

Aug. 25, 1959

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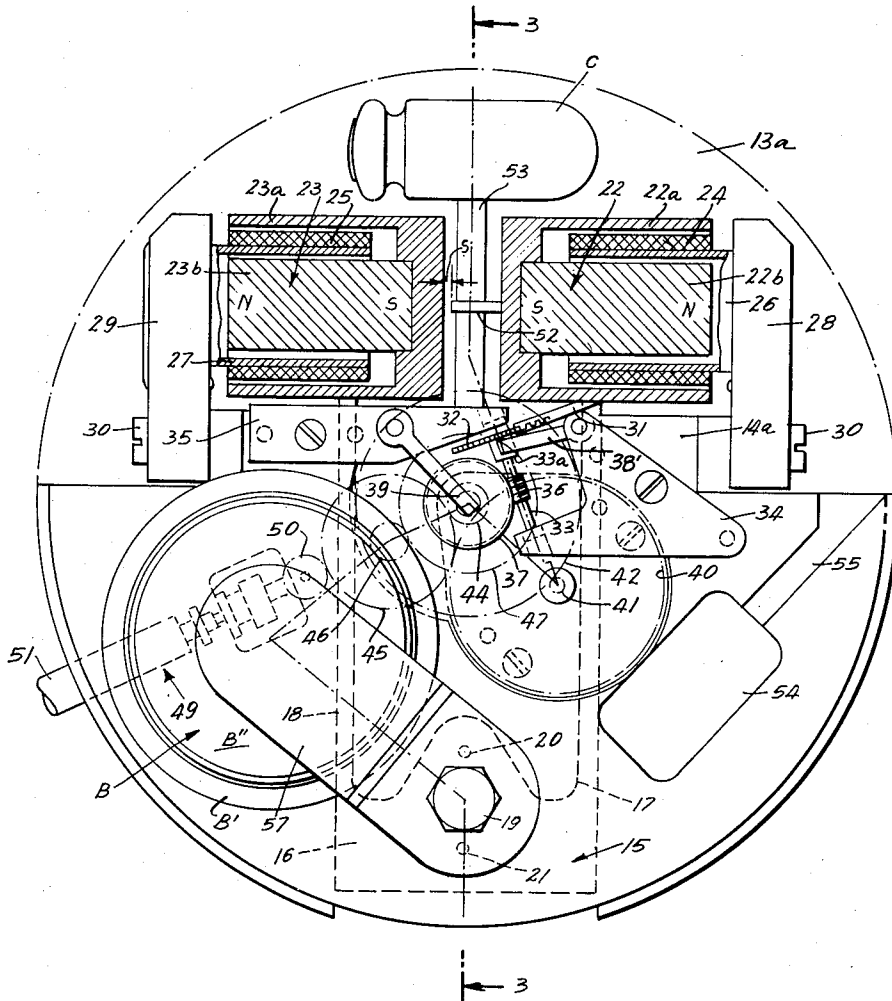
2,900,786

