(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 354 460 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.08.2011 Bulletin 2011/32

(51) Int Cl.:
F01D 9/04 *(2006.01)* ***F01D 25/24*** *(2006.01)*

(21) Application number: **10152535.0**

(22) Date of filing: **03.02.2010**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA RS

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(54) Turbine Guide Vane

(57) The turbine guide vane (10) comprises a platform (12) from which at least a guide vane blade (13) extends. The platform (12) has a front rail (18) and a rear rail (20) arranged to be housed in guide vane carrier seats (19, 21). The front and rear rails (18, 20) have projecting pads (23, 24) arranged to rest against the guide vane carrier seats (19, 21). The front and rear rails (18, 20) have at least two pads (23) extending from one side of the front and rear rails (18, 20) and at least two further pads (24) extending from an opposite side of the front and rear rails (18, 20).

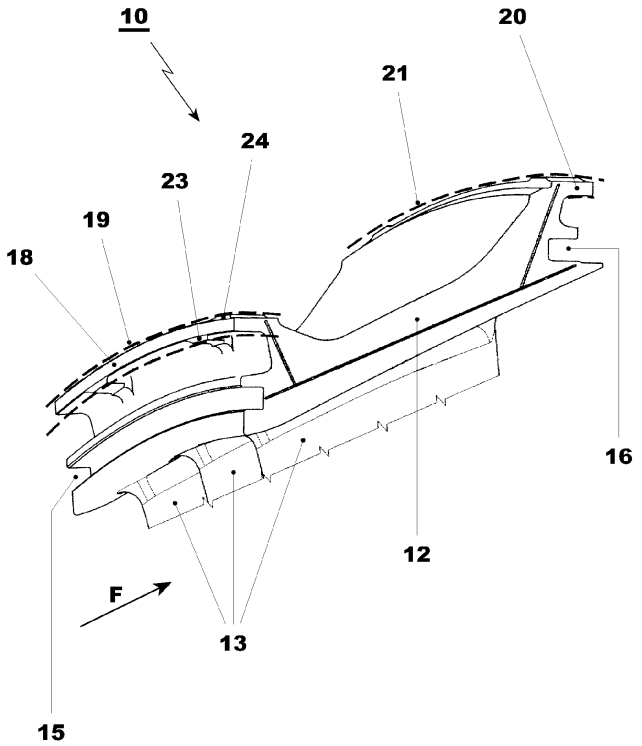

FIG. 3

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Description

TECHNICAL FIELD

[0001] The present invention relates to a turbine guide vane.

[0002] In particular the present invention refers to a supporting system for turbine guide vanes.

BACKGROUND OF THE INVENTION

[0003] Gas turbine guide vanes are known to comprise a platform from which one or also more than one guide vane blade extend.

[0004] For example, in guide vanes of the third or fourth stage, from each platform two or also three guide vane blades extend.

[0005] The platforms have a front rail and a rear rail arranged to be inserted into guide vane carrier seats having a slot shape.

[0006] When in operation, mechanical forces and thermally induced deformations highly stress the guide vane rails and the guide vane carriers.

[0007] For this reason, the shape of the rails must allow free deformations in order to avoid stress concentration and breakage risk.

[0008] Figure 1 shows a first embodiment of a traditional rail 1 inserted into a guide vane carrier seat 2 (in this figure the dimensions are exaggerated for sake of clarity, particularly radial dimensions are exaggerated); moreover, figure 1 also shows in dashed line a portion of a guide vane blade 3.

[0009] The rail 1 has a pad 4, extending from its side towards the guide vane blades 3, resting against the guide vane carrier seat 2; a second pad 5 extends from the side of the rail 1 opposite the guide vane blade 3 and rests against the guide vane carrier seat 2.

[0010] The guide vane in this traditional embodiment proved to have good deformation properties and also easy of assembling (i.e. sliding of the rail 1 into the guide vane carrier seat 2 proved to be easy); nevertheless this structure can only be implemented in lighter guide vanes; i.e. typically in guide vanes having only one or two guide vane blades 3.

[0011] Figure 2 shows a different embodiment of traditional rails.

[0012] This rail 1 is provided with pads 6 extending from the same side being the side of the rail 1 towards the guide vane blade 3; the opposite side of the rail 1 has no pads and rests directly against the guide vane carrier seat 2.

[0013] The guide vanes with these rails can be much heavier than those with the rails of figure 1, for example these guide vanes can have three or also more than three guide vane blades.

