United States Patent [19]

Hubert

[11] **3,834,493**

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[54] **RECLASSIFIER FOR OIL FOG LUBRICATION SYSTEMS**

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[52] **U.S. Cl.** ..... **184/7 R,** 55/462, 184/6.26

[51] **Int. Cl.** **F16n 39/00**

[58] **Field of Search** ..... 55/462 X; 184/7 R, 7 D, 184/7 C R, 55 A, 6.26

[56] **References Cited**

UNITED STATES PATENTS

2,753,953	7/1956	Tear	184/6.26 X
3,052,318	9/1962	Thomas	55/465

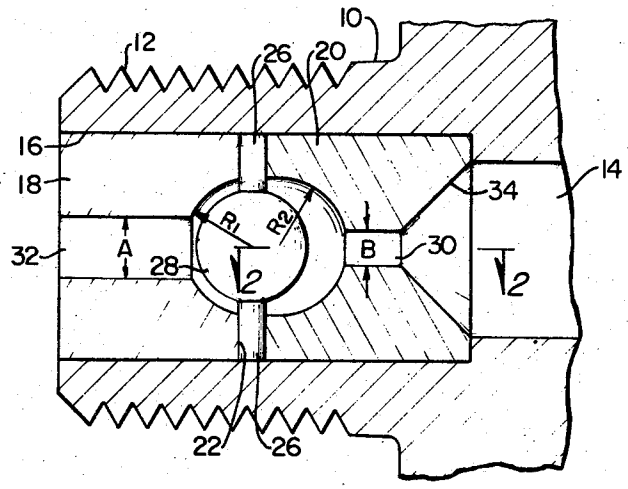
Primary Examiner—Manuel A. Antonakas

Attorney, Agent, or Firm—Sheridan, Ross & Fields

[57] **ABSTRACT**

Reclassifier for oil fog lubrication systems for producing oil droplets of discrete size for lubricating machines or the like, characterized by a generally spherical chamber having a ball supported therein forming a surrounding passageway between a supply orifice and a diametrically disposed discharge orifice. A film of oil collects on the upstream face of the ball and flows around its surface to the downstream face where it is picked up by the air flow and is discharged in the form of droplets through the discharge orifice.