TIMEPIECE ARRANGEMENT

Filed May 31, 1956

3 Sheets-Sheet 1

FIG. 1



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TIMEPIECE ARRANGEMENT

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FIG. 2

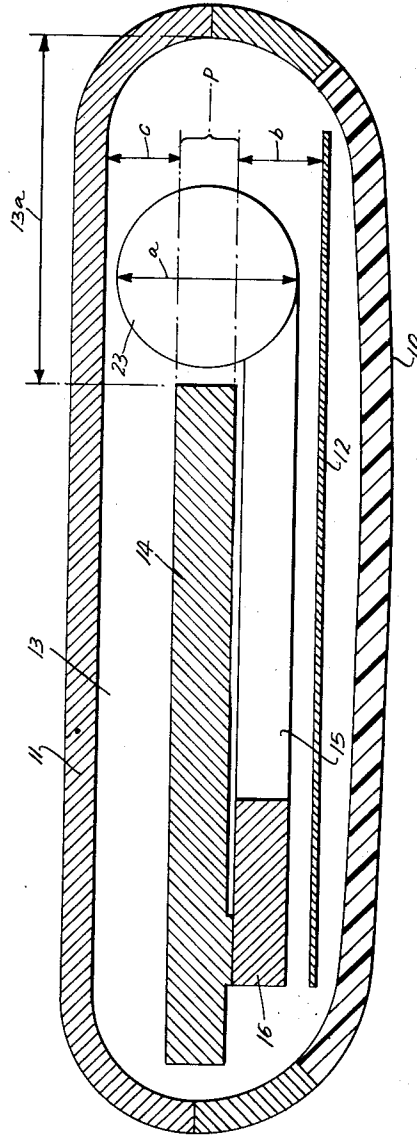
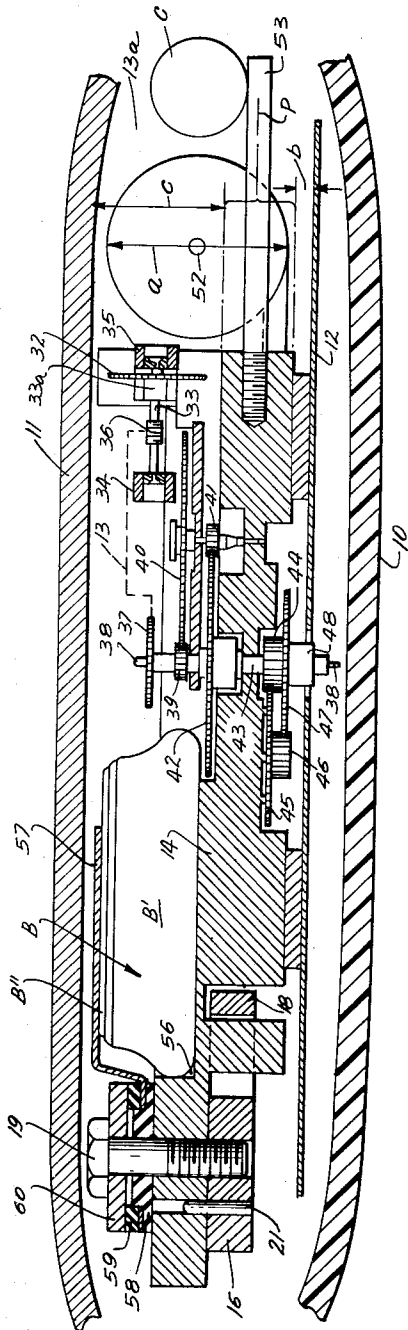


FIG. 3

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TIMEPIECE ARRANGEMENT

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FIG. 4

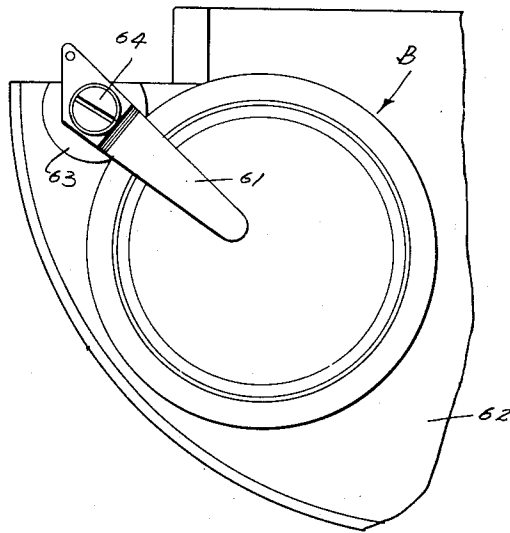
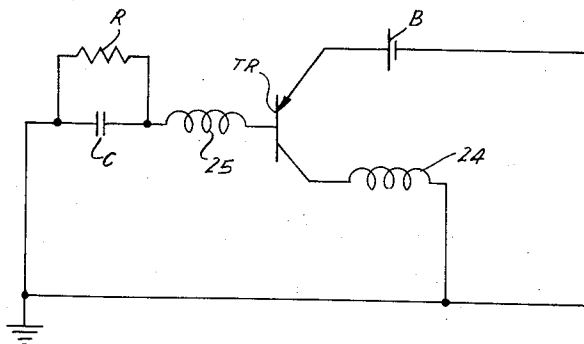


FIG. 5



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2,900,786

TIMEPIECE ARRANGEMENT

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Application May 31, 1956, Serial No. 588,409

8 Claims. (Cl. 58—23)

The present invention relates to a timepiece arrangement.

