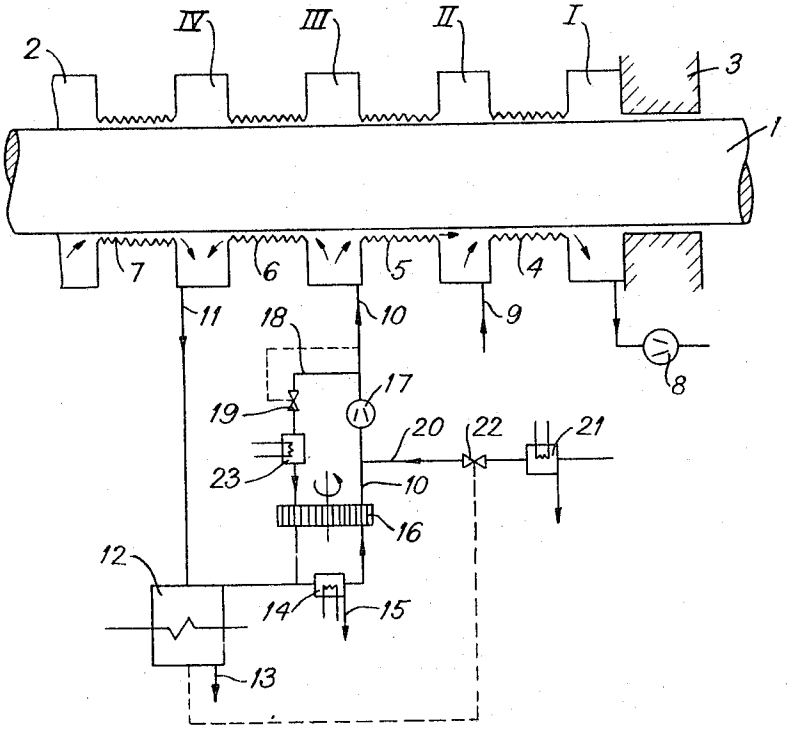
Feb. 7, 1967 C. B. OLESEN 3,302,951

METHOD FOR SEALING A TURBINE OR COMPRESSOR SHAFT

Filed Jan. 26, 1965



INVENTOR.

Carsten Balsler Olesen

BY

ERIC Y. MUNSON

Attorney

United States Patent Office

3,302,951

Patented Feb. 7, 1967

3,302,951

METHOD FOR SEALING A TURBINE OR COMPRESSOR SHAFT

Carsten Balslev Olesen, Finspang, Sweden, assignor to Stal-Laval Turbin AB, Finspang, Sweden, a corporation of Sweden

Filed Jan. 26, 1965, Ser. No. 428,165
Claims priority, application Sweden, Mar. 31, 1964, 3,953/64
2 Claims. (Cl. 277—1)

This invention relates to a method for sealing a turbine or compressor shaft, an example of which is disclosed in my co-pending application for patent Serial No. 282,781, filed May 23, 1962, now Patent No. 3,235,269.

In said application is disclosed a means and method for sealing a turbine or compressor shaft by means of an arrangement located between a chamber containing vapour of, for example heavy water (D_2O) and a bearing, and it comprises a series of sealing glands, separated from each other by chambers. The described arrangement is such that air at atmospheric pressure is admitted to one of the chambers, and air mixed with oil, formed by oil leaking from the bearing to another of the chambers in one direction along the shaft, and by atmospheric air leaking from the first chamber in the other direction, is withdrawn by a fan, thereby maintaining a pressure lower than atmospheric in the second-mentioned chamber.

The present invention is characterized by the fact that in a line extending to one of the chambers, the air pressure from a fan in said line is kept constant due to the fact that a part of the air is returned to the suction side of the fan through a return line provided with a pressure-controlled regulating valve, and in addition, the pressure on the suction side is kept constant by supplying atmospheric air through a line provided with a regulating valve which is controlled by the pressure on the suction side. This provides a system of control which can maintain a constant pressure in several of the chambers with different flow rates through seals arranged around the shaft, that is, a very stable control is provided which makes it possible to supply the shaft seal with the quantities of sealing air required by the leakage variations due to changes in the clearance at the edges of the seal, at constant line pressure before and after the fan.

The view shown in the accompanying drawing diagrammatically illustrates a shaft-sealing means for sealing a shaft in accordance with the present invention.

