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SCREW MACHINE

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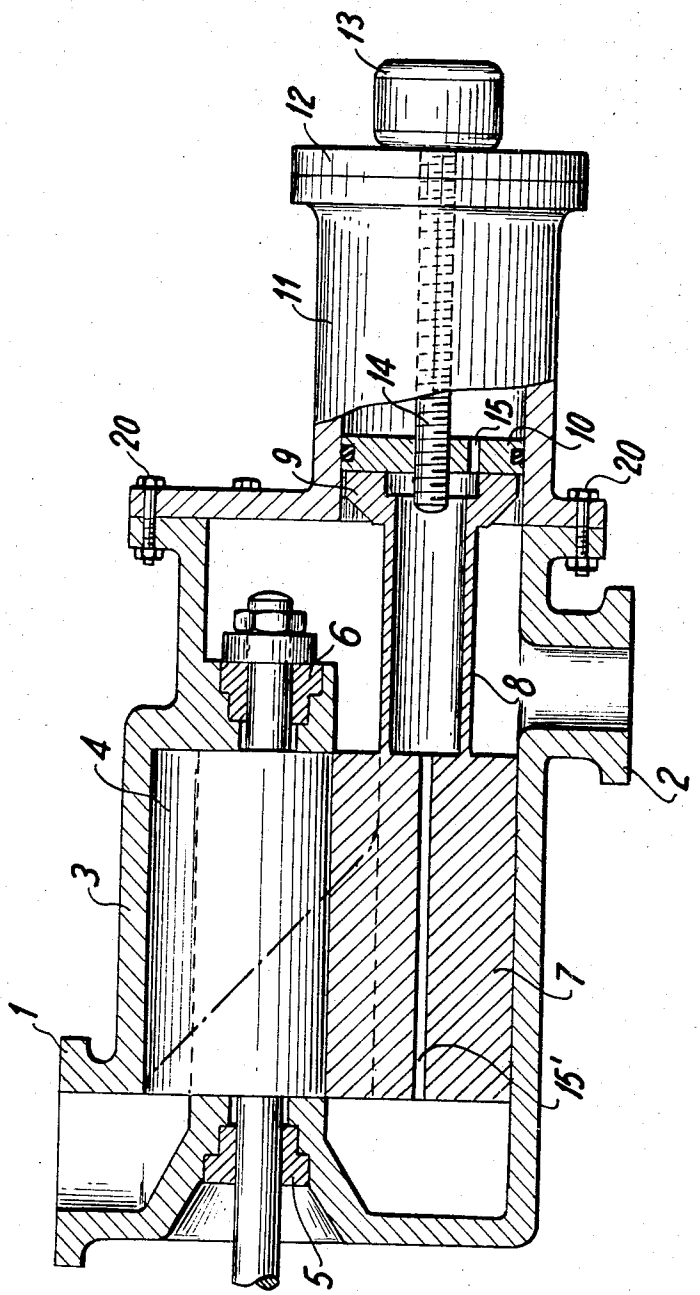

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SCREW MACHINE

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ABSTRACT OF THE DISCLOSURE

A rotary screw compressor or pump, or helical vane compressor, includes a housing having an inlet defined at one end of the compressor rotors and an outlet adjacent the outlet end. The slide is connected to a pressure equalization piston which is charged by the exit or inlet pressure of the pump medium in a direction opposite to the charging of the slide.

SUMMARY OF THE INVENTION

This invention relates, in general, to the construction of a rotary compressor, and in particular, to a new and useful compressor or pump having a displaceable slide for controlling its output.

Screw compressors or pumps are known which include a means for varying the output from two interengaging rotors. For example, they may include an adjustable tap opening which leads to the compressor discharge. The working spaces of the rotors, as defined by the peripheries of the rotor vanes or threads, can come into communication with this tap opening for a regulated period of time which is dependent upon the position of a slide which serves as a control member. Such a slide, which is movable or adjustable relative to the rotors, is subjected to forces in axial directions which correspond to the variations of the charging on the respective ends of the rotor as determined by the inlet and outlet operating pressures of the machine. Since the end face of the slide which is charged with the outlet or discharge pressure cannot be formed in any desired small size and since the compression ratio of the screw compressors should be as large as possible for economical reasons, the considerable axial forces which act on the slide may be disadvantageous and may result in unreliable operation of the control device.

In another known screw compressor machine having a slide which is mechanically actuated by a threaded spindle, the axial forces which appear on the slide are compensated by a hydraulic system. A disadvantage of such a construction is that the hydraulic pressure necessary for the compensation has to be supplied by an additional pump which acts constantly. Adaptation of such a system to the variable axial forces which are caused by the pressure variations or fluctuations, both in the front and rear end of the machine, require additional means for the adjustment of the equalization of compensation pressure. For this reason, an integrated transmission cannot be built without blocking the oil supply pipe for the hydraulic system.

In another known screw machine, the drive of the slide is caused by means of a piston which is charged on one or two sides. The piston is hydraulically actuated and this construction requires a constantly complicated return or recycling of the oil flow in order to maintain a predetermined slide position.

