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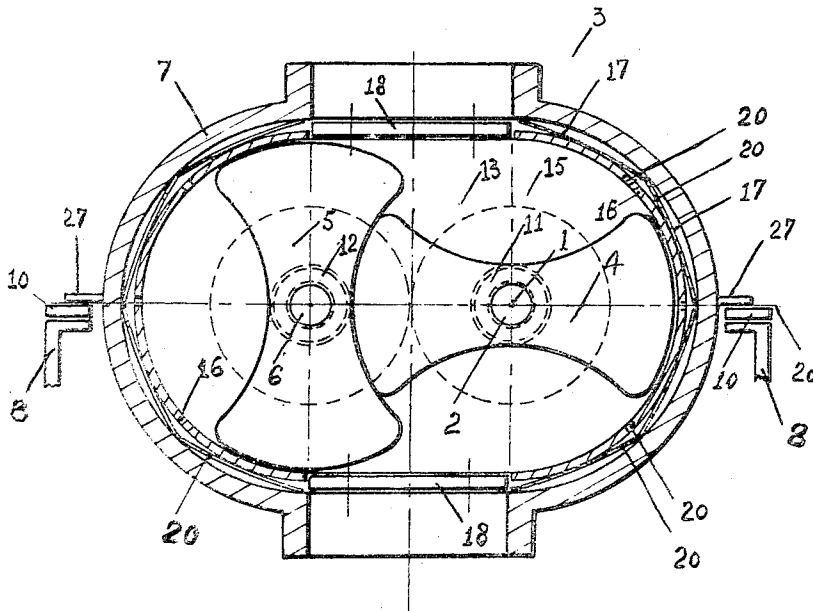
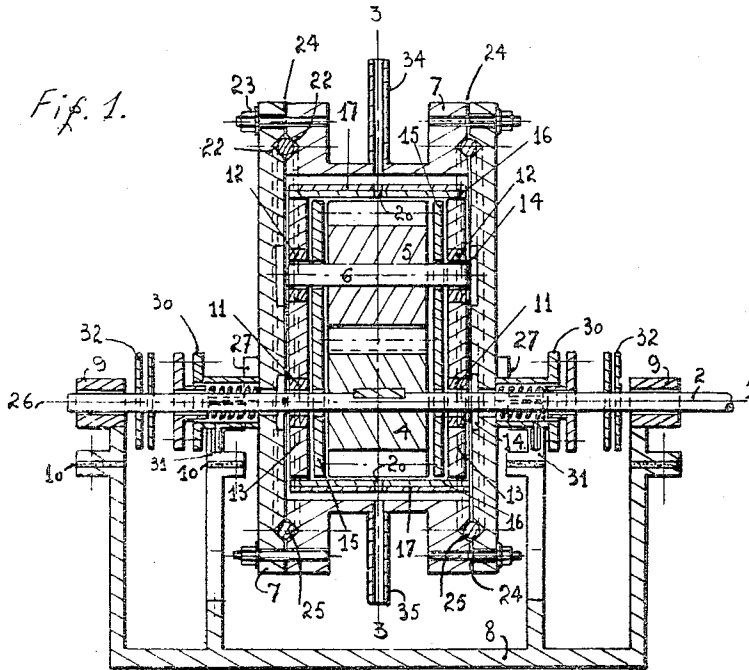
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VOLUMETRIC ROTARY PUMPS AND COMPRESSORS

