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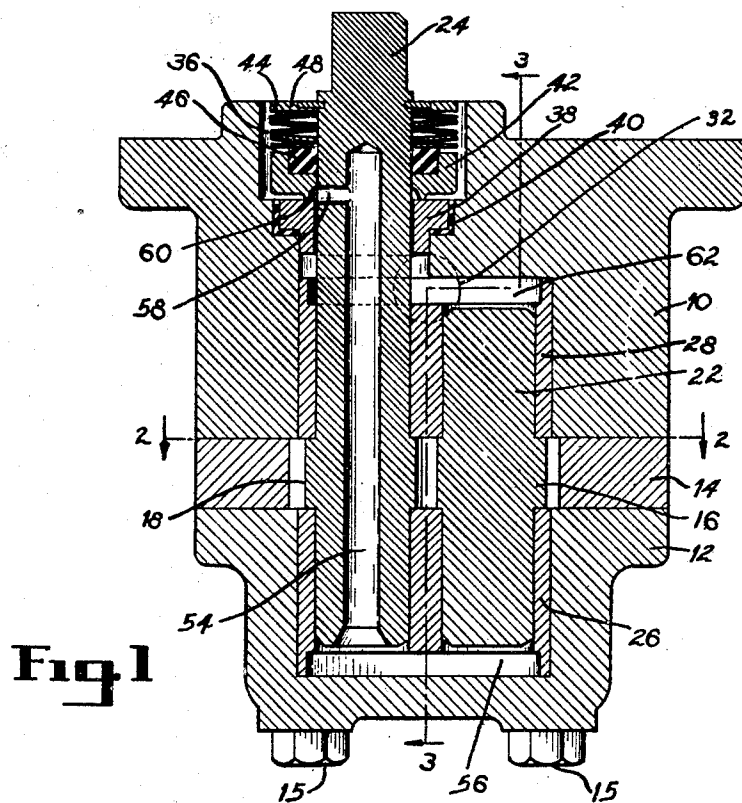
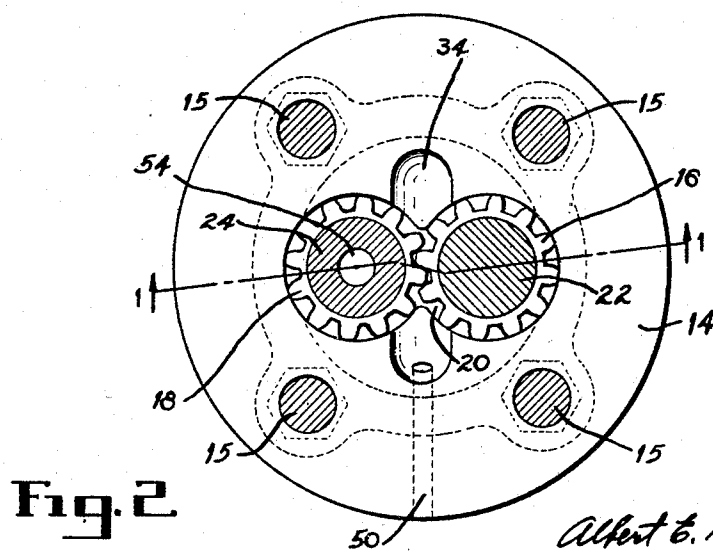
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2,432,576

GEAR PUMP FOR AERONAUTICAL APPARATUS

Filed Nov. 25, 1942

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 3

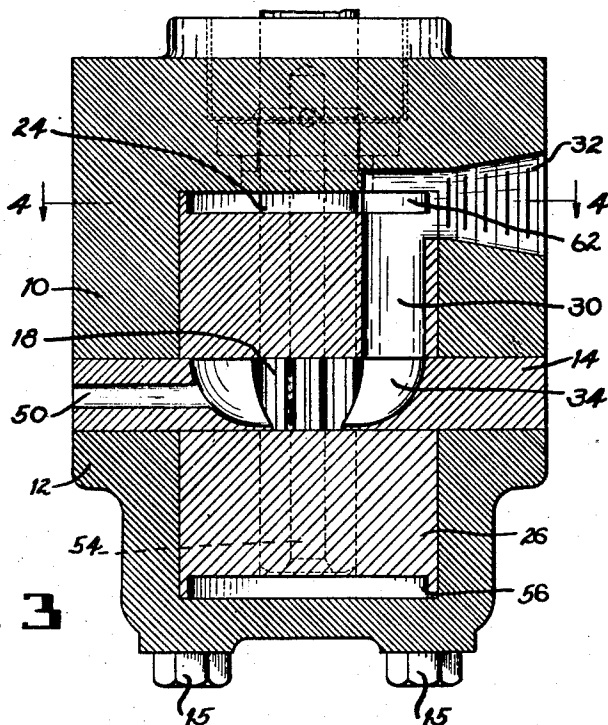
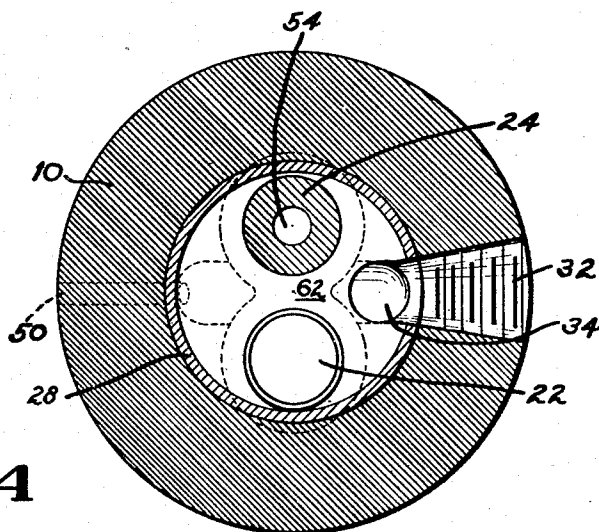


