May 9, 1933. C. E. JEFFERS 1,907,973

AUTOMOBILE FAN

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Fig. 1.

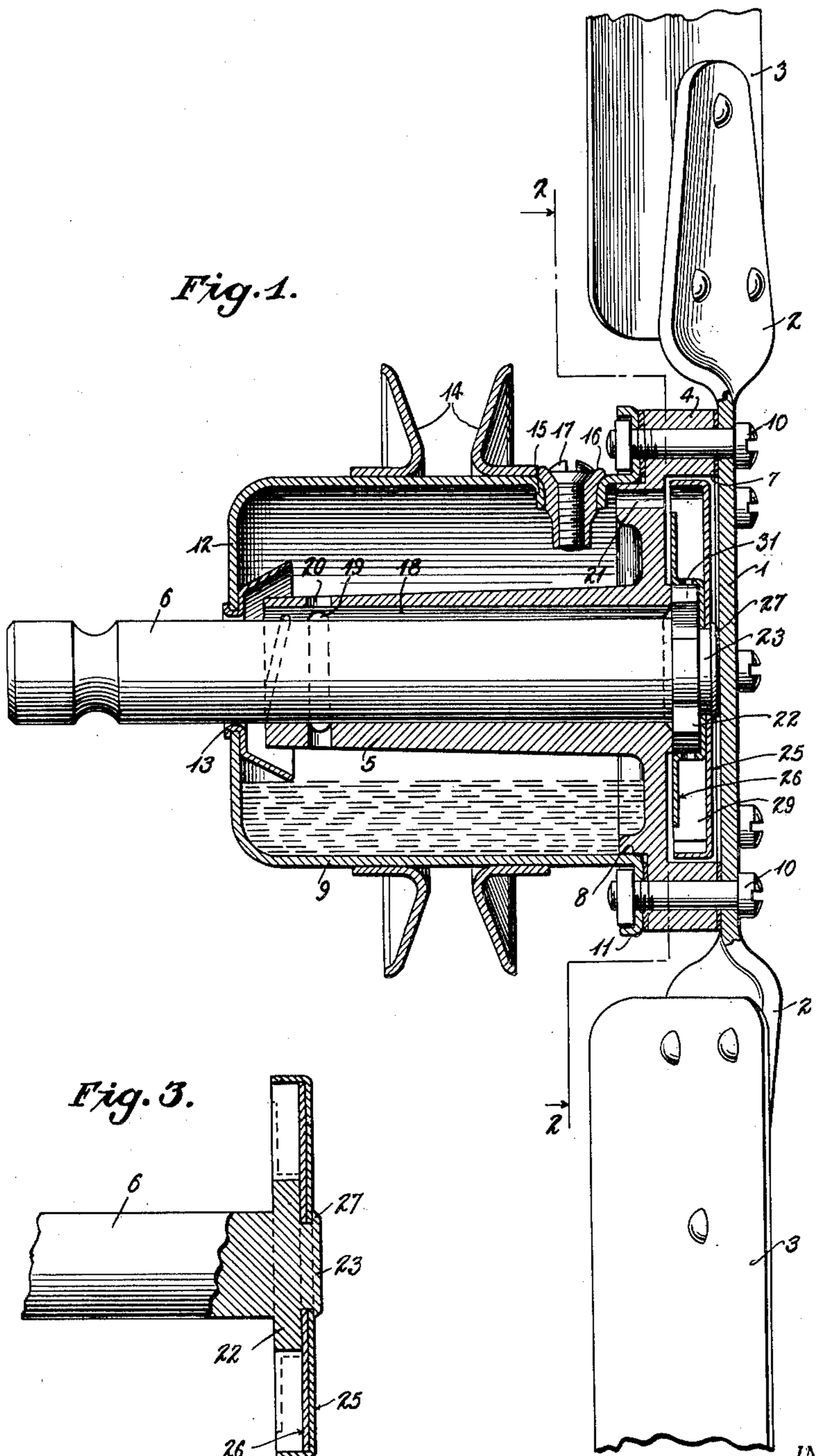

Fig. 3.