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2 Sheets-Sheet 1



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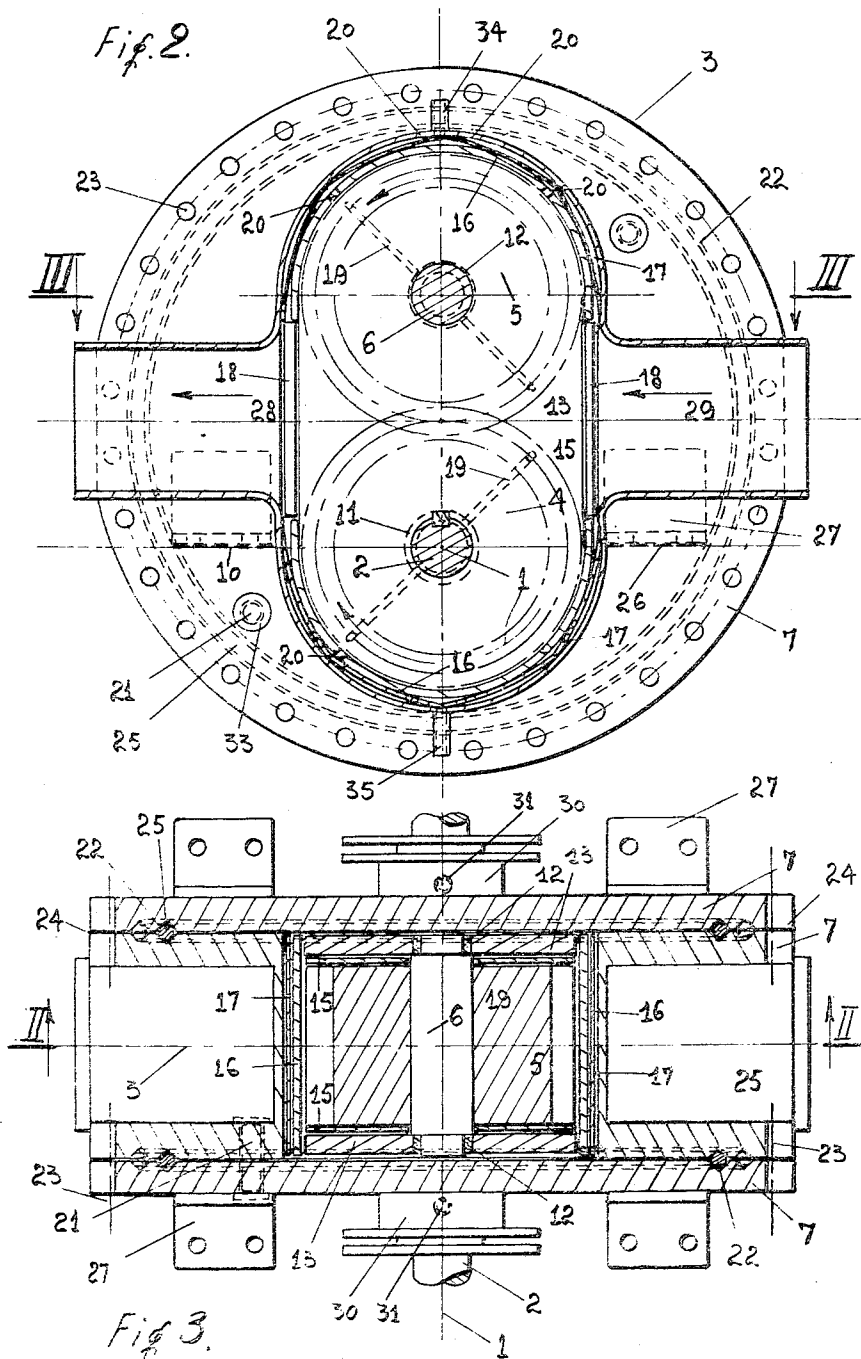
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VOLUMETRIC ROTARY PUMPS AND COMPRESSORS

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3 Claims. (Cl. 103—126)

My invention has for its object improvements in rotary pumps and/or compressors which I will term hereinafter "rotary machines" indifferently. My invention covers more particularly those rotary fluid-handling devices which operate with fluids at high or very high temperatures i. e. with heat-carrying fluids as used for modern technical purposes, the temperature of which fluids may reach 400° C. and even more before their vapor pressure attains the value of 1 atm. in other words, before they begin boiling.

The chief object of my invention consists in modifying in such a manner the structure of a rotary volumetric machine that it includes, whatever be its type, whether it is of the rotor, sprocket gear, blade or the like type, a rotary basic system which remains unaltered at all running speeds and around which the different elements of the machine may expand freely without this leading to any disturbance in the operation of the said machine.

A further object of my invention consists in designing a volumetric rotary machine in a manner such that the clearances between the different parts of the machine which are subjected to variable expansions, are made practically constant in spite of the modifications in the temperature of the machine under average running conditions.

A still further object of my invention consists in ensuring perfect fluidtightness for the different sections inside the machine in spite of the modifications in their temperature, under all running conditions.

My invention has also for its object to ensure perfect fluidtightness for the body of the machine from the inside towards the outside.