Fig. 4



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GEAR PUMP FOR AERONAUTICAL APPARATUS

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4 Claims. (Cl. 103—126)

1

This invention relates to aeronautical apparatus and more particularly to an oil pump.

One object of this invention is to simplify the pump structure so as to facilitate its manufacture and assembly.

Another object of this invention is to improve upon the means for lubricating the main pump bearings and the shaft seal.

Still another object is to provide an oil pump capable of handling oil under high pressures without the danger of any oil leaking out along the shaft of the pump.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a vertical sectional view taken on line 1—1 of Fig. 2;

Fig. 2 is a horizontal sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is another vertical sectional view taken on line 3—3 of Fig. 1; and

Fig. 4 is another horizontal sectional view taken on line 4—4 of Fig. 3.

Referring now to Fig. 1, wherein I have shown a preferred embodiment of my invention, reference numeral 10 designates a first casing element, reference numeral 12 designates a second casing element, and reference numeral 14 designates the main gear casing which is sandwiched in between the casing elements 10 and 12. The elements 10, 12 and 14 are held in proper assembled relationship by means of the bolts 15.

The pump is a gear type of pump having a first gear element 16 and a second gear element 18, both of which are disposed within the main pumping chamber 20 formed in the element 14. The gear 16 is carried by a shaft 22 and may be formed integrally therewith or otherwise secured thereto. The gear 18 is carried by the main drive shaft 24 and may be formed integrally therewith or secured thereto in any well-known manner. The lower ends of the shafts 22 and 24 are journaled in a bearing member 26 and the upper ends of these shafts are journaled in a bearing member 28.

In order to simplify the manufacture and assembly of the parts, the bearing elements 26 and 28 are made from identical castings and are similar in all respects except that the upper bearing member 28 is provided with an inlet passage 30 which conveys the oil or other medium to be pumped from the main inlet 32 provided in the

2

element 10 to the intake port 34 provided in the element 14. By virtue of this similarity, the number of different shaped parts has been reduced.

A shaft seal cavity 36 is provided in the upper end of the casing section 10 and has mounted therein a shaft seal construction which prevents the lubricant from escaping from the main casing at the point where the shaft passes through the casing. This shaft seal comprises a stationary sealing ring 38 which is held in place within the shaft seal cavity by means of a rubber-like gasket 40 arranged as shown in Fig. 1. Ring 38 is provided with an inner diameter slightly greater than the outer diameter of the main drive shaft 24 so as to provide a running clearance space for the shaft 24 at the point thereof surrounded by ring 38. This running clearance space forms a communicating means utilized for a purpose to be presently described. The rubber-like gasket 40 is preferably made of neoprene or some similar synthetic rubber which is unaffected by lubricant. A rotating seal ring 42 cooperates with the stationary seal ring 38 in accordance with well known practice and is biased into engagement with the stationary ring 38 by means of a plurality of spring washers 44 which press against the neoprene ring 46. The neoprene ring 46 not only serves to seal the ring 42 to the shaft 24 but also serves to prevent relative rotation between the shaft 24 and the ring 42. A suitable end thrust washer 48, keyed or otherwise secured to the shaft 24, serves as an abutment for the spring washers 44.

It will be noted that the opposite ends of the bearing elements 26 and 28 are recessed so as to provide a space between the end of each bearing and the main casing. The oil enters the pump through the inlet 32 and leaves through the passage 50 provided in the member 14. In a pump of this type, the pressures at the outlet are extremely high with the result that there is a tendency for the oil to flow along the shafts and escape adjacent the ends of the shafts. Thus, the main shaft bearings are adequately lubricated by the oil flowing along the shafts. In order to prevent the oil flowing along the shaft from leaving the main pump casing, I have provided means for maintaining the ends of the shaft at a pressure corresponding to the inlet pressure and for returning the escaping oil to the inlet of the pump.

