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F. FRANZ

3,386,327

METRONOME

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Fig. 1

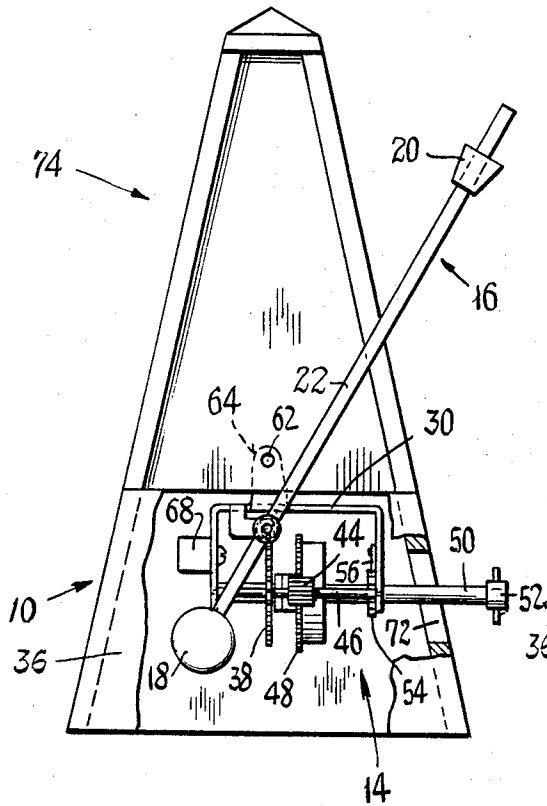


Fig. 2

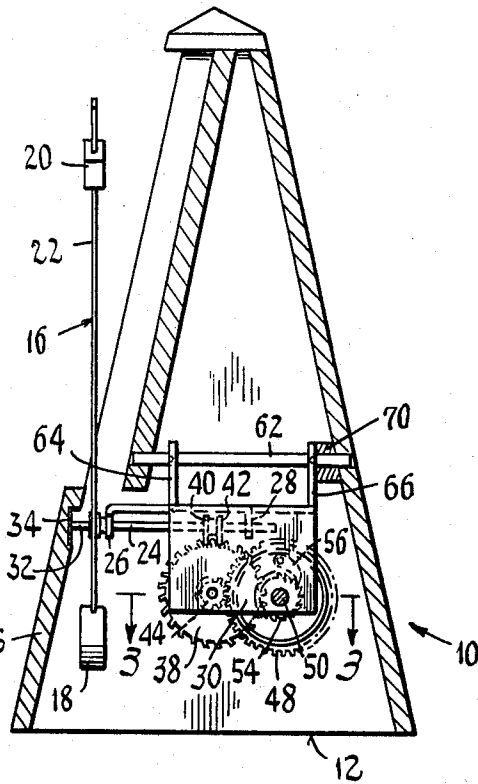
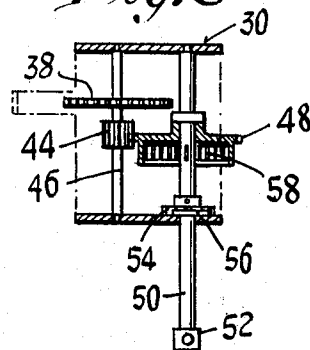


Fig. 3



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METRONOME

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10 Claims. (Cl. 84-484)

This invention relates to metronomes wherein the metronome movement is gravity controlled, as by use of a pendulum.

Heretofore pendulum type metronomes, just as with pendulum clocks, would experience unequal back and forth movements called "limping" if the metronome movement was not set plumb. This disadvantage was a source of inconvenience and annoyance, existing for many years, and is now obviated by this invention which has for one object the provision of an improved pendulum-type metronome which will not "limp" if set out-of-plumb.

In the illustrated embodiment, the metronome movement is self-righting, being itself suspended from a pivot located above its center of gravity, whereby the movement is automatically maintained plumb by the action of gravity.

A further object of the invention is to provide an improved metronome as characterized, wherein the tendency of the suspended or pivoted metronome movement to oscillate is minimized and largely eliminated.

A feature of the invention resides in the provision of an improved and simplified damping means to eliminate oscillation of the metronome movement while at the same time insuring the required freedom of travel of the metronome movement.

Another feature of the invention resides in the provision of an improved metronome in accordance with the foregoing, wherein a sound button is utilized as part of the oscillation-damping means of the metronome movement.

A further feature resides in the provision of an improved metronome as outlined wherein the natural period of oscillation of the metronome movement about its suspension lies outside of the established musicians range (Maelzel-Beethoven) of 40 to 208 half oscillations per minute, thereby to minimize the tendency for the movement to oscillate.

Other objects are to provide an improved metronome as above set forth, which is especially simple, reliable, foolproof, small light and compact, and economical to fabricate and produce.

Other features and advantages will hereinafter appear.

In the drawings:

FIG. 1 is a front view partly in elevation and partly in vertical section of a metronome embodying the invention, shown in process of operation.