The above objects, together with further objects and advantages of my invention, will appear clearly in the reading of the following description, reference being made to accompanying drawings, given solely by way of exemplification. In said drawings:

Fig. 1 is a sectional elevational view illustrating diagrammatically an improved rotary volumetric pump according to my invention;

Fig. 2 is an elevational sectional view illustrating diagrammatically an improved volumetric rotary compressor according to the invention;

Fig. 3 is a sectional view through line III—III of Fig. 4, illustrating an embodiment of my improved volumetric pump;

Fig. 4 is a sectional view through line IV—IV of Fig. 3;

Turning now to Figs. 1, 3 and 4, the basic rotary system of the volumetric pump includes a driving shaft 2 revolving round its axis 1 and the rotors 4 and 5, the common medial plane of which registers with the vertical plane 3 perpendicular to the axis 1.

As illustrated, the rotor 4, which is constituted in the example illustrated by a sprocket wheel, is keyed to the driving shaft 2 while the other or auxiliary rotor 5 which

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is also constituted by a sprocket wheel, is keyed to a driven shaft 6. The rotors 4 and 5 are housed inside the pump casing 7 which includes a plurality of elements and is secured to the support 8 by means of intermediate carriers 27 connected with the said body 7 at the level of a plane 26 passing through the axis 1, this arrangement allowing the body 7 of the pump to expand freely, starting from said plane 26.

The shaft 2 is revolvably mounted in bearings 9 rigid with the support 8, and the axes of which are aligned with the axis 1 of the basic rotary system. These bearings 9 allow a longitudinal expansion of the shaft 2 to the right and to the left of the basic plane of symmetry 3. Furthermore, and in order to prevent any movement of the said bearings 9, insulating wedges 10 separate on one hand the support 8 from the body 7 of the pump, and, on the other hand, the bearings 9 from the said support, which latter is made of units having a substantial thickness so as to retain a practically uniform temperature and thereby an accurate alignment for the basic axis 1 at all running speeds.

The driving shaft 2 carries two rings or bearings 11 rigid with two plates 13, provided with two further rings or bearings 12. These two plates 13 are floatingly carried at suitable locations formed on the body 7 of the pump, the above mentioned rings or bearings 12 being adapted to carry the driven shaft 6 on which is mounted the auxiliary rotor 5.

Possibly, in the case where the rings 11 and 12 are large-sized, the body 7 of the pump is provided with recesses 14 inside which the said rings may be shifted when they are caused to move as a consequence of the expansion of the body 7 of the pump.

Between the rotors 4 and 5 on the one hand and the plates 13 on the other hand are fitted a number of shims 15 and friction plates while similar shims and friction plates may also be fitted, if required, between the plates 13 and the body 7 of the pump.

By reason of the arrangement disclosed, yielding hydraulic seals are formed inside the pump body 7 by the fluid flowing through the latter, the said fluid filling the spaces comprised between the shims 15, the plates 13 and the pump body 7, the said shims, plates and pump body being provided, if required, with grooves, striations, recesses and the like so as to form a labyrinthic system adapted to brake the circulation of fluid between their surfaces.

The pump is closed by lateral covers 16 matching the outer edges of the plates 13, the clearance between each rotor 4 or 5 and the corresponding cover remaining the same, whatever the temperature may be, by reason of the fact that the plates 13 expand together with the rotors 4 and 5. Any risk of wedging of the latter at the start is cut out since the rotors 4 and 5 are thicker than the plates 13 so that the latter expand more quickly at the start than the rotors.

With a view to providing for a better fluidtightness between the delivery chamber 28 of the pump and the suction chamber 29 thereof, a special fluidtight arrangement is mounted between the covers 16 and the inner wall of the body 7 of the pump. This arrangement may be constituted e. g. by plates of corrugated steel, by cylinders having a thin steel wall or, as illustrated in Figs. 3 and 4, by a number of spring plates 17 fitted between the cover 16 and the body 7 of the pump in association with fitting pieces 18 which serve also for positioning the covers 16 to either side of the delivery and suction chambers. Furthermore, with a view to providing a greater uniformity in the static pressure of the circulating fluid, openings 20 are formed in the covers 16 and in the spring plates 17.

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The correct position of the different elements of the body 7 of the pump is ensured by centering pegs 21 while lubricating channels 19 passing out of the areas under pressure and leading to the areas subjected to a reduced pressure, provide for the lubrication of the rings or bearings 11 and 12.

