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[72] Inventor **Robert R. Lawson**
Somerset, Wis.
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[73] Assignee **The Bunker-Ramo Corporation**
Oak Brook, Ill.

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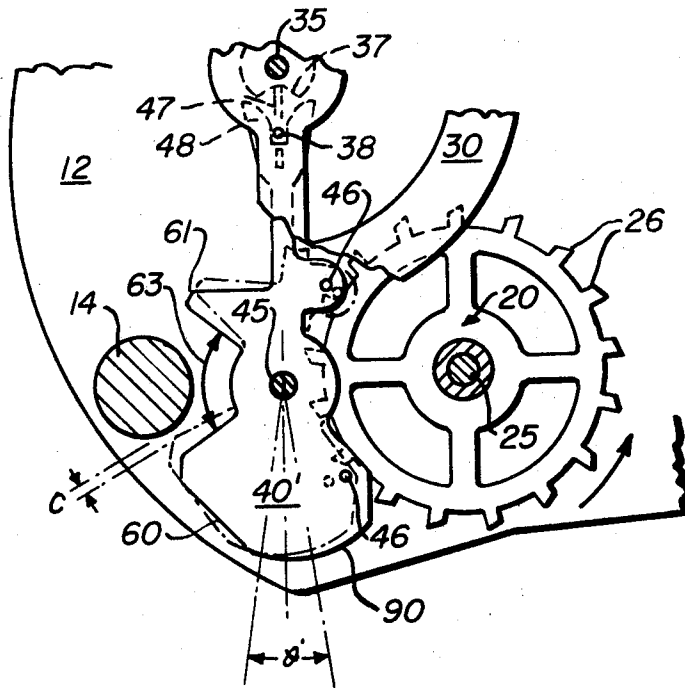
Primary Examiner—Richard B. Wilkinson
Assistant Examiner—Stanley A. Wal
Attorney—Frederick M. Arbuckle

[54] **PROTECTIVE PALLET ASSEMBLY**
10 Claims, 4 Drawing Figs.

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74/1.5

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ABSTRACT: A timepiece escapement pallet lever carrying pallet pins and journaled proximate a frame support post for pivotal oscillation within a predetermined angle to time a driven escape wheel by intermittent engagement of escape wheel teeth with the pallet pins. Bumpers extend from one side of the pallet lever to bear against the support post upon pivoting of the pallet lever beyond extremes of the oscillation angle to prevent damage to the pallet pins.



PROTECTIVE PALLET ASSEMBLY

SUMMARY OF THE INVENTION

This invention relates generally to timepiece escapements, and more particularly, to a protective pallet assembly therein.

Timepiece configuration and gear train geometry usually require that the escapement mechanism be located at or near the periphery of the timepiece support framework. A framework support post is often located proximate to the escapement mechanism to afford some protection thereof. Nevertheless, portions of the escapement mechanism remain unprotected; for example, the pallet escape lever generally has an outermost periphery which extends beyond or to the outer edges of the framework at an extreme of its pivotal oscillation. The pallet escape lever carries a pair of delicate pallet pins which engage the teeth of a driven escape wheel for timing thereof. A problem exists in that prior to assembly of the timepieces into their protective casings, the pallet pins are easily bent out of proper engagement disposition. This is caused by inadvertent placement down of the timepiece upon the exposed periphery of the pallet lever or by accidental touching thereof by the fingers of the assemblers. This caused the pallet lever to pivot beyond its oscillation limits to bend the pallet pins. A high rate of rejects resulted.

