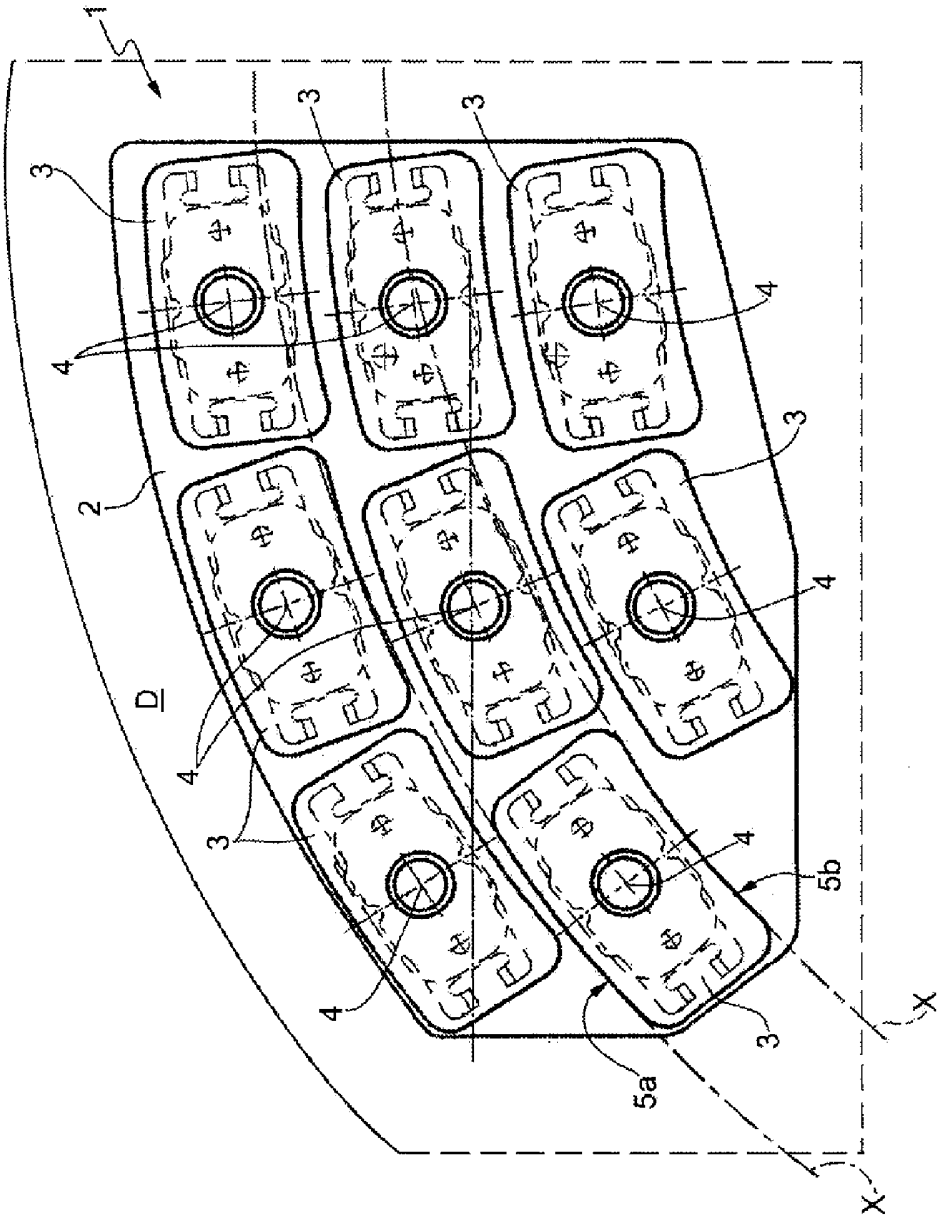
6. Skivebremse til jernbane- og industrikøretøjer ifølge krav 5, **kendetegnet ved**, at hvert antirotationselement (12) omfatter en plade (13), i hvilken der er udformet et midterhul (14) til nitten (4) og to huller (15) til optagelse af låsetænderne (9).

7. Skivebremse til jernbane- og industrikøretøjer ifølge krav 6, **kendetegnet ved**, at hvert antirotationselement (12) omfatter to fordybninger (16) udformet langs respektive sider (17) af pladen (13) og til optagelse af respektive rotationslåseelementer, der strækker sig fra støttepladen (2).

8. Skivebremse til jernbane- og industrikøretøjer ifølge et hvilket som helst af de foregående krav, **kendetegnet ved**, at friktionselementerne (3) er i det væsentlige rektangulære.

9. Skivebremse til jernbane- og industrikøretøjer ifølge et hvilket som helst af kravene 1 til 7, **kendetegnet ved**, at friktionselementerne (22) er i det væsentlige trapezformede.