FIG. 2 is a view partly in vertical section and partly in side elevation, of the metronome of FIG. 1.

FIG. 3 is a fragmentary horizontal section taken on the line 3-3 of FIG. 2.

The improved metronome comprises a base 10 in the form of a pyramidal-shaped housing, having a bottom edge 12 which engages the supporting surface on which the metronome rests. Heretofore, where metronomes were placed on sloping supporting surfaces, they "limped"; i.e. the back-and-forth movements of the pendulum were unequal, due to the pendulum drive and escapement being tilted.

Carried by the base 10 is a spring motor or metronome movement 14 having a compound pendulum 16 including a fixed weight 18 and a movable weight or slider 20 which is adjustable along the pendulum arm 22 to vary the frequency of oscillation.

The pendulum 16 is carried by an escapement shaft 24 mounted in bearing arms 26, 28 of a stamped frame 30.

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The forward end 32 of the escapement shaft 24 engages a sound button or metal disk 34 carried by a sounding board portion 36 of the base-housing 10, such end being continually urged into said engagement under the action of an escapement wheel 38 alternately engaging escapement disks or pallets 40, 42 on the shaft, in the well-known manner.

The escapement wheel 38 turns with a pinion 44, both being on a shaft 46 and the pinion being driven by a main-spring gear 48 on a winding shaft 50 having a key 52 and also a back-check ratchet 54, the latter engaged by a spring-charged pawl 56 on the frame 30. A main spring 58 drives the gear 48. The escapement pallets 40, 42 have the usual interrupted peripheries with bent, camming portions at radial cuts, whereby alternate, opposite turning moments are imparted to the shaft 24 by the escapement wheel 38 to maintain oscillation of the pendulum 16. Whenever a tooth of the escapement wheel 38 strikes one of the pallets 40, 42, the impact is transmitted through the shaft 24 to the sound button 34, causing the sounding board 36 to emit a distinct click. Thus far, the above description is that of a conventional metronome clockwork movement, which has been well known for many years to those skilled in the art.

In accordance with this invention, the motor 14 which carries the pendulum 16 is suspended or movably mounted on the base 10 so as to be under the control of gravity whereby its position is automatically adjusted, providing (for different tilted positions of the base 10 within limits about an axis transverse to the direction of gravity) a fixed orientation of said movement with respect to a plane extending in the direction of gravity, said axis being contained in said plane. The axis that is transverse to the direction of gravity could, for example, be parallel or substantially parallel to the axis of the escapement shaft 24, and the said reference plane that extends in the direction of gravity would of course be a vertical plane which could include the axis of the shaft 24. The mounting for the motor 14 may be thus thought of as maintaining the motor in a given horizontal position such as illustrated in FIG. 1 even though the base 10 is tilted either clockwise or counterclockwise as viewed in FIG. 1. By such an arrangement the pendulum 16 and the drive mechanism for the pendulum, involving the pallets 40, 42 and the escapement wheel 38, will not be tilted either clockwise or counterclockwise from the shown position of FIG. 1, even though the base 10 is tilted clockwise or counterclockwise within limits.

The invention provides a simple means for effecting such automatic gravity-controlled positioning of the metronome movement, in the form of a generally horizontal pivot shaft 62 which is carried by the base 10 and which in turn carries the metronome movement 14, 16, as by means of bearing arms 64, 66 of the frame 30. The movement 14, 16 is thus pivotally suspended below the pivot shaft 62 whereby its position is under the control of gravity. An advantageous location of the suspension arms 64, 66 is as shown in FIGS. 1 and 2, wherein the pivot or rocker shaft 62 is disposed vertically above and parallel to the escapement shaft 24. To effect a proper balance with such arrangement, a counterbalance weight 68 is mounted on the frame 30 whereby the effective center of gravity of the metronome unit 14, 16 is located vertically below the pivot shaft 62 as seen in FIG. 1.

A thrust collar 70 is provided on the pivot shaft 62 to take the thrust force existing between the shaft 24 and sound button 34. It will be understood that the escapement wheel 38 turns counterclockwise as viewed in FIG. 2, thereby exerting force from left to right on the shaft 24, and that said shaft is axially movable within limits.

Advantageously, the natural period of oscillation of

the metronome movement 14, 16, about the pivot shaft 62 is outside of the traditionally accepted musicians range of from 40 to 208 half oscillations per minute, thereby minimizing the tendency for the swinging pendulum 16 to cause a sympathetic oscillation of the movement 14. 5
Also, a frictional drag exists as a result of engagement between the end 32 of the shaft 24 and the sound button 34, which frictional drag tends to damp any oscillation of the metronome movement 14, 16, about the pivot shaft 62.

The winding shaft 50 passes through a side opening 72 of the pyramidal housing (indicated generally by the numeral 74) there being adequate clearance above and below the winding shaft 50 to permit the metronome movement 14 to assume different angular positions with respect to the base 10 and housing portion 74 thereof. 15

The pivotal suspension of the metronome movement 14 is effective regardless of front-to-rear tilting of the base 10 within limits, as will be understood.

