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[54] **SHUTOFF DEVICE FOR STEAM PATH OF STEAM TURBINE**
2 Claims, 6 Drawing Figs.

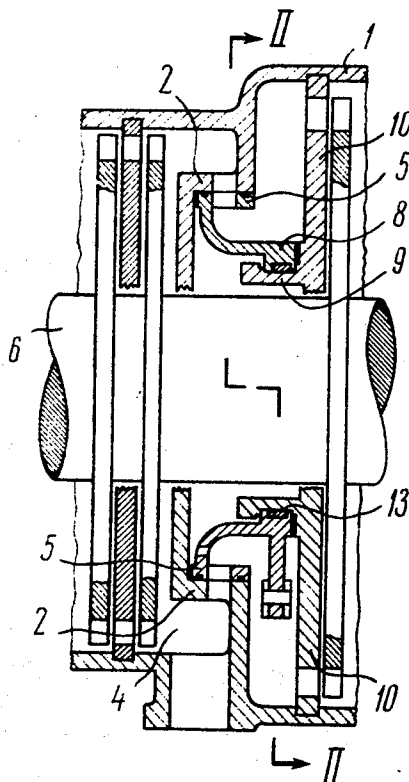
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103/97; 415/159—166

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ABSTRACT: A shutoff device for a steam turbine comprises a stationary annular member fixed in the turbine and having a circumferential array of spaced ports. A rotatable annular member is supported internally of the stationary annular member and which rotatable annular member surrounds the turbine shaft. The rotatable annular member includes a circumferential array of spaced ports also. The rotatable annular member is supported so that it may be moved and the ports thereof may be aligned with the ports of the stationary annular member so as to permit the passage of steam into the turbine portion. The rotatable annular member similarly is rotatable so as to bring its respective ports out of alignment with the ports of the stationary annular member so as to block the passage of steam into the turbine.