10 Claims, 4 Drawing Figures



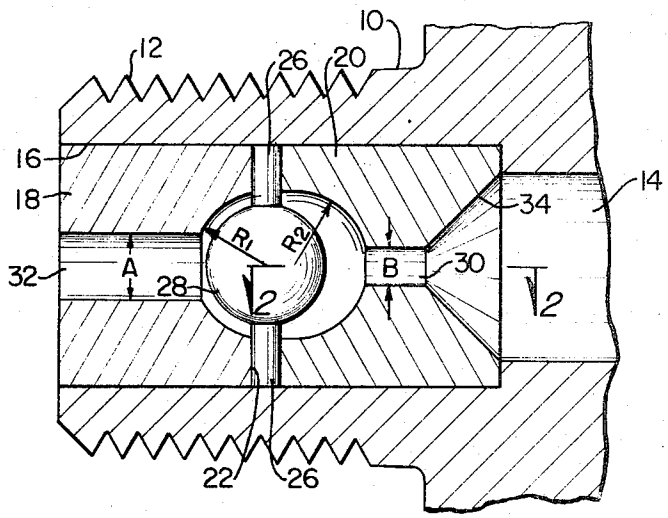


FIG. 1

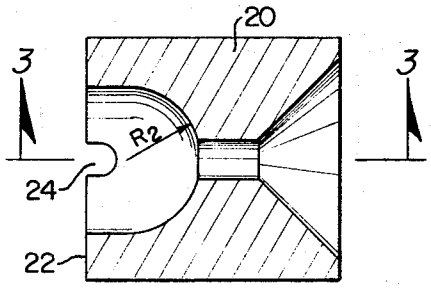


FIG. 2

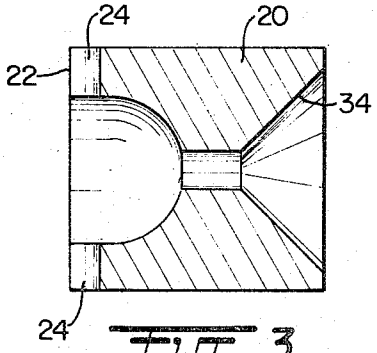


FIG. 3

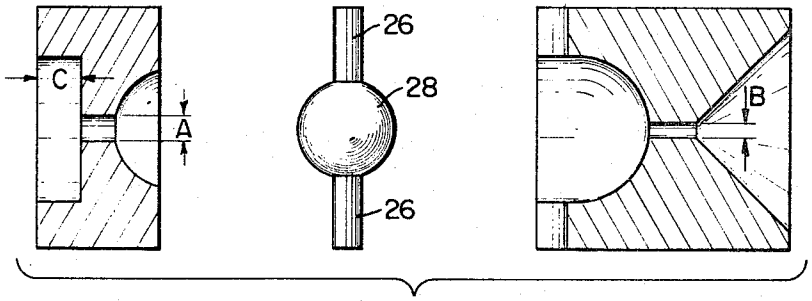


FIG. 4

RECLASSIFIER FOR OIL FOG LUBRICATION SYSTEMS

BACKGROUND OF THE INVENTION

In the art of lubrication of moving parts of tools, machinery, and the like, it is conventional practice to form an aerosol of oil particles suspended in an air stream and coalesce or reclassify the particles of oil into discrete size drops near the locus of application. Various devices have been devised for this purpose, exemplary of which are disclosed in such U.S. Pat. Nos. as Norgren 2,840,185; Tear 2,753,953; Bystricky 2,772,750; Thomas 2,954,844 and Gothberg et al, 2,959,249. The principles of operation involve change of velocity, adhesion, change of direction of flow, impingement, turbulence, centrifugal force and possibly others.

Ideally, such a device should reclassify substantially all of the oil fog particles into "wet" usable droplets for reasons of economy and also to minimize contamination of the ambient air to which the air stream is lost, vented or exhausted along with any remaining particles suspended therein.

SUMMARY OF THE INVENTION

The present invention relates to the general type of device just referred to and is a highly efficient reclassifier characterized by a generally spherical chamber having a ball supported therein, providing a space thereon about and through which the aerosol flows from a supply orifice to a diametrically disposed discharge orifice. Impingement of the stream on the upstream face of the ball "wets" same with precipitated particles and this film flows around the surface of the ball to its downstream face where droplets of discrete size are picked up by the air flow and discharged through the discharge orifice. By proper choice of the sizes of the orifices, the quantity of reclassified particles per unit time may be varied between wide limits to thus satisfy the lubrication requirements of various machines, bearings, moving parts, etc.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a longitudinal central section of the subject of the invention, a portion being broken away, and illustrated about seven times actual size;

FIG. **2** is a section taken on line **2—2**, FIG. **1**, the ball shown in FIG. **1** being omitted;

FIG. **3** is a section taken on line **3—3**, FIG. **2**; and

FIG. **4** is an exploded view of a modification of portions of FIG. **1**.

DESCRIPTION OF PREFERRED EMBODIMENTS

Referring now to the drawing, and first to FIG. **1**, the subject of the invention comprises a body member **10** or pipe fitting having at one end a bore **14** to which aerosol is supplied and threads **12** at its other end adapted to be connected to a machine part adjacent a bearing or other part which requires wet lubrication in the form of droplets.

Member **10** is provided with a cylindrical bore **16** which, for purposes of comparative dimensions may be considered as 0.250 inch in diameter, the drawing being to scale and about seven times actual size.