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Fig. 2.

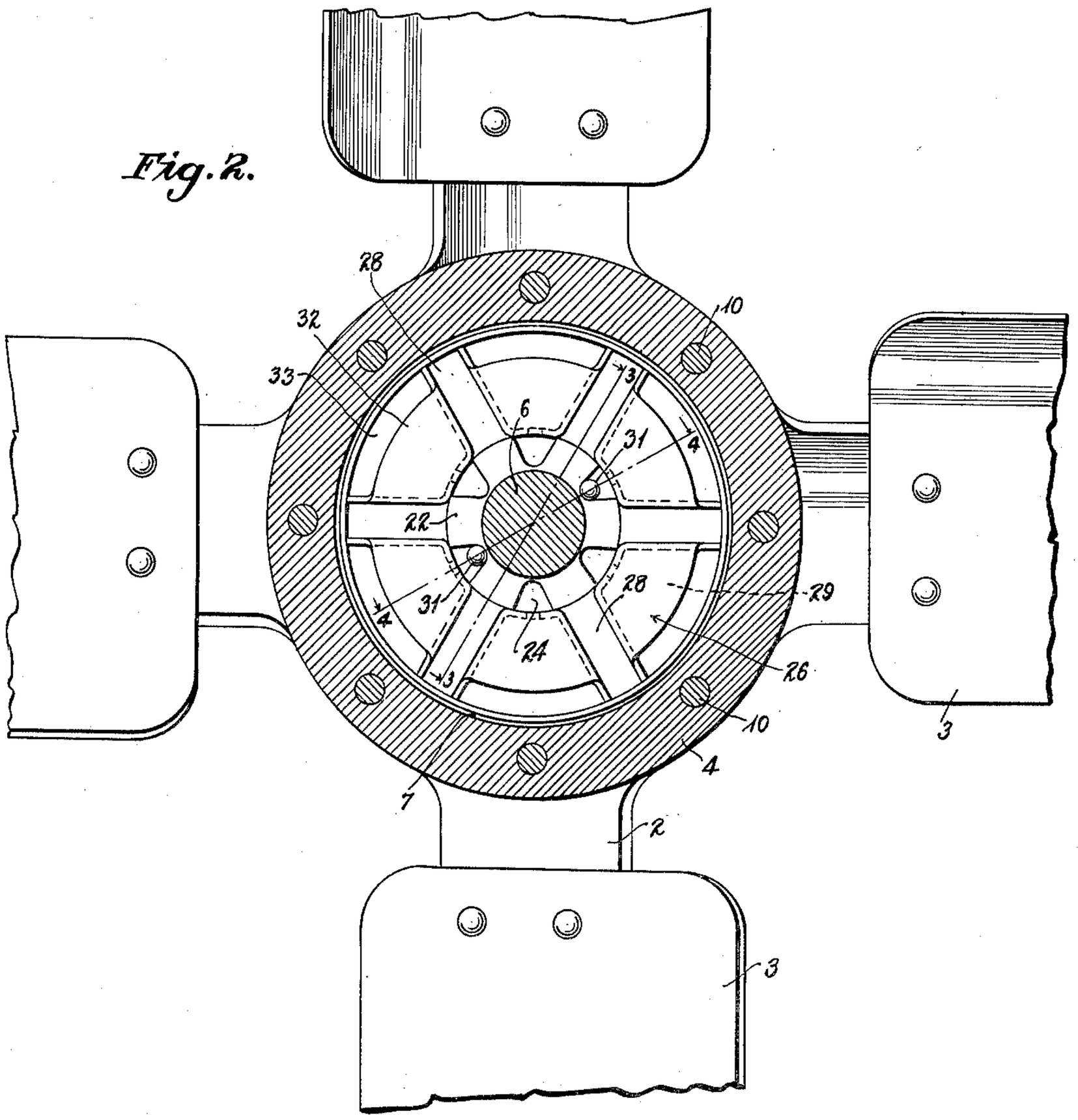


Fig. 4.

