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(54) **Inlet volute of a steam turbine and steam turbine**

(57) The invention relates to an inlet volute (1) of a steam turbine, whereby the inlet volute (1) supplies steam to blades which are fixed at a rotor device which is rotatably mounted around an axis (6), whereby the inlet volute is arranged inside an outer casing (2) of the steam turbine and whereby the inlet volute (1) is split along a split plane (3) in two parts (4, 5) which are being fixed together to build the inlet volute (1), and whereby the split plane (3) of the two parts (4, 5) of the inlet volute (1) is inclined relating to the axis (6) of the rotor device of the steam turbine. The invention relates further to a steam turbine, comprising at least one inlet volute (1), which is arranged inside an outer casing (2) of the steam turbine, whereby the at least one inlet volute (1) supplies steam (7) to blades which are fixed at a rotor device which is rotatably mounted around an axis (6), whereby the inlet volute (1) is being built like this.

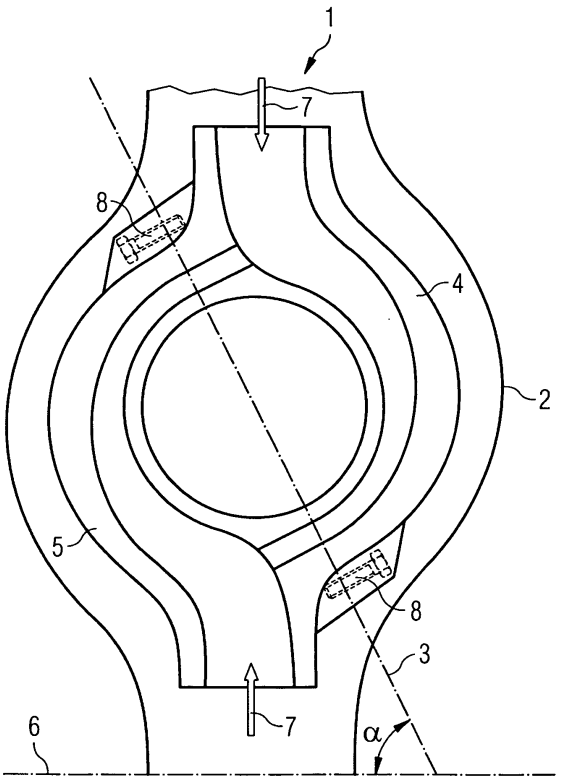


Fig. 1

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Description

[0001] The present invention relates to an inlet volute of a steam turbine, whereby the inlet volute supplies steam to blades which are fixed at a rotor device which is rotatably mounted around an axis, whereby the inlet volute is arranged inside an outer casing of the steam turbine and whereby the inlet volute is split along a split plane in two parts which are being fixed together to build the inlet volute. The invention relates further to a steam turbine comprising at least one inlet volute, which is arranged inside an outer casing of the steam turbine, whereby the at least one inlet volute supplies steam to blades which are fixed at a rotor device which is rotatably mounted around an axis.

[0002] The inlet volute of a steam turbine supplies steam evenly over the circumference of a turbine stage, leading to aerodynamic efficiency. The inlet volute for even steam distribution to the first inlet stage protect the outer turbine casing from very hot inlet steam. A single inlet volume provides optimal performance for combined-cycle sliding pressure operation.

[0003] The inlet volute is surrounded by the outer turbine casing. The dimension of the outer casing is therefore dependent from the size and form of the inlet volute. Known inlet volutes comprise to parts which are fixed together at a horizontal split plane. Horizontal means the direction of the split plane relating to the axis of the rotor device of the steam turbine.

[0004] The problem to be solved by the present invention is to keep the dimension of an inlet volute, which consists of two parts, of a steam turbine and the size of the outer casing of the steam turbine, in which the inlet volute is arranged, small. In particular a steam turbine should be established, whereby the dimension of the steam turbine can be kept small.

[0005] The problems of the invention are solved by an inlet volute with the features according to claim 1 and by a steam turbine with the features according to claim 5. Advantages, features, details, aspects and effects of the invention arise from the dependent claims, the description and the figure. Features and details which are described in connection with the inlet volute count as well for the steam turbine, and vice versa.

[0006] According to a first aspect of the present invention the problem is solved by an inlet volute of a steam turbine, whereby the inlet volute supplies steam to blades which are fixed at a rotor device which is rotatably mounted around an axis, whereby the inlet volute is arranged inside an outer casing of the steam turbine whereby the inlet volute is split along a split plane in two parts which are being fixed together to build the inlet volute, and whereby the split plane of the two parts of the inlet volute is inclined relating to the axis of the rotor device of the steam turbine.