[0014] Nevertheless these guide vanes have limited freedom of deformation; this could cause during operation stress and forces concentration and consequently possibility of structural breakages.

[0015] In addition, assembling (i.e. sliding the rails of these guide vanes into the corresponding guide vane carrier seats 2) and disassembling (i.e. sliding the rails out of the guide vane carrier seats 2) proved to be very difficult, because of the weight of these guide vanes and the large surfaces of the rails and guide vane carrier seats that are directly in contact with one another.

SUMMARY OF THE INVENTION

[0016] The technical aim of the present invention is therefore to provide a guide vane by which the said problems of the known art are eliminated.

[0017] Within the scope of this technical aim, an aspect of the invention is to provide a guide vane that can have a substantial weight and, in this respect, can also have three or more than three guide vane blades.

[0018] Another aspect of the invention is to provide a guide vane with rails having large deformation possibilities, such that during operation stress and forces concentration are avoided or limited and the lifetime of the guide vanes is increased.

[0019] A further aspect of the present invention is to provide a guide vane that can be easily and quickly assembled and disassembled.

[0020] The technical aim, together with these and further aspects, are attained according to the invention by providing a guide vane in accordance with the accompanying claims.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Further characteristics and advantages of the invention will be more apparent from the description of a preferred but non-exclusive embodiment of the guide vane according to the invention, illustrated by way of non-limiting example in the accompanying drawings, in which:

Figures 1 and 2 are two different embodiments of rails of a guide vane of the prior art;

Figure 3 is a side view of a guide vane in an embodiment of the invention; and

Figure 4 and 5 are views respectively of a front rail and rear rail of the guide vanes; in these figures the dimensions (in particular radial dimensions) are exaggerated for clarity.

DETAILED DESCRIPTION OF THE INVENTION

[0022] With reference to figures 3-5, these show a turbine guide vane indicated by the reference 10.

[0023] The guide vane 10 has a platform 12 from which guide vane blades 13 extend; in particular figure 3 shows an embodiment of a guide vane 10 with three guide vane blades 13, it is anyhow clear that in different embodiments their number can also be different.

[0024] The guide vane 10 is also provided with sup-

porting means that are located at the front side and rear side of the platform 12 (with reference to the hot gas flow direction indicated by arrow F in figure 3).

[0025] In particular, the front side of the platform 12 has a seat 15 for the stator heat shield and, correspondingly, the rear side of the platform 12 has a seat 16 for a further stator heat shield (the stator heat shields are not shown).

[0026] In addition, the front side of the platform 12 has a rail 18 arranged to be housed into a guide vane carrier seat 19; the guide vane carrier seat 19 is of traditional type and have the shape of a circumferential slot.

[0027] Similarly, the rear side of the platform 12 has a rail 20 arranged to be housed into a guide vane carrier seat 21; also the guide vane carrier seat 21 is of traditional type and have the shape of a circumferential slot.

[0028] The rails 18 and 20 have projecting pads arranged to rest against the guide vane carrier seats 19, 21.

[0029] Advantageously, each rail 18, 20 has two pads 23 extending from one side of the rail and two further pads 24 extending from an opposite side of the rail 18, 20.

[0030] In particular, as shown in the enclosed figures, the pads 23 and 24 extend from opposite radial sides of each rail 18, 20; the pads 23 extend from a side of the rails 18, 20 facing the guide vane blades 13, and the other pads 24 extend from the opposite side, i.e. from the side opposite the guide vane blades 13.

[0031] In addition, the pads 23 and 24 extend from opposite circumferential portions 26 of the rails 18, 20, i.e. they are located close to the circumferentially opposite ends of the rails 18, 20.

[0032] The pads 23, 24 that extend from the same circumferential portion 26 of the rails 18, 20 are advantageously at least partly staggered with respect to one another.

[0033] In this respect figure 4 (referring to the front rail 18) shows the pads 23 and 24 that are staggered but are circumferentially very close one to the other.

[0034] Figure 5 (referring to the rear rail 20) shows that the pads 23 and 24 that are staggered are also circumferentially distant one from the other.

[0035] In addition, in each couple of pads 23, 24 extending from the same circumferential portion 26 of each rail 18, 20, the pads 23 extending from the side of the rail facing the guide vane blades 13 are farther from the respective rail end 27 than those opposite the guide vanes blades 13 (i.e. the pads 24).

