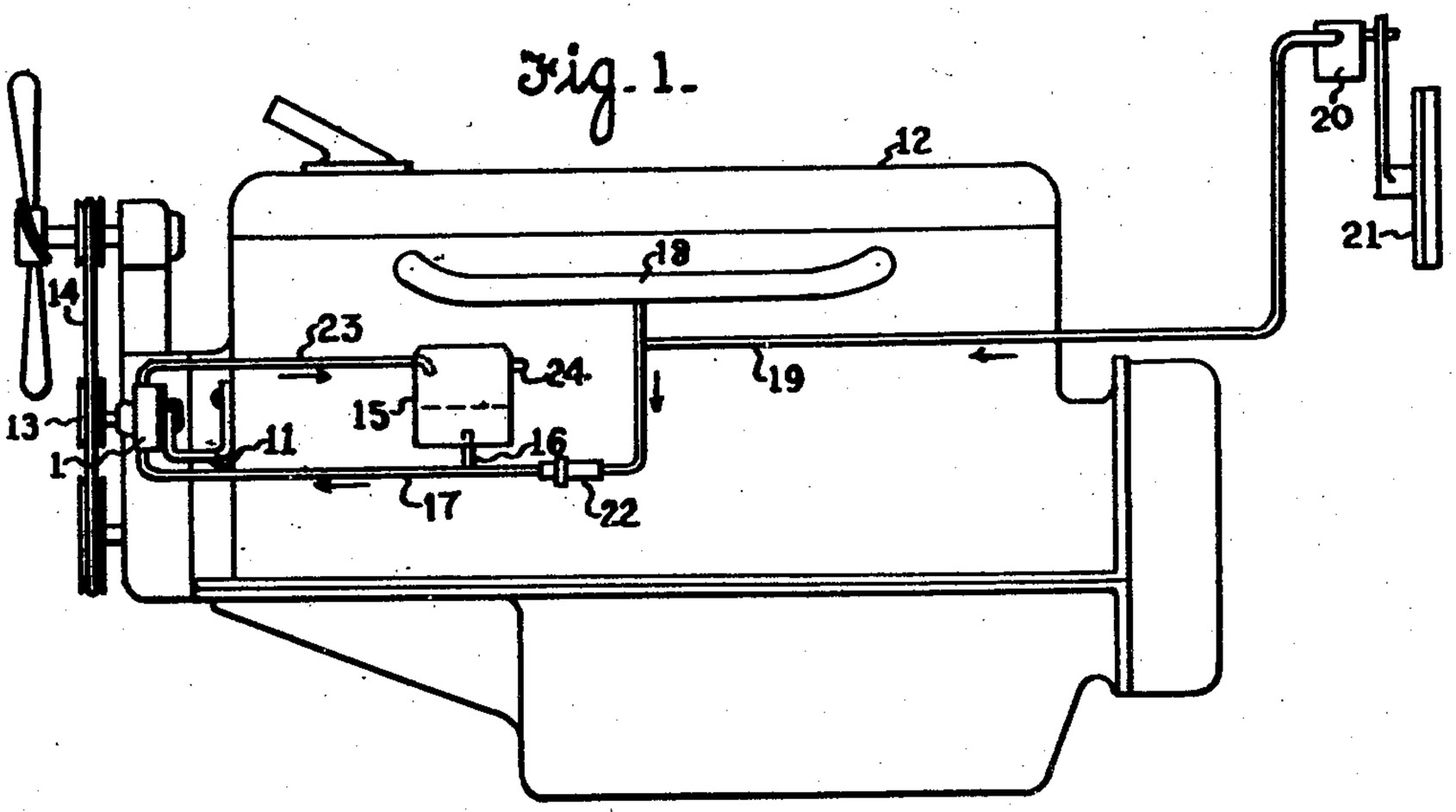
Sept. 16, 1947. P. F. BESSY 2,427,347

VACUUM PUMPING APPARATUS

Filed Oct. 18, 1944

Fig. 1.