Bore **16** telescopically receives a pair of axially aligned inserts **18, 20** which abut at a face **22.** Insert **20** is provided with a pair of axially aligned slots **24,** as best

shown in FIGS. **2** and **3,** which receive pins **26,** the axis of which extends through the center of a ball **28** or ball-like member to which they are integrally connected. As will be apparent, the ends of the pins lie within slots **24** so that face **22** on insert **18** abuts one side of each pin, locating the ball in a predetermined position relative to the two inserts.

A hemispherical cavity is formed in insert **18** having a center of curvature at the center of the ball, as indicated by radius of curvature R_1. As will be apparent, this provides a space of uniform width around the ball at the left half thereof. Insert **20** is provided with a similar cavity of radius R_2 which is the same as R_1 but its center is displaced to the right side of the center of the ball. The space surrounding this side of the ball is thus of non-uniform width and is essentially a crescent of revolution, narrowing in width in all radially outward directions until its width is finally the same as the space on the left side of the ball. The two aligned cavities form a generally spherical cavity, the latter being illustratory of a preferred cavity but of course the invention is not intended to be so limited with other cavities, such as a true spherical cavity with the ball located centrally therein, being within the scope thereof.

In the embodiment illustrated, an aerosol supply aperture **30** is disposed in insert **20,** its axis intersecting the center of the ball, and a diametrically disposed discharge aperture **32** is disposed in insert **18.**

A frusto-conical chamber or entry mouth **34** joins bore **14** and aperture **30** which serves to eliminate extreme turbulence and provide a smooth transition and velocity increase as the aerosol flows into orifice **30** with substantially no reclassification occurring therein.

In operation, aerosol enters the spherical cavity and impinges with some turbulence upon the center of the right side of the ball and spreads outwardly in all radial directions. This impingement and turbulence at the right side of the ball wets it depositing an oil film thereon. The drag of the flowing air on this film moves it to the left side of the ball and as the air stream approaches the discharge orifice it, in the embodiment illustrated, increases in velocity due to the continued decrease in cross section. The stream picks up droplets (reclassified particles) which have coalesced on the left side of the ball, carrying same through the discharge orifice in the form of a fog with oil particles larger than those of the aerosol entering aperture **30.** As will subsequently appear, the reclassification rate may be varied by varying the diameters of the supply and discharge orifices without dimensional change of the ball and cavity in which it is disposed. Also, the shape of the generally spherical cavity may be modified, as mentioned, which in conjunction with varying the diameters of the orifices would change the reclassification rate. In the example so far described the ball diameter is 0.125 inch and R_1 and R_2 are 0.078 inch.

FIG. **4** is essentially the same as FIG. **1** except that R_1 and R_2 are 0.063 inch and ball diameter is 0.094 inch. The principal purpose of this figure is to illustrate a counterbore (0.150 inch diam.) with a variable depth C.

The classification capacities of the two embodiments follow wherein BI signifies bearing inch, a measure of lubrication requirement.

FIGS. 1–3

R_1, R_2 = .078"	Ball Diameter .125"	
BI	A Diam.	B Diam.
16	.070	.041
24	.086	.052
32	.099	.059
50	.025	.073
80	.156	.093

FIG. 4

R_1, R_2 = .063"		Ball Diameter .094"	
BI	A Diam.	B Diam.	Counterbore C.(.150" Diam.)
2	.025	.014	.046
4	.035	.021	.030
6	.043	.025	.020
8	.052	.029	0
12	.059	.036	0

What I claim is:

1. An oil aerosol reclassifier for coalescing oil particles suspended in an air stream into discrete droplets for use in lubricating parts of moving apparatus, comprising:

a. a body member having a generally spherical chamber therein,

b. a ball-lke member disposed within said chamber and means supporting same therein in a fixed position relative to the body member to form a space therearound,

c. an aerosol supply orifice communicating with said space and so oriented to discharge the aerosol in a direction substantially radially toward an upstream surface of the ball member,

d. a discharge orifice communicating with said space at a position substantially diametrically opposite from the supply orifice,

e. the construction and arrangement being such that aerosol impinging on the upstream surface of the ball member forms an oil film thereon which flows by frictional drag produced by air flow around the ball member to the downstream surface thereof from which it is picked up by the flow in the form of discrete droplets for delivery through the discharge orifice.