In accordance with the invention, there is provided a construction which includes a control slide which is connected with a pressure equalization piston. The pressure

equalization piston is charged by the inlet or discharge pressure of the medium being pumped and in a direction opposite to that at which the slide is charged. In this construction, the corresponding end faces of the slide and the pressure equalization piston are of the same size, or at least, almost the same size. The slide and the pressure equalization piston are thus only charged by the through-put medium. No auxiliary energy is necessary and this means that both the quantity of the medium being pumped and also the pressure ratio of the machine can be charged without changing the axial thrust equalization of the slide.

Accordingly, it is an object of the invention to provide an improved screw compressor which includes a slide which is connected to a pressure equalization piston, the piston being charged by either the inlet or the discharge pressure in a direction opposite to that in which the slide is charged.

A further object of the invention is to provide a screw compressor which is simple in design, rugged in construction and economical to manufacture.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

The only figure in the drawing is an axial sectional view of a portion of a rotary compressor constructed in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, in particular, the invention embodied therein comprises a casing or housing **3** for a spiral lobe or screw compresor having an inlet **1** and an outlet or discharge **2** spaced axially and vertically therefrom. The compressor comprises a pair of rotors or lobes only one of which, rotor **4**, is visible in the drawing. The rotors cooperate to draw air or other fluid inwardly from the inlet **1** and discharge it out through the outlet or discharge **2**. As indicated in repsect to the rotor **4**, the rotors are supported on axially spaced bearings **5** and **6** in the upper portion of the casing **3**. Below the rotors there is located an axially adjustable slide **7** having a connecting rod portion **8** terminating in a reception piece **9** for a pressure equalization piston **10**. The pressure equalization piston **10** is mounted in a guide cylinder **11** which can be detached from the casing **3** by removing securing bolts **20**, **20**. The guide cylinder **11** is closed by a detachable cover **12** which mounts a drive element or motor **13** for rotating a threaded spindle **14**. The threaded spindle **14** is threadably engaged with the pressure equalization piston **10** and rotation of the spindle will effect axial movement of the pressure equalization piston within the guide cylinder **11**.

The pressure equalization piston **10**, in accordance with the invention, is located opposite the end face of the slide **7** which is charged by the discharge pressure. The end face of the pressure equalization piston **10** which faces away from the slide **17** is located within the guide cylinder **11** and communicates through bores **15** in the pressure equalization piston **15'** in the slide **7** to the inlet side so that the inlet pressure acts on the pressure equalization piston **10** and on one end of the slide **7** in the direction opposite to the outlet pressure which acts on the slide **7** and the reception piece **9** at the location of the outlet **2**.

In order to facilitate the mounting and removal of the pressure equalization piston **10**, the reception piece **9** which is connected with this piston has a slightly smaller diameter than the pressure equalization piston itself. The slide **7** also has a diameter which is equal to that of the reception piece **9** so that it is small enough to be removed with the equalization piston to the end of the guide cylinder after the cover **12** is removed.

The construction of the slide and the pressure equalization is such that they are charged by the inlet or discharge pressure of the throughput medium itself and in a manner such that the system is balanced. No auxiliary medium is necessary for loading of the parts in order to overcome unbalancing forces. With the construction, both the quantity of the throughput medium and also the nominal or rate of pressure ratio of the machine can be changed without changing the axial thrust balance of the slide.

What is claimed is:

1. A compressor comprising a housing having an inlet opening and a discharge spaced from said inlet opening, cooperative rotor means mounted in said housing between said inlet and said outlet for drawing a medium in through said inlet and discharging it out through said outlet, a slide mounted in said housing for axial movement and having an end face communicating with said inlet and an opposite end face communicating with said outlet, said slide being located between said rotor and said outlet and being movable to vary the flow area from said rotor to said outlet, a pressure equalization piston in sealing engagement with said housing and connected to and movable in the same axial directions of said slide, and means for communicating the side of said piston opposite to said slide to said inlet.

2. A compressor, according to claim **1**, wherein said pressure equalization piston is located alongside the end face of said slide which is in communication with said outlet.

3. A compressor, according to claim **1**, wherein said housing includes a guide cylinder extension facing away from said slide, said pressure equalization piston being movable in said guide cylinder extension, said means for communicating the side of said piston opposite to said slide to said inlet comprising a connecting rod extending from said slide to said pressure equalization piston and a through passage defined through said pressure equalization piston, said connecting rod and said slide to communicate said inlet to the opposite side of said pressure equalization piston from said slide.

4. A compressor, according to claim **3**, wherein said guide cylinder comprises a removable cylindrical extension of said housing.

5. A compressor, according to claim **4**, including a motor mounted on said extension cylinder, a threaded spindle rotated by said motor, said threaded spindle being threadably engaged with said pressure equalization piston for shifting said piston within said guide cylinder.

6. A compressor, according to claim **5**, wherein said pressure equalization and said slide are connected together by a connecting rod, said connecting rod, said pressure equalization piston and said slide having a through passage therethrough for communicating the inlet side of said slide with the opposite side of said pressure equalization piston from said slide.

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