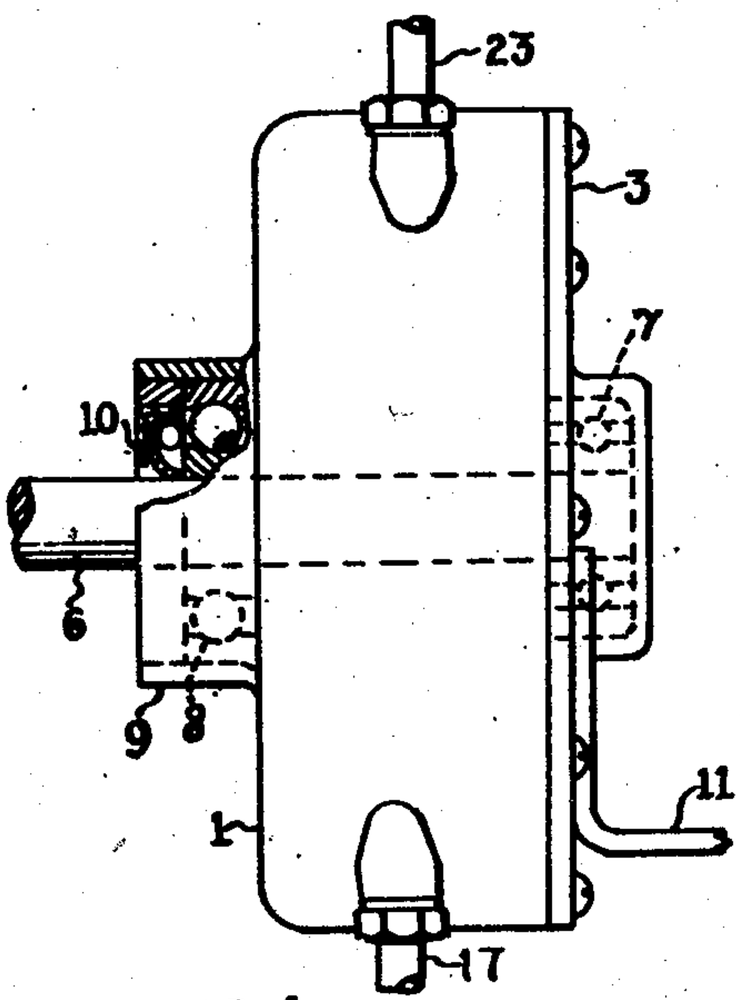


Fig. 3.

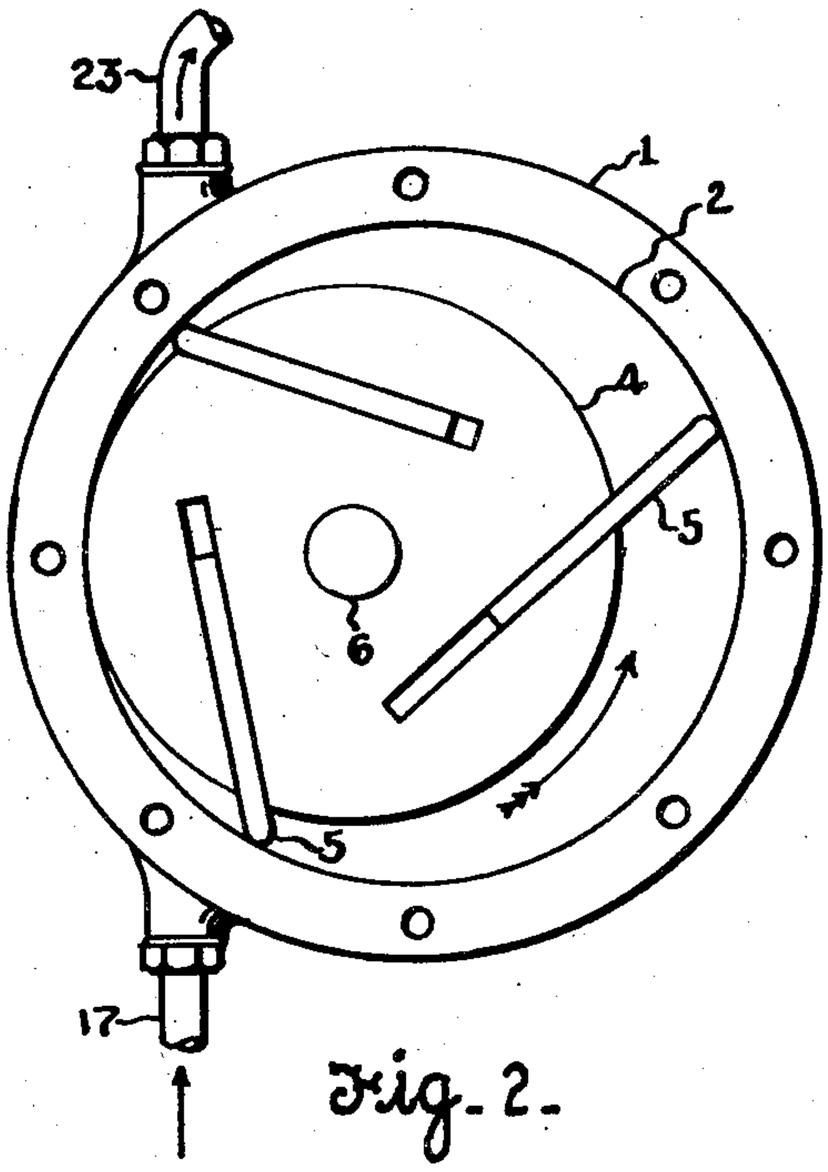


Fig. 2.