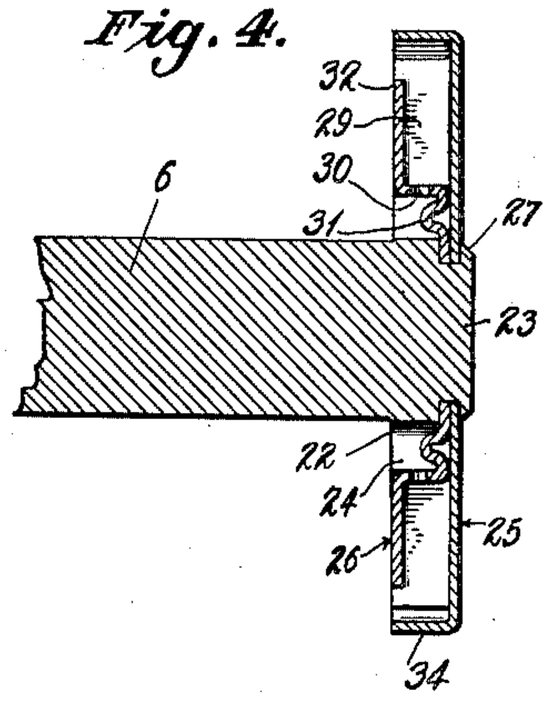
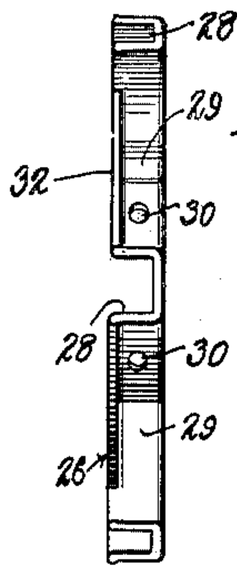


Fig. 5



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UNITED STATES PATENT OFFICE

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AUTOMOBILE FAN

Application filed May 29, 1928. Serial No. 281,536.

This invention relates to a fan structure designed for use in connection with the cooling systems of automobile engines. The invention is more particularly concerned with the problem of automatically and continuously effecting proper lubrication of such fans and with effecting economies in the commercial production of such automatically lubricated fans.

One of the principal objects of the present invention is to provide a fan structure which is capable of continuous and efficient self-lubrication and which can be commercially produced at a minimum cost.

More particularly, this invention contemplates the production of a self-lubricating fan wherein a majority of the parts may be formed from sheet metal by simple and inexpensive stamping and bending operations.

Also, this invention embraces the thought of minimizing the number of necessary parts and of facilitating production and assembly by certain novel features of construction and arrangement of the elements and units comprising the fan.

These and other objects and advantages of the present invention will be more easily understood after an inspection of the accompanying drawings and the following description thereof.

Fig. 1 is a view in longitudinal section of a fan constructed in accordance with the objects of this invention,

Fig. 2 is an end view partly in section, taken in the plane of the line 2—2 of Fig. 1 and looking in the direction of the arrows,

Fig. 3 is a detail view in section according to line 3—3 of Fig. 2,

Fig. 4 is a detail view in longitudinal section taken on line 4—4 of Fig. 2 and

Fig. 5 is a view in side elevation of one of the lubricant collecting elements.

The fan element of my improved device embraces in its construction a spider consisting of a circular sheet metal disc or plate 1 from which extend a plurality of radially directed arms or extensions 2. The arms 2 are preferably formed integral with the spider 1 and this unitary structure may conveniently be formed from sheet metal by a simple stamping operation. Fan blades 3 are mounted upon the arms and secured thereto by rivets or equivalent means. The desired feathering of the blades is accomplished by suitably bending arms 2.

The central disc portion of the fan spider is secured to the end face of a radial flange 4 and is supported thereby. This flange is formed integral with and extends radially from an end of an elongated hub or sleeve 5. A relatively stationary spindle 6 affords a rotative bearing support for hub 5 and the assembly carried thereby.

