Dec. 2, 1969 F. T. CONWAY 3,481,240

TEMPERAMENT TIMER

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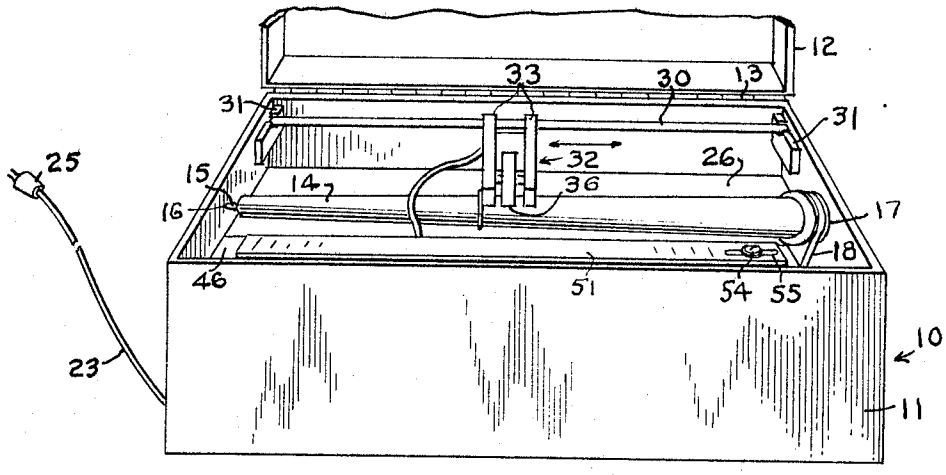


FIG. 1.

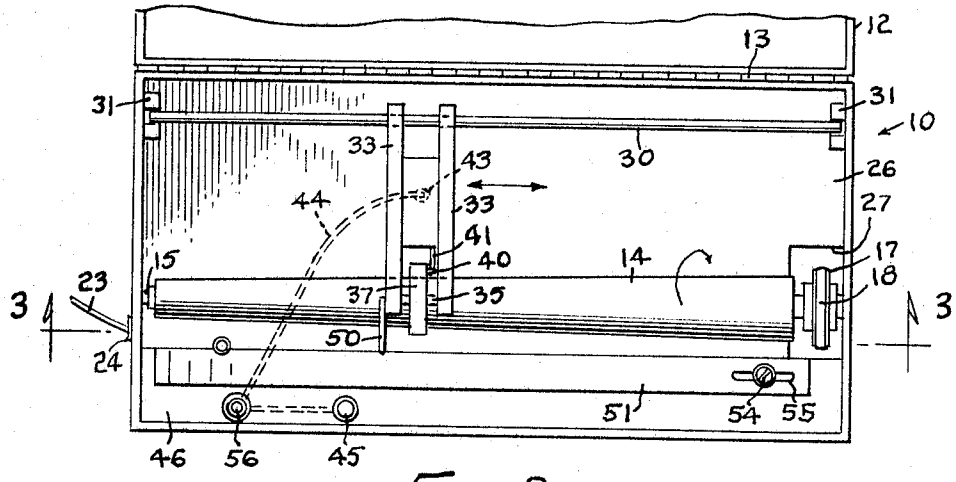


FIG. 2.

INVENTOR

Fred T. Conway

BY Alexander B. Blair

ATTORNEY

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FIG. 3.

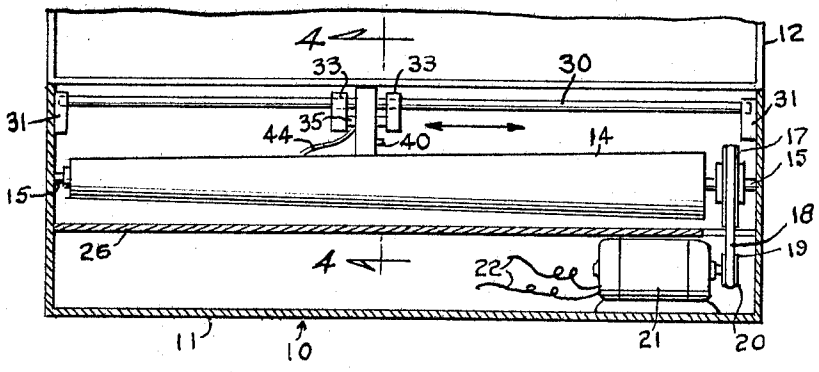


FIG. 4.