The shaft 24 is provided with a central oil passage 54 which has its lower end communicating with the space 56 provided between the bearing

3

element 26 and the casing section 12. The upper end of the passage 54 communicates with a radial bore 58 which conveys the oil into the small cavity 60 provided between the shaft seal rings 38 and 42 and the outer surface of the shaft. In this manner, the oil escaping along the lower ends of the shafts is used for lubricating the shaft seal surface and is then returned to the chamber 62, formed between the upper end of the bearing element 28 and the casing section 10, through the running clearance space heretofore described and which permits cavity 60 to communicate with the chamber 62. As best shown in Figs. 3 and 4, the chamber 62 communicates with the inlet passage 32 whereby the oil all returns to the inlet side of the pump rather than escaping to the outside. It will also be noted that the oil flowing upwardly along the shafts from the gear cavity will be discharged into the chamber 62 from whence the oil will return to the inlet of the pump.

For convenience in describing this pump, I have referred to it as a vertical pump, whereas it is obvious that the pump may be disposed horizontally or at any other angle and that the pump may be used for pumping liquids other than those normally thought of as lubricants.

The bearing elements 26 and 28 are made from some suitable bearing material such as "Sabeco," whereas the casing elements may be made from any cheap material which may be formed, such as by casting or moulding.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a pump, means forming a pumping cylinder, cylinder heads disposed on opposite sides thereof, a pair of pumping gears within said cylinder, shaft means projecting from opposite sides of each of said gears into said cylinder heads, said cylinder heads including bearing inserts for said shaft means, said bearing inserts having substantially identical outer dimensions, a passage in one of said bearing inserts through which fluid to be pumped enters into said pumping cylinder, said shaft means including a drive shaft projecting through one of said cylinder heads, an outboard shaft seal for said drive shaft including a pair of relatively rotatable seal rings having seal surfaces in engagement with one another, means including a lubricant passage in said drive shaft whereby lubricant is centrifugally discharged to said shaft seal from a point substantially opposite said seal surfaces and means whereby the excess lubricant supplied to said seal surfaces is thereafter introduced into said pumping cylinder.

2. In a lubricant pump, means forming a lubricant pumping cylinder, cylinder heads disposed on opposite sides thereof, a pair of pumping gears in said cylinder, shaft means projecting from opposite sides of each of said gears into said cylinder heads, said shaft means including a drive shaft projecting through one of said cylinder heads, a shaft seal for preventing the escape of lubricant along said drive shaft, said cylinder heads including bearing inserts for said shaft means, a low pressure lubricant inlet, a high pres-

4

sure lubricant outlet, a shaft seal lubricating cavity, lubricant collecting reservoirs at the outer ends of said bearing inserts for collecting the lubricant escaping from said cylinder along said shaft means, one of said reservoirs communicating with said low pressure lubricant inlet, means for conveying lubricant from another of said reservoirs through one of said shafts and into said cavity, and means for returning lubricant from said cavity to said low pressure lubricant inlet.

3. In a pump, means forming a pumping cylinder, cylinder heads disposed on opposite sides thereof, a pair of pumping gears in said cylinder, shaft means projecting from opposite sides of each of said gears into said cylinder heads, said shaft means including a drive shaft projecting through one of said cylinder heads, a shaft seal for preventing the escape of lubricant along said drive shaft, a low pressure inlet, a high pressure outlet, a shaft seal lubricating cavity, lubricant collecting reservoirs adjacent the outer ends of said shaft means for collecting the lubricant escaping from said cylinder along said shaft means, one of said reservoirs communicating with said low pressure lubricant inlet, means for conveying lubricant from another of said reservoirs through one of said shafts and into said cavity, and means for returning lubricant from said cavity to said low pressure inlet.

4. In a pump, means forming a pumping cylinder, cylinder heads disposed on opposite sides thereof, pumping means in said cylinder, shaft means extending from opposite sides of said pumping means into said cylinder heads, said shaft means including a drive shaft projecting through one of said heads, a shaft seal adjacent the projecting end of said shaft for preventing the escape of lubricant along said drive shaft, a suction port, an outlet port, means forming a shaft seal lubricating cavity adjacent said suction port and in communication with said suction port, means forming a lubricant collecting reservoir at the inner end of said drive shaft for collecting the lubricant escaping from said cylinder along said drive shaft, said drive shaft being provided with a lubricant passage for conveying lubricant from said lubricant collecting reservoir at the inner end of the drive shaft to said shaft seal lubricating cavity.

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