More particularly, the present invention relates to an arrangement of an electric timepiece incorporating a vibrator for driving the timepiece mechanism, which vibrator is oscillated by suitable means which are operatively associated therewith. The electric timepiece may be of the type disclosed in copending applications Serial No. 436,949, filed June 15, 1954, Serial No. 485,781, filed February 2, 1955, Serial No. 547,510, filed November 17, 1955, all now abandoned (said application Serial No. 547,510 being a continuation of application Serial No. 463,462, filed October 20, 1954, now abandoned), Serial No. 565,451, filed February 14, 1956, Serial No. 565,452, filed February 14, 1956, Serial No. 570,958, filed March 12, 1956, Serial No. 580,813, filed April 26, 1956, and Serial No. 584,709, filed May 14, 1956, and entitled "Electrical Timepiece." This application is a continuation-in-part of said copending application Serial No. 584,709, filed May 14, 1956.

It is an object of the present invention to provide an electric timepiece incorporating a mechanical vibrator which timepiece is so constructed and arranged that all of the movable parts, including the vibrator, are arranged within the timepiece casing.

It is another object of the present invention to provide a vibrator actuated timepiece, such as a watch, which is so constructed that a relatively large space is provided within which the largest part of the vibrator may vibrate.

The objects of the present invention also include the provision of a timepiece which incorporates an electrically driven vibrator, wherein the source of electric energy is carried within the timepiece casing.

The objects of the present invention further include the provision of an electric timepiece wherein a very small battery carried within the timepiece casing may readily be inserted therinto or removed therefrom.

The objects of the present invention also include the provision of an electric timepiece which is compact, which is ruggedly constructed, and which is capable of giving long periods of trouble-free service.

With the above objects in view, the present invention mainly resides in that improvement in a timepiece which comprises substantially flat front and back wall means forming between themselves a flat timepiece chamber; substantially flat base plate means arranged within the chamber, extending substantially parallel to the front and back wall means and having an area smaller than the sectional area of the chamber in the plane of the base plate means so as to leave a free chamber portion between the front and back wall means which is unoccupied by the base plate means; a timepiece mechanism within the chamber and carried by the base plate means; a vibrator operatively associated with the timepiece mechanism for driving the same during oscillation of the vibrator, the vibrator having spaced attaching and oscillatable portions, the former of which is fixed to the

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base plate means and the latter of which is arranged in the free chamber and has in a direction normal to the base plate means a maximum dimension which is greater than the distances between the base plate means and each of the front and back wall means so that the oscillatable portion of the vibrator projects across the plane of the base plate means; and means, at least partly within the chamber, carried by the base plate means and being operatively associated with the vibrator for oscillating the oscillatable portion thereof.

In a preferred embodiment of the present invention the means for oscillating the oscillatable portion of the vibrator are electrical means which include a battery that may readily be secured to or removed from the timepiece.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings in which:

Fig. 1 is a plan view of the interior of a timepiece according to the present invention as seen from the rear;

Fig. 2 is a sectional elevational view taken substantially along line A—B—C—D—E—F—G—H of Fig. 1; Fig. 2 including an illustration of the front and back walls of the timepiece casing and of the timepiece dial plate;

Fig. 3 is a diagrammatic sectional elevational view taken substantially along line 3—3 of Fig. 1, Fig. 3 showing a modified arrangement of only certain parts of the timepiece in order more clearly to illustrate the present invention;

Fig. 4 is a fragmentary plan view of a modified embodiment of the present invention showing a mounting and retaining arrangement by means of which a battery may be secured to the base plate of the timepiece; and

Fig. 5 is a wiring diagram of an electric circuit incorporating a battery, which electric circuit is part of the electrical means capable of oscillating the vibrator.