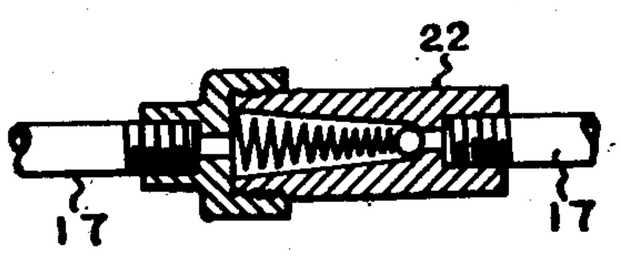


Fig. 4.

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VACUUM PUMPING APPARATUS

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3 Claims. (Cl. 230—2)

1

This invention relates to vacuum pumping apparatus and particularly to the production of a vacuum for energizing a windshield wiper or other automotive appliance.

In the practice now common, vacuum motors such as are used on motor vehicles to actuate windshield wipers and other appliances, derive energy from the vehicle engine through provision of a suction line leading to the engine intake. Such arrangements are open to serious objection for the reason that the applied vacuum effect has a wide range of fluctuation and falls off materially as engine load increases and in many installations, fails completely to energize the motor, when conditions are especially adverse. Such arrangements, therefore, are least dependable under conditions rendering their satisfactory performance most vital.

It has been proposed to eliminate reliance aforementioned on vacuum induced in the engine cylinders by deriving a vacuum from a gear type of pump driven by the engine, crank case oil being circulated through such pump for sealing purposes. This is believed an unsatisfactory solution of the problem because crankcase oil is an engine lubricant and as such is too thin to properly seal an inexpensive rotary pump. Moreover, the initial thinness of said oil is materially increased through engine heat. Also such oil frequently is badly fouled by carbon from the cylinders.

An object of the invention is to provide an apparatus that will apply dependable energy to a vacuum motor under substantially all conditions of engine operation.

Another object is to utilize an inexpensive type of bladed, rotary pump for evacuating the suction line of a vacuum motor, and to maintain the necessary seal at the blades of such motor by circulating a suitable quantity of oil through the pump chamber.

A further object is to adapt my improved pumping apparatus to be installed and operated independently of the lubrication system of the vehicle engine, so that it may use a sealing oil of viscosity best suited to the desired seal rather than to engine lubrication.

A further object is to provide for the actuation of a vacuum motor either by a small pump or by vacuum induced in the engine cylinders, whichever is at a given time more powerful.

A further object is to safeguard the apparatus against any access of the circulating oil to the vacuum motor.

These and various other objects are attained

2

by the construction hereinafter described and illustrated in the accompanying drawing, wherein:

Fig. 1 is a diagrammatic view of the apparatus as applied to energize a windshield wiper.

Fig. 2 is an elevational view of the pump with its cover broken away to show the impeller.

Fig. 3 is a side view of the pump.

Fig. 4 is a sectional view of a check valve employed in the apparatus.

In these views the reference character 1 designates the casing of a rotary pump, 2 a circular chamber formed in such casing, and 3 a removable cover for such chamber. Eccentrically mounted in the chamber 2 is an impeller comprising a disk 4 smaller than said chamber and occupying a substantially tangential relation to its periphery, and a plurality of blades 5 slidingly fitted in slots of said disk and projecting beyond the disk periphery to engage that of the chamber 2. The disk and blades are of an equal width such as to maintain sealing contact with the side walls of said chamber. Said disk is centrally secured on and driven by a shaft 6, suitably journaled in said casing, and centrifugal force urges the blades outwardly and against the periphery of the chamber 2 when the disk is driven, the blades sliding in or out according as they approach or recede from the point of tangency. It is preferred to journal the shaft in ball bearings mounted in the casing at opposite sides of the impeller, one such bearing 7 being set into an embossed central portion of the cover 3 and the other, 8 occupying a housing formed by an annular flange 9 on the casing 1. An oil seal 10 of ordinary construction is press fitted in said housing in exterior contact with the bearing 8. The described pump may be supported and driven in any desired manner and, as illustrated, is bolted to a bracket 11 serving to attach it to the engine 12 of a motor vehicle (not shown), being driven by a pulley 13 rotated by the fan driving belt 14.

