July 30, 1963 F. H. BECKFIELD 3,099,387

VACUUM AND AIR PUMPS

Filed July 21, 1960

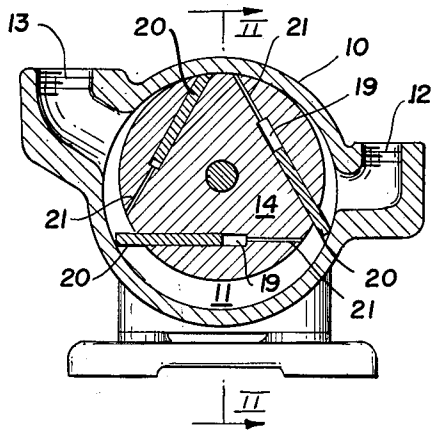


Fig. 1.

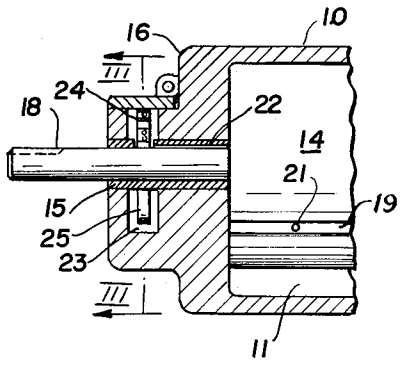


Fig. 2.

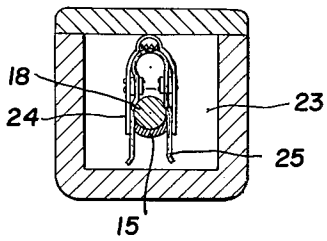


Fig. 3.

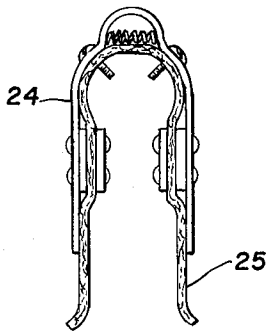


Fig. 4.

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VACUUM AND AIR PUMPS

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4 Claims. (Cl. 230—152)

This invention relates to vacuum and air pumps and particularly to a vacuum and air vane pump structure which eliminates the problems of vane lubrication and vanes hanging up in the vane channels during the pumping action. Two of the very significant problems in vane vacuum and air pumps are in lubrication of the vanes and rotor and the vanes traveling in slots are retarded by suction from going out against the pump housing wall and are prevented from returning by pressure behind the vane. In the former case, large losses in efficiency result, whereas, in the latter case, the vanes tend to gouge and unduly wear the walls of the pump.

The present invention provides a structure which completely eliminates both of these problems and permits the vanes to move freely in and out of their guide slots in the pump rotor. In addition the balancing of force achieved by my invention reduces or eliminates the mechanical noise which is conventionally associated with each cycle of travel of the vanes and the lubricating film remains longer on the surfaces of the cylinder and vanes and thereby maintains the seal which is necessary for compression.

In a preferred embodiment of my invention, I provide a housing having a cylindrical bore, a rotor in said bore rotatable about an axis parallel to and spaced from the axis of the bore, slots in said rotor transverse to the circumference of the rotor terminating in the body of the rotor, piston blades or vanes movable in said slots in contact with the internal walls of the cylindrical bore and means communicating between the base of each slot and the circumference of the rotor adjacent the leading surface of the next adjacent blade. An oil or grease reservoir is preferably provided in the housing with communication adjacent the rotor axis to the bore whereby rotation of the rotor meters oil or grease to the bore and rotor.

In the foregoing general statement, I have set out certain objects, advantages and purposes of my invention. Other objects purposes and advantages will be evident from a consideration of the following description and the accompanying drawings in which,

FIGURE 1 is a vertical section through a pump according to my invention;

FIGURE 2 is a segmental section on the line II—II of FIGURE 1, with the rotor in elevation;

FIGURE 3 is a section on the line III—III of FIGURE 2; and

FIGURE 4 is a side elevation of a lubricator for use in my invention.

Referring to the drawings I have illustrated a housing **10** having an inner cylindrical bore **11** with an inlet port **12** and outlet port **13**. A rotor **14** is journaled in bearings **15** in end bells **16** and **17** on a shaft **18** adapted to be driven by a suitable power source not shown. The shaft **18** is parallel to but spaced from the axis of bore **11** so that the periphery of rotor **14** contacts the periphery

of bore **11** along a straight line but is otherwise spaced from the bore. Spaced slots **19** are provided in rotor **14** transverse to the periphery of the rotor. Vanes **20** are freely movable in slots **19** so that centrifugal force causes them to be wedged out of the slots into contact with the inner wall of bore **11**. A passageway **21** is drilled from the base of slot **19** to the periphery of the rotor at a point in advance of the leading edge of the next adjacent slot.

The above described structure creates a balancing of forces on the two ends of each vane **20** which is commensurate with its position in bore **11**. The net result is a gradual increase of effective pressure on the back of the vanes which eliminates retardation of the vanes on their outward stroke and a decrease of effective pressure on front of the vanes on the inward stroke which eliminates gouging.

Each of bearings **15** is provided with a passageway **22** communicating from oil reservoirs **23** in the end bells to the inner end wall of the bell housings in contact with the ends of rotor **14**. A lubricator made up of a clamp which may be brass, steel, plastic or like resilient material, and spring **24** carrying a felt member **25** is placed over shaft **18** in the bearings so that oil from reservoir **23** is drawn up to the shaft, where it is carried along passageway **22** into bore **11** and distributed over the surfaces of the rotor and vanes.

In the foregoing specification, I have described a preferred embodiment of my invention, however, it will be understood that this invention may be otherwise embodied within the scope of the following claims.

I claim:

1. In a rotary vane pump having a housing, a cylindrical bore in the housing, inlet and outlet ports communicating with said bore, the improvement comprising a rotor in said bore rotatable on a shaft journaled in the housing and spaced from the parallel to the axis of the bore, said rotor having slots in said rotor transverse to the periphery of the rotor and terminating in said rotor, vanes movable in said slots in contact with the inner periphery of the bore, passages of smaller cross section than said slots lying in the plane of the slots throughout the extent of said passages communicating between the bottom of each slot and the periphery of the rotor adjacent the leading surface of the next following adjacent vane with respect to the direction of rotation of the rotor whereby the area of the slot beneath the vane is open to the bore during the entire period that the said next adjacent blade is moving out of the retracted position and returning to the retracted position, and lubricant reservoir means in the housing delivering lubricant along the shaft to the rotor.

2. A rotary vane pump as claimed in claim 1 wherein the lubricant reservoir means is a well adjacent the shaft journal and wick means is provided in the reservoir surrounding a portion of the shaft delivering oil from the reservoir to the shaft.

3. A rotary vane pump as claimed in claim 2 wherein the housing is provided with a passage adjacent the shaft for carrying oil along the shaft from the wick means to the rotor.

4. A rotary vane pump as claimed in claim 1 wherein the housing is provided with a passage adjacent the shaft

for carrying lubricant along the shaft from the reservoir means to the rotor.

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