Referring to the drawing, there is therein shown a shaft **1** for a turbine which, for example, operates on D_2O steam. A steam chamber in the turbine is designated at **2**. The shaft **1** is carried in a bearing shown at **3**. Between the chamber **2** and the bearing **3** is a shaft seal which surrounds the shaft **1** with a plurality of sealing points designated respectively at **4**, **5**, **6** and **7**, the same being separated or spaced apart by means of the chambers I, II, III and IV.

Oil from the bearing **3** is sprayed into the chamber I, wherein a vacuum is maintained by means of a suction or evacuation fan **8** and from the opposite side of which air leaks in along the shaft **1** from the chamber II, which chamber is supplied with atmospheric air entering through the line shown at **9**. This assures a stream of air toward the bearing through the edges of the seal at sealing point **4** which prevents oil from leaking past at this point.

Dry sealing air under above-atmospheric pressure is

supplied to the chamber III through a line **10**. Part of this air flows into chamber II at atmospheric pressure and part flows into the chamber IV from which air and steam from chamber **2** are withdrawn through a line **11** leading to a leakage condenser **12**. From here the D_2O steam is led away through a line **13** while air saturated with D_2O steam is led to a pre-dryer **14** from which D_2O is carried away through a line **15**. From here the medium is led through a final dryer **16** which, in the arrangement shown in the drawing, can be a rotary air dryer of the absorption type. Dry air is sucked from the dryer **16** by a fan **17** through the line **10** and delivered into the chamber III.

After passing from the fan **17**, air from line **10** is returned to the suction side of the fan through a return line **18**, provided with a valve **19**, controlled by the pressure in line **10**. The pressure in line **10** beyond the fan can thus be kept constant. The pressure on the suction side of the fan in line **10** can also be kept constant due to the fact that air evacuated by the fan **8** through sealing points **4** and **5** is replaced with air supplied to the line **10** through line **20** which is provided with a dryer **21**. The pressure on the suction side of the fan **17** in line **10** is kept constant by means of a regulating valve **22** which is controlled by the pressure in the leakage condenser **12**.

If the leakage in the seal **5** increases due to wear at the edges of the seal, the air flow in the line **10** to chamber III will increase. This acts to throttle the valve **19** and the pressure in the leakage condenser **12** drops, which in turn means that the valve **22** opens to admit atmospheric air. If the leakage through seal **6** to chamber IV increases, the air flow in line **10** to chamber III increases. This acts to throttle the valve **19**. The pressure in the leakage condenser **12** rises as more air is supplied through the line **11**, but less air flow through line **18** results in an unchanged flow through the valve **22**.

As shown on the drawing, the return air may be heated, or at least a part of it can be heated, by means of a heater connected into the line **18** from which it is led through the dryer **16**. Such a heater is shown at **23** and it serves to absorb the moisture given off in the dryer by the medium in the line **10**. From the dryer the medium is returned to the line **10** by way of the predryer **14**.

Having thus described an embodiment of the invention, it is obvious that the same is not be restricted thereto, but is broad enough to cover all structures coming within the scope of the annexed claims.

What I claim is:

1. The method of sealing a turbine or compressor shaft by means of a sealing arrangement located between a chamber containing vapour and a bearing, and comprising the use of a series of sealing glands, which sealing glands are separated from one another by chambers I, II, III and IV in sequence from the bearing and located around the shaft, characterized in that air at atmospheric pressure is admitted to the chamber II and that air mixed with oil formed by oil leaking into the chamber I in one direction along the shaft from the bearing, and by atmospheric air leaking from the chamber II in the opposite direction, is withdrawn by a fan, maintaining a pressure lower than atmospheric in the chamber I, admitting dry blocking air into the chamber III at a pressure higher than atmospheric and which air leaks along the shaft partly to the chamber II and partly to the chamber IV, the pressure in the line leading to chamber III being kept constant due to the fact that a part of the air is returned to the suction side of a sec-

ond fan through a return line provided with a pressure-controlled regulating valve, and in addition the pressure on the suction side is kept constant by supplying atmospheric air through a line provided with a regulating valve which is controlled by pressure on the suction side.

2. A method according to claim 1, characterized in that the return air or at least a part of it is heated and passes through an air dryer such as a rotary air dryer of the absorption type which absorbs moisture given off by air flowing through the air dryer to the fan.

References Cited by the Examiner

UNITED STATES PATENTS

1,867,236	7/1932	Van Rijswijk	277—12 XR
2,650,116	8/1953	Cuny	277—3
2,903,280	9/1959	Cuny	277—15
3,003,321	10/1961	Warth	277—12 XR
3,235,269	2/1966	Olesen	277—1

SAMUEL ROTHBERG, *Primary Examiner.*