An inexpensive pump of the described character would be quite unsatisfactory for vacuum purposes in absence of some provision for adequately sealing the sliding intersections of the blades with the pump casing, and it has been found that a quite satisfactory seal is obtained by continuously flowing through the pump a small quantity of a fairly heavy oil. It has been further found that such oil may be conveniently delivered to and discharged from the pump together with the impelled air. Thus an oil reservoir 15 is exteriorly mounted on the engine 12 and has

a restricted outlet 16 discharging from its bottom portion into a pipe 17 extending to the pump inlet from the intake manifold 18 of the engine. Connected to the pipe 17 at a point between the manifold and oil connection 16 is a pipe 19 extending to an ordinary vacuum motor 20 actuating any desired appliance as for example the illustrated windshield wiper 21. Thus the pump takes effect on the vacuum motor jointly through the pipes 17 and 19. It is preferred to insert a check valve 22 in the pipe 17 between its connections 16 and 19, such valve allowing a free flow toward the pump but positively preventing reverse flow. Such valve has two essential functions, namely, the prevention of oil delivery either to the vacuum motor or to the intake manifold. In absence of the check valve, shutting off of the engine would produce an oil flow to the motor to satisfy the vacuum left in such motor. In the next subsequent use of the wiper there would be an exhaust of such oil from the motor, whereby the windshield would be badly smeared. Also in absence of said check valve, there would be a flow of oil into the intake manifold whenever engine suction exceeds that of the pump, with result that the reservoir 15 would soon be emptied and the wiper would be inoperative or only partially operative during such oil flow.

Air and oil discharging from the pump 1 are conducted by a pipe 23 to the upper portion of the reservoir 15, the air being vented from the upper portion of the reservoir through an outlet 24.

In operation of the described system of energizing a vacuum motor, all operating conditions are fully met, the motor being responsive to either the pump 1 or engine manifold, whichever is productive of higher vacuum. When the engine vacuum drops off due to a heavy load or to engine acceleration, the pump will prevent any corresponding decrease in efficiency of the motor. When the engine is idling at a speed inadequate to get the best results from the pump, the engine will be producing a high vacuum and will assure efficient operation of the motor.

As compared to a system attempting to use engine oil for establishing a pump seal, the construction described has vital advantages. When a heavy oil is best suited to sealing purposes but poorly suited to engine lubrication, it is clear that poor results must follow from an effort to make one oil serve both purposes. The present system, moreover, avoids material heating of the circulating oil, whereas crankcase oil acquires a considerable temperature through engine operation. Thus my improved system avoids the considerable thinning effect that is imposed by heat on crankcase oil. It is necessary only at long intervals to replenish oil in my improved system since the oil circulation involves only a trifling diminution.

It is to be noted finally that my system is quite easily installed and entails no objectionable perforation of the engine crank-case, nor any disturbance of lubrication systems as now standardized.

What I claim is:

1. In a vacuum motor drive system, the combination with a vacuum-inducing power plant and a vacuum-inducing rotary pump, of intercommunicating suction connections from the power plant and the inlet of said pump to an area to be evacuated, means for maintaining a circulation of oil through said pump, and means associated with at least one of said connections positively opposing oil delivery to the area to be evacuated and also opposing such delivery to the power plant.

2. In a vacuum motor drive system, the combination with a vacuum-inducing power plant and a vacuum-inducing rotary pump, of a connection between the inlet of said pump, the low pressure area of said power plant, and an area to be evacuated whereby evacuation may be effected by either the power plant or pump, means for delivering oil to said connection for sealing the pump, and a check valve resisting oil flow through said connection to either the power plant low pressure area or the area to be evacuated.

3. In a vacuum motor drive system, the combination with a vacuum-inducing power plant and a vacuum-inducing rotary pump, of an oil reservoir exteriorly mounted upon said power plant and vented to the atmosphere above the normal oil level, of intercommunicating suction connections from the power plant and the inlet of the pump to an area to be evacuated, a restricted oil delivery connection from said reservoir to said suction connection opening into said reservoir from the pump outlet, and means resisting oil flow in said connections to the power plant and area to be evacuated.

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