[0007] The core of the invention is the specific location and arrangement of the split plane of the two parts of the inlet volute. The split plane is inclined with regard to the extension of the axis of the rotor of the steam turbine. This enables that the dimension of the inlet volute inside the outer casing of the steam turbine can be kept relatively small. The fixation of the two parts can be made along the inclined split plane and therefore the fixating devices, like bolts, can be placed at an inconsiderable position. That means the fixation of the two parts of the inlet volute is been made at a position, in which the fixation does not enlarge the dimension of the inlet volute inside the outer turbine casing. Inclined means that the split plane is arranged in an angle between 0° and 90° regarding the axis of the rotor of the steam turbine. The outer casing of the steam turbine can be kept small because the fixating devices of the inlet volute are arranged at a position, where they do not influence the form of the outer casing. Because of keeping the dimensions of the volute down it is possible to save size on the outer turbine casing. The arrangement of the split plane of the two parts of the inlet volute and therefore the position of the fixating devices to fix both parts together enable that there is no need of extra space for the split plane fixating devices, like split plane bolts. An inlet volute like this can save space to keep the dimensions of the outer casing down.

[0008] In a preferred embodiment the split plane of the inlet volute is inclined with an angle between 20° to 70°, in particular between 40° to 50°, relating to the axis of the steam turbine. The arrangement of the split plane in such a way allows that the outer casing of the steam turbine can be arranged vertically and horizontally as near as possible next to the inlet volute, because the fixation of the two parts of the inlet volute is arranged at the split plane. Exceptionally an inlet volute is preferred where the plane of the inlet volute is inclined with an angle of 45° in regard to the axis of the steam turbine.

[0009] The two parts of the inlet volute can be fixed together by different fixating devices. In a preferred embodiment of the inlet volute the two parts of the inlet volute are fixed together by bolts or screws, respectively. The fixation could be made by a clamp-connection or a welded-connection, as well. The two parts of the inlet volute comprise in a preferred embodiment bore holes for passing through bolts.

[0010] Preferred is further an embodiment of the inlet volute, whereby at least one part of the inlet volute comprises a fixating device for fixation at the outer casing of the steam turbine. This enables that the inlet volute can be fixed at the outer turbine casing. The fixating device can comprise a bore hole, a clamp-connection or a welded-connection.

[0011] According to a second aspect of the present invention the problem is solved by a steam turbine, comprising at least one inlet volute, which is arranged inside an outer casing of the steam turbine, whereby the at least one inlet volute supplies steam to blades which are fixed at a rotor device which is rotatably mounted around an axis, and whereby the inlet volute is being built according to the first aspect of the invention. A steam turbine having

such an inlet volute can have smaller outer dimensions, because the outer turbine casing can be kept smaller, then the known outer turbine casing. The outer casing can be arranged very close to the casing of the inlet volute in vertically and horizontally direction, because the fixating devices are placed in the area between the vertically and horizontally direction of the inlet volute. The inclined split plane enables the arrangement of the fixating devices, like bolts, to mount the two parts of the inlet volute together, in an inconspicuous place.

[0012] Preferred is a steam turbine, whereby at least one part of the at least one inlet volute is fixed at the outer casing of the steam turbine. This allows to positioning of the inlet volute inside the steam turbine. The inlet volute is preferred fixed at the outer turbine casing by means of a fixating device, like a bolded-connection.

[0013] The steam turbine is preferably a low-pressure steam turbine.

[0014] The invention will now be described again in detail with reference to the enclosed figure, wherein:

Figure 1 shows an inlet volute.

[0015] Fig. 1 shows an inlet volute 1 which is divided into a first 4 and a second part 5. The two parts 4, 5 are mounted to each other at the split plane 3. The split plane 3 is inclined in regard to the direction of the axis 6 of a not shown rotor device of the steam turbine. The angle α has preferably a value between 40° and 50°. The two parts 4, 5 are fixed to each other by fixating devices 8. In this embodiment the fixating devices 8 are bolts. The advantage of such an inlet volute 1 is that because of the specific arrangement of the split plane 3 und therefore of the fixating devices 8, the inlet volute 1 can be build very small, especially in the horizontal and vertical direction. The fixating devices 8 are placed at a very in inconspicuous position. Because of the possibility to build the inlet volute 1 with small dimensions, the outer casing, which surrounds the inlet volute 1, can be small, as well. The special arrangement of the split plane 3 and therefore of the fixating devices 8 can save space to keep the dimensions of the outer turbine casing 2 down. Between the two parts 4, 5 of the inlet volute 1 can be a special sealing. The inlet volute 1 supplies steam 7 evenly over the circumference of the first turbine stage.

Claims

1. Inlet volute (1) of a steam turbine, whereby the inlet volute (1) supplies steam to blades which are fixed at a rotor device which is rotatably mounted around an axis (6), whereby the inlet volute is arranged inside an outer casing (2) of the steam turbine and whereby the inlet volute (1) is split along a split plane (3) in two parts (4, 5) which are being fixed together to build the inlet volute (1), **characterized in that** the split plane (3) of the two parts (4, 5) of the inlet volute (1) is inclined relating to the axis (6) of the rotor device of the steam turbine.