Referring now to the drawings and to Figs. 1 to 3 thereof in particular, there is shown a timepiece encased in a flat timepiece casing having approximately circular substantially flat front and back walls 10 and 11, the former of which is transparent. A timepiece dial plate 12 is arranged behind the front wall 10 so that a flat timepiece chamber 13 is formed between the dial plate 12 and the rear wall 11, these elements thus constituting substantially flat front and rear wall means, respectively, of the timepiece chamber 13.

An approximately semi-circular base plate 14 having at its flat side a boss portion 14a is arranged within the chamber 13 and extends parallel to front and back walls thereof. The base plate 14 thus has an area smaller than, and equal to about one-half of, the sectional area of the chamber 13 in the plane p of the base plate 14 (Figs. 2 and 3) so as to leave an approximately semi-circular free chamber portion 13a between the front and back wall means 12, 11 which is entirely unoccupied by any part of the base plate. The plane of the base plate, as used throughout the instant specification and claims, is deemed to include the entire thickness of the flat base plate 14.

The timepiece mechanism, which will be described more detailedly below, is driven by a mechanical vibrator 15 which is preferably of the tuning-fork type having a base 16 and a pair of oscillatable tines 17 and 18. The base constitutes an attaching portion at which the vibrator is firmly secured to that side of the base plate 14, which is nearest the dial plate 12, the mounting of the vibrator being such that its axis of symmetry lies in the plane of symmetry of the base plate. Suitable attaching means,

such as a screw 19 and a pair of pins 20, 21 are provided.

The vibrator may have any suitable configuration, as, for example, any one of those described in copending application Serial No. 565,451.

The tines 17 and 18 extend beyond the boss portion 14a and carry, at their respective free ends which are located in the region of the free chamber portion 13a, oscillating members 22 and 23 which are in the form of substantially cylindrical magnetic drums each having an outer diameter a . The drums are part of electrical driving means capable of oscillating the vibrator, and they are arranged in the free chamber portion 13a with the axis of each drum extending substantially parallel to the plane p . As may best be seen in Figs. 2 and 3, the outer diameter a of each drum is greater than the distance b between the front side of the base plate and the dial plate or front wall means 12 of the chamber 13 and also greater than the distance c between the rear side of the base plate and the rear wall means 11 of the chamber. Thus, the maximum dimension of each oscillating member, in a direction normal to the base plate 14, is greater than the distances between the base plate and each of the front and back wall means thereof so that the oscillating members project across the plane p of the base plate. In this way, the magnetic drums may be of relatively large size, the advantages of which will become apparent upon further consideration of the instant specification.

In practice, either of the distances b or c may be very small or even be equal to zero. For example, it will be seen from Fig. 2 that the distance b between the front side of the base plate and the dial plate 12 is very small, and that if the dial plate were in face-to-face relationship with the base plate, the distance b would be zero. Thus, in the embodiment shown in Figs. 1 and 2, the magnetic drums simply project into that part of the free chamber portion 13a which is between the rear wall 11 and the plane p of the base plate 14.

Each magnetic drum is composed of a cup-shaped member 22a, 23a and a permanent magnet 22b, 23b located therewithin. Each cup-shaped member and permanent magnet form an annular space between themselves, and a pair of coils 24, 25 extend into these annular spaces, respectively. The coils are carried by tubular carriers 26, 27, respectively, which are mounted on supports 28, 29. The latter, in turn, are fixedly secured to the boss portion 14a of the base plate 14 by means of screws 30 or the like.