It will be appreciated that the structure thus far described is complete in so far as fundamental operativeness is concerned. However, it is apparent that the bearing surfaces of spindle 6 and sleeve 5 must be provided with some means of lubrication and it is with such a means that the present invention is chiefly concerned. To this end, a cylindrical lubricant reservoir 9 is secured to the fact of flange 4 opposite the fan spider in concentric relation with and surrounding spindle 6 and sleeve 5. Flange 4 is formed with a shoulder 8 of a diameter to receive the cylindrical end of reservoir 9 and a radial flange 11 of the reservoir bears against the corresponding face of flange 4. Securing bolts 10 pass through registering apertures in the disc portion of the spider and flanges 4 and 11. Suitable gaskets are interposed between the meeting faces of these elements for preventing the escape of lubricant. The end wall 12 of the reservoir encircles spindle 6 and is provided with a lubricant collector 13 for preventing leakage of lubricant around the spindle. Suitable packing may also be used in conjunction with this collector.

The face of flange 4 adjacent the disc 1

is centrally recessed for a substantial axial distance to form a closed chamber between the disc and the face of the flange which lies in the plane of the end of sleeve 5. A passage 21 in the flange places this chamber in communication with the lubricant reservoir.

The spindle 6 has formed integrally therewith, adjacent its outer end, an element 22 which serves the dual function of a thrust bearing member and a lubricant conveyor. As best illustrated in Fig. 1, this element 22 is in bearing engagement with the end of sleeve 5, thus acting to take the outward thrust of this sleeve and the fan assembly carried thereby As shown in Fig. 2 the element 22 is formed with radial pockets 24 of sufficient depth to expose the meeting surfaces of the sleeve and spindle. Thus, it is apparent that lubricant collected in the pockets will be fed to these bearing surfaces.

Disposed within the chamber formed by flange 4 and disc 1 is my improved lubricant collecting device. The elements of this device and their relationship are best illustrated in detail views 3, 4, and 5, from which will be seen that it comprises but two simple parts, namely, a collector 26 and a cup or housing 25. The collector, shown in detail in Fig. 5, is formed as a disc having a plurality of circumferentially spaced radial corrugations 28, defining between them lubricant collecting pockets 29 of generous proportions. The bottom wall of each of these pockets is provided with an aperture 30 and the collector is so arranged with reference to the thrust member 22 that the apertures lie in registration with the pockets 24 as shown in Fig. 2. Immediately beneath one or more of the apertures 30, the radial wall of the collector is formed with an inwardly directed lug or depression 31 which is so arranged with reference to the axis of the spindle that such lug seats in the bottom of the adjacent pocket 24 of the thrust member 22. Two such lugs are preferably employed as indicated in Fig. 2 and their purpose is to form an interlock between the lubricant collecting assembly and the non-rotatable thrust member.

The collector 26 and cup or housing 25 are of such design as to facilitate their construction from sheet metal stock by stamping or equivalent methods. The walls 32 of pockets 29 of the collector are of smaller radial dimension than the corrugations 28 which form the lateral walls of the pockets. The circumferential wall 34 of housing 25 projects over and fits upon the ends of corrugations 28. Thus, openings are formed between the peripheral edge of walls 32 and the circumferential portion 24 of the cap whereby lubricant may be discharged from the reservoir through aperture 21 into the several pockets.

The elements 25 and 26 forming the lubricant collecting means are mounted upon a reduced axial extension 23 of spindle 6 immediately adjacent the thrust member 22. The end of the spindle is peened over to engage and securely hold these elements in place. Thus, the spindle, thrust member, and lubricant collecting device are rigidly associated together and in effect form an integral unit.

In order to adequately take care of the inward axial thrust of sleeve 5 and associated fan assembly, the outer end of spindle 6 is arranged in close proximity to the inner surface of disc 1 whereby to have contact therewith and receive inward thrust therefrom. As heretofore pointed out, the oppositely directed axial thrust is received by member 22.

The reservoir is provided with a pulley formed by two stamped sheet metal flanges 14 arranged in opposed relation. These flanges may be pressed on to the reservoir or may be secured thereto in any other convenient manner such as shrinking or spot welding. The reservoir also has an opening punched therein as indicated by the inwardly extending annular flange 15. An internally threaded sleeve 16 is secured in this opening and receives a removable threaded plug 17, thus providing a means whereby the reservoir may conveniently be supplied with lubricant.