[0036] In a particular embodiment the pads 23 and 24 are symmetrically disposed with respect to the vane axis 28; it is anyhow clear that in different embodiments the pads 23 and 24 are not symmetrically disposed with respect to the vane axis 28.

[0037] Assembling of the guide vanes of the invention is quite easy and fast, because the rails 18 and 20 must be inserted into the guide vane carriers seats 19, 21 and made to slide thereinto.

[0038] Since the contact occurs only between the pads 23, 24 and the guide vane carrier seat 19, 21, and since, when the rails 18, 20 are housed in the guide vane carrier seats 19, 21 preferably a certain gap between the pads 24 and the same guide vane carrier seats 19, 21 is provided, rails slide with a limited friction. In addition pads staggering makes rail introduction into the seats 19, 21 very easy.

[0039] Also disassembling is easy and quick; in fact since there are no large contact surfaces between the rails 18, 20 and the guide vane carrier seats 19, 21, there is no risk or only a limited risk that dust or deformations due to mechanical forces and thermal stress block the rails 18, 20 inside of the guide vane carrier seats 19, 21.

[0040] In addition, the guide vanes of the invention may also have a heavy structure (such as for example guide vanes having three or more guide vane blades 13), since assembling/disassembling is easy and the degree of allowable deformations is very large.

[0041] In fact, when the guide vanes 18, 20 are assembled within the guide vane carrier seats 19, 21 deformations can freely occur in a large extent, because space and support are always available.

[0042] Naturally the features described may be independently provided from one another.

[0043] In practice the materials used and the dimensions are chosen according to requirements and to the state of the art.

REFERENCE NUMBERS

Prior art

[0044]

1	rail
2	guide vane carrier seat
3	guide vane blade
4	pad
5	pad
6	pad

Embodiment of the invention

[0045]

10	guide vane
12	platform
13	guide vane blades
15, 16	seat for the stator heat shield
18	front rail

19	guide vane carrier seat of 18
20	rear rail
21	guide vane carrier seat of 20
23	pad
24	pad
26	portion of 18, 20
27	rail end
28	guide vane axis
F	flow gas direction

Claims

1. Guide vane (10) of a gas turbine comprising a platform (12) from which at least a guide vane blade (13) extends, said platform (12) having a front rail (18) and a rear rail (20) arranged to be housed in guide vane carrier seats (19, 21), wherein said front and rear rails (18, 20) have projecting pads (23, 24) arranged to rest against the guide vane carrier seats (19, 21), **characterised in that** said front and rear rails (18, 20) have at least two pads (23) extending from one side of the front and rear rails (18, 20) and at least two further pads (24) extending from an opposite side of the front and rear rails (18, 20).

2. Guide vane (10) as claimed in claim 1, **characterised in that** said pads (23, 24) extend from opposite radial sides of said front and rear rails (18, 20).

3. Guide vane (10) as claimed in claim 2, **characterised in that** said pads (23, 24) extend from a side of the front and rear rails (18, 20) facing the guide vane blade (13), and from the opposite side being opposite the guide vane blades (13).

4. Guide vane (10) as claimed in claim 1, **characterised in that** said pads (23, 24) extend from opposite circumferential portions (26) of the front and rear rails (18, 20).

5. Guide vane (10) as claimed in claim 4, **characterised in that** said pads (23, 24) extending from the same circumferential portion (26) of the front and rear rails (18, 20) are at least partly staggered with respect to one another.

6. Guide vane (10) as claimed in claim 5, **characterised in that** in each couple of pads (23, 24) extending at the same circumferential portion (26) of each front and rear rail (18, 20), the pads (23) extending from the side of the front and rear rails (18, 20) facing the guide vane blades (13) are farther from the respective rail end (27) than those opposite the guide vanes blades (13).

7. Guide vane (10) as claimed in claim 1, **characterised in that** said pads (23, 24) are symmetrically disposed with respect to a guide vane axis (28).

8. Guide vane (10) as claimed in claim 1, **characterised in that** said pads (23, 24) are not symmetrically disposed with respect to a guide vane axis (28).

9. Guide vane (10) as claimed in claim 1, **characterised by** comprising a plurality of guide vane blades (13).

10. Guide vane (10) as claimed in claim 9, **characterised in that** said plurality of guide vane blades (13) comprises at least three guide vane blades (13).