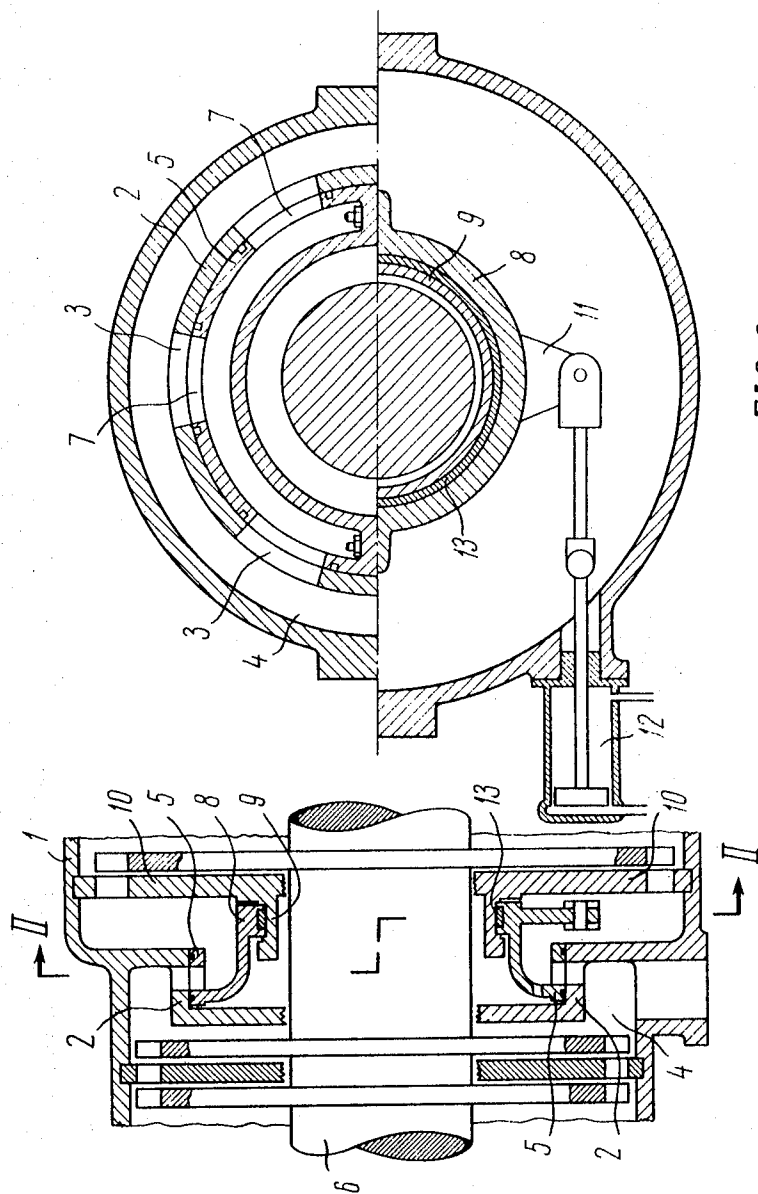
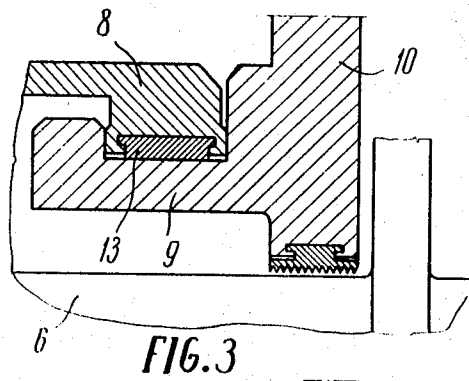
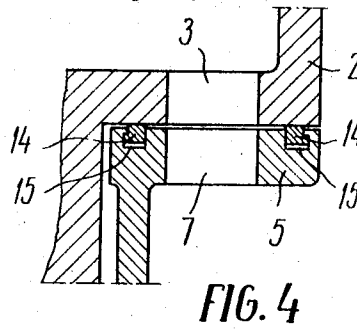
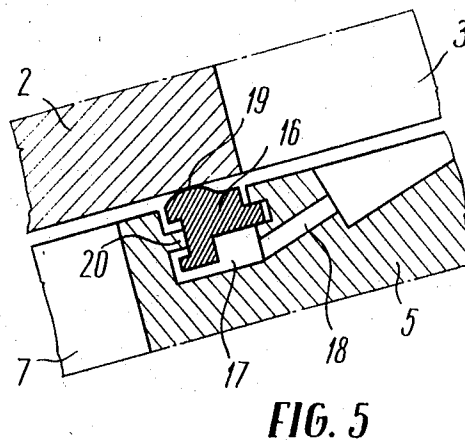


