

March 22, 1938.

M. UESUGI

2,111,682

OIL PUMP

Filed May 6, 1936

2 Sheets-Sheet 1

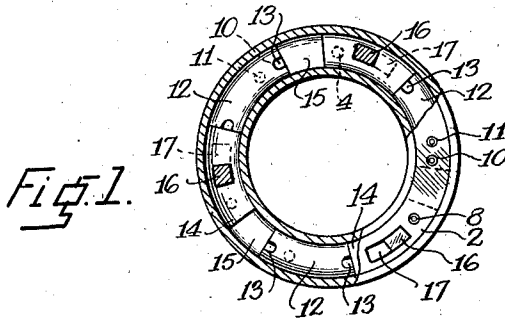


Fig. 2.

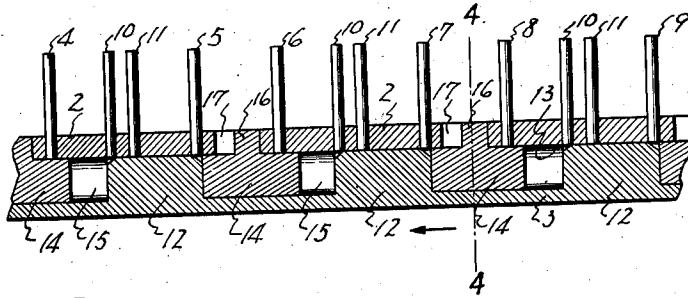


Fig. 3.

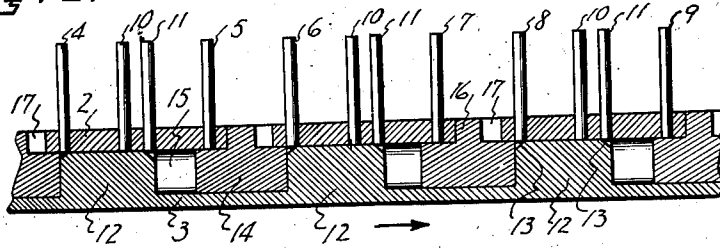


Fig. 4.

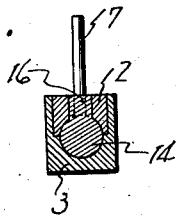
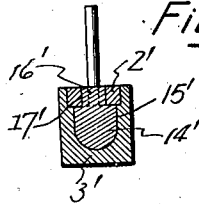


Fig. 5.



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2 Sheets-Sheet 2

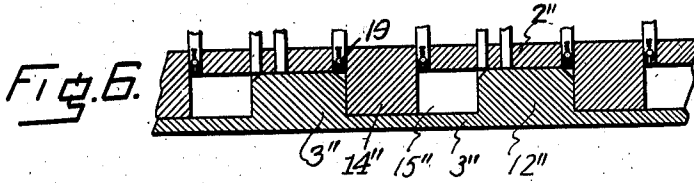


Fig. 7.

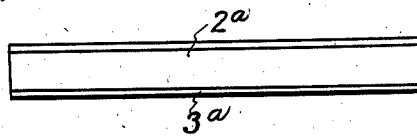


Fig. 8.

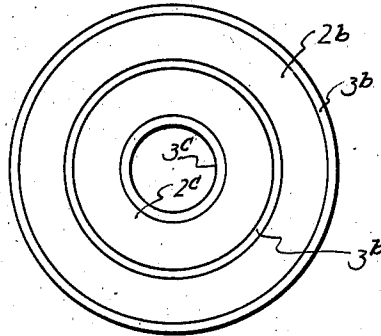


Fig. 9.

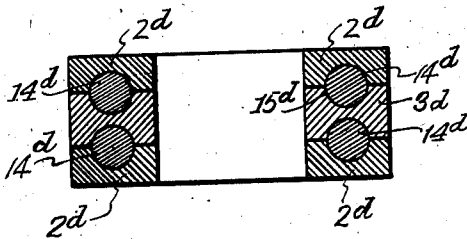


Fig. 10.

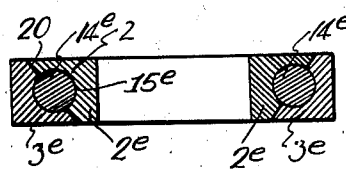
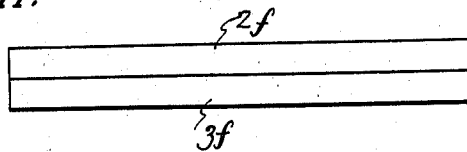


Fig. 11.