2. An aerosol reclassifier in accordance with claim **1** wherein said supply orifice has a cross section less than that of the discharge orifice whereby the velocity through the supply orifice is greater than the velocity through the discharge orifice.

3. An aerosol reclassifier in accordance with claim **1** wherein said ball member is supported in position by a pin having diametrically disposed ends, the axis of which is disposed transversely to the axis of the supply and discharge orifices, and about which said film may flow.

4. An aerosol reclassifier in accordance with claim **1** wherein the rate of flow of the aerosol is such that it is turbulent adjacent said upstream surface to thereby aid in coalescing particles thereof on the surface of the ball member.

5. An aerosol reclassifier in accordance with claim **1** wherein the velocity of the air around the downstream surface of the ball member increases as it moves toward the discharge orifice thus aiding in picking up oil disposed thereon.

6. An aerosol reclassifier in accordance with claim **1** wherein said spherical chamber is formed of two parts having abutting ends, a substantially hemispherical cavity in each, the two cavities being aligned to form the generally spherical cavity.

7. An aerosol reclassifier in accordance with claim **6** wherein the two parts are provided with cylindrical outer surfaces and adapted to be fitted within a cylindrical bore of a member adapted to be secured to an aerosol supply conduit.

8. An aerosol reclassifier in accordance with claim **7** wherein the supply conduit has a cross sectional area considerably in excess of that of said supply orifice, and a substantially conical transition counterbore disposed between the supply conduit and supply orifice, the counterbore adapted to increase the velocity of the aerosol but without any substantial reclassification therein.

9. An aerosol reclassifier in accordance with cbaim **1** wherein said chamber and ball member are of predetermined size and the reclassification capacity is varied by choice of the cross sections of the supply and discharge orifices.

10. An aerosol reclassifier in accordance with claim **1** wherein the ball member supporting means extends between the ball member and body member at a position in non-alignment with the supply and discharge orifices, whereby spherical segments of the ball member are in alignment therewith.

11. An oil aerosol reclassifier for coalescing oil particles suspended in an air stream into discrete droplets for use in lubricating parts of moving apparatus, comprising:

a. a body member having a wall forming a chamber.

b. a baffle member disposed within said chamber and means supporting same therein in a fixed position relative to the body member to form a space therearound,

c. said wall having a surface formed by a first generatrix rotated about a reference axis, whereby all sections thereof in planes perpendicular to said axis are circular, said generatrix intersecting said axis at its ends and having a maximum radius at a point intermediate thereof to provide a divergent upstream surface portion between one end and toward the maximum radius and thence a convergent downstream portion toward its other end,

d. said baffle member having an outer surface formed by a second generatrix rotated about said reference axis, whereby all sections thereof in planes perpendicular to said axis are also circular and the distance between its outer surface and said wall at any section in a plane perpendicular to said axis is uniform, said second generatrix also intersecting said axis at its ends and having a maximum radius at a point intermediate thereof to provide a divergent upstream surface portion between one end and toward its maximum radius and thence a convergent downstream surface portion toward its other end,

e. an aerosol supply orifice communicating with said chamber and so oriented to discharge the aerosol along said axis onto the upstream surface portion of the baffle member for outward flow therearound,

f. a discharge orifice communicating with said chamber at a position along said axis and so oriented to receive aerosol flowing inward around the downstream surface portion of the baffle member,

g. the construction and arrangement being such that aerosol impinging on the upstream surface portion of the baffle member forms an oil film thereon which flows by frictional drag produced by air flow around the baffle member to the downstream surface portion thereof from which it is picked up by the flow in the form of discrete droplets for delivery through the discharge orifice.

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