The periodic travel of the pendulum 16 and the vibration which is a consequence of such travel result in the metronome movement 14, 16 readily overcoming any friction of its shaft suspension. It is noted that periodically the force of the shaft end 32 against the sound button 34 is relieved, whereby the metronome movement 14, 16 25 maintain a fixed orientation with respect to gravity regardless of tilting of the base 10, within the limits of the device.

Variations and modifications may be made within the scope of the claims, and portions of the improvements 30 may be used without others.

I claim:

1. A metronome comprising, in combination:
 - (a) a base
 - (b) a gravity-controlled metronome movement, and 35
 - (c) means movably mounting said movement on the base and automatically providing, for different tilted positions of the base within limits about an axis transverse to the direction of gravity, a fixed orientation of said movement with respect to a plane extending in the direction of gravity, said axis being contained in said plane.
2. A metronome as in claim 1, wherein:
 - (a) said mounting means comprises a pivot from which the metronome movement hangs under the action of gravity. 45
3. A metronome as in claim 2, wherein:
 - (a) the metronome movement has a range embracing the traditionally accepted musicians range of from 40 to 208 half oscillations per minute, 50
 - (b) the period of oscillation of said metronome movement about its pivot being outside of said musicians range.
4. A metronome as in claim 2, wherein:
 - (a) said metronome movement has an axially movable escapement shaft which experiences periodic axial forces, 55
 - (b) a sound button on said base, engageable by an end of the escapement shaft,
 - (c) the friction between said escapement shaft and sound button constituting a means for damping oscillations of the metronome movement about said pivot. 60
5. A metronome as in claim 2, wherein:
 - (a) said metronome movement has an axially movable escapement shaft and a pendulum carried thereby, 65
 - (b) said pivot comprising a rocker shaft parallel to said escapement shaft and normally disposed vertically above the latter.
6. A metronome as in claim 5, wherein:
 - (a) a counterweight is provided on the metronome movement to counterbalance the latter for disposing the said shafts one above the other. 70
7. A metronome as in claim 2, wherein: 75

- (a) the base includes a housing surrounding the metronome movement.
 - (b) said metronome movement comprising a spring motor having a winding shaft and key thereon,
 - (c) said housing having a clearance opening through which the winding shaft extends,
 - (d) said opening normally providing space both above and below the winding shaft to provide for freedom of travel of the metronome movement about said pivot.
8. A metronome as in claim 2, wherein:
- (a) the base includes a housing surrounding the metronome movement,
 - (b) said metronome movement comprising a spring motor having a winding shaft and key thereon,
 - (c) said housing having a clearance opening through which the winding shaft extends,
 - (d) said opening normally providing space both above and below the winding shaft to provide for freedom of travel of the metronome movement about said pivot,
 - (e) said metronome movement having an axially movable escapement shaft which experiences periodic axial forces,
 - (f) a sound button on said base, engageable by an end of the escapement shaft,
 - (g) the friction between said escapement shaft and sound button constituting a means for damping oscillations of the metronome movement about said pivot.
9. A metronome as in claim 2, wherein:
- (a) the base includes a housing surrounding the metronome movement,
 - (b) said metronome movement comprising a spring motor having a winding shaft and key thereon,
 - (c) said housing having a clearance opening through which the winding shaft extends,
 - (d) said opening normally providing space both above and below the winding shaft to provide for freedom of travel of the metronome movement about said pivot,
 - (e) said metronome movement having an axially movable escapement shaft which experiences periodic axial forces,
 - (f) a sound button on said base, engageable by an end of the escapement shaft,
 - (g) the friction between said escapement shaft and sound button constituting a means for damping oscillations of the metronome movement about said pivot,
 - (h) said metronome movement having a range of frequency embracing the traditionally accepted musicians range of from 40 to 208 half oscillations per minute,
 - (i) the period of oscillation of said metronome movement about its pivot being outside of said musicians range.
10. A metronome as in claim 2, wherein:
- (a) the base includes a housing surrounding the metronome movement,
 - (b) said metronome movement comprising a spring motor having a winding shaft and key thereon,
 - (c) said housing having a clearance opening through which the winding shaft extends,
 - (d) said opening normally providing space both above and below the winding shaft to provide for freedom of travel of the metronome movement about said pivot,
 - (e) said metronome movement having an axially movable escapement shaft which experiences periodic axial forces,
 - (f) a sound button on said base, engageable by an end of the escapement shaft,
 - (g) the friction between said escapement shaft and sound button constituting a means for damping os-

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cillations of the metronome movement about said pivot,

- (h) said metronome movement having a range of frequency embracing the traditionally accepted musicians range of from 40 to 208 half oscillations per minute, 5
- (i) the period of oscillation of said metronome movement about its pivot being outside of said musicians range,
- (j) a counterweight is provided on the metronome movement to counterbalance the latter for disposing 10 the said shafts one above the other.

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