In practice, the coils have a large number of turns, and each, together with its tubular carrier, must extend into the annular space formed by one of the magnetic drums with sufficient clearance to permit free reciprocating movement thereof relative to the coil during oscillation of the tines in a plane parallel to the base plate. Thus, the annular space should, on the one hand, be as large as possible so as readily to accommodate the coil and carrier. On the other hand, the size of the timepiece chamber, i.e., the physical space available within a timepiece casing, particularly in the case of a wrist or pocket watch, is very limited so that the size of the magnetic drums should be kept as small as possible. It has been found, however, that a relatively large magnetic drum can be accommodated within a watch casing by providing a partial rather than a full or complete base plate, i.e., a base plate which is so constructed and arranged as to leave a free chamber portion entirely unoccupied by any part of the base plate. With the magnetic drums being arranged within this free chamber portion, the maximum dimension of each drum in a direction transverse to the watch, i.e., the outer diameter in the case of a cylindrical element, can be practically the entire thickness of the watch. In this way, the magnetic drums and consequently the annular space formed between each cup-shaped member and the corresponding magnet, can be sufficiently large so as readily to receive the corresponding coil and carrier thereof with sufficient clearance to

permit free movement of each magnetic drum relative to the coil associated therewith.

Clearly, if the base plate were a complete one which did not leave any free chamber portion, the outer diameter of the drums would perforce have to be considerably less than the thickness of the watch, and the annular spaces within which the coils and carriers could be received would accordingly have to be smaller.

The vibrator is operatively associated with the timepiece mechanism in such a manner that the same is driven during oscillation of the tines. For this purpose, the tine 17 carries a pawl 31 which cooperates with a ratchet wheel 32. The same is fixedly mounted upon a shaft 33 the free ends of which are rotatably supported by brackets 34 and 35 which are firmly secured to the base plate 14. The shaft 33 also carries a worm 36 and a friction wheel 33a which may be integral with the shaft 33. The friction wheel cooperates with a friction brake which is constituted by a leaf spring 38', one end of which is secured to the bracket 34 and the other end of which is in frictional engagement with the friction wheel. In this way, the ratchet wheel 32 and consequently the shaft 33 together with the worm 36 will be rotated during oscillation of the tines, the friction brake serving to prevent rotation of the shaft 33, either under the influence of its own inertia following a forward stroke of the pawl or under the influence of the pawl during its backward stroke. In this connection, reference may be had to copending application Serial No. 485,781, now abandoned.

Thus, if the length of the stroke of reciprocation of the pawl, in a direction tangential to the ratchet wheel 32 at the point of engagement between the pawl and the ratchet wheel is greater than P and smaller than $2P$, being the pitch of the ratchet teeth of the ratchet wheel, each reciprocation of the pawl will cause the ratchet wheel to be rotated an angular distance corresponding to the pitch. With the speed of rotation of the worm 36 controlling the movement of the hands of the timepiece, as will be more detailedly set forth below, it is essential that this speed of rotation be maintained constant. This is achieved by oscillating the tines of the vibrator at such an amplitude that the length of the stroke of reciprocation of the pawl, which is dependent upon the amplitude of oscillation of the tines, is maintained between P and $2P$. In this way, each oscillation of the tines brings about the same angular displacement of the ratchet wheel and consequently of the worm, so that the speed of rotation of the worm is directly proportional to the natural frequency of the vibrator. The latter has an extremely high degree of constancy, so that so long as the amplitude of oscillation of the tines is maintained within the prescribed limits, the timepiece mechanism is driven at the same high degree of constancy at which the vibrator oscillates.

The electrical means for oscillating the vibrator and which include the magnetic drums and the coils 24 and 25 are capable of maintaining the amplitude of oscillation of the tines substantially constant. The coils 24 and 25 are electrically interconnected with a capacitor C , a resistor R , a battery B and a transistor TR , as shown in Fig. 5, the electrical components cooperating with each other in such a manner that the tines are oscillated at the proper amplitude. For a more detailed explanation of this feature, reference may be had to copending applications Serial No. 436,949, filed June 15, 1954, now abandoned and Serial No. 584,709, filed May 14, 1956, and entitled "Electrical Timepiece."