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OIL PUMP

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Application May 6, 1936, Serial No. 78,257

5 Claims. (Cl. 103—1)

This invention is directed to an improvement in oil pumps designed more particularly for use in connection with engines of various types.

The primary object of the invention is the provision of a pump made up of two relatively movable main parts, one of which is formed with recesses and spaced abutments with slides operating in the recesses and limited in movement by the other main part, one of the main parts being formed with a plurality of oil pipes and connected with a source of supply and serving as delivery pipes to the pump and with other oil pipes connected with engine parts to be lubricated and serving as delivery pipes from the pump; the relatively movable main parts being arranged in sealing cooperation and the relative movement of the main parts utilizing the cooperation of the slides and abutments to alternately create suction areas in the recesses for drawing a supply of oil from the source of supply and pressure chambers in the recesses for the delivery of oil through the delivery pipes to the place of use.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a plan view, partly in horizontal section, showing the improved pump.

Figure 2 is an enlarged broken vertical section with the pipes in elevation, showing the slides in one position in the recesses resultant from one stroke of the pump.

Figure 3 is a similar view showing the slides in the opposite position resultant from the opposite stroke of the pump.

Figure 4 is a section on the line 4—4 of Figure 2.

Figure 5 is a similar section showing a slightly modified form of construction.

Figure 6 is a view similar to Figure 2, showing a modified form of slide.

Figure 7 is a plan view showing the pump constructed in linear form rather than in the circular form of Figure 1, the details of the pump being omitted from Figure 7.

Figure 8 is a plan view showing a duplication of the form of the pump in that two concentrically arranged pumps are provided, the pump details being in accordance with those shown in Figure 1 and being omitted from Figure 8 for the sake of clearness.

Figure 9 is a transverse sectional view through a circular form of pump, wherein the pump details are duplicated in superimposed relation.

Figure 10 is a vertical section through the pump structure, showing a modified arrangement of the main cooperating parts.

Figure 11 is a plan view showing a modified

arrangement of the main parts in that they are arranged side by side in the same horizontal plane, the details of the pump being omitted for the sake of clearness.

In the form shown in Figures 1, 2, 3 and 4, the pump is circular in plan and made up of a lower main part or member 3 and an upper main part or member 2. These parts are mounted for relative reciprocating movement in the rotary plane in which they are arranged and it will be seen from Figure 4 that preferably the main part 3, constituting the lower part, has side walls which provide a sliding channel for the other main part 2, constituting the upper part. The upper and lower parts have sealing cooperation at their juncture and in the lower part are formed spaced vertical abutments 12 providing recesses 15 between them, with such recesses opening through the upper surface of the lower part but not extending through the full vertical dimension of the lower part.

Slides 14 are mounted for sliding movement in the recesses 15, the slides being of materially less length than the same dimension of the recess. The slides fill the recesses except in length and are provided with upstanding projections 16 seating in openings 17 in the upper member, providing a lost motion connection for the slide which, however, is of such dimension that in the relative movements of the main parts, the slides will, at the start of each of such movements, remain at rest for a predetermined part of the movement for a purpose which will later appear.

Suction pipes 10 and 11 extend through the upper main member 2 and open to the upper surface at the line of contact between the members 2 and 3, these pipes 10 and 11 being arranged in pairs for each abutment 12. Delivery pipes 4, 5, 6, 7, 8 and 9, as shown, extend through the upper member 2 and between the line of contact between the members 2 and 3. The delivery pipes, which of course will be an appropriate number according to the size of the pump, are arranged in pairs, with the pipes of each pair on opposite sides of the pair of suction pipes, as will be plain from Figure 2.

The respective end walls of the abutments 12 are cut away at their upper ends, merging into the line of contact between the upper and lower members. These cut-away portions are indicated at 13 and they are provided to permit communication between the respective suction and delivery pipes and the recesses 15 at proper intervals in the rotary reciprocatory relative move-

ment of the upper and lower main parts of the pump.

Again referring to Figures 1 to 4, inclusive, attention is called to the fact that the slides 14 are circular in transverse section and that the recesses 15 are formed partly in the lower member 3 and partly in the upper member 2, this being merely the preferred detail of this form of structure.