11. Guide vane (10) as claimed in claim 1, **characterised in that** when the rails (18, 20) are housed in the guide vane carrier seats (19, 21) a gap between the pads (23, 24) and the same guide vane carrier seats (19, 21) is provided

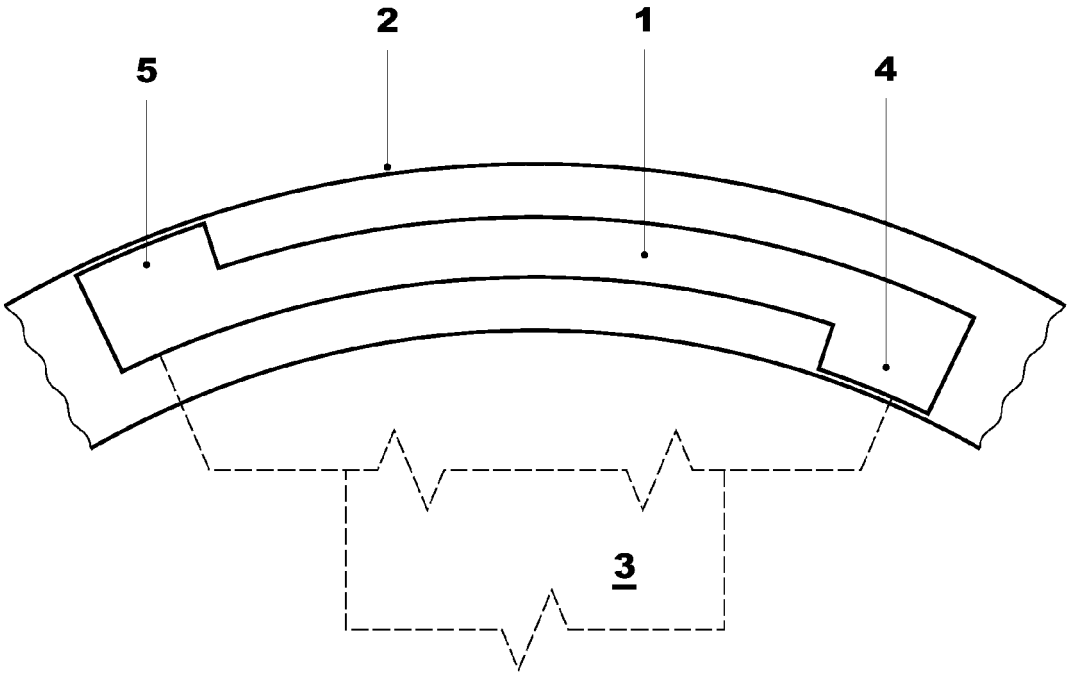

