

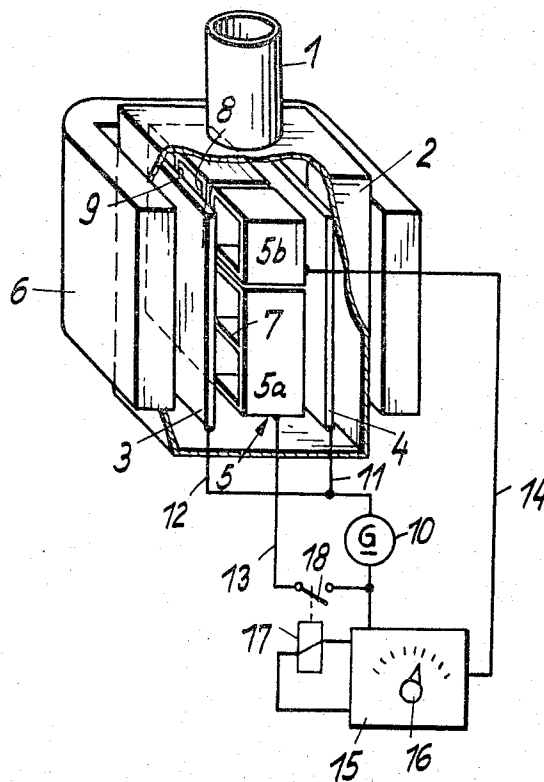
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VACUUM PUMP

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VACUUM PUMP

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3 Claims. (Cl. 230-69)

ABSTRACT OF THE DISCLOSURE

A vacuum pump arrangement formed of an anode which is subdivided into cells and mounted between cathode plates in a vacuum sealed casing. A magnetic field is provided vertical to the cathode plates and parallel to the axes of the anode cells. The pump is divided into electrically separated sections of different sizes, the smaller section thereof being connected to a control device for actuating the larger section in response to the pressure level within the pump.

Disclosure

The invention concerns a vacuum pump in which the electric ionization of the gas to be pumped away is used to create the vacuum and to regulate the pumping mechanism. Pumps of this nature are used in systems, for example in metal vapourizing units, where processes have to take place in a defined vacuum.

Several devices are known where it is possible to regulate the required vacuum to a certain set pressure. For this purpose it is usual to use a switching manometer, by means of which a pump is turned off when the desired minimum pressure is reached, and turned on again when the pressure is increased. These devices, however, have the disadvantage that the set pressure is only reached at irregular intervals.

In another known arrangement the vapourization of getter material as well as the ionization of the gas is used for the creation of the vacuum. The regulating of the pump mechanism is effected by the size of the electric current which flows through the ionized particles. Since the flow of ions depends upon the presence of ionizable gas particles as well as on the pressure, it is therefore possible to effect a pump control that is dependent on the pressure. The disadvantage here, however, is that a special vapourizing apparatus, which means a part that is subject to wear, must be used.

With this invention these disadvantages are avoided by the division into electrically separate parts of different sizes of the anode of an ion pump, and the fitting of this subdivided anode between cathode plates in a vacuum-sealed casing. A magnetic field is introduced vertical to the plates and parallel to the axes of the cells of the anode. The smaller part of the anode is connected to a known control device by which the other part of the anode is turned off when the lower pressure level is reached, and turned on again at the upper level.

By the subdivision of the anode pump sections of different sizes are obtained, which can be taken into operation separately. Here, as in the known arrangements, the whole pump is so designed that it is capable of the pumping speed necessary for the purposes required of it. With

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the separation of the larger pump section there remains the smaller section whose pumping speed is no longer great enough to create the necessary vacuum.

At the same time a slow rise in pressure takes place, which, in connection with a slight deviation in the desired upper pressure limit, switches on the pump, which then effects the evacuation down to the lower pressure level. Since the switching on of the second pump section only results in an increase in the pumping speed, only a slight transmission of the lower pressure limit occurs.

In an advanced model of the invention the ratio of the pumping capacity of the smaller section to the larger section of the anode is 1:9. The selection of this ratio depends upon the difference between the two pressure limits. Indeed it is an advantage to use several pump sections, if this enables the suction power of the pump to be altered when, for example, there are various sized volumes of gas to be pumped away.

The transmission of the signal for the switching on and off of the larger pump section is picked from the circuit of the smaller section, either by means of a contact galvanometer, or by some other known switching device.

In the sample model represented in the figure the pump housing 2, which can be connected via the connecting pipe 1 to a vacuum apparatus, is made of metal. Inside the vacuum-sealed housing 2 the anode 5 lies between the two cathode plates 3 and 4. Outside the housing 2 the horseshoe magnet 6 is arranged with its two poles opposite the plates 3 and 4, so that the lines of the magnetic field run vertical to the plates 3 and 4, and parallel to the axes of the cells of the anode which are separated by the partitions 7, 8, and 9. The electrical supply to the pump comes from the D.C. source 10, which can be connected via the leads 11 and 12 with the cathode plates 3 and 4, and via lead 13 with the anode 5.

The anode 5, which is subdivided into cells, is separated into two parts 5a and 5b, part 5a having eight cells, part 5b one cell. The current flowing between the cathode plates 3 and 4 and part 5b of the anode 5 is led via the lead 14 to the switching device 15. In the switching device 15 there is a contact galvanometer which, when the current strength set with knob 16 is reached, which flows through the arrangement via the anode part 5b, closes the switch 18 in the circuit 13 by means of the relay 17 and switches on the anode part 5a. As soon as the current in part 5b has dropped away from the preset value because of the decrease in pressure, the anode part 5a is switched off again via the relay 17 by the opening of the switch 18.

We claim:

1. A vacuum pump arrangement, in which the electric ionization of the gas to be pumped away is employed to create a vacuum and to regulate the pumping mechanism, comprising

- (a) a pump including
 - (1) a vacuum sealed casing,
 - (2) a pair of cathode plates mounted within said casing,
 - (3) an anode formed of a plurality of cells and mounted between said cathode plates, and
 - (4) means for producing a magnetic field orthogonally to said cathode plates and parallel to the axes of the anode cells,
- said pump being divided into electrically separated sections of different sizes, and

(b) control means responsive to a predetermined pressure in a smaller one of said sections for deenergizing the larger of said sections and further responsive to a pressure higher than the predetermined pressure in the smaller section for activating said larger section. 5

2. A vacuum pump arrangement as defined in claim 1 wherein a number of the cells of said anode are electrically connected with one another to form the larger section and electrically separated from the remaining cells of said anode which form the smaller section. 10

3. A vacuum pump arrangement as defined in claim 1, wherein the smaller section is formed of one cell of said anode and the larger section is formed of eight cells of said anode.

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ROBERT M. WALKER, *Primary Examiner.*