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DEVICE FOR CONTROLLING THE FLOW OF FLUID BETWEEN CAMBERED BLADES

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Fig. 1

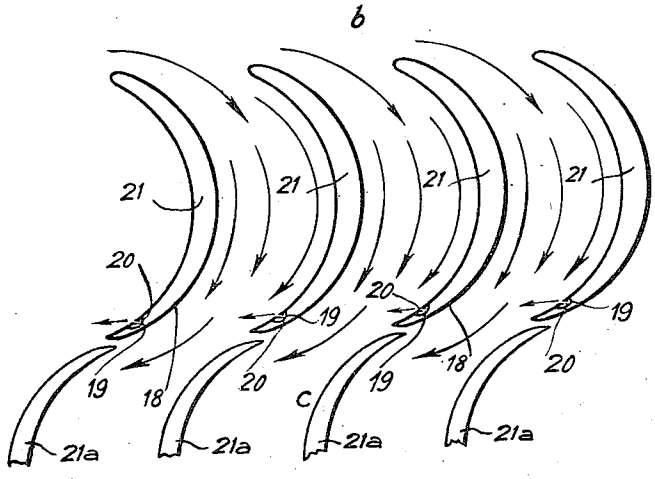
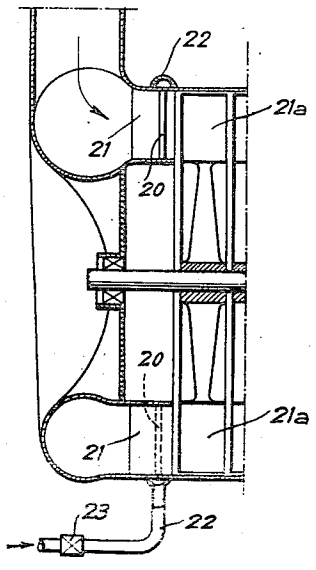


Fig. 2



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DEVICE FOR CONTROLLING THE FLOW OF FLUID BETWEEN CAMBERED BLADES

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Claims priority, application France January 4, 1951

3 Claims. (Cl. 253—78)

This application is a divisional application of our co-pending U. S. patent application Serial No. 263,666, filed December 27, 1951.

The present invention relates to the control of the flow of a gaseous fluid between adjoining blades of cambered shape, disposed in a row, in a turbo-machine such as a turbine or a compressor.

The device designed for carrying out this control comprises nozzle means on said blades opening out on the concave surface thereof and directed towards the convex surface of the next successive blades in said row, said nozzle means being fed with gaseous fluid under pressure, the flow of which is controllable by valve means.

In the accompanying drawings:

Figure 1 is a diagrammatic developed view of a row of stator and a row of rotor blades of a machine equipped with a flow control device in accordance with the invention.

Figure 2 shows an axial section a turbo-machine provided with the device described with reference to Figure 1.

As shown in the drawings, a fluid coming from the space *b* travels towards the space *c* through the clearances between cambered blades **21** disposed in a row. This flow tends to separate from the convex surfaces in the rear part **18** of the latter, i. e. in the vicinity of their trailing edges. If the blades are hollow or provided near to their trailing edges with passages **19** and if the concave surface is formed with slot-like nozzles **20** near the trailing edge, the said slots communicating with the interior of the blades or the passages **19**, it is possible by feeding a gas under pressure to the interior of the blades or the passages to obtain through the slot-like nozzles **20** auxiliary jets directed towards the convex surfaces of the next successive blades **21** in the row, which jets can be employed for the following purposes.

(*a*) To force the main flow more or less strongly against the convex surfaces of the blades according to the force of the auxiliary jets, and consequently to vary the direction of the flow issuing from the blading;

(*b*) To restrict the available area between the blades, that is to say to regulate the flow of the main stream.

If it is desired to obtain the first result without substantially restricting the free area for the flow, the slot-like nozzles **20** must be considerably inclined in the direction of the main flow. On the other hand, if it is desired to obtain the second result, the slot-like nozzles **20** must more closely approach the perpendicular to the outline of the blade in the zone in which these slot-like nozzles are situated.

The importance of these two results naturally depends upon the pressure of the air fed to the slot-like nozzles

20. On the same blade differently inclined separate slot-like nozzles **20** fed by separate passages **19** provided with separate means for the regulation of the flow may be separately formed and utilised according to whether it is desired to force back the flow to a greater or smaller extent and to control the direction of the jet issuing from the blading or to vary the rate of flow.

The drawings illustrate the particular case of a turbine distributor.

The blades **21** comprising the passages **19** and the slot-like nozzles **20** constitute stationary guide vanes disposed annularly in a row, whereas the blades **21***a* are mounted on the rotor. The passages **19** are connected to a common passage **22** for feeding gas under pressure (e. g. air or steam), the regulation being effected by means of a valve **23**. It is thus possible to obtain a regulation corresponding to the rate at which the turbine is to operate without employing mechanical means such as pivotal guide vanes or valve means in the motive fluid supply line, which is of particularly great importance in a gas turbine.

Similar means are naturally applicable to compressors.

For certain applications, it may be desirable to vary periodically the rate of flow of blown gas instead of having a continuous rate of flow. This is the case especially in turbines fed with a pulsating stream of motive fluid, such as impulse action turbines, for example, which are operated by the exhaust gases of an explosion engine or internal combustion engine. The periodical variation of the rate of flow of blown gas can readily be effected by periodically controlling the valve **23**, which may consist of a rotary distributor having movable ports travelling past fixed ports.

What we claim is:

1. In a rotary elastic fluid machine having at least one row of cambered blades spaced from each other and each having a concave surface and a convex surface, a device for controlling the flow of elastic fluid through said row comprising nozzle means on the concave surface of each blade in the trailing edge zone thereof, said nozzle means pointing towards the convex surface of the next successive blade in a direction at an acute angle to the flow direction of the elastic fluid through said row, and controllable means communicating with and supplying pressure fluid to said nozzzle means to form jets directed transversely to said flow direction, each said jet being directed towards the convex surface of the next successive blade.

2. Device as claimed in claim 1 wherein the nozzle means point in a direction substantially perpendicular to the flow direction of the elastic fluid, and in any event at an angle no greater than 90° to said flow direction.

3. Device as claimed in claim 1 wherein the nozzle means point towards the trailing edge zone of the next successive blades.

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