Feb. 2, 1943. W. ELZE 2,309,833

ARRANGEMENT FOR THE COOLING OF THE COMPRESSOR SPACE OF AIR AND GAS COMPRESSORS

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Fig. 1

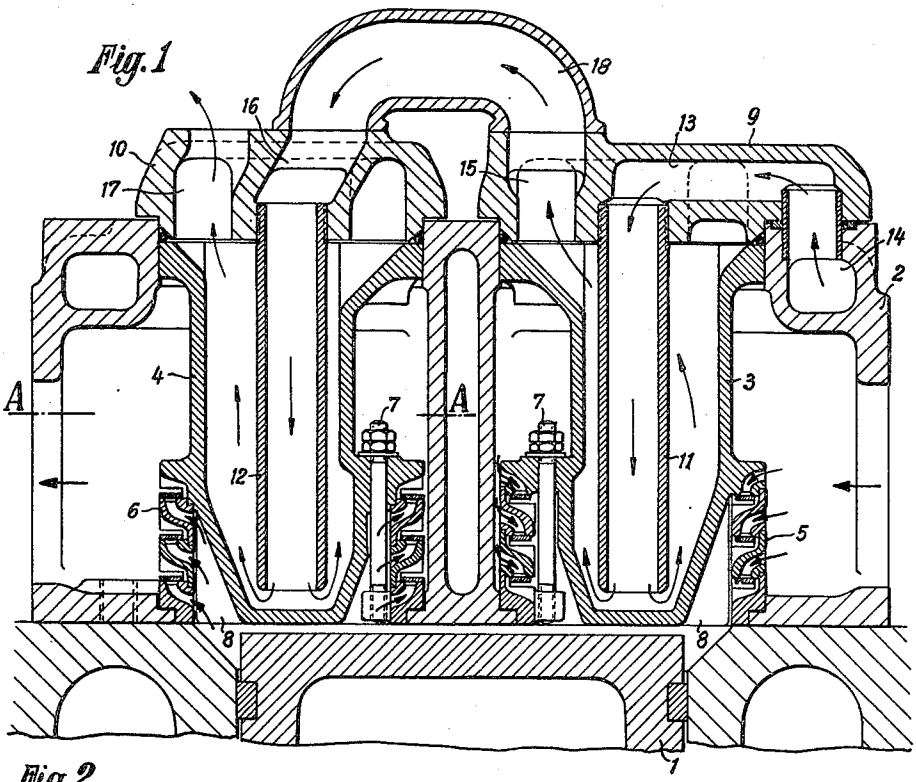
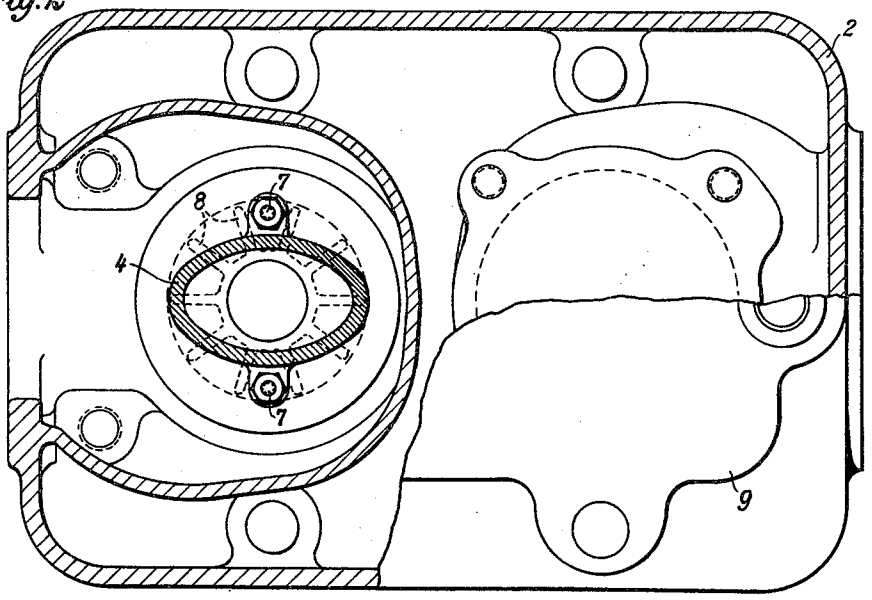