The inside of the pump is insulated with reference to the outside by a fluidtight arrangement constituted by one or more suitably shaped rings 25 positioned each in a groove 22 formed inside the elements forming the pump body 7, the said rings being fitted in the grooves through the agency of the bolts 23, while a shim packing 24 is fitted in the clearance so as to adjust the clamping and to urge home the said ring or rings without deforming the body of the pump. The shape of the rings 25 should be such that they have a tendency to be locked inside the grooves 22 whenever the pressure inside the pump rises. Preferably, each ring 25 is made of the same metal as the body 7 of the pump while the shim packing 24 is made preferably of a metal having a higher expansion coefficient, such as brass, copper or aluminium.

In order to provide for fluidtightness of the pump body 7 at the points at which the shaft 2 passes out of the latter, there are provided stuffing boxes 30 including draining pipes 31. Furthermore, cooling means 32 are carried if desired by the shaft 2 (Fig. 1), and by the pipes 31, the different openings formed in the pump body in the making being fluidtightly closed by plugs 33.

For the upkeep of the pump, there are provided therein emptying ports 34 and draining ports 35, the said ports being associated with cocks, and any risk of accident arising in case of a temporary over-pressure inside the pump is eliminated through the automatic discharge valve or by-pass connecting the delivery chamber 28 with the suction chamber 29.

As far as the rotary volumetric compressor illustrated in Fig. 2 is concerned, its structure is identical with that of the pump which has just been described, its chief components being designated by the same reference numbers. Thus, in particular, 4 and 5 designate the two rotors keyed respectively to the shaft 2 and to the shaft 6. Similarly, 13 designates the floating plates provided with rings or bearings 11 for the shaft 2 and with rings or bearings 12 for the shaft 6. Again 16 designates the two covers matching the outer edges of the plates 13, one of the said covers corresponding to the rotor 4 and the other to the rotor 5.

As to the reference numbers 17, they designate as precedingly the spring plates fitted between each cover and the body 7. Similarly 18 designates the fitting plates which serve for holding in position the covers 16, while 20 designates the openings in the said covers 16 and in the spring plates 17 with a view to equalizing the static pressure of the fluid circulating through the pump.

As a result of the precedingly disclosed structure, my improved pumps and compressors are practically proof against the action of rapid modifications in temperature, since the expansion of their different parts has no action on their proper operation.

Furthermore, the said pumps are perfectly fluidtight, whatever may be their temperature of operation, and they may be subjected to very rapid increases and reductions of the said temperature without this leading to any disturbance in their operation and without their fluidtightness being affected thereby. Moreover, since the parts inside the pump are completely independent of the body

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of the latter, which arrangement leads to the possibility of an unobstructed modification in their volume, and in their relative position as produced by their individual expansion, this results in that the temperature of the fluid, flowing inside the pump and also that of the stationary parts and of the moving parts inside the body of the machine, may be much higher than the temperature of the body of the machine which is always cooled down by the ambient atmosphere, even if it is heat-insulated.

What I claim is:

1. In a rotary fluid machine for use with high temperature fluids, a housing including a body member and cover plates at opposite ends of said body member to maintain a pressure tight fluid seal for the fluid and rotating parts therein, a driving element and a driven element within said housing, said driving element and driven element being each mounted on a separate shaft, having bearings in sealing contact with said housing, the shaft of said driving element extending outside of said housing while the shaft of said driven element lies within said housing, said shaft of said driving element provided with inner bearings at opposite ends within said housing and with outer bearings at opposite ends outside of said housing, a support for said outer bearings which also supports said housing independently of the supporting action for the ends of said shaft of said driving element, recesses in said housing for said inner bearings, within which said bearings may under go limited floating movement, floating plates attached to said inner bearings and supported by said inner bearings which floating plates support said driven shaft, said floating plates moving with said bearings within said recesses, and insulation wedges for supporting said driving shaft and said housing including a wedge interposed between said outer bearings and said support for mounting said driving shaft and a wedge interposed between said housing and said support for mounting said housing whereby thermal expansion of said floating plates which affects the performance of said machine is compensated at said wedge mounting of said housing and at said wedge mounting of said driving shaft.

2. A machine as claimed in claim 1 wherein apertured elastic means are provided at the ends of said body portion of said housing between said body portion and said cover plates to compensate for thermal expansion of said plates and body portion.

3. A machine as claimed in claim 1 wherein the walls of said housing include double encircling portions having machining opposite grooves formed therebetween, an endless sealing member positioned in each groove, a packing disposed between said portions, and bolts interconnecting the portions of each wall, whereby said bolts and packings in said grooves resist deformation of said housing.

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