Nov. 19, 1957 A. C. EISENHART 2,813,763

LUBRICANT COOLING SYSTEM

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Fig. 1.

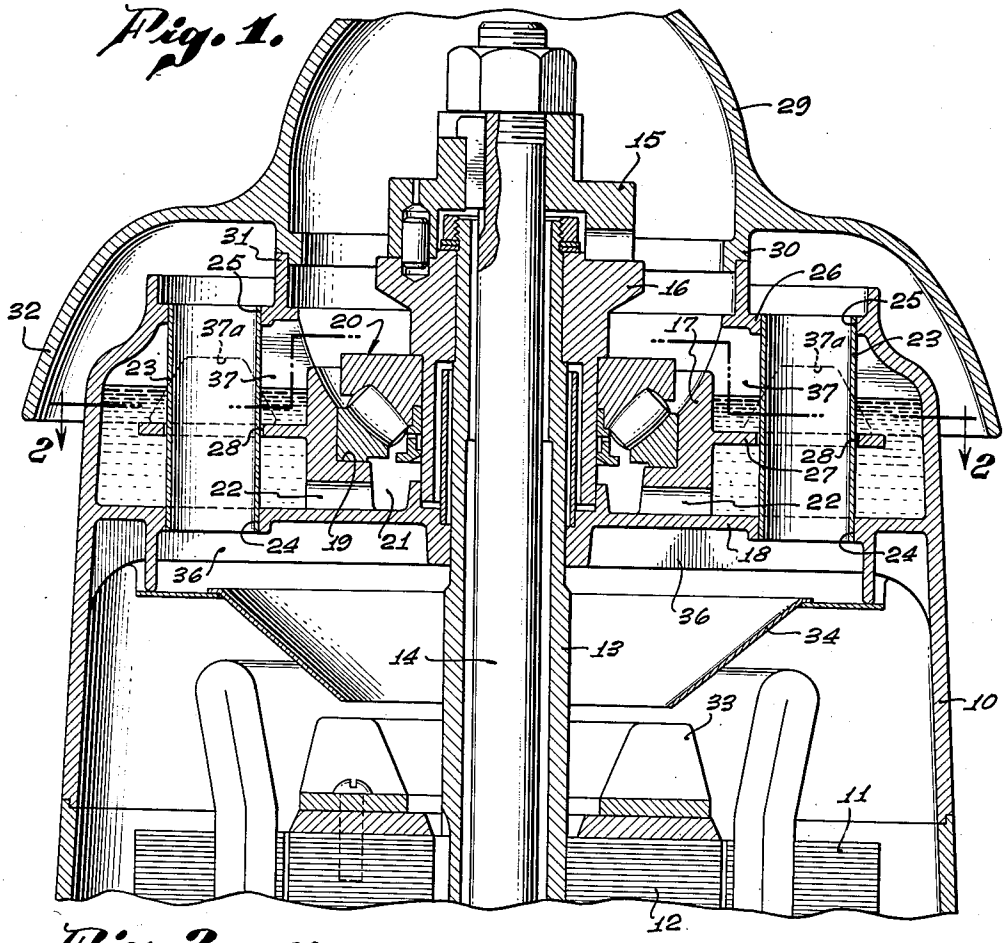


Fig. 2.

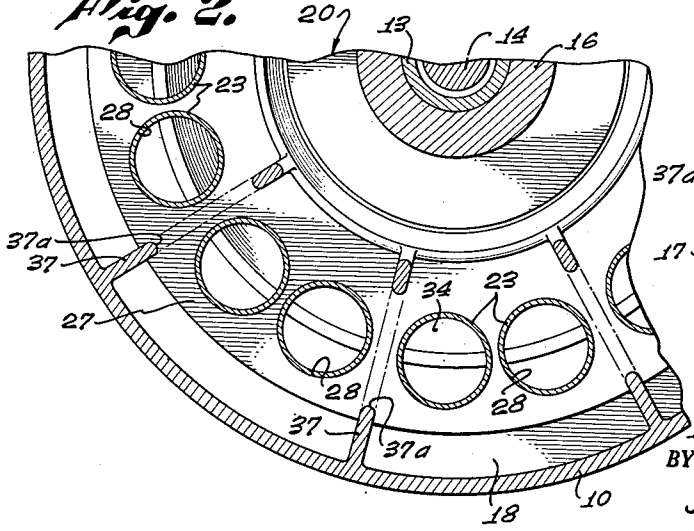
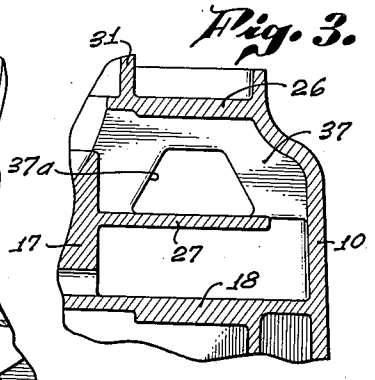


Fig. 3.



INVENTOR.
ARLIN C. EISENHART,
BY
Flam and Flam
ATTORNEYS.

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LUBRICANT COOLING SYSTEM

Arlin C. Eisenhart, Los Angeles, Calif., assignor to U. S. Electrical Motors, Inc., Los Angeles, Calif., a corporation of California

Application August 9, 1954, Serial No. 448,638

1 Claim. (Cl. 308—77)

This invention relates to a lubrication system for rotary apparatus, and especially to a system utilizing air currents for maintaining the lubricant cool.

It is an object of this invention to provide a casing structure for rotary apparatus, such as an electric motor, incorporating a lubricant well communicating with a bearing structure in which, by a simple arrangement of parts, the lubricant in the well is maintained cool.