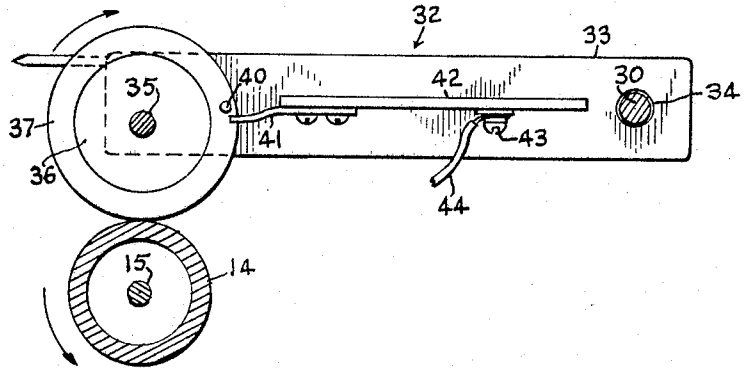
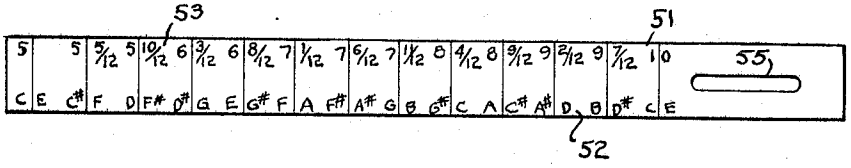


FIG. 5.



INVENTOR

Fred T. Conway

BY Alexander B. Blair

ATTORNEY

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TEMPERAMENT TIMER

Fred T. Conway, P.O. Box 701,
Monterey, Calif. 93940

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U.S. Cl. 84—454 10 Claims

ABSTRACT OF THE DISCLOSURE

A timing device for determining exact timing of the beat note of different coinciding harmonics for use in facilitating tuning of a keyboard musical instrument comprising a rotatable cone, motor means for rotating the cone at a constant speed, a follower including a rotatable disc contacting the surface of the cone and linearly movable along the axis thereof, means on the disc for actuating an audible or visible signal upon each complete rotation, and a linearly adjustable scale of musical notes adjacent the cone whereby the position of the slide may be adjusted to permit the precise determination of the beat note occasioned by tuning forks vibrating at different rates to determine exact pitch.

This invention relates to a timer for facilitating the tuning of musical instruments, particularly such keyboard type instruments as the piano, and has as its primary object the provision of an audible or visual indicator which will be actuated at precisely timed intervals in accordance with the frequency of an individual tone or half tone.

An additional object of the invention is the provision of such a timer wherein substantially infinite variation in timing within the normal limits of the device is obtained.

A further object of the invention is the provision of a device of this character which is sturdy and durable in construction, extremely accurate and sensitive, exceptionally reliable and efficient in operation, and relatively simple and inexpensive to manufacture.

As conducive to a clearer understanding of this invention it may here be pointed out that in the evenly tempered scale which is in virtually universal use today, each successive half tone is related to the next lower tone by a factor of the twelfth root of two. Notes in this scale, which have relatively simple frequency relationship such as approximately one-half, three-quarters or the like, which readily break down into twelfths, have harmonics which coincide in frequency, and in tuning by ear the tuner strikes the notes simultaneously and adjusts the tuning until no beat note between the harmonics is apparent. The frequency of the particular string is then tuned slightly off to compensate for the temperament of the instrument. When this is done wholly by ear, the results vary in success. An object of this invention is therefore to give a precise beat count which will enable the tuner to determine exactly the off tuning required in accordance with the temperament of the instrument.

Mechanically the device consists of a truncated cone which is rotated at a constant speed, a follower including a rotatable disc slidable along and in continual contact with the cone, and an audible or visual signal actuated on each rotation of the disc, the signals enabling the precise division of a beat into twelfths, without total reliance upon the ear.

Other objects of the invention will in part be obvious and in part be pointed out as the description of the invention proceeds, and shown in the accompanying drawings wherein:

FIGURE 1 is a perspective view partially broken away of one form of device embodying the instant inventive concept;

FIGURE 2 is a top plan view, parts being broken away, of the device of FIG. 1;

FIGURE 3 is a sectional view taken substantially along the line 3—3 of FIG. 1 as viewed in the direction indicated by the arrows;

FIG. 4 is an enlarged detailed sectional view taken substantially along the line 4—4 of FIG. 3; and

FIGURE 5 is an enlarged plan view of the adjustable scale comprising an element of the instant invention.

Similar reference characters refer to similar parts throughout the several views of the drawings.

Having reference now to the drawings in detail, the device of the instant invention is generally indicated at **10**, and includes a housing or casing **11** having a lid **12** hinged thereto as at **13**. The casing contains a precisely tapered truncated cone **14** having an axle **15**, the opposite ends of which are mounted in suitable journals **16** in the side walls of the casing. A pulley **17** is mounted at one end of the cone, and is driven by a belt **18** from a pulley **19** mounted on the drive shaft **20** of a suitable electric motor **21** contained within the casing. Current is supplied to motor **20** through wires **22** and a cable **23** which extends outwardly through a suitable opening **24** in the side wall of the casing, and terminates in a plug **25** which may be plugged into any available source of electric power.

Alternatively, if desired, the motor may be battery driven from suitable batteries, not shown, contained in the casing.

A partition **26** may be provided to divide the casing **11** into a motor compartment and a cone compartment. The partition has an opening **27** therein through which belt **18** extends.