Fig. 2



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ARRANGEMENT FOR THE COOLING OF THE COMPRESSOR SPACE OF AIR AND GAS COMPRESSORS

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6 Claims. (Cl. 230—212)

The invention relates to an arrangement for the cooling of the compressor space of air- and gas-compressors with suction- and pressure-valve arranged in the valve head.

Compressors of this type demand large air-admission and exhaust cross sections. For this reason so-called slit- or ring-plate valves are used in the known compressors, said valves having the required large passage cross sections. These valves possess however a great inconvenience. They occupy often the whole, but at least almost the whole surface of the lower side of the valve head facing the cylinder. The cylinder bottom is therefore useless for the necessary cooling of the compression space.

According to the invention a decisive advantage in this respect is attained thereby, that the valves are constructed after the manner of the known tower-valves with air admission or exhaust points arranged the one above the other, and the free inner space of these valves is cooled by a liquid such as water. A large portion of the cylinder bottoms is thereby utilized for the cooling of the compression space and the degree of efficiency of the compressor is accordingly considerably improved. The new valve arrangement further has a strong sound damping effect which is chiefly due to the core of cooling medium in the interior of the valves and to the subdivision of the air into several air currents by the valve plates of the tower valves arranged the one above the other.

The valves are suitably constructed so that the carriers of the same, constructed hollow and insert-like, project into the interior of the valves and that the cooling medium flows through these carriers. The carriers for the valves, which always exist, are utilized in the best manner for the cooling, so that no other separate conduits for the cooling medium are required.

According to the invention the valve inserts are particularly suitably constructed in that their ends shaped like a truncated cone extend up to the lower side of the cylinder head. The inconvenience of increase of the clearance space of the tower valves is thereby equalized almost completely.

In order to further increase the cooling effect of the cooling liquid, the portion of the valve inserts projecting into the valves is equipped on the outer side with cooling ribs which extend in the direction of the flowing cooling medium. As these ribs are located in the path of the flowing medium, they are intensively flushed by the air so that the air is quite considerably cooled before it gets, for instance on the suction side, into the cylinder or is discharged from the cylinder on the pressure side.

A further improvement is attained according to the invention in that the cooling face of the valve inserts facing the piston projects from the piston face on the outer side. The cooling surface is thereby still further increased. This increasing may be carried through so far, that the cooling surface becomes larger than the piston face, so that the compression proceeding shifts, not as in the constructions which have become known up to the present towards the adiabate, but towards the isotherm.

The cooling intensity may be further increased thereby that down pipes project into the valve inserts and lead the cooling liquid close to the bottom of the valve inserts. It is hereby ensured, that the cooling liquid flows along the decisive cooling wall of the inserts. The guiding of the cooling liquid is practically selected so that it flows first through the suction valve insert and then through the pressure valve insert.

An embodiment of the invention is shown by way of example in the accompanying drawing, in which

Fig. 1 shows a cross-section through a valve head equipped with the new cooling arrangement,

Fig. 2 shows in the left hand half a parallel section on line A—A and in the right hand half a top plan view on the valve head.

In Fig. 1, 1 designates the piston of the compressor. The valve head 2 mounted on the cylinders has hollow inserts 3, 4. The insert 3 serves as carrier for the suction valve 5, whereas the insert 4, which is also hollow, serves as carrier for the delivering valve 6. The suction valve 5 and the delivering valve 6 are constructed after the manner of the well known tower valves. The air admission or discharge points of these valves are located the one above the other. In the form of construction shown three such admission or delivering points are provided. The tower valves are held by screws 7 on the inserts 3 and 4.