FIG.1



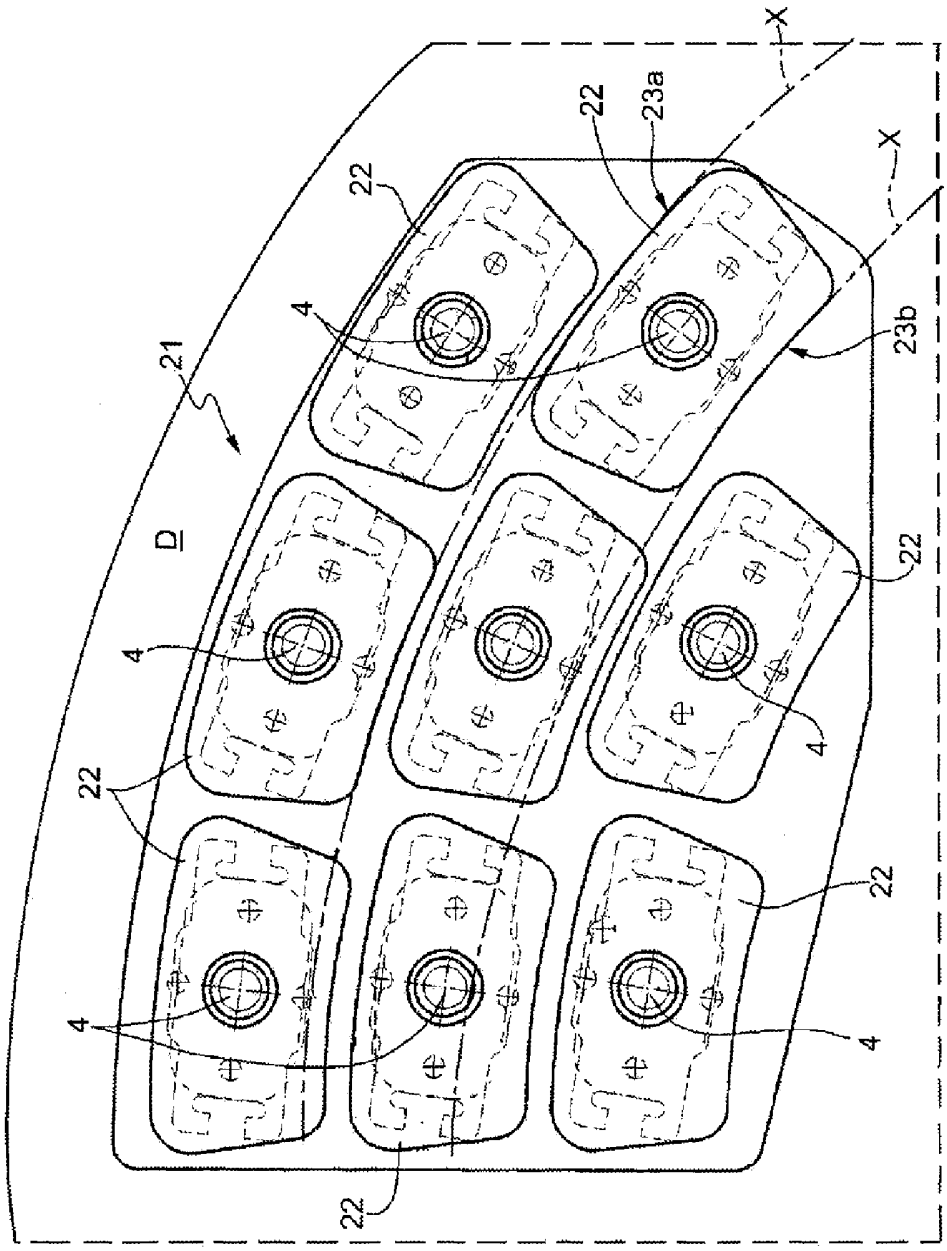


FIG.2

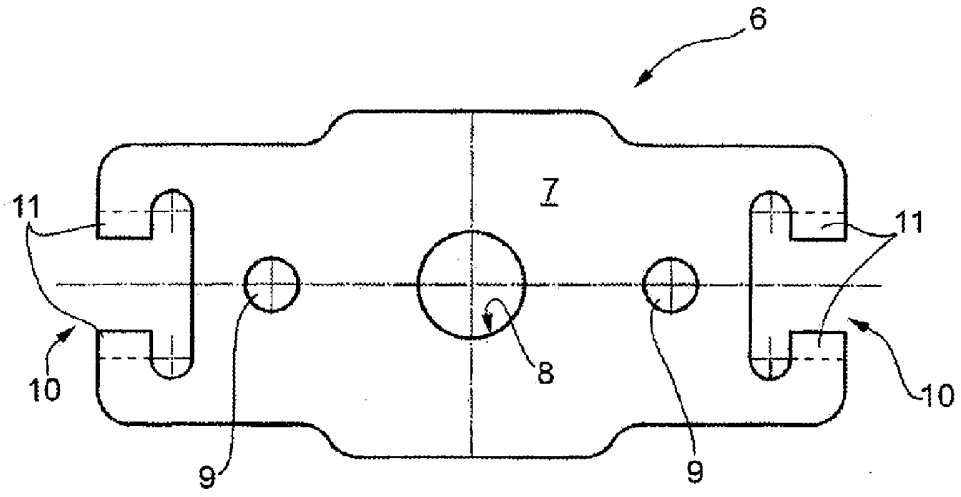