A rod **30** extends transversely across casing **11** in parallelism to the axis of cone **14**, and has its ends seated in open journals **31** on the opposite side walls of the casing to facilitate removal thereof. A follower generally indicated at **32** is linearly movable along the rod **30** and consists of a pair of arms **33** having openings **34** therein through which the rod **30** extends. An axle **35** extends across the outer ends of the arms **33** and has rotatably mounted thereon a disc **36** having a friction contact collar **37** which is in constant contact with the outer surface of cone **14**.

It is to be noted that follower **32** is freely rotatable about rod **30** as a pivot, and is positioned above cone **14** so that when the device is in operation, gravity constantly forces the periphery of band **37** into contact with the adjacent portion of the cone.

A pin **40** is carried at a peripheral point on disc **36**, and once during each rotation engages an electrical contact finger **41**, which is in turn carried by an insulating block **42**, which also carries a terminal **43** in electrical association with electrical contact finger **41**.

Suitable electrical wires **44** extend from terminal **43** to an audible or visible signal or light **45** which is carried by panel **46** adjacent the side of cone **14**. Power is supplied to the signal in any conventional manner, as by means of batteries, not shown.

A pointer **50** is mounted on one of arms **33** and indicates on a scale **51** the exact position of the slide **32** relative to the number of beat phases pertinent to a selected note, the notes being indicated on the scale as at **52** in FIG. 5. The difference between adjacent notes in twelfths is also indicated as at **53** on the scale.

Scale **51** is mounted on panel **46** by means of a screw **54** which extends through a slot **55** in the scale, this arrangement permitting linear adjustment of the scale in order that each selected note may be precisely correlated with the precise position on the cone indicative of the phase beat for that precise note.

An operating switch **56** is provided for actuating the motor, it being noted that cone **14** is turned at a constant speed during the energization of motor **21**, and that the speed of rotation of disc **36** is entirely controlled by its linear position relative to cone **14**.

The open journals or sockets **31** facilitate the removal of rod **30**, and if desired, of follower or slide **32**, for purposes of packing or cleaning the device.

In the use and operation of the device, for example, in testing the major thirds from C–E to middle C–E, it is desired that the temperament be set by adding 5/12 of a beat per second in sequence. If tuning forks A–**440** and **435** are sounded together, a resultant pulsation of 5 beats occurs, or 1/10 of a tone. One line C is set to 523 3/10 and an octave C is tunedd own, and then E, the two are sounded together, and the pitch of E is raised or lowered until the beat disappears, at which time there is provided a perfect Third. The E is then raised until the beat is five per second, and there is provided a perfect tempered Third. The following Third is C♯–F which must be 5 5/12 of a beat per second, and so on to C and E of the octave above, which beats ten per second.

The above example obviously may be expanded to cover all tones.

Tuning by perfect pitch or chords or electric tuning devices does not temper the piano so that the tones will be exactly one-half tone apart. This is due to the fact that the piano has a bridge, and it is impossible to set the scale so that the tones will be one-half tone apart, from the vibration standpoint. By means of the instant device the tones may be precisely timed to provide exact results.

From the foregoing it will now be seen that there is herein provided an improved timer which accomplishes all of the objects of this invention, and others, including many advantages of great practical utility and commercial importance.

As many embodiments may be made of this inventive concept, and as many modifications may be made of the embodiment herein shown and described, it is to be understood that all matter herein is to be interpreted merely as illustrative, and not in a limiting sense.

I claim:

1. A temperament timer for facilitating the precise tuning of stringed instruments in conjunction with a plurality of tuning forks comprising a cone, means for rotating said cone at a constant speed, a follower including a member in contact with said cone, means for varying the linear position of said follower relative to the linear axis of said cone to vary the speed of rotation of said member, and signal means actuated by rotation of said member to facilitate the counting of pulsations occasioned by tuning forks vibrating at different rates.

2. The structure of claim **1** wherein the means for rotating said cone includes an electric motor, a source of electric power therefor and a driving connection between said motor and said cone.

3. The structure of claim **1** wherein said follower comprises a rotating disc, a slide mounted adjacent said cone carrying said disc, and a pin on said disc.

4. The structure of claim **3** wherein said signal means comprises an electrically actuated light and a switch in circuit with said light, and said pin closes said switch momentarily upon each complete rotation of said disc.

5. The structure of claim **3** wherein said signal means comprises an electrically actuated audible signal and a switch in circuit with said audible signal, and said pin closes said switch momentarily upon each complete rotation of said disc.

6. The structure of claim **2** wherein a casing is provided containing said cone, said follower and said signal means.

7. The structure of claim **6** wherein said source of electric power comprises battery means contained in said casing.

8. The structure of claim **7** wherein a scale is provided adjacent said cone having indicia thereon indicative of musical notes.

9. The structure of claim **8** wherein said scale is linearly adjustable to provide precise timing.

10. The structure of claim **3** wherein means are provided for constantly biasing said disc against said cone.

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STEPHEN TOMSKY, Primary Examiner

U.S. Cl. X.R.

84—484