

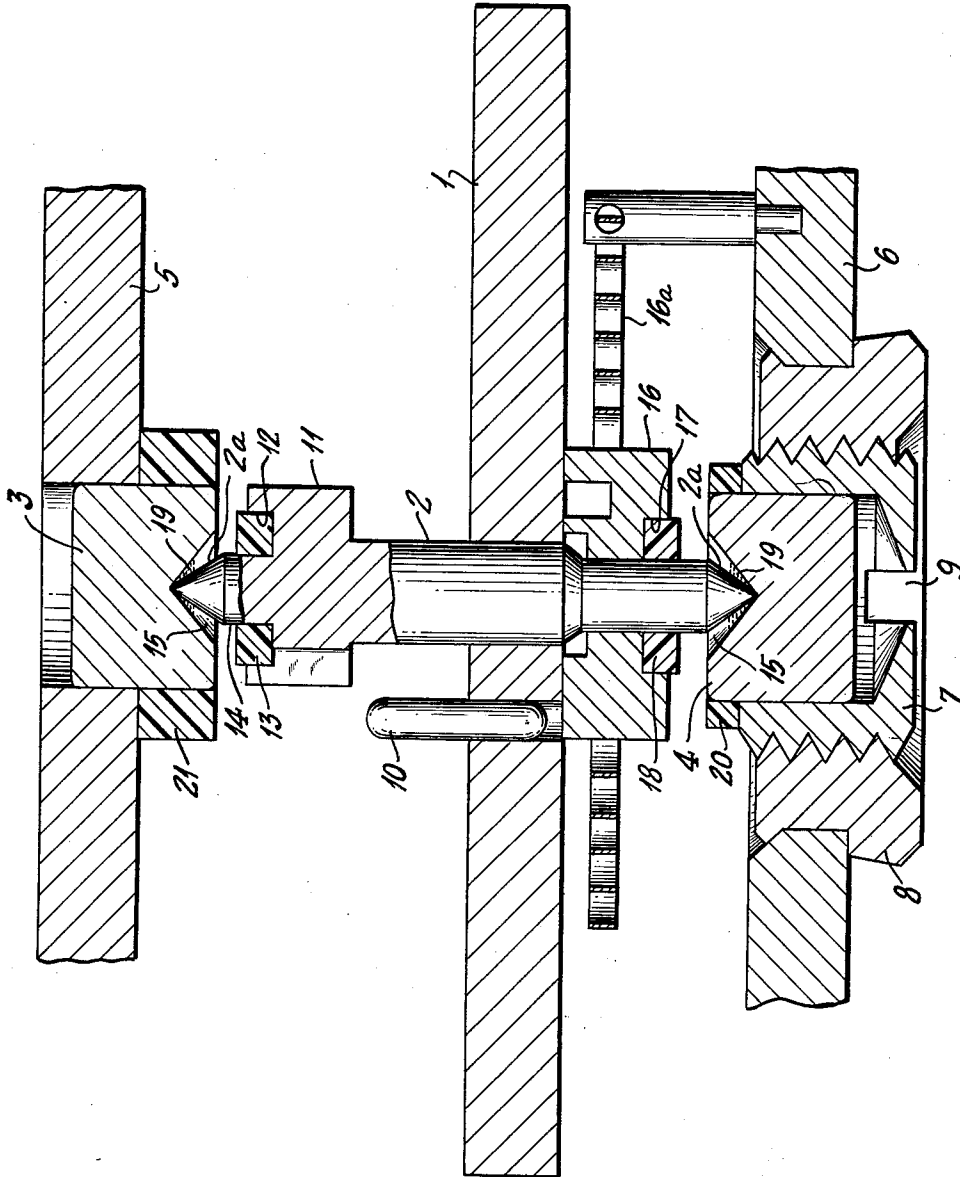
March 12, 1963

A. J. BODY

3,080,703

WATCH LUBRICATION SYSTEM

Filed Jan. 12, 1961



INVENTOR.
ALBERT J. BODY

BY

Davis, Horie, Faithfull & Hapgood
ATTORNEYS.

1

3,080,703

WATCH LUBRICATION SYSTEM

Albert Joseph Body, Waterbury, Conn., assignor to The United States Time Corporation, Waterbury, Conn., a corporation of Connecticut

Filed Jan. 12, 1961, Ser. No. 82,291

5 Claims. (Cl. 58-140)

This invention is in the field of lubrication systems for watches and clocks and in particular relates to apparatus and methods for preserving lubricant in the balance pivot stud recesses.

It is known that watches and clocks of the oscillating balance wheel-hairspring variety occasionally fail to function properly after a short period of use because of the occurrence of a condition of insufficient lubricant in the balance wheel stud recesses. I have found that one reason for this condition is that there is creepage of lubricant out of the pivot stud recesses on to both the watch frame and the balance wheel assembly until the initial quantity of lubricant stored in the recesses has been dispersed in large part to other areas.

