June 5, 1928. 1,672,205

C. EISLER

COMPOUND VACUUM PUMP

Filed June 26, 1925

Fig. 1.

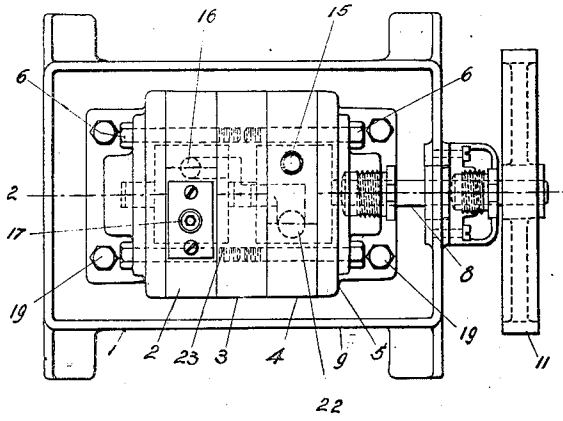


Fig. 4.

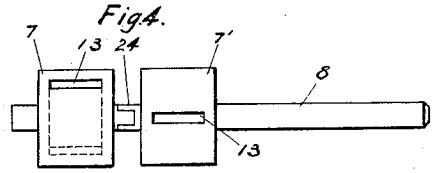


Fig. 5.

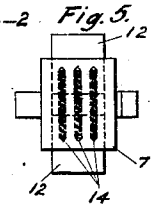


Fig. 6.

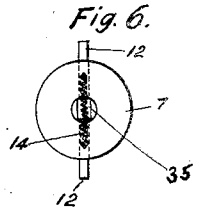


Fig. 7.

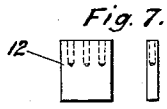


Fig. 2.

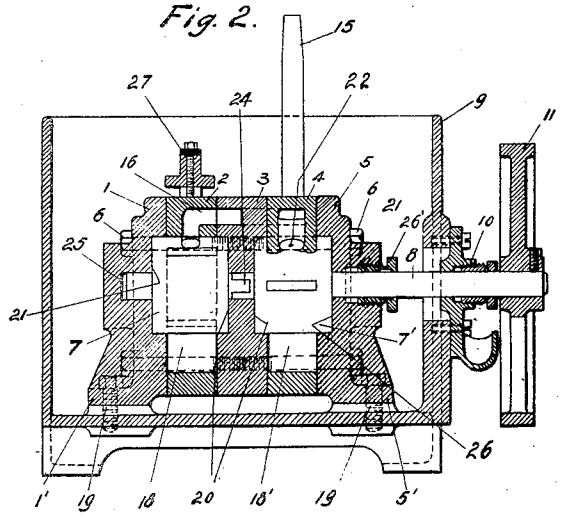


Fig. 3.

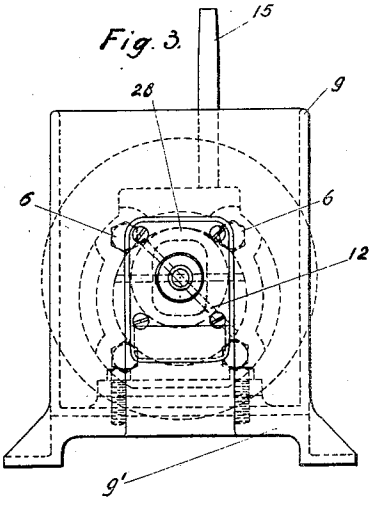


Fig. 8.

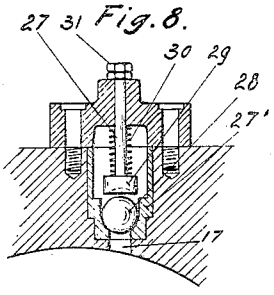
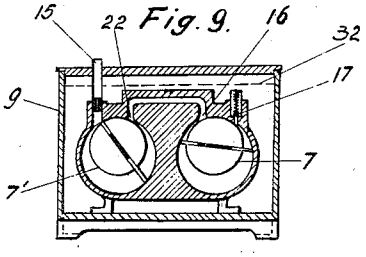


Fig. 9.