Therefore, to overcome the foregoing and other difficulties of the prior art, new and improved means of protecting the pallet escape lever are required. Preferably, such protective means are afforded without addition to the support framework or redesign of the timepiece geometry. To this end, the present invention envisions modification of existing pallet escape levers to provide a novel protection means. In accordance with the present invention, the pallet escape lever is modified to provide a pair of spaced bumpers defining therebetween an open portion of the lever which receives the framework support post therein. The bumpers have a clearance with respect to the support post, at the oscillation extremes, which is within the deformation limits of the pallet pins. Upon pivoting of the pallet escape lever beyond normal oscillation limits a distance sufficient to deflect a pin one diameter, the bumpers will bear against the post to prevent damage to the pins. The configuration of the pallet escape lever, according to the present invention, is asymmetric with respect to a central axis to provide portions balancing the bumpers. Also, the outermost periphery of the invented pallet lever configuration is within a radius concentric with the movement center to eliminate any outstanding projection at oscillation extremes.

Thus, one of the objects of this invention is to provide improved protection for a timepiece escapement mechanism.

It is an object of this invention to utilize the existing support framework together with a modification of an existing pallet lever configuration to provide protection therefore.

Another object is to provide pallet escape lever protection without addition to the timepiece support framework or modification of the timepiece geometry.

Still another object is to provide a modification to a pallet escape lever which protects against movement beyond oscillation extremes by engagement against the timepiece support framework.

Yet another object is the provision of a protective pallet lever modification which is easily achieved and susceptible to economical mass production manufacturing techniques.

An object of this invention is the provision of a pallet escape lever modified for protection and balance thereof.

Further and other objects, and a more complete understanding of the invention may be had by referring to the following description and claims, taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred, it being understood, however, that this invention is not necessarily

limited to the precise arrangement and instrumentality there shown.

FIG. 1 is a partial plan view showing a portion of a prior-art timepiece escapement mechanism.

FIG. 2 is a partial side elevational view of a timepiece escapement mechanism having a protective pallet assembly therefore according to the present invention.

FIG. 3 is a cross-sectional view of the escapement mechanism and protective pallet assembly of FIG. 2 taken along line 3-3 thereof.

FIG. 4 is a plan view of a form of pallet lever according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The best mode presently contemplated of carrying out this invention, which is an improvement in prior-art timepiece escape mechanisms, is set forth in the written description and drawings wherein parts relating to the improvement are particularly pointed out together with those prior-art parts as necessarily cooperate with the improvement and as are necessary to a complete understanding and description of the present invention. Referring to the drawings in detail, wherein like numerals indicate like elements, there is shown in FIG. 1 an illustration of a prior-art timepiece escapement mechanism indicated generally by the numeral 10. Generally, as illustrated, the timepiece support frames include two or more frame plates, such as the one shown at 12, which are spaced apart by support posts such as the one indicated at 14. The escapement mechanism shown is typical and includes escape wheel 20, balance wheel 30 and pallet lever 40, all journaled on shafts 25, 35 and 45, respectively, between frame plates 12 in the manner illustrated at FIG. 2. As is well known in the art, the escapement wheel 20 is driven by a timepiece gear train (such as that partially visible at 22 in FIG. 2) and timed by intermittent engagement of the teeth 26 with the pallet pins 46, which are carried on pallet lever 40. It is understood that balance wheel 30 is driven, with rotary oscillations, by the pallet lever 40 through interaction between fork slot configuration 48 and impulse pin 38. Oscillations of balance wheel 30 are timed by a hairspring such as shown at 32 in FIG. 2. Interaction of guard pin 47 and roller crescent 37 prevent an out of phase condition between fork slot 48 and impulse pin 38. The pallet lever 40 will oscillate back and forth, as indicated by the double-headed arrow of FIG. 1, in a customary manner to time the escape wheel 20. The usual regulator fan and rate adjusting means 33 shown in FIG. 2 may be utilized to change the oscillation period if necessary to correct the timing. The phantom representation in FIG. 1 of pallet lever 40 indicates its position at one extreme of the oscillation angle θ . It is readily apparent from FIG. 1 that an outer peripheral corner of the pallet lever 40 is exposed and that the pallet lever 40 can pivot beyond the extremes of the oscillation angle θ . The pallet pins 46 are delicate and have a specific spacing for the proper timing of escape wheel 20. It is readily understood that the pins 46 are highly susceptible to damage in the exposed and unprotected assembly of FIG. 1.