It will be understood, of course, that the bore of sleeve 5 is provided with some form of lubricant channel. This may be of straight, spiral or any other desired form but is herein illustrated as a straight channel 18. An annular groove 19 formed internally of the sleeve and spaced from the inner end thereof serves to collect lubricant from channel 18 and return it to the reservoir by way of ports 20. Obviously, any desired number of channels and ports may be employed.

Lubricant contained within the reservoir assumes the form of an annular layer upon the internal cylindrical surface of the reservoir during rotation of the fan. This, of course, is caused by centrifugal force, and by virtue of the location of aperture 21, the lubricant is forcefully discharged therethrough and into the pockets 29. From these pockets the lubricant passes inwardly to the smaller pockets formed in the thrust member and thence to the spindle and sleeve bearing surfaces and back into the reservoir. Thus, a continuous forced circulation is maintained.

From the foregoing description, it will be seen that the design and arrangement of parts is such as to permit the use of simple and inexpensive sheet metal stampings for all essential parts excepting the sleeve and spindle. Great economies in manufacture are thus achieved. It should also be apparent that the arrangement of elements affords a most convenient assembly plan since there are, in effect, three units, one consisting of the

spindle and lubricant collecting assembly rigidly carried thereby, the second consisting of the bearing sleeve and reservoir, and the third comprising only the fan spider and blades. By virtue of this construction and arrangement, the entire device can be readily dismantled by merely removing the fan spider. Finally, it should be appreciated that the device embodies a minimum number of parts for efficient operation.

Notwithstanding the specific nature of the disclosure herein made, it is to be understood that I do not regard all of the details thereof as essential to my invention. Therefore, the scope of my invention is not to be construed as limited other than by the limitations of the following claims.

Having thus described my invention, what I claim is:

1. In a fan the combination with a relatively fixed supporting spindle, of a radially slotted thrust receiving disc formed integral with said spindle and slightly spaced from one end thereof, a sleeve rotatably mounted on said spindle and having an end thereof disposed in bearing engagement with one face of said thrust receiving disc, a flange formed integral with said sleeve and extending radially from said end thereof, a cylindrical lubricant reservoir surrounding said sleeve and spindle and secured to one face of said flange, the opposite face of said flange being recessed, a fan spider secured to said opposite face of said flange and closing the open end or the recess whereby to form a closed lubricant chamber, said flange having an aperture passing therethrough for placing said reservoir and chamber in communication, said spindle having a part extending beyond said thrust disc and bearing against the inner face of said fan spider, and a lubricant collecting device disposed within said chamber and adapted to receive lubricant discharged from the reservoir through said aperture said device being secured upon the extended portion of said spindle and so arranged as to feed lubricant to the radial slots of said disc and means for conducting the lubricant from said slots to the bearing surfaces of said sleeve and spindle and then back into the reservoir.

2. In a device of the character described, the combination with a non-rotatable spindle, of a bearing sleeve on said spindle, a radial flange formed on one end of said sleeve, a lubricant reservoir secured to one face of said flange, the opposite face of said flange being recessed, a fan spider secured to said opposite face and closing the open end of said recess whereby to form a closed chamber, an aperture in said flange placing the reservoir and chamber in communication, and means mounted on said spindle, and within said chamber and spaced from said spider for collecting lubricant discharged from the reservoir through said aperture and directing the same to the bearing surfaces of said sleeve and spindle, said means comprising a sheet metal disc having a plurality of spaced radial corrugations formed therein, the spaces between such corrugations constituting pockets and a second disc forming a lateral closure wall for said pockets.