The present invention consists of a barrier of material especially selected to have a high contact angle factor with respect to the lubricant. The contact angle of a given material is a physical characteristic indicating whether a small droplet of liquid deposited on the surface will flatten out and spread over a wide area or whether it will tend to remain in spherical form. High contact angle material is of the form in which the fluid remains as a droplet rather than as a film spread widely over the surface of the material. I have found that when a barrier of such material is compressively attached to the end of the balance staff it will prevent oil creepage not only across the surface of the barrier and around the barrier but also between the staff and the barrier. I have also found that annular barriers compressively disposed on the outer surface of the balance studs will prevent oil creepage either across the surface of the barrier or between the barrier and the stud on to the frame members supporting the studs. Moreover, when oil barriers of this type are compressively attached to the working members there is little danger of their being loosened during cleaning operations. A further feature of importance in watches and clocks of the mass produced variety is that the barriers prevent particles of brass or copper plating from dropping into and contaminating the balance lubricating oil.

The invention may more readily be understood by reference to the single drawing which is a partial cross-sectional view of a watch or clock balance wheel and pillar plate or frame assembly embodying the preferred form of the invention.

In the drawing the balance wheel 1 affixed to the balance staff 2 is supported for rotation by the pivots 2a in the balance studs 3 and 4 which in turn are supported by the pillar plates or frames 5 and 6, respectively. The balance stud 4 is set in the balance screw 7 which is screwed into the hairspring regulator bushing 8 staked into the pillar plate or frame 6. The balance screw 7 is provided with a slot 9 in order that the balance stud 4 may be adjusted either inwardly or outwardly to provide the proper longitudinal spacing for the balance staff. The balance wheel 1 is provided with the roller pin 10 which

2

intermittently receives energy from the main spring and train in the usual manner.

It is to be noted that the staff 2 is provided at its upper end with an enlarged flange portion 11 having an annular recess 12. An oversized washer 13 of high contact angle deformable material, preferably Teflon, is compressed on to the neck 14 of the staff and into the recess 12. I have found that an annular Teflon washer 13 having a central hole of a size approximately two thousandths of an inch less than the diameter of the neck 14 and having an outside diameter approximately two thousandths of an inch larger than the inside diameter of the recess 12, when compressed into the recess, effectively eliminates oil creepage from the pivot seats 15 on to the staff 2 at points beyond the exposed surface of the barrier 13. Teflon bodies also have the known property of high resistance to deterioration by lubricating oils and cleaning solutions of the types commonly used with watches. These properties are set forth in U.S. Patents 2,392,388, 2,392,389 and 2,559,750.

At the opposite end of the staff 2 is seen the hairspring hub or collet 16 which carries the inner end of the hairspring 16a. The outer end of the collet 16 is similarly provided with a recess 17 into which is compressed another oversized Teflon washer 18 as above described.

Both washers are preferably of greater thickness than the depth of the recesses to provide a longer oil creepage path than would be obtained if they were flush with the surface of the recesses.

To further prevent oil creepage from the pivot cavities 15 of the balance studs, the inner ends of the studs 3 and 4 projecting beyond the pillar plates are also provided with undersized Teflon washers 20 and 21 stretched over the studs. The oil 19 is thus confined to the pivots and the balance stud cavities 15 as desired.

What is claimed is:

1. In a timekeeping device lubricated by a liquid lubricant, the combination of a rotating shaft having a bearing surface disposed thereon, and an annular washer of deformable material having an internal diameter less than the outer diameter of said shaft disposed on the shaft adjacent to the bearing surface, said washer being of material having a high contact angle relative to the lubricant.

2. In a timekeeping device lubricated by a liquid lubricant, the combination of a rotating shaft, said shaft having a bearing surface thereon, and an annular washer of deformable material having an internal diameter less than the outer diameter of said shaft disposed on the shaft adjacent to the bearing surface and a rigid retaining member surrounding the outer surface of said washer compressively engaging the washer to bias said washer against the shaft, said washer being of material having a high contact angle relative to the lubricant.

3. In a timekeeping device lubricated by a liquid lubricant, the combination of a rotating shaft having a bearing surface thereon, a lubricant retaining bearing member within which said shaft is disposed for rotation, a frame member adapted to support said bearing member, a first annular washer of deformable material having an internal diameter less than the outer diameter of said shaft disposed on the shaft adjacent to the bearing surface and a second annular washer of deformable material having an internal diameter less than the outer diameter of said bearing member disposed on the outer surface of the

3

bearing member between the frame and the end of the bearing member, said annular washers being of material having a high contact angle relative to the lubricant.

4. In a timekeeping device lubricated by a liquid lubricant, the combination of a liquid retaining cavity, a rotating shaft having a bearing surface at its end, and a material having a high contact angle relative to the lubricant compared to the shaft, wherein the high contact angle material is secured onto the shaft adjacent to the bearing surface, whereby the lubricant in the cavity is prevented from

4

migration up the shaft by the high contact angle material.

5. The combination as in claim 4 in which said material of high contact angle relative to the lubricant is also of high resistance to deterioration by lubricating oil and cleaning solvents.

References Cited in the file of this patent

FOREIGN PATENTS

302,967 Switzerland ----- Jan. 17, 1955