FIG.3

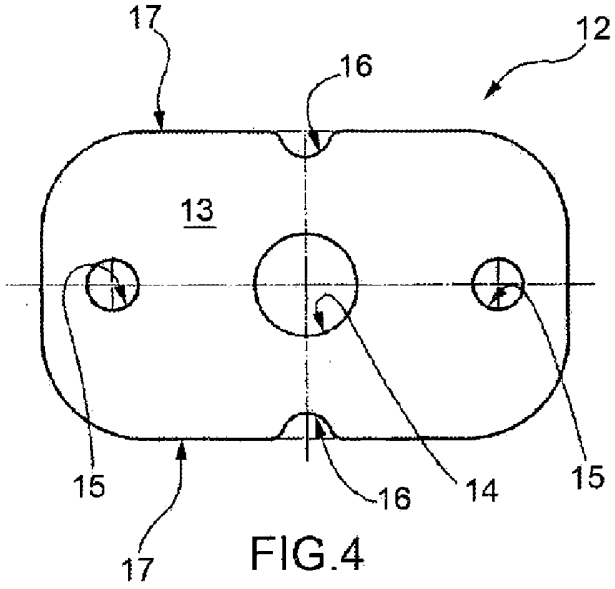


FIG.4

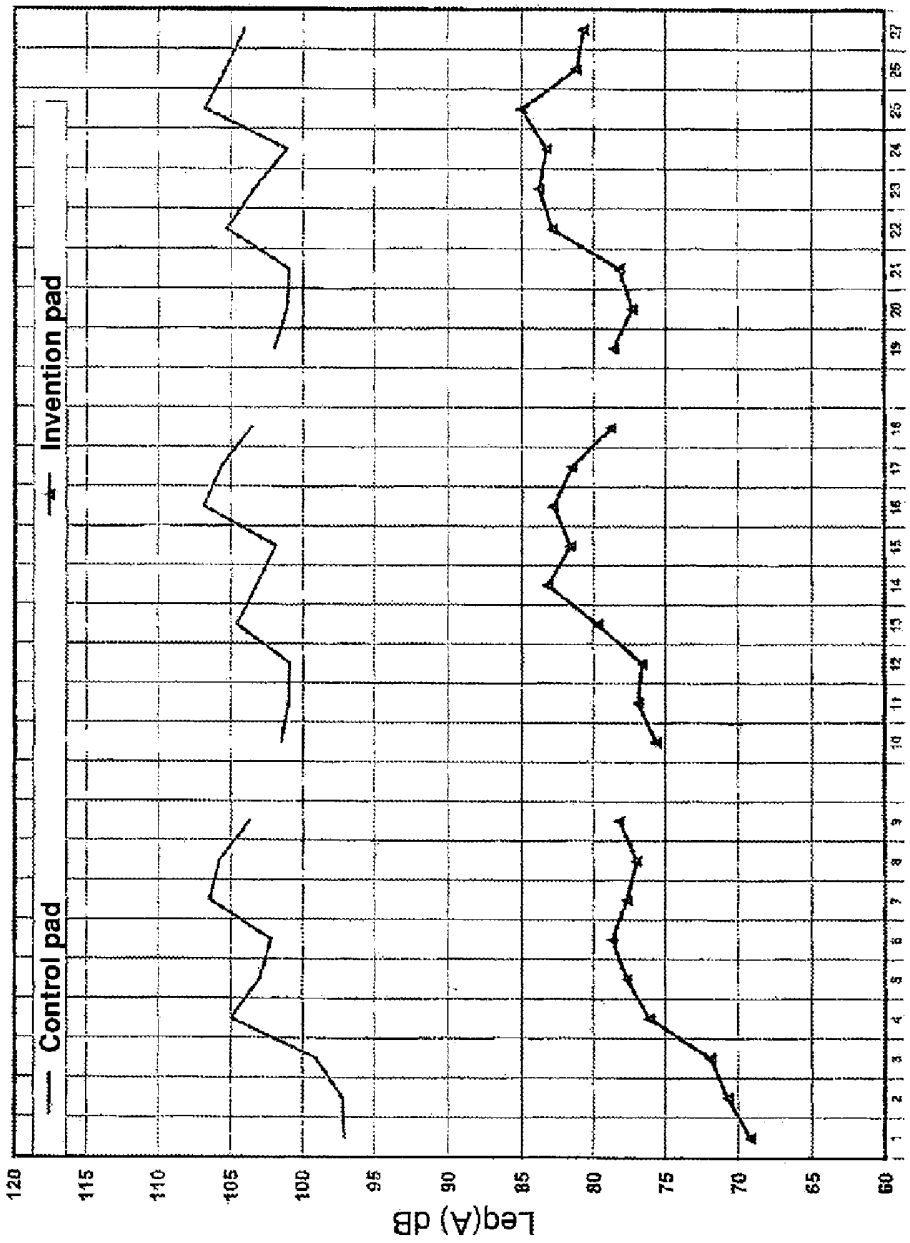


FIG.5

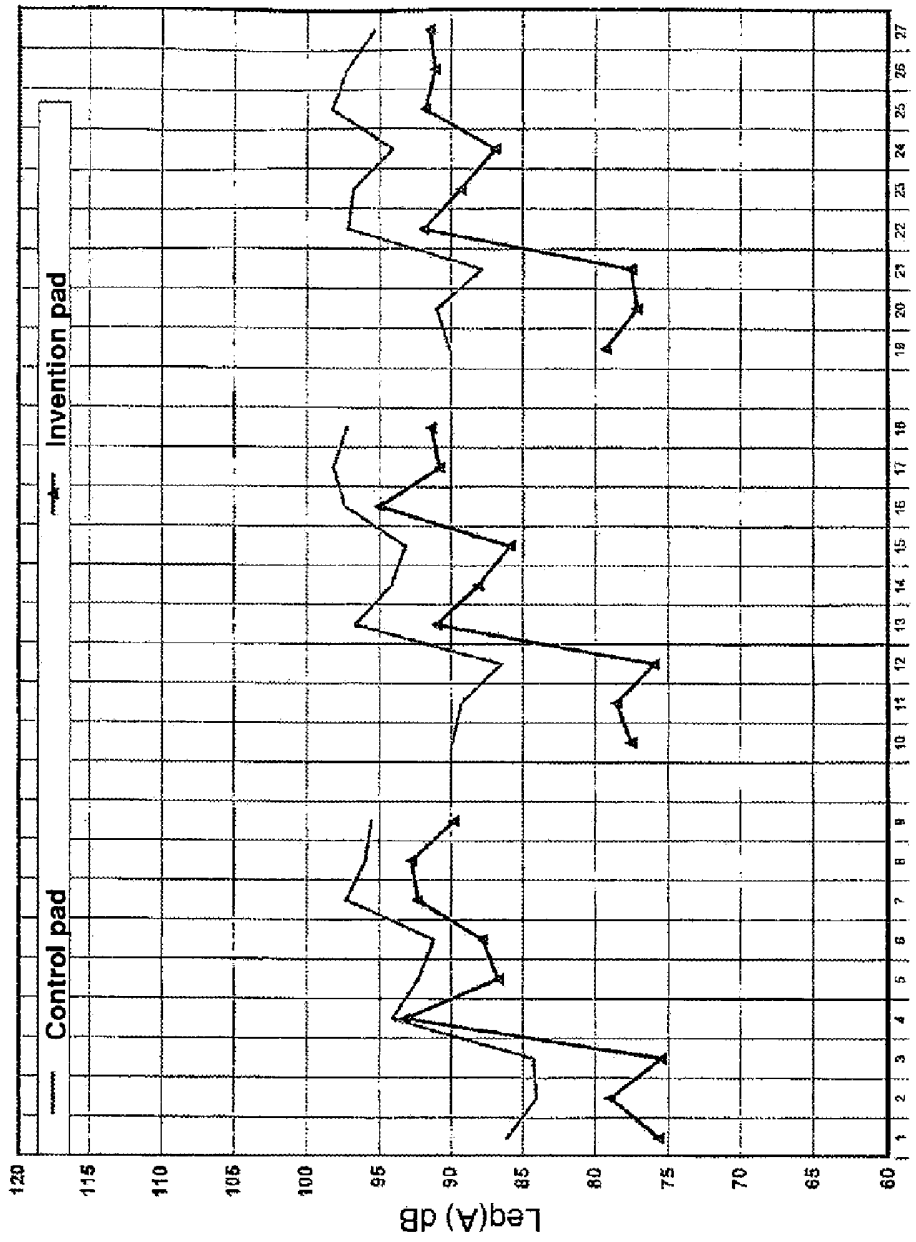


FIG.6