3. In a device of the character described, the combination with a non-rotatable spindle, of a bearing sleeve on said spindle, a radial flange formed on one end of said sleeve, a lubricant reservoir secured to one face of said flange, the opposite face of said flange being recessed, a fan spider secured to said opposite face and closing the open end of said recess whereby to form a closed chamber, an aperture in said flange placing the reservoir and chamber in communication, and means mounted on said spindle, and within said chamber for collecting lubricant discharged from the reservoir through said aperture and directing the same to the bearing surfaces of said sleeve and spindle, said means comprising a sheet metal disc having a plurality of spaced radial corrugations formed therein, the spaces between such corrugations constituting pockets and the transverse walls of said pockets being of less radial dimension than said corrugations which form the radial walls of the pockets, and a second disc forming the opposed transverse wall of said pockets, said second disc having a circumferential flange extending over the first mentioned disc whereby said flange forms the circumferential wall of said pockets, the space between the peripheral edges of the first mentioned transverse walls and the inner surface of said circumferential flange defining openings for the introduction of lubricant into said pockets.

4. In a device of the character described, the combination with a non-rotatable spindle, of a bearing sleeve on said spindle, a radial flange formed on one end of said sleeve, a lubricant reservoir secured to one face of said flange, the opposite face of said flange being recessed, a fan spider secured to said opposite face and closing the open end of said recess whereby to form a closed chamber, an aperture in said flange placing the reservoir and chamber in communication, and means mounted on said spindle, and within said chamber, for collecting lubricant discharged from the reservoir through said aperture and directing the same to the bearing surfaces of said sleeve and spindle, said means comprising a sheet metal disc having radially disposed pockets stamped therein, said pockets each having a bottom wall, two radial side walls and a single transverse side wall, the latter walls being of less radial dimension than said radial walls, a second cup shaped sheet metal disc cooperating with the first said disc to provide a second transverse wall

for said pockets and having its circumferentially flanged portion in engagement with and overlying the periphery of said radial walls whereby to form openings between said flange and the periphery of said first mentioned transverse walls for the introduction of lubricant into said pockets and the bottom walls of said pockets having apertures therein for the discharge of lubricant to said bearing surfaces.

5. In a fan, the combination with a relatively fixed supporting spindle, of a radially slotted thrust receiving disc fixedly mounted on said spindle and slightly spaced from one end thereof, a sleeve rotatably mounted on said spindle and having an end thereof disposed in bearing engagement with one face of said thrust receiving disc, a flange formed integral with said sleeve and extending radially from said end thereof, a cylindrical lubricant reservoir surrounding said sleeve and spindle and secured to one face of said flange, the opposite face of said flange being axially recessed, a fan spider secured to said opposite face of said flange and closing the open end of the recess whereby to form a closed lubricant chamber, said flange having an aperture passing therethrough for placing said reservoir and chamber in communication, said spindle having a part extending beyond said thrust disc and bearing against the inner face of said fan spider, and a lubricant collecting device disposed within said chamber and adapted to receive lubricant discharged from the reservoir through said aperture, said device being secured upon the extended portion of said spindle and so arranged as to feed lubricant to the radial slots of said disc and means for conducting the lubricant from said slots to the bearing surfaces of said sleeve and spindle and then back into the reservoir.

6. In a lubricating system embodying a fixed spindle and a rotatable housing including a lubricant reservoir and a collecting chamber divided by a perforated partition, said housing having a bearing surface surrounding said spindle, said spindle having one end disposed in said chamber, a thrust receiving and lubricant collecting device on said spindle end and having means establishing communication between said reservoir and the bearing surfaces of the housing and spindle, the extremity of said spindle end being disposed intermediate said means and the outer wall of said chamber and being engageable with said wall to receive the thrust thereof.

7. In a lubricating system embodying a fixed spindle and a rotatable housing including a lubricant reservoir and a collecting chamber divided by a perforated partition, said housing having a bearing surface surrounding said spindle, one end of said spindle being disposed within the chamber and being provided with spaced flanges, a collector mounted between said flanges and surrounding one of said flanges, said one flange having means cooperating with said collector to conduct lubricant to the bearing surfaces of the housing and spindle, the extremity of said end being closer than said collector to the outer wall of the chamber, whereby the thrust of said wall will be received by said extremity.

In testimony whereof I affix my signature.

CLARENCE E. JEFFERS.