In the operation of the form shown in Figures 1, 2, 3 and 4, and referring to Figure 2 as the initial position of the parts, it will be noted that the slides 14 have been moved to their limit in the recesses 15 to the left and that the recesses 15 present open spaces between the right hand ends of the slides and the proximate walls of the adjacent abutment 12. It will be further noted in this position that the suction pipes 10 are in open communication with these open spaces by means of the cut-away portion 13, those walls of the abutments defining one boundary of these open spaces.

The main parts 2 and 3 then move relative to each other for the pumping operation and for the sake of this explanation, it will be assumed that the lower part 3 is moving in the direction of the arrow indicated in each of Figures 2 and 3. The initial movement of the plungers 12 from the position shown in Figure 2 toward the position shown in Figure 3 will cut off communication between the suction pipes 10 and the then open spaces of the recesses 13. The slides, however, are free to move under the incompressible body of oil in the open spaces until they have reached the limit permitted by the channel 17 in the upper main part 2 which is at a point intermediate of the stroke in one direction of the lower main part 3.

During this movement the pipes 4, 6 and 8, as shown in Figure 2, are uncovered by the slides and these pipes are in communication with the oil spaces of the recesses 15. This communication between the delivery pipes 4, 6 and 8 and the respective oil charged spaces of the recesses occurs practically when the movement of the slides is interrupted by the end walls of the channels 17. The further movement of the abutments 12, of course, creates a pressure on the bodies of oil in the oil spaces of the recesses 15 and so forces the oil through the delivery pipes 4, 6 and 8. By reason of the cut-away portion 13 in the end walls of the abutments, these pipes 4, 6 and 8 remain in communication with these oil spaces during the full stroke in this direction of the lower part 3. Of course, the slides 14 move with the lower part 3 for a portion of this full stroke and are then prevented from further movement by engagement with the end walls of the channel 17.

When the movement of the slides is interrupted, such slides remain stationary with respect to the fixed member of the main parts while the movable member of the main parts continues its movement. The movable member (the lower part 3 being so utilized in the present instance) continues its movement after the movement of the abutment 12 is interrupted. This not only creates the necessary pressure in the oil spaces of the channels 15 but tends to move the abutment beyond each slide in the direction of movement of the main part with the effect to provide a space forming end portions of the recesses beyond the slide which naturally tends to a vacuum condition in such space because it is closed against the admission of air.

As the movable member reaches the limit of its stroke in the described direction, the cut-off portions 13 of the abutments 12 register with the suction pipes 11. These pipes are then open to the greatly reduced or rarefied spaces described and oil from the source of supply will immediately fill such spaces. As the movable member (3 in this instance) makes its opposite stroke, the exact operation is repeated except of course that in this instance the pressure areas and vacuum areas of the recesses 15 are at the opposite ends of the slides 14. At the limit of this movement, the delivery pipes 5, 7 and 9 are in communication with the pressure spaces for the delivery of the oil while at the limit of the stroke in this direction the suction tubes 10 communicate with the vacuum spaces.

The movement is a reciprocating one, limited in each stroke as described, and the various suction and delivery pipes are arranged in accordance with the length of stroke to carry out the operation described. It is to be noted that the slides 14 serve to create pressure in the pressure spaces and effect a rarefaction in the vacuum spaces incident to the movement of the abutments 12, thus providing automatically for the flow of oil through the pump to the source of supply and the delivery of all of that oil from the pump to the point of use.

Figure 5 illustrates a slightly modified form wherein the upper member 2' and the lower member 3' are substantially similar to the preferred form. The recesses 15' are, however, formed with rounded bottoms and straight sides and the slides 14' are shaped to fit the recesses. The slides have the projections 16' to fit in the slots 17' in the upper member 2'.

In Figure 6, the construction of the lower member 3'' and of the upper member 2'' is substantially similar to that previously described except that the pressure and vacuum forming element, here indicated at 14'', is fixed to or integral with the upper member 2'' and the pipes are provided with valved elements 19 to prevent return flow.

Figure 7 shows the development of the pump in straight form rather than the circular form of Figure 1. Here the upper member 2^a and the lower member 3^a cooperate in a manner previously described and the illustration is diagrammatically correct as to the outline shape of these respective parts. The remaining portions of the pump, which are in accordance with the details illustrated in Figure 1, are omitted from Figure 7 in order to avoid confusion.

