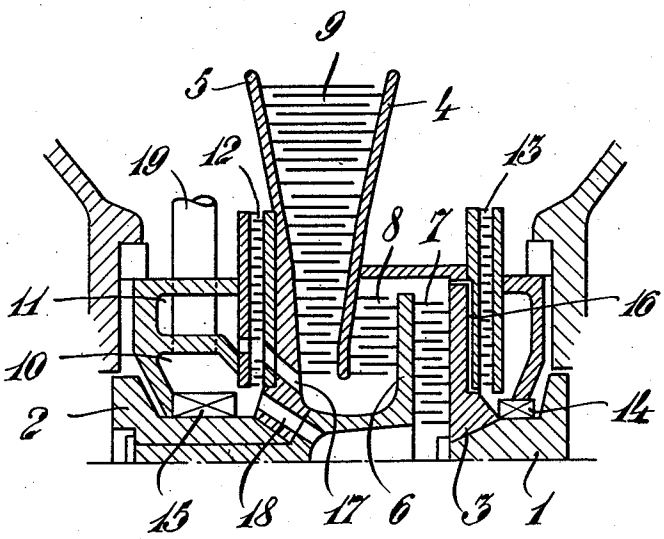
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RADIAL FLOW ELASTIC FLUID TURBINE

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RADIAL FLOW ELASTIC FLUID TURBINE

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This invention relates to double rotation turbines for elastic fluid, hereinafter for the sake of simplicity referred to as steam, of the radial flow type in which there are two or more axially spaced groups of concentric bladings which are passed in series by the steam so that the group of bladings to be first passed by the steam and the group to be last passed by the steam are actuated at opposite ends of the turbine. Hitherto, it was common practice to admit steam to the said first-mentioned group of bladings, that is, the high pressure system of the turbine, from a steam chest located at the same end of the turbine where the said group of bladings was situated. This method of supplying the driving fluid may easily be found, as there is only need of those channels in the turbine disc which are ordinarily provided in connection with double rotation turbines in order to effect a communication between the steam chest and the innermost portion of the said group of bladings, that is, the high pressure system. In certain turbine types, however, such as, for instance, condensing turbines, the group of bladings situated at the end of the series, that is, the low pressure system, is of a comparatively large diameter and is, therefore, considerably heavier than the other group of bladings or each of the other groups of bladings. The distance between the centers of gravity of the two rotary turbine halves and the centers of the respective bearings will be quite different due to the unsymmetrical position of the heavier low pressure system. As a result, the deflections of the shaft ends will be unequal and the turbine halves will obtain different critical numbers of revolutions.

The object of this invention is to provide a turbine of the type above set forth, hereinafter referred to as a multiple disc turbine, in which the low pressure system is situated substantially in the middle of the turbine and in which the centers of gravity of the two oppositely rotating turbine halves are situated at about equal distances from their respective bearing centers.

The invention is characterized, chiefly, by the fact that the steam chest of the multiple disc turbine is situated on the side of the turbine, where the low pressure system is situated, a connection for passing steam from this steam chest to the high pressure system situated on the other side of the turbine being provided by passages formed in the rotary turbine half next to the steam chest. By moving in this way the steam chest from the side where it has hitherto been positioned to the opposite side of the turbine, the inner turbine system will be displaced towards the said first-mentioned side. As a result, the low pressure system will obtain a more central position with relation to the turbine bearings and the turbine casing. This will afford several advantages, such as substantially equal distances between the centers of gravity of the two oppositely rotating turbine halves and the respective bearing centers, nearly equal deflections of the shaft ends, and much the same critical number of revolutions for both turbine halves. Furthermore, the steam discharged from the low pressure system will flow out into the central portion of the surrounding turbine casing, whereby ample space will be available for the laterally expanding flow of steam as compared with the space available for said steam in the hitherto known multiple disc turbines in which the low pressure system is situated on one side of the turbine casing.

As a rule, the steam chest is concentrically surrounded by one or more additional steam chambers for supplying overload steam. With the steam chambers arranged in conformity with the present invention, a higher overloading capacity may be obtained due to the fact that fresh steam may be supplied directly to the low pressure system. Previously, this was possible only by providing steam chests on both sides of the turbine. This, too, means a considerable advantage of the present invention.