FIG. 1

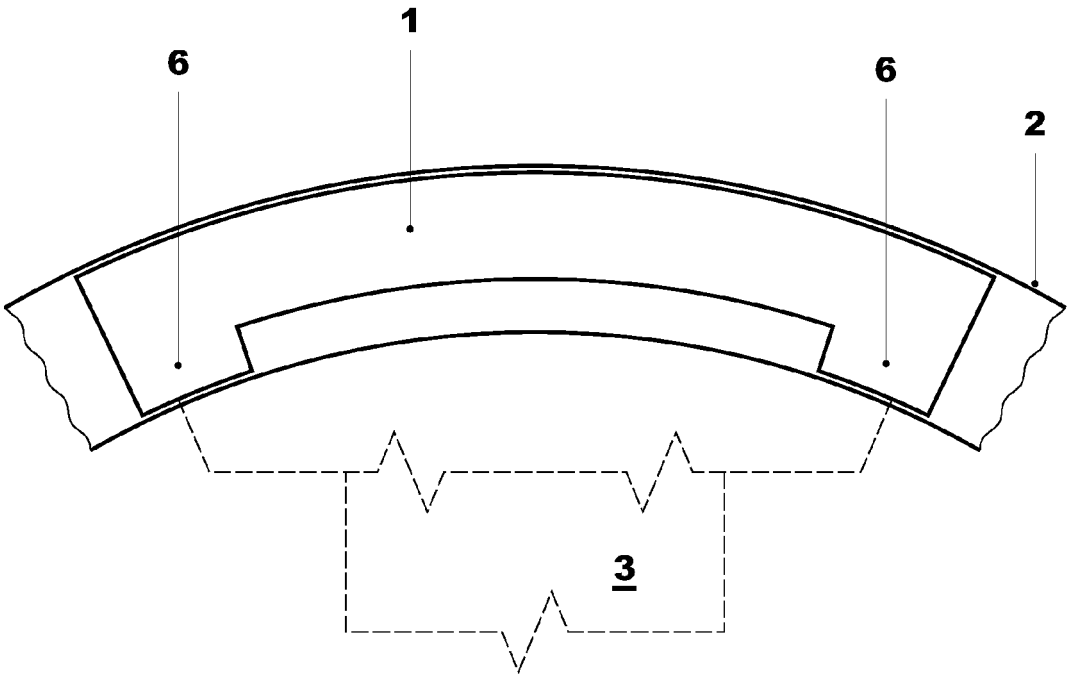

FIG. 2

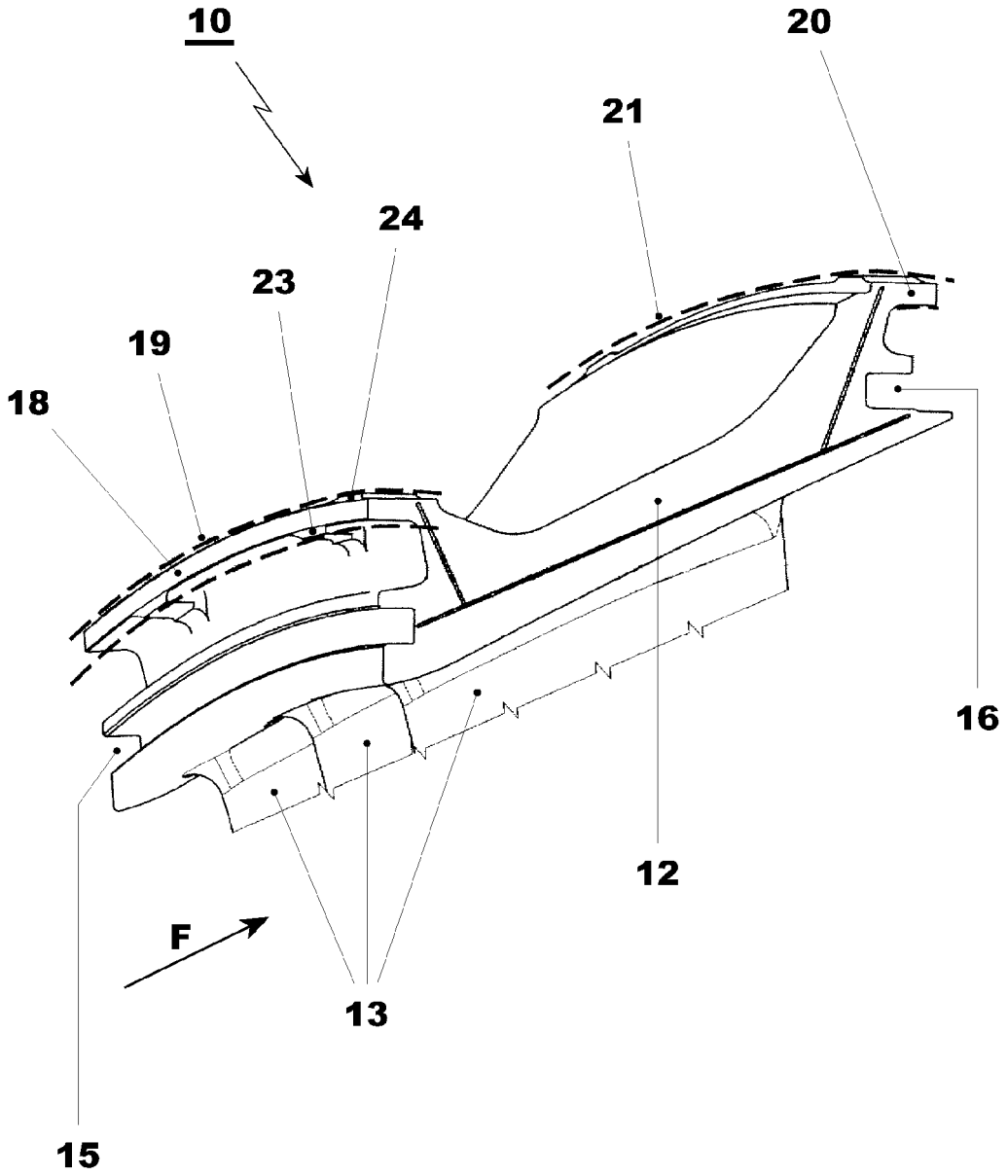

FIG. 3

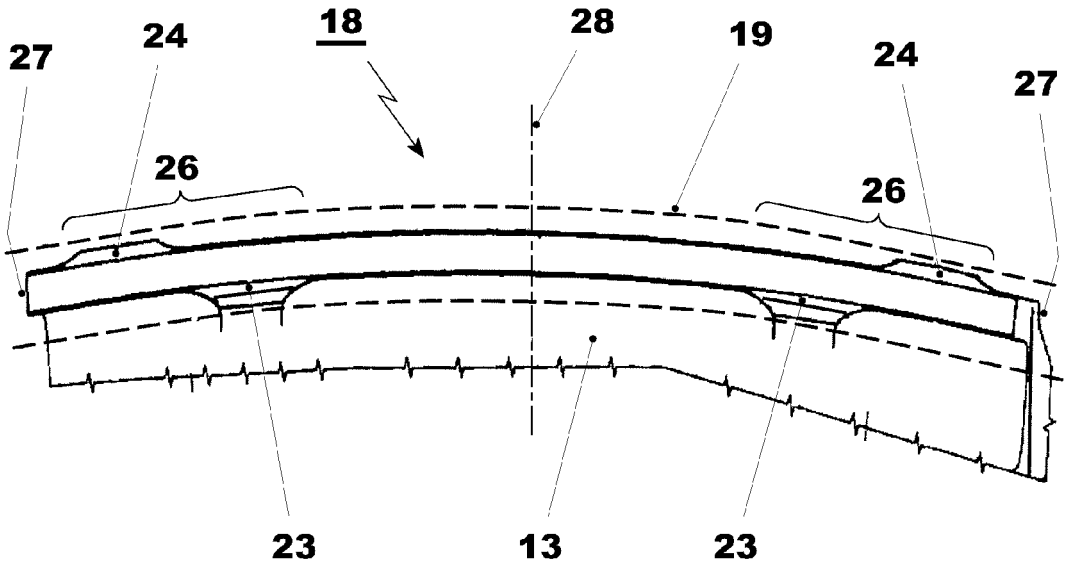

FIG. 4

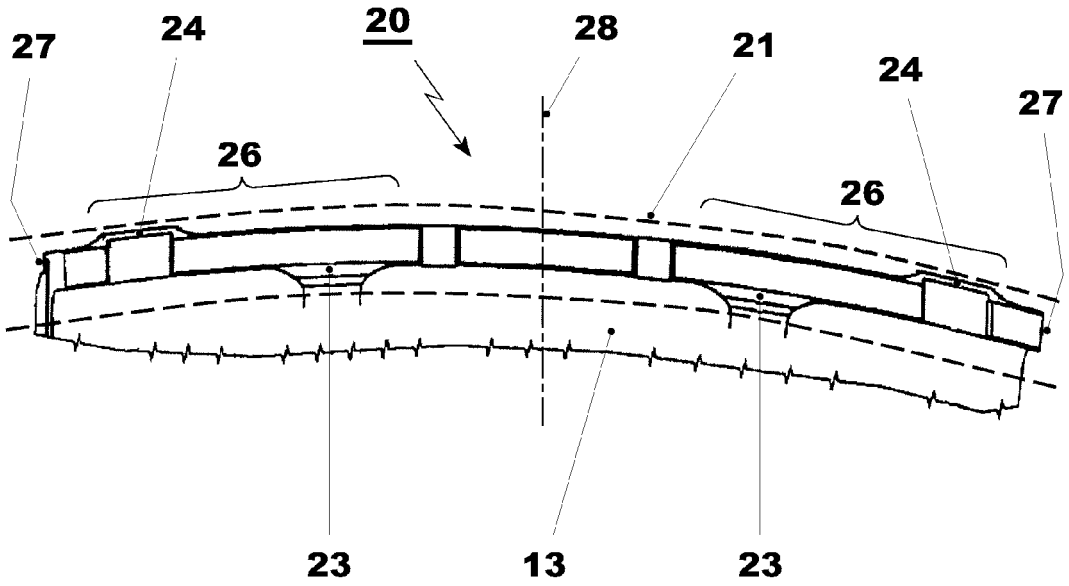

FIG. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 10 15 2535

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
			F01D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	15 June 2010	Oechsner de Coninck

CATEGORY OF CITED DOCUMENTS

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82