Figure 8 shows a duplication of the pump shown in Figure 1, wherein the upper member 2^b and lower member 3^b are duplicates of the parts 2 and 3 of Figure 1. In this form, however, there is an additional pump structure arranged in duplication of, concentric with, and inwardly of the outer pump. In this duplication, the members 2 and 3 of the preferred form, here indicated as members 2^c and 3^c, are in all respects duplicates of the form shown in Figure 1 except that the inner pump is of less diameter than the outer pump disposed in the same horizontal plane and inwardly concentric with the outer pump. The pump details are omitted from this disclosure for the sake of clearness.

In Figure 9, the construction of the pump details except in the particulars noted, are duplicates of those shown in Figure 1 and are largely omitted from Figure 9 for the sake of clearness. The essential feature shown in Figure 9 is that the element corresponding to the lower member

3 of Figure 1 is here shown as an intermediate member 3^d and this member is formed on its opposite sides with channels 15^d receiving slides 14^d and elements corresponding to the upper member 2 of the preferred form, and here shown at 2^d, cooperate with the slides 14^d exactly as in the preferred form. The elements of the pump, other than as illustrated, are duplicates of those shown in Figure 1 and are omitted from Figure 9 for the sake of clearness. This form shown in Figure 9 is in effect a double pump, providing one main member in cooperation with two other main members, with the respective pumps arranged in superimposed relation.

15 In Figure 10, there is a further modification of the pump form in that the member corresponding to the upper member 2, and indicated in Figure 10 as 2^e, is arranged inwardly of an outer member 3^e corresponding to the lower member 3 of the preferred form. These members have their meeting faces on a line 20 inclined to the vertical and the channels indicated in Figure 10 at 15^e are formed preferably in the meeting faces of each of the members. The slides 14^e operate in this form as in the preferred form and the remaining details of the form are omitted for the sake of clearness, as such would be a substantial duplication of the parts shown in Figure 1.

30 Figure 11 shows the respective main parts arranged in the same horizontal plane and in straight rather than circular form. The member corresponding to the upper main member 2 of the preferred form is shown in Figure 11 at 2^f while the cooperating member corresponding to the lower member 3 of the preferred form is shown in Figure 11 at 3^f. These main members of Figure 11 meet on a flat surface which is directly vertical with respect to the length of the pump. The operating parts of the form shown in Figure 11 are duplicates of the operating parts of the preferred form and are omitted from the showing in Figure 11 for the sake of clearness.

I claim:

45 1. An oil pump made up of two relatively movable parts, one such part being fixed, the movable part having sealing sliding contact with the fixed part and formed with oil receiving recesses, a slide in each recess and of less length than the recess, the slide having otherwise a sealing interfit with the walls of the recess, cooperating means on the fixed part and slide to limit movement of the slide relative to the recess in which it is located to at all times maintain a space between one end wall of the recess and the proximate wall

of the slide, operation of the movable part in the presence of oil in said space compelling movement of the slide to a limit permitted by the fixed part, the further movement of the movable part being relative to the slide to create a vacuum between the end wall of the recess and the proximate wall of the slide in the direction of movement, a suction pipe connected to a source of oil supply and leading through the fixed part and normally sealed against said recess in the movable part except at the limits of movement of the movable part, and a delivery pipe opening through the fixed part and normally sealed by the slide except at the limit of movement of the slide as determined by the fixed part, whereby in the movement of the movable part in one direction the oil contained in the recess between the end wall thereof and the slide is put under pressure to move the slide to a position to uncover the delivery pipe and force said oil through said delivery pipe during which delivery the movement of the movable part creates a vacuum condition at the opposite end of the slide and at the limit movement of the movable part opens the suction pipe to the vacuum space for the inflow of oil.

25 2. An oil pump including relatively movable members arranged in sealing contact, one of which is provided with means to admit oil and means to deliver oil, the other of said members being formed with an oil recess, a member movable in the recess and of less length than that of the recess, and means to limit movement of the member for a linear distance less than that of the recess, the oil admitting means being open to the recess only at the limit of movement of the relatively movable parts, the means for delivering oil being open to the recess only at the limit of movement of the slide.

40 3. A construction as defined in claim 2, wherein the part formed with the recess is movable and the part carrying the oil delivery and admitting means is fixed.

45 4. A construction as defined in claim 2, wherein the part carrying the oil delivery and admitting means is fixed and the part formed with the recess is mounted for longitudinal reciprocation with respect to the fixed part.

50 5. A construction as defined in claim 2, wherein the movable part seals the oil admitting means except in its limit positions, and wherein the oil delivery means is sealed by the slide except at the limit movement of the slide.

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