INVENTOR

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UNITED STATES PATENT OFFICE.

CHARLES EISLER, OF NEWARK, NEW JERSEY.

COMPOUND VACUUM PUMP.

Application filed June 26, 1925. Serial No. 39,708.

This invention relates to vacuum pumps.

The object of the invention generally is a high vacuum pump of novel construction and operation which is particularly adapted to use in exhaust machines for exhausting radio tubes and lamp bulbs. A further object of the invention is a pump construction of this character which is characterized by the simplicity of its parts and construction, may be readily assembled or disassembled with a minimum of attention and labor, and lends itself generally to inexpensive and economical manufacture. In carrying out my invention I have devised a compound high vacuum pump which is capable of functioning in a peculiarly satisfactory manner in the exhausting of radio tubes and lamp bulbs and otherwise possesses novel and advantageous features of construction.

For a better understanding of the invention, reference may be had to the accompanying drawings forming a part of this application, wherein:

Fig. 1 is a plan view of the pump,

Fig. 2 is a sectional view along the line 2—2 of Fig. 1,

Fig 3 is a front view of the machine,

Fig. 4 is a view of the rotor piston assembly,

Fig. 5 is a plan view of one rotor and its piston blades,

Fig. 6 is an end view thereof,

Figs. 7 and 8 are details, and

Fig. 9 is a diagrammatic illustration of the pump connections.

Referring to the drawings where like numerals designate similar parts throughout, I have indicated my invention as embodied in a compound pump contained in a housing 9, the latter in the particular embodiment shown being of rectangular shape, and the housing 9 is carried by a suitable base 9′. The pump casing consists essentially of five transverse sections, 1, 2, 3, 4, 5 which are assembled together in abutting relation to form cylindrical chambers for the reception of the cylindrical rotors 7, 7′, with surrounding eccentric chambers 18 which are traversed by the piston blades 12 and 13 carried by the rotors 7 and 7′. The end transverse sections 1 and 5 of the casing are cast into suitable shape and formation to form the main casing supports with bases 1′ and 5′ resting upon the base 9′ and secured thereto by the bolts 19, as indicated. The intermediate transverse sections 2, 3 and 4 are held firmly in position between the end sections 1 and 5 by means of the axially disposed bolts 6, these bolts passing through the end sections 1 or 5 and engaging screw-threaded openings in the middle section 3. The intermediate sections 2 and 4 are of ring-like form and have openings therethrough registering with the openings in sections 1 and 3 or 3 and 5 respectively for the reception and accommodation of the bolts 6. In the particular embodiment illustrated there are eight of these bolts 6, four on each end. The ring sections 2 and 4 define the eccentric chambers 18 and 18′. The middle section 3 is of disc-like form and separates the chambers 18 and 18′ from one another It is provided through its center with an opening for the reception of the shaft 8, carrying the cylindrical rotors 7 and 7′. It is also provided on each side with a cylindrical recess 20 to receive in a closely fitting manner the ends of the rotors 7 and 7′. The other sides of the rotors 7 and 7′ fit into similar recesses 21 formed on the inner faces of the transverse members 1 and 5. The rotors 7 and 7′ fit tightly against the upper inner surface of the rings 2 and 4 forming the eccentric chambers 18 and 18′ and the chamber 18′ is in communication with the chamber 18 through an opening 22 formed in the upper part of the intermediate ring 4, a registering recess or opening 23 formed in the middle ring member 3, and a communicating registering chamber 16 formed in the intermediate ring 2. It is observed that the communicating chambers 22 and 16 lead to the chambers 18′ and 18 at points on opposite sides of the contact line of the rotors 7 and 7′, with the rings 2 and 4. On the other side of the rotor 7′ opposite the connection 22, the eccentric cylindrical chamber 18′ is connected with the exhaust line by the pipe 15, leading to an opening through the intermediate ring 4, and similarly in the ring 2 there is provided an opening 17 leading from the chamber 18 on the side of the rotor 7 opposite the location of the communicating chamber 16, this opening 17 leading to an outlet to the atmosphere or to the body of oil within which the pump is immersed. For convenience in assembly the shaft 8 upon which the rotors 7 and 7′ are mounted, is divided between the rotors 7 and 7′ into a coupling 24 so as to enable the two rotors, with the shaft, to be readily and quickly assembled with their