The worm cooperates with a worm gear 37 which is fixedly mounted upon a rotatable shaft 38 that extends through the base plate 14 so that the opposite end of the shaft 38 is in the region of the dial 12 which may be secured to the base plate in any suitable manner. The natural frequency of oscillation of the vibrator, the

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number of ratchet teeth of the ratchet wheel and the transmission ratio between the worm 36 and the worm gear 37 are so selected that the latter makes one revolution per minute. The shaft 38 may therefore carry a sweep-second hand.

The shaft 38 also carries a pinion 39 which drives a gear 40. The latter causes rotation of another pinion 41 which, in turn, drives a minute gear 42. The latter causes rotation of a tubular shaft 43 which encompasses the shaft 38 and carries the minute hand, the gear ratios between the gears and pinions 39, 40, 41, 42 being so selected that the minute hand rotates at one-sixtieth the speed of the sweep-second hand.

The tubular shaft 43 also carries a pinion 44 which drives a gear 45. The latter causes rotation of another pinion 46 which, in turn, drives an hour gear 47. The latter causes rotation of another tubular shaft 48 which encompasses the shafts 38 and 43 and carries the hour hand, the gear ratios between the gears and pinions 44, 45, 46, 47 being so selected that the hour hand rotates at one-twelfth the speed of the minute hand.

A manual setting mechanism, shown schematically at 49, is provided for setting the hands of the timepiece, and includes a pinion 50 which cooperates with the gear 45 so that the latter may be rotated upon actuation of the stem 51.

While in the above-described embodiment the ratchet wheel 32 is rotatable about an axis parallel to the base plate 14, it will be understood that the ratchet wheel may be mounted for rotation in a plane parallel thereto. In this connection, reference may be had to copending applications Serial No. 436,949, filed June 15, 1954, now abandoned, and Serial No. 584,709, filed May 14, 1956, and entitled "Electrical Timepiece." Also, the drive between the vibrator and the timepiece mechanism need not be identical to the one illustrated in the drawings, but may, for example, be as disclosed in copending applications Serial No. 485,781, now abandoned, Serial No. 547,510, now abandoned, and Serial No. 580,813. Moreover, both coils 24 and 25 may be associated with the same magnetic drum, in which case the other magnetic drum may be replaced by a suitable counter-balance weight. In that event, the natural frequency of oscillation of the tines, and consequently the speed at which the timepiece mechanism is driven, may be adjusted in a manner disclosed in copending applications Serial No. 565,452, filed February 14, 1956, Serial No. 570,958, filed March 12, 1956, Serial No. 580,813, filed April 26, 1956, and Serial No. 584,709, filed May 14, 1956, and entitled, "Electrical Timepiece."

As set forth above, the electrical oscillating means include a capacitor C, a resistor R, a transistor TR and a battery B which are electrically connected to each other, such as by wiring or grounding. The capacitor C, which may have a cylindrical shape, is also arranged in the free chamber portion 13a, adjacent the magnetic drums. A suitable carrier is provided and may be in the form of a rod 53 emanating from the boss portion 14a of the base plate. The rod extends between the magnetic drums 22 and 23 and is screwed or otherwise securely fastened to the base plate.

The resistor R (not shown) may also be arranged within the free chamber portion 13a but may, if desired, be otherwise positioned within the timepiece casing.

The base plate 14 is formed with a recess 54 within which the transistor TR (not shown) may be received. A conduit or channel 55 communicating with the recess 54 is provided for accommodating the electrical wiring (not shown) connecting the transistor base, emitter and collector electrodes to the other components of the electrical oscillating means.

In the embodiment shown in Figs. 1 and 2, the base plate 14 is formed with a recess 56 which constitutes a receiving portion adapted to receive the battery B. The

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battery is a very small one, preferably of the mercury-cell type. The outer casing of the battery, i.e., the bottom and sides thereof, constitute the negative terminal B', so that the battery is grounded to the base plate 14 which is made of electrically conductive material. A combined conductor and clamping member 57 is provided for clamping the battery to the base plate 14 and also for providing an electric connection to the positive terminal B''. The member 57 is in the form of a metallic leaf spring one end of which, with the intermediary of a pair of insulating washers 58, 59 and a retaining washer 60, is firmly secured to the base plate 14 by means of the screw 19 which serves to fasten the vibrator 15 to the base plate.

