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METHOD OF LUBRICATING A TIMEPIECE MOVEMENT

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5 Claims

ABSTRACT OF THE DISCLOSURE

A solid lubricant in admixture with a material having an affinity for the solid lubricant and the surface to be lubricated and in an amount sufficient to form a film on the solid lubricant particles together with a solvent for the material is applied to a timepiece movement. The solvent is volatile and evaporates to leave the solid lubricant with its film of material held in place on the timepiece movement.

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of application Ser. No. 435,081, filed Feb. 24, 1965, and now abandoned.

BACKGROUND OF THE INVENTION

The lubrication of the escapement of a timepiece is a problem for which an absolutely satisfactory solution has not yet been found. The generally used method consists in depositing by means of an oil-pike a drop of a suitable oil used in watch-making on the impulse faces of the pallets of the lever. Owing to the successive passages of the teeth of the escape wheel, the drops of oil deposited on the pallets are swept, so that the major portion of the oil is carried outside the functional surfaces, where it can no longer take a part in the lubrication. If this oil excess were discharged into a zone where it would be localized, the harm would not be so great, after all, but it spreads over the whole piece in the form of a film which is more or less thick as the case may be and it reaches functional places on which it is indispensable to avoid the presence of a lubricant, or else the rate of the timepiece is greatly disturbed. It is obvious that numerous solutions have already been proposed to overcome this drawback. However, none of them was up to now entirely satisfactory from a technical and economical point of view.

BRIEF SUMMARY OF THE INVENTION

The present invention aims at overcoming these drawbacks. It has just been seen that the use of liquid lubricants such as oil is not desirable, particularly in the case of the escapement. Therefore, a lubricant has to be sought which, while withstanding the very high specific pressures occurring in certain places of a watch, does not spread. The use of greases is not suitable for several reasons the principal of which resides in the fact that the thickness and the viscosity of the lubricating film are such that the movable parts are braked in their motion. On the other hand, the use of solid lubricants such as, for instance, graphite, molybdenum disulphide, tungsten sulphide or organic compounds, renders possible in certain conditions the formation of a lubricating film whose resistance to wear is high. It is however difficult to form with the desired certitude the lubricating film on parts which are as small as those constituting a watch.

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The invention relates to a method of lubricating a timepiece movement, more particularly its escapement, comprising applying onto the surface to be lubricated, by means of a micro spraying-pistol, a conveyor solvent containing in suspension a compound consisting of a solid lubricant in powder form and in dissolution a material adapted to form a film surrounding each grain of the solid lubricant after the solvent has evaporated, said film ensuring the adhesion between the said surface and the grains of the solid lubricant.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is directed essentially to a particular formulation of a lubricating agency adapted to be spray-applied to timepiece movements, and to the method employed for its application. Essentially, it has been found that powdered dry lubricant may be applied to a timepiece movement in such fashion that the lubricant will remain in place indefinitely both prior to assembly and while in actual use, provided that (1) it is applied in conjunction with a lubricating, film-forming medium which is liquid at room temperature and which is present in an amount sufficient only to form a film around each particle of dry lubricant and (2) that the dry lubricant and film-forming medium are initially present in a volatile liquid carrier having certain properties. These properties are that it is a solvent for the liquid film-forming agent and that it is sufficiently volatile as to completely or substantially completely evaporate before the mixture, when sprayed, reaches the surface to be lubricated. Thus, the mixture as it reaches the surface to be lubricated essentially is a mist or cloud which consists essentially only of the dry lubricant particles each of which is coated with a film of the liquid film-forming agent.

The thus wetted particles of dry lubricant will adhere tenaciously to the part lubricated and will remain in place thereon provided the film-forming agent displays an affinity for such part.

Various dry lubricants capable of being suspended in the volatile liquid carrier may be employed as, for example, molybdenum disulphide, tungsten sulphide and graphite, as well as such materials as Teflon (polytetrafluoroethylene) and the like. The dry lubricants must be in powder form and of such particle size as will readily form a suspension in the volatile liquid carrier. To this end, it is preferred that the dry lubricant be of particle size not to exceed about one micron. This will also assure sufficient dry lubricant surface area to substantially completely take up all of the film-forming agent, by virtue of the fact that the finely divided dry lubricant will itself form a substantially continuous film on the surface lubricated and thereby substantially completely cover it.

The film-forming agent may be an oil, specific examples of which are Synt-A-Lube oil (synthetic oil of the alkylphenylethylalcohol group), Etsyntha Silber oil (oil of the biester group with addition of neat's-foot oil) or a silicone oil.

The volatile liquid carrier must, as specified, volatilize so rapidly as to be substantially non-participating at the surface to be lubricated when the mixture is sprayed from a small distance onto such surface. The Freons, and particularly those ordinarily used as solvents (i.e., trichloroethane, trichloromonofluoromethane, and tetrachlorodifluoroethane), are preferred.

To assume proper flow from the spray nozzle such that the volatile carrier evaporates while forming a mist such that the dry lubricant particles coated with the film-forming agent may evenly and completely cover the part being lubricated, the volatile carrier is the principal liquid initially present and should exist initially in such amount as obtains a minor amount of solids (dry lubricant) con-

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tent in the order of at least about 1% by weight of the initial dry lubricant-liquid lubricant-volatile carrier mixture.

A preferred mixture consists of the following:

Powdered molybdenum disulphide	-----grams----	25	5
Synt-A-Lube oil	-----cc----	15	
Trichlorotrifluoroethane	-----cc----	1,000	

This mixture is sprayed by atomization with air directly on the teeth of an escapement wheel from a distance of about 50-60 mm. using air pressure of about 0.5-1 atmosphere in an amount to form a dry lubricant film of approximately 0.010 mm. thickness which substantially completely covers the surface to which the material is directed.

The term "oil" as used herein should be understood to relate to that class of oils used in watchmaking. As will be appreciated by those skilled in the art, watchmaking oils are of synthetic nature since no natural oils have been found which possess all of the properties desired in watchmaking, and they are compounded with the addition of oxidation inhibitors to assure good stability. A good grade of synthetic watchmaking oil may be used as the film-forming agent within the purview of this invention, preferred types of these oils being specified hereinabove.

What is claimed is:

1. The method of lubricating timepiece movements, which comprises:

forming an initial mixture consisting of a volatile liquid carrier, powdered dry lubricant suspended in said carrier and having a particle size not greater than about one micron and a liquid lubricant dissolved in said carrier and which is liquid at room temperature, said liquid lubricant being present in no greater amount than is absorbed on the surfaces of the dry lubricant particles,

spraying said mixture onto the surface to be lubricated in amount sufficient substantially to completely coat such surface with the liquid lubricant coated dry lubricant particles.

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and controlling the spray to substantially completely volatilize said carrier by the time the mixture reaches said surface.

2. The method according to claim 1 in which the volatile liquid carrier is trichlorotrifluoroethane.

3. The method according to claim 2 in which the dry lubricant is molybdenum disulphide.

4. The method according to claim 3 in which the liquid lubricant is an oil.

5. The method of lubricating timepiece movements, which comprises:

coating a timepiece surface to be lubricated with dry lubricant particles coated with a film of liquid lubricant by spraying a volatile liquid carrier containing the dry lubricant as a suspension and the liquid lubricant as a solute therein,

said liquid lubricant being present in no greater amount than is absorbed on the surfaces of said particles, and controlling the spray to substantially completely volatilize the liquid carrier by the time the mixture reaches the timepiece surface to be lubricated.

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