FIG. 2

FIG. 1



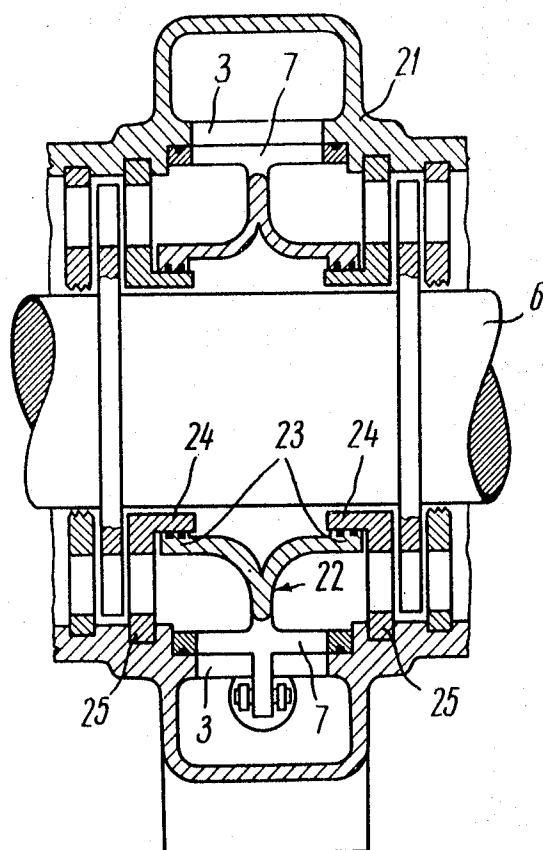


FIG. 6

SHUTOFF DEVICE FOR STEAM PATH OF STEAM TURBINE

The invention relates to steam turbines and more specifically it relates to the shutoff devices for the steam path of the steam turbine.

Most effectively this invention can be utilized in the turbines with a relatively large volumetric steam consumption.

Known in the art is a shutoff device for the steam path of a steam turbine, consisting of a stationary annular member with ports, said member being embraced by a movable annular member likewise provided with ports. As the outer annular member is turned, its ports move into alignment, either partly or completely, with the ports in the stationary annular member thereby changing the area of the shutoff device section, through which the steam passes (see, for example, A. V. Schegliayev, "Steam Turbines," Moscow, 1967, pp. 360 and 361).

Operation of the known shutoff devices of the above-mentioned type for the steam path of steam turbines involves certain difficulties, caused by a relatively strong friction arising due to the turning of the movable member (the friction surfaces lying comparatively remote from the axis of rotation). This necessitates the use of a comparatively powerful drive. Moreover, the degree of tightness of the known shutoff devices is relatively low.

An object of the present invention lies in eliminating the aforesaid disadvantages and providing such a shutoff device for the steam path of a steam turbine, which would combine a relative simplicity of design with simplicity of turbine disassembly, would be pressure-tight to a high degree and require little power for moving the rotatable annular member.

In accordance with the above object the invention relates to a shutoff device for the steam path of a steam turbine with ports in the movable annular member and the stationary one, one of said members accommodating the other; one of these members being rotatable, the turbine shaft passing inside the inner member.

According to the invention the rotatable member is located inside the stationary member and rests on a circular projection of the adjacent diaphragm by the circular supporting part which serves as a partition which prevents direct penetration of the steam streams flowing through the ports onto the section of the shaft within the limits of the rotatable member.

In the preferable embodiment of the shutoff device for the steam path of a steam turbine according to the invention it is practicable that some packing parts be installed in the gap between the annular members around the ports.

A substantial advantage of the present invention resides in that the forces, required for moving the rotatable annular member are reduced 50 percent approximately because the diameter of the circular projection of the adjacent diaphragm supporting the rotatable member is smaller than that of the stationary annular member which serves as a support for the movable member in the known designs of the shutoff devices. The use of the packing parts, installed in the gap between the annular members around the ports ensures a high degree of tightness of the shutoff device.

Given below is a description of the embodiments of the present invention with reference to the accompanying drawings, wherein:

FIG. 1 is a longitudinal section through a part of the cylinder of a single-flow turbine in the area of the shutoff device, according to the present invention;

FIG. 2 is a section taken along line II-II of FIG. 1;

FIGS. 3, 4, 5 are an enlarged views of individual parts of the shutoff device; and

FIG. 6 is a longitudinal section of a part of a double-flow turbine in the area of the shutoff device, according to the present invention.

The shutoff device of a single-flow steam turbine 1 with an intermediate steam-superheating means (FIGS. 1 and 2 showing a part of the turbine only) is installed in the steam path of

the turbine housing and incorporates a stationary annular member 2 with ports 3 to which steam is fed from a header 4.

Installed inside the stationary annular member 2 is a rotatable annular member 5 consisting of two parts bolted together. Located inside this member 5 is the turbine shaft 6. This annular member 5 is provided with ports 7 for the passage of steam therethrough. The circular or annular supporting part 8 of the member 5 rests on the cylindrical sleeve or circular projection 9 of the adjacent diaphragm 10. The latter is secured in the cylinder of the steam turbine 1 by keys (not shown); on removal of the upper half of the cylinder the diaphragm 10 remains in its lower half together with the rotatable annular member 5.