The battery B may easily be removed from the recess 56 simply by raising the free end portion of the leaf spring 57 and rotating the same into a position wherein the leaf spring is out of alignment with the recess. A fresh battery may then be inserted into the recess and the leaf spring be returned into the position shown in the drawings. It will be seen, therefore, that the leaf spring is pivotable about an axis normal to the base plate 14 between operative and inoperative positions.

The embodiment illustrated in Fig. 4 differs from the above-described one in that the leaf spring 61 instead of being secured to the timepiece base plate 62 by the screw which serves to fasten the vibrator to the base plate, is mounted by a separate screw arrangement. The same includes a carrier 63 adapted to receive the screw 64, suitable insulation being provided so that the leaf spring 61 is electrically insulated from the base plate 62. The arrangement of parts is such that the screw 64 immovably retains the leaf spring 61 in position, so that in order to pivot the leaf spring the screw 64 must first be loosened.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of electric timepieces differing from the types described above.

While the invention has been illustrated and described as embodied in an electric timepiece incorporating a tuning-fork type vibrator, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. In a timepiece, in combination, substantially flat front and back wall means forming between themselves a flat timepiece chamber: substantially flat base plate means arranged within said chamber, extending substantially parallel to said front and back wall means and having an area smaller than the sectional area of said chamber in the plane of said base plate means so as to leave a free chamber portion between said front and back wall means which is unoccupied by said base plate means; a timepiece mechanism within said chamber and carried by said base plate means; a vibrator operatively associated with said timepiece mechanism for driving the same during oscillation of said vibrator, said vibrator having spaced attaching and oscillatable portions the former being fixed to said base plate means and the latter being arranged in said free chamber portion and having in a direction normal to said base plate means a maximum dimension which is greater than the distances between said base plate means and each of said front and back wall means so that said oscillatable portion of said vibrator projects across the plane of said base plate means; and means within said

chamber, carried by said base plate means and being operatively associated with said oscillatable portion of said vibrator for oscillating the same.

2. In a timepiece, in combination, substantially flat front and back wall means forming between themselves a flat timepiece chamber; substantially flat base plate means arranged within said chamber, extending substantially parallel to said front and back wall means and having an area smaller than the sectional area of said chamber in the plane of said base plate means so as to leave a free chamber portion between said front and back wall means which is unoccupied by said base plate means; a timepiece mechanism within said chamber and carried by said base plate means; a vibrator operatively associated with said timepiece mechanism for driving the same during oscillation of said vibrator, said vibrator having spaced attaching and oscillatable portions the former being fixed to said base plate means and the latter being arranged in said free chamber portion and having in a direction normal to said base plate means a maximum dimension which is greater than the distance between said base plate means and at least one of said front and back wall means so that said oscillatable portion of said vibrator projects across the plane of said base plate means; and means within said chamber, carried by said base plate means and being operatively associated with said oscillatable portion of said vibrator for oscillating the same.

3. In a timepiece, in combination, substantially flat front and back wall means forming between themselves a flat timepiece chamber; substantially flat base plate means arranged within said chamber, extending substantially parallel to said front and back wall means and having an area approximately one-half the sectional area of said chamber in the plane of said base plate means so as to leave a free chamber portion between said front and back wall means which is unoccupied by said base plate means; a timepiece mechanism within said chamber and carried by said base plate means; a vibrator operatively associated with said timepiece mechanism for driving the same during oscillation of said vibrator, said vibrator having spaced attaching and oscillatable portions the former being fixed to said base plate means and the latter being arranged in said free chamber portion and having in a direction normal to said base plate means a maximum dimension which is greater than the distances between said base plate means and each of said front and back wall means so that said oscillatable portion of said vibrator projects across the plane of said base plate means; and means within said chamber, carried by said base plate means and being operatively associated with said oscillatable portion of said vibrator for oscillating the same.