2. Inlet volute (1) according to claim 1, **characterized in that** the split plane (3) is inclined with an angle α between 20° to 70°, in particular between 40° to 50°, relating to the axis (6) of the steam turbine.

3. Inlet volute (1) according to claim 1 or 2, **characterized in that** the two parts (4, 5) of the inlet volute (1) are fixed together by fixating devices (8).

4. Inlet volute (1) according to one of the claims 1 to 3, **characterized in that** at least one part (4, 5) of the inlet volute (1) comprises a fixating device for fixation at the outer casing (2) of the steam turbine.

5. Steam turbine, comprising at least one inlet volute (1), which is arranged inside an outer casing (2) of the steam turbine, whereby the at least one inlet volute (1) supplies steam (7) to blades which are fixed at a rotor device which is rotatably mounted around an axis (6), **characterized in that** the inlet volute (1) is being built according to one of the claims 1 to 4.

6. Steam turbine according to claim 5, **characterized in that** at least one part (4, 5) of the at least one inlet volute (1) is fixed at the outer casing (2) of the steam turbine.

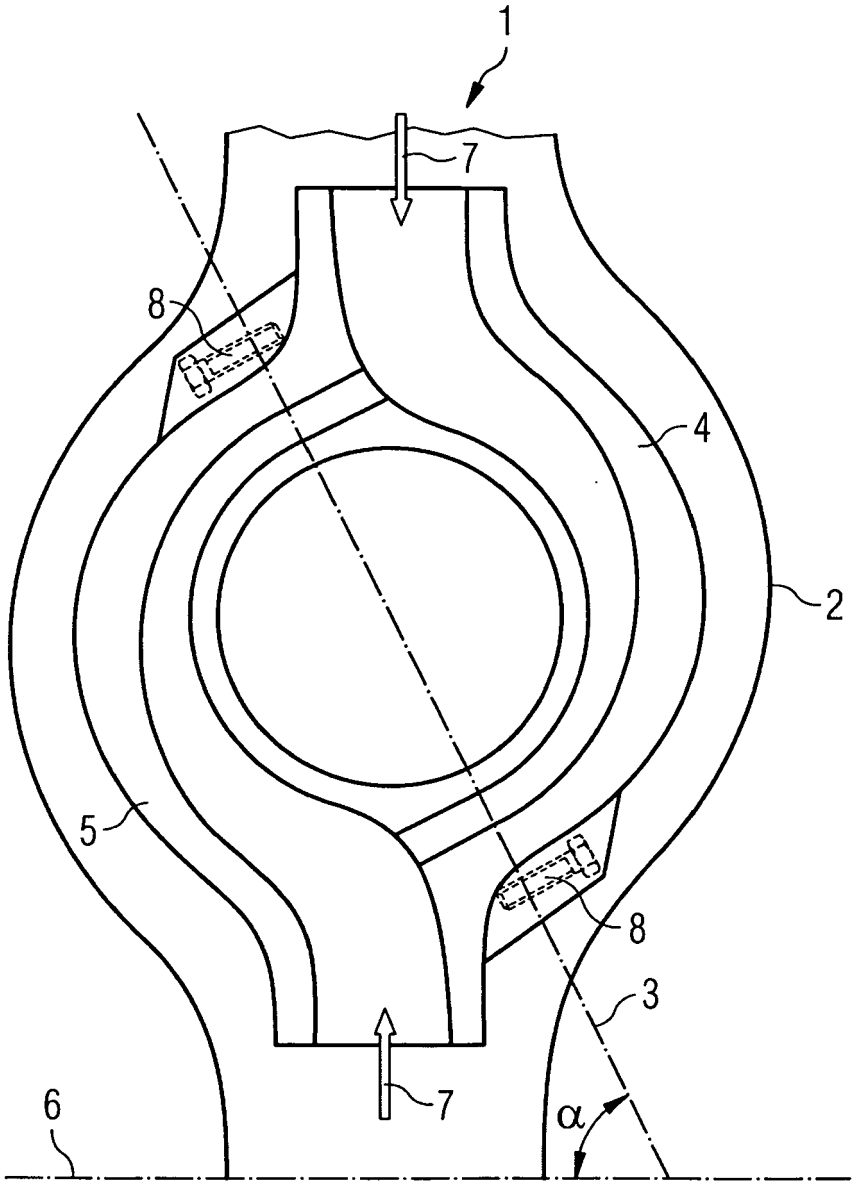


Fig. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 09 00 0798

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 128 343 A1 (BBC BROWN BOVERI & CIE [CH]) 19 December 1984 (1984-12-19) * figure 2 *	1-6	INV. F01D9/02 F01D9/06 F01D25/24
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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
The Hague	12 August 2009	Angelucci, Stefano

CATEGORY OF CITED DOCUMENTS

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12-08-2009

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