coupling ends 24 passing through the center opening in the middle transverse member 3. The shaft 8 at one end is provided with a suitable bearing 25 in the frame member 1 and suitable bearings 26′ with packing glands therein are provided in the end frame member 5 for the accommodation of the shaft. Similarly a bearing 10 with suitable glands therein is provided on one end of the housing 9 for the passage therethrough of the shaft 8, and a pulley 11 is carried by the overhanging end of the shaft as a driving medium. Any driving means may be utilized as for example an electric motor (not shown for convenience in illustration). The piston blades 12 and 13 are mounted for reciprocable movements radially through the rotors 7 and 7′, suitable slots being provided therethrough for the reception of these piston blades. There is a pair of these blades for each piston and the blades of each pair are urged or biased in an outward direction by means of intermediate compression springs 14 disposed within the slots, with their ends resting in sockets formed in the blades, there being provided three of these compression springs 14 in each rotor. The shaft 8 also is provided with a slot 35 registering with the corresponding chambers of the rotors to provide for the unhindered reciprocation of the piston blades 12 and 13 therethrough. At 27 is indicated a valve for preventing the leakage of oil down into the pump chamber through the outlet 17.

The operation of the compound pump is readily apparent from the diagrammatic illustration of Fig. 9. The two rotors 7 and 7′ are assembled with their respective blades 12 and 13 assuming the relative positions illustrated. The blades 13 one after the other trap the air coming in through the exhaust pipe 15 and carry the entrapped air around counter-clockwise into the opening 22 from whence it escapes through the openings 23 and 16 into the chamber 18. The air is here again entrapped by the blades 12 as they pass the opening 16 and is forced out through the opening 17 leading to the oil chamber, the two rotors 7 and 7′ with their respective piston blades 12 and 13 cooperating and functioning together and operating in series in the manner indicated to effectively exhaust the air from the exhaust line 15. The valve 27 indicates an oil check valve for preventing the leakage of oil and air down into the chamber 18 when the pump is not working. This valve includes a casing or valve seat 27′ which is tool steel and hardened, a steel ball 28 resting on the bottom thereof, a spring pressed plunger 29 immediately thereabove to retain the ball in the vicinity of its seat, and a spring 30 surrounding the plunger stem, suitable nuts 31 being carried by the upper end of the stem to adjustably mount the same in position The oil level may be something like that indicated by the broken line 32 in Fig. 9.

The pump may be readily disassembled by disconnecting the bolts 6. For example, the transverse sections 1 and 2 may be taken down by removing the four bolts 6 on the left end of Fig. 2 and the rotor 7 then removed by simply moving it longitudinally of the shaft so as to uncouple the coupling 24. Similarly the other end of the pump may be disassembled by disengaging the bolts 6 on the right.

I claim:

1. A vacuum pump comprising five transverse casing sections constructed and arranged to form when assembled in abutting relation two cylindrical chambers for the accommodation of two cylindrical rotors, each of said cylindrical chambers extending into the central casing section and into one of the end casing sections and each being contained in part within an eccentric chamber of larger diameter but of shorter length, each eccentric chamber being tangent to its associated cylindrical chamber along the same line parallel to the axis, rotors for said cylindrical chambers having reciprocable piston blades radially disposed therein and arranged to traverse the eccentric chambers of larger diameter, each of said eccentric chambers being provided with an outlet and an inlet disposed on opposite sides of the said axially parallel line along which the eccentric and the associated cylindrical chambers are tangent to each other and a connection between the outlet of one of said eccentric chambers and the inlet of the other of said eccentric chambers comprising registering passages through the intermediate and central casing sections arranged so as to cause the rotors to function in series.

2. A compound rotary pump comprising a casing having two end portions and a central portion, said central portion being provided with an opening therethrough, cylindrical chambers within said casing, rotors for said chambers and shafts coupled within said opening for said rotors.

In testimony whereof, I have signed my name to this specification.

CHARLES EISLER.