It is another object of this invention to utilize in a simple manner a current of air created by a fan carried by the rotary structure within the casing in order to cool the lubricant. For this purpose, a series of flues or air ducts pass transversely through the lubricant well, the lubricant well being located above the fan.

This invention possesses many other advantages, and has other objects which may be made more clearly apparent from a consideration of one embodiment of the invention. For this purpose, there is shown a form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of this invention is best defined by the appended claims.

Referring to the drawings:

Figure 1 is an axial sectional view of the upper portion of a vertical electric motor incorporating the present invention;

Fig. 2 is a fragmentary sectional view, taken along the plane corresponding to line 2—2 of Fig. 1; and

Fig. 3 is a fragmentary sectional view, corresponding to a part of the structure shown in Fig. 1, the lubricant being omitted.

Supported within a motor casing frame **10** are stator and rotor structures **11** and **12**.

The rotor **12** has a hollow shaft **13** adapted to be coupled to a load shaft **14** located therein. For this purpose, coupling members **15** and **16** are provided at the upper ends of the shafts **13** and **14**.

The shaft **13** projects axially through a bearing cup **17** that is formed integrally upon a supporting web **18**. The web **18**, having radially extending ribs **36** on its lower side, extends inwardly from the casing frame **10**.

The cup **17** has an intermediate shoulder **19** upon which the outer race of a roller bearing structure **20** rests. The lower coupling member **16** carries the inner race of the bearing structure **20**.

An annular lubricant well extends entirely about the cup **17**, the lubricant well being bounded by the exterior surface of the cup **17**, the interior surface of the casing frame **10**, and that portion of the upper surface of the web **18** located between the cup **17** and the casing frame **10**. The upper end of the casing frame **10** has a continuous flange **26** extending inwardly substantially to overlie the lubricant well.

Several angularly spaced reinforcing ribs or vanes **37** (see, particularly, Fig. 3) extend radially between the

upper portion of the cup **17** and the casing frame **10**. The lower edges of the ribs are spaced above the web **18**, and joined thereat to the upper surface of a substantially annular supporting flange **27** extending outwardly from the cup **17**. The flange **27** extends below the normal level of lubricant in the well, the outer edge of the flange terminating short of the casing frame **10**. Openings **37***a* are formed in the reinforcing ribs that adjoin the flange **27** in order to ensure free circumferential movement of the lubricant at the upper levels of the well.

Lubricant may pass into the cup **17** to an annular space **21** beneath the bearing structure **20** through a plurality of radial passages **22** near the base of the cup **17**. The lubricant from the annular space **21** may pass upwardly through the bearing structure and over the upper edge of the cup **17** or through a slot or port in the cup back to the lubricant well.

In order to cool the lubricant in the well, a series of ducts or flue pipes **23** are provided. These ducts **23** extend upwardly entirely through the well. Air passing through the ducts **23** conducts heat from the lubricant, the ducts **23** being made of metal material having good heat-transfer properties.

The lower ends of the ducts or flue pipes **23** sealingly fit apertures **24** provided in the web **18**. The upper ends of the flue pipes **23** fit apertures **25** formed in the overlying flange **26** of the casing frame **10**.

The supporting flange **27** has apertures **28** through which the ducts **23** project with slight clearance.

In the present instance, the ducts **23** are arranged uniformly, there being one series of closely angularly spaced ducts. A different arrangement of ducts could, of course, be provided, it being essential only that the ducts permit substantial total flow of air and that the ducts have a substantial area exposed to the lubricant in the well.

The flue pipes **23** establish communication between the space beneath the web **18**, in which the motor structure is accommodated, and the exterior of the casing frame **10**.

Air is urged downward through the ducts or flue pipes **23** by the aid of a series of fan blades **33** fastened to the end of the rotor **12**. A conical deflector **34** appropriately directs the air into the ducts.

A bell cap cover **29** has a central stepped flange **30** fitting within an annular upwardly extending terminal portion **31** of the overlying casing frame flange **26**. The bell cap cover **29** has a peripheral portion or flange **32** projecting over the upper ends of the ducts **23** and downwardly along the casing frame to shield the ducts **23**. This shielding flange **32** ensures against material entering into the casing frame **10** through the ducts **23**, while permitting egress of air from the casing.

The inventor claims:

In a lubricant cooling system for a vertical electric motor having a fan; a casing for the motor; a partition wall extending transversely of the casing beneath the top thereof and dividing the casing into an upper space and a lower space; said wall having a centrally located apertured cup for accommodating a bearing structure and for passage of the shaft of said motor; said cup having an integrally formed outwardly extending flange provided with a series of angularly spaced openings; said upper space forming a circular lubricant reservoir into which said cup flange radially projects, said reservoir being bounded by the casing and by the cup; said casing having an inwardly extending flange overlying the marginal portion of the partition wall, and provided with a series of angularly spaced openings; said partition wall also having a series of angularly spaced openings aligned respectively with the openings of said casing flange; a series of ducts, each fitting at opposite ends an opening of the flange and

the corresponding opening of the partition wall and extending through an opening of the cup flange; a cover having a central portion fitting the terminal portion of said casing flange, exposing said ducts exteriorly of the casing, said cover having an annular flange overlying the openings of said casing flange and extending downwardly beeath the casing flange along and spaced from the exterior of the casing; a deflector secured to the underside of the partition wall forming a guide for air between the openings of said partition wall and the lower space; and a series of reinforcing vanes angularly located about the cup and joining the cup to the casing flange, said vanes

extending into the reservoir and having openings permitting circular movement of lubricant in the reservoir.

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