The inserts 3 and 4 end in downward direction like truncated cones. The under side of the inserts lies on the same level as the side of the valve head facing the cylinder. The inserts 3 and 4 have ribs 8 in their ends shaped like a cone, said ribs extending between the tapered wall of the inserts and the valves. The longitudinal faces of the ribs extend in the direction of the flowing air. The ribs 8 are distributed on

the whole circumference of the valve inserts in the required number.

The valve insert 3 is closed by a valve cover 9 and the valve insert 4 by a valve cover 10. In the cover 9 a down pipe 11 is inserted and in the cover 10 a down pipe 12. Both these down pipes, when the lids are screwed on, extend down to close proximity of the bottoms of the inserts. In the cover 9 a passage 13 is provided which at the one end is connected with an admission 14 for the cooling liquid and at the other end with the down pipe 11. The cover 9 further has a wider passage 15 which is connected to the inner space of insert 3.

The cover 10 has also two passages 16, 17. The passage 16 communicates with the down pipe 12. The passage 17 is connected with the interior of the insert 4 and communicates with a discharge point. The passages 15 and 16 are connected the one with the other by a tubular connecting piece 18.

The liquid flows then in the direction indicated by the arrows from the admission 14 through the passage 13, the down pipe 11, the inner space of the insert 3, the passage 15, the connecting piece 18, the passage 16, the down pipe 12, the inner space of the insert 4, the passage 17 to the discharge point. As on the one hand the speed of air or gas at the place where the truncated cone-shaped parts of the valve inserts are situated is very great owing to the construction of the tower valves and as on the other hand the speed of flowing of the water is also great, owing to the arrangement of the down pipes 11 and 12, the coefficient of heat transmission is also very great. It is considerably increased compared with the known cooling arrangements. Therefrom results that at the cooling faces obtained by the valve inserts great heat transmission takes place so that it makes itself perceivable in a considerable measure on the final temperature of the pressure air.

I claim:

1. Means for cooling the compressor space of air- and gas-compressors with suction valve and pressure valve arranged in the valve head, comprising a plurality of annular valves each arranged with a plurality of ports spaced one above the other, the free inner space within these valves being cooled by a liquid, and hollow valve carrier inserts projecting into the interior of said valves and through which the cooling liquid flows.

2. Means as specified in claim 1, characterized by the ends of the valve inserts which project into said valves being in the shape of a truncated cone extending to the lower side of the valve head.

3. Means as specified in claim 1, characterized by the ends of the valve inserts which project into said valves being in the shape of a truncated cone extending to the lower side of the valve head, and cooling ribs on the outer side of the portion of the valve inserts projecting into the valves, the longitudinal faces of said cooling ribs extending in the direction of the flowing medium.

4. Means as specified in claim 1, characterized by the ends of the valve inserts which project into said valves being in the shape of a truncated cone extending to the lower side of the valve head, and cooling ribs on the outer side of the portion of the valve inserts projecting into the valves, the longitudinal faces of said cooling ribs extending in the direction of the flowing medium, and the cooling surface of said valve inserts facing the piston projecting in outward direction over the piston surface.

5. Means as specified in claim 1, characterized by the ends of the valve inserts which project into said valves being in the shape of a truncated cone extending to the lower side of the valve head, and cooling ribs on the outer side of the portion of the valve inserts projecting into the valves, the longitudinal faces of said cooling ribs extending in the direction of the flowing medium, the cooling surface of said valve inserts facing the piston projecting in outward direction over the piston surface, and down pipes projecting into said valve inserts for conducting the cooling liquid close to the bottom of said valve inserts.

6. Means as specified in claim 1, characterized by the ends of the valve inserts which project into said valves being in the shape of a truncated cone extending to the lower side of the valve head, and cooling ribs on the outer side of the portion of the valve inserts projecting into the valves, the longitudinal faces of said cooling ribs extending in the direction of the flowing medium, the cooling surface of said valve inserts facing the piston projecting in outward direction over the piston surface, and down pipes projecting into said valve inserts for conducting the cooling liquid close to the bottom of said valve inserts, the cooling liquid flowing first through the suction valve insert and then through the pressure valve insert.

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