The above described construction effects a good balancing of the turbine in axial direction due to the fact that the labyrinth packing on the low pressure side is in communication with the steam chest for the fresh steam and is thus fed with steam of high pressure. With the steam chest situated on the high pressure side, the balancing steam has to be admitted to the labyrinth packing on the low pressure side through pipe lines extending from the steam chest. The invention renders this arrangement unnecessary and makes the construction more simple.

In the drawing, one embodiment of a turbine constructed according to this invention is illustrated in a diagrammatic manner. The drawing shows an axial section of the upper portion of the turbine.

With reference to the drawing, the turbine is provided with three axially spaced groups of concentric bladings which are passed by the steam in succession. The numerals 1 and 2 indicate the ends of the two shafts otherwise not illustrated. The shaft end 1 carries two turbine discs 3 and 4. The shaft end 2 carries likewise two turbine discs 5 and 6, the latter of which being so constructed

as to secure the disc 5 to the shaft end. The three groups of bladings are numbered 7, 8 and 9, respectively. High pressure steam is supplied through the pipe line 19 to a steam chest 10 situated on the same turbine side as the low pressure system 9, axially outside the same. The steam chest 10 is surrounded by an overload or bleeding chamber 11 which, though this is not shown in the drawing, is connected to the steam chest 10 or, by means of pipes likewise not shown, to some consumption apparatus for bleeding steam. Between the steam chambers and the turbine disc 5 is inserted a labyrinth packing 12. On the opposite side of the turbine there is a similar labyrinth packing 13. Surrounding the journals 1 and 2 are shaft packings 14 and 15, respectively.

The group of concentric bladings 7 represents the high pressure system of the turbine to be supplied with fresh steam. As above described, the steam chest 10, if arranged in the hitherto usual manner, would have been situated to the right of the labyrinth packing 13 and in such case the fresh steam would have entered the group of bladings 7 through holes formed in the turbine disc 3. According to this invention, on the contrary, the steam chest 10 is positioned on the side of the turbine, remote from the high pressure system 7. In this case the fresh steam is admitted to the high pressure system 7 through passages 18 formed in the disc 5 and in disc 6 or its journal-like portion. The steam thus admitted to the system 7, then passes through the intermediate system 8 and, finally, through the low pressure system 9 to be then passed to a condenser, not shown.

A passage 16 extends through the turbine disc 3 and one disc of the labyrinth packing 13 to allow steam to flow from the space between the groups of bladings 7 and 8 to the inner periphery of the labyrinth packing 13 for balancing purposes.

The outer steam chamber 11 communicates through passages 17 with the inner periphery of the low pressure system 9. If desired, steam may be discharged from the space between the groups of bladings 8 and 9 through said passages 17.

What I claim is:

1. A radial flow elastic fluid turbine comprising, in combination, a plurality of axially spaced groups of concentric bladings including a high pressure rotary system and a low pressure rotary system at axially opposite ends of said groups, said low pressure system being of a greater radial length than said high pressure system, a fluid chest situated axially outside said low pressure system on the side thereof remote from the high pressure system, and a conduit between said fluid chest and the inlet end of said high pressure system.

2. A radial flow elastic fluid turbine comprising, in combination, two axially spaced shaft ends adapted to rotate in opposite directions, turbine discs and associated blades carried by said shaft ends forming a plurality of axially spaced groups of concentric bladings including a high pressure rotary system, a low pressure system and an intermediate system, said low pressure system being at one end of said group of systems and being of a greater radial length than either of the other systems, a fluid chamber surrounding the shaft end axially outside said low pressure system on the side thereof remote from the other systems, a conduit extending between said fluid chamber and the inner end of the said high pressure system, another fluid chamber surrounding said first-mentioned fluid chamber, and a conduit between said other fluid chamber and the inner end of said low pressure system.

3. A radial flow elastic fluid turbine comprising, in combination, two axially spaced shaft ends adapted to rotate in opposite directions, turbine discs and blades thereon carried by said shaft ends forming a plurality of axially spaced, radially extending fluid passages connected alternately at their outer and inner ends, so as to be in series arrangement with relation to the flow of the fluid, the last passage of said series being of a greater radial length than the other passages, a fluid chest situated axially outside said longer passage by the side thereof remote from the other passages, and a conduit leading directly from said fluid chest to the inlet end of the first fluid passage of the series.

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