A protective pallet assembly, according to the present invention, is set forth herein with references to FIGS. 2 through 4. Parts of the escapement mechanism shown in FIGS. 2 and 3 which are identical to those shown in FIG. 1 are indicated by identical numerals, and no further description of those parts is believed necessary. However, the pallet lever 40', to which the improvement relates, according to the present invention, is particularly pointed out by the following detailed description of pallet lever 40' parts.

The pallet lever 40', in accordance with the present invention, has a markedly different configuration from that of the prior-art pallet lever 40; however, both may be metal punchings which are force fitted, each on an individual shaft 45 which extends perpendicularly therethrough for pivoting about an axis indicated at (X) in FIG. 4. Note with reference to FIG. 3 that the shaft 45 and its pivot axis are parallel and

relatively proximate to the support post 14. The pallet pins 46 are spaced apart in the projections 50, 51 at one side of the central axis (Z-Z) through the pallet lever 40' as shown in the detail of FIG. 4. The pallet lever 40' also includes at one end a guard pin 47 and a fork slot configuration 48 for interaction with the roller crescent 37 and impulse pin 38 of the balance wheel 30, in the conventional manner.

Bumper means for bearing against the post 14 upon pivoting beyond extremes of the oscillation angle θ are provided by the spaced bumper arm members 60, 61 which extend outwardly at the side of the central axis (Z-Z) opposite that of the projections 50, 51. The bumper arm members 60, 61 define therebetween an open portion 63 of the lever, within which the post 14 is partially received as shown. The open portion 63 extends over an arc concentric with axis (X), between the bumper points 65, 66 at the ends of the arm members 60, 61 respectively. The opening 63 naturally must be sufficient in extent to permit unimpaired oscillation between the extremes of oscillation angle θ . The pallet pins 46 are of a resilient material which springs back without damage when displaced one pin diameter or less at the escape wheel 30. To insure unimpaired oscillation, the resiliency of pins 46 is taken advantage of and a clearance is provided between the arm members 60, 61 and post 14 at the corresponding extremes of the oscillation angle θ . With reference to FIG. 3, notice the clearance (C) between the phantom edge of arm member 60 and the post 14. Clearance (C) may be chosen by an appropriate extent of the arc of open portion 63 to allow a displacement of pins 46 at the escape wheel 20 of one diameter of the pins, or less if desired.

The extent of the arc between bumper points 65, 66 may be determined by reference to FIG. 4. Tangents 70, 71 between the axis (X) and post 14 subtend an arc length 72 between the tangential points 73, 74 on post 14. Projections 75, 76 of tangents between axis (X) and diametrically opposed points on the pins 46 may be transposed as indicated in FIG. 4 to subtend two arc lengths 78. The total of arc lengths 80 are subtended by the oscillation angle, that is, each separate arc length 80 being equal to one-half θ . Thus, the extent of the arc of open portion 63 is readily understood to be a summation of arc lengths 72, 78 and 80, as shown in FIG. 4. Therefore, the lever 40' may oscillate between the extremes of oscillation angle θ with a clearance (C) at each extreme sufficient to allow displacement of the pallet pins 46 one pin diameter at the escape wheel 20.

Note, with reference to FIG. 4, that the pallet lever 40 is asymmetric with respect to the central axis (Z-Z). The asymmetry is to provide balanced areas on each side of the axis (Z-Z). The periphery 90 at the outermost end of lever 40', has a configuration within a radius (R) which is concentric with the axis (X). With reference to FIG. 3 it may be seen that the periphery 90 is well within the confines of the frame plates 12 at any extreme of the oscillation angle.