4. In a timepiece, in combination, substantially flat front and back wall means forming between themselves a flat timepiece chamber; substantially flat base plate means arranged within said chamber, extending substantially parallel to said front and back wall means and having an area smaller than the sectional area of said chamber in the plane of said base plate means so as to leave a free chamber portion between said front and back wall means which is unoccupied by said base plate means; a timepiece mechanism within said chamber and carried by said base plate means; a vibrator operatively associated with said timepiece mechanism for driving the same during oscillation of said vibrator, said vibrator having spaced attaching and oscillatable portions the former being fixed to said base plate means and the latter being arranged in said free chamber portion, being oscillatable in a plane substantially parallel to the plane of said base plate means, and having in a direction normal thereto a maximum dimension which is greater than the distance between said base plate means and at least one of said front and back wall means so that said oscillatable portion of said vibrator projects across the plane of said base plate means; and means within said chamber, carried by said base plate

means and being operatively associated with said oscillatable portion of said vibrator for oscillating the same.

5. In a timepiece, in combination, substantially flat front and back wall means forming between themselves a flat timepiece chamber; substantially flat base plate means arranged within said chamber, extending substantially parallel to said front and back wall means and having an area smaller than the sectional area of said chamber in the plane of said base plate means so as to leave a free chamber portion between said front and back wall means which is unoccupied by said base plate means; a timepiece mechanism within said chamber and carried by said base plate means; a vibrator operatively associated with said timepiece mechanism for driving the same during oscillation of said vibrator, said vibrator having an attaching portion and at least one substantially cylindrical oscillatable portion spaced from said attaching portion, said attaching portion being fixed to said base plate means and said oscillatable portion being arranged in said free chamber portion with the axis of said oscillatable portion extending substantially parallel to the plane of said base plate means, the diameter of said oscillatable portion being greater than the distances between said base plate means and each of said front and back wall means so that said oscillatable portion projects across the plane of said base plate means; and electrical means within said chamber, carried by said base plate means and being operatively associated with said oscillatable portion of said vibrator for oscillating the same.

6. In a timepiece, in combination, substantially flat front and back wall means forming between themselves a flat timepiece chamber; substantially flat base plate means arranged within said chamber, extending substantially parallel to said front and back wall means and having an area smaller than the sectional area of said chamber in the plane of said base plate means so as to leave a free chamber portion between said front and back wall means which is unoccupied by said base plate means; a timepiece mechanism within said chamber and carried by said base plate means; a vibrator operatively associated with said timepiece mechanism for driving the same during oscillation of said vibrator, said vibrator having an attaching portion and at least one substantially cylindrical oscillatable portion spaced from said attaching portion, said attaching portion being fixed to said base plate means on that side thereof which is nearest to said front wall means and said oscillatable portion being arranged in said free chamber portion with the axis of said oscillatable portion extending substantially parallel to the plane of said base plate means, the diameter of said oscillatable portion being greater than the distance between said base plate means and said back wall means so that said oscillatable portion projects into that part of said free chamber portion which is between said rear wall means and the plane of said base plate means; and electrical means within said chamber, carried by said base plate means and being operatively associated with said oscillatable portion of said vibrator for oscillating the same.

7. In a timepiece, in combination, substantially flat front and back wall means forming between themselves a flat timepiece chamber; substantially flat base plate means arranged within said chamber, extending substantially parallel to said front and back wall means and having an area smaller than the sectional area of said chamber in the plane of said base plate means so as to leave a free chamber portion between said front and back wall means which is unoccupied by said base plate means; a timepiece mechanism within said chamber and carried by said base plate means; a tuning-fork type vibrator having a base and a pair of oscillatable tines and being operatively associated with said timepiece mechanism for driving the same during oscillation of said tines, said vibrator being attached at said base thereof to said base plate means at a portion thereof spaced from said free chamber portion in such a manner that the free end

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portions of said tines are in the region of said free chamber portion; and oscillating means for oscillating said tines of said vibrator and including a pair of substantially cylindrical oscillating members connected to said free end portions of said tines