The rotatable annular member 5 has an arm 11 to which the rod of two-way servomotor 12 is connected. As the rod of the servomotor 12 moves, the rotatable annular member 5 turns, the ports 7 of this member and the ports 3 of the stationary annular member 2 moving relative to each other thus changing the area of the shutoff device section, through which the steam passes.

The circular supporting part 8 of the rotatable annular member 5 has a press-fitted bushing 13 (FIG. 3) consisting of two or more parts; the surface of said bushing is wear resistant at the steam temperatures in the zone of this bushing. The circular supporting part 8 of the rotatable annular member 5 rests on the circular projection 9 of the adjacent diaphragm 10 via the bushing 13. Owing to a relatively small inside diameter of this bushing and a stable coefficient of friction, the force required for moving the rotatable annular member 5 is comparatively small.

Installed in the gap between the annular members 2 and 5 around the ports 3 and 7 are packing parts 14 (FIG. 4) and 16 (FIG. 5). The packing parts 14 (FIG. 4) prevent the steam from flowing axially through the gap between the annular members 2 and 5 when the shutoff device is closed. These parts have the form of rings cut into several parts and inserted into grooves 15 made in the rotatable annular member 5. The packing parts 16 (FIG. 5) prevent the steam from flowing along tangents to the adjacent cylindrical surfaces of the annular members 2 and 5 (in the gap between them) when the shutoff device is closed. The packing parts 16 are essentially shaped bars cut into a number of parts and inserted into slots 17 in the rotatable annular member 5. A passage 18 communicates the slot 17 under the packing part 16 with the zone of high-pressure steam so that the packing part 16 is pressed by its projection 19 against the surface of the stationary annular member 2. The pressure difference of steam acts only on the surface of the packing part 16 which is located between a projection 19 and projection 20 in the slot 17. As a result, the force with which the packing part 16 is pressed against the stationary annular member is small and depends on the location of the projection 19 on the packing part 16.

In a double-flow turbine 21, illustrated in FIG. 6, the rotatable annular member 22 has symmetrical circular supporting parts 23, resting on two circular projections 24 of adjacent diaphragms 25. This ensures simplicity of the turbine cylinder disassembly, and protects the turbine shaft 6 against the effect of the steam flowing through the ports of the diaphragm, which is most essential for the steam turbine with an intermediate superheating of steam (at the point where the steam returns into the turbine after intermediate superheating). A relatively small effort is required to move the rotatable annular member. A high degree of tightness of the shutoff device is thus ensured.

What we claim is:

1. A shutoff device for a steam turbine, said turbine having a housing and a shaft rotatably supported in the housing, said device comprising a stationary annular member fixed in said housing and surrounding said shaft in spaced relation, said stationary annular member having a plurality of spaced ports in circumferential array, a diaphragm fixed in said housing and including a cylindrical sleeve surrounding said shaft in spaced relation, a rotatable annular member rotatably supported on

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said cylindrical sleeve and interposed between said cylindrical sleeve and said stationary annular member, said rotatable annular member having a plurality of ports in circumferential array, said rotatable annular member including an annular supporting portion rotatably engageable with said cylindrical sleeve and acting as a partition for preventing steam passing through the ports of the rotatable annular member from transversely engaging the shaft, said rotatable annular member being rotatably supported such that its respective ports are movable into alignment with respective ports of the stationary

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annular member and further rotatable such that its respective ports are movable out of alignment with respective ports of the stationary annular member and means for rotating said rotatable annular member relative to said stationary annular member.

2. A shutoff device as claimed in claim 1 including packing elements interposed between the stationary and rotatable annular members and surrounding respective ports thereof.

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