Timing operation of the timepiece escapement shown in FIGS. 2 and 3 is conventional, as described beforehand. However, the protective pallet assembly thereof, in accordance with the present invention, prevents damage to the delicate pallet pins 46. In the first instance there is no protrusion or exposure of the outermost periphery 90 of the lever 40' at either extreme of angle θ . The clearance (C) between each bumper arm member 60, 61 and post 14, at each extreme of angle θ , allows unimpaired timing oscillation. In the event that lever 40' is forced beyond either extreme of angle θ , one of the pins 46 which is engaged at teeth 26 of escape wheel 20 will be displaced up to the limit of one diameter of the pin. Further displacement is prevented by the contact of one of the bumper points 65, 66, of arm members 60, 61 against a respective tangential point 73, 74 at post 14. The post 14, being one of the substantial and principle structural members of the timepiece support frame, bears against a respective one of the arm members 60, 61, and prevents damage to either of the pins 46. Resiliency of the pins 46 will return the pins to their correct timing positions, once the force that causes the pivoting

beyond the extremes of angle θ is released. In this manner, a protective pallet assembly, dependent upon existing major structural support frame members, is provided in accordance with the present invention.

While a particular embodiment of the invention has been illustrated and described, it will be obvious to those skilled in the timepiece art that changes and modifications may be made without departing from the invention in its broader aspects and, therefore, the aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of the invention.

I claim:

1. In a timepiece escapement within a frame having a support post, a protective pallet, comprising:

an escape lever carrying a pair of pallet pins and journaled on a shaft in said frame to pivot about an axis proximate said post for pivotal oscillation within a predetermined angle, and:

bumper means on said lever cooperating with said support post for limiting the pivoting of said lever beyond extremes of said angle to protect said pins.

2. A pallet according to claim 1 wherein said bumper means are provided by a pair of spaced bumper arm members of said lever defining therebetween an open portion of said lever for reception of said post therein, said open portion extending over an arc concentric with said axis, said arc being of an extent sufficient to include an arc length subtended by said angle and an arc length subtended between tangents from said axis to said post, each of said arm members extending outward from said axis a radial distance sufficient to meet the tangential points of said tangents to bear against said post thereat upon pivoting of said lever beyond a corresponding extreme of said angle, respectively.

3. A pallet according to claim 2 wherein each of said arm members has a clearance with respect to said post at said corresponding extreme of said angle, said clearance being sufficient to allow deflection of said pins within their elastic limit, and said clearance being provided by said arc extent also including arc lengths equivalent to those subtended by projections of tangents from said axis to diametrically opposed selected points on said pins.

4. A pallet according to claim 3 wherein said lever is asymmetric with respect to a central axis to provide balance therefore.

5. A pallet according to claim 4 wherein said lever includes an outermost periphery with respect to said frame, said periphery having a configuration within and conformity to a radius concentric with said axis and within said frame to eliminate exposure therebeyond of said periphery at any extreme of said angle during said oscillation for protection thereof within said frame.

6. A pallet according to claim 4 wherein said pins and arm members are on opposite sides of said axis.

7. In a timepiece escapement having a driven escape wheel timed by a pair of pallet pins oscillating in and out of engagement therewith, a protective assembly therefore, comprising in combination:

a pair of frame plates;

a support post spacing said plates apart;

a pallet escape lever journaled on a shaft between said plates on an axis proximate said post, said lever carrying said pallet pins for pivotal oscillation about said axis within a predetermined angle, and;

bumper means extending from said lever for bearing against said post upon pivoting of said lever substantially beyond extremes of said angle to prevent damage to said pins.

8. A pallet according to claim 7 wherein said bumper means are provided by bumper arm members of said lever, each of said arm members having a clearance with respect to said post at a corresponding extreme of said angle sufficient to allow deflection of said pins not more than their elastic limit at said escape wheel.

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9. A pallet according to claim 7 wherein said lever is asymmetric with respect to a central axis to provide portions balancing said bumper means, and wherein said pins and bumper means are on opposite sides of said axis.

10. A pallet according to claim 7 wherein said lever has an outermost periphery with respect to said plates, said periphery

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having a configuration within and conforming to a radius concentric with said shaft and within said plates to prevent exposure therebeyond of said periphery at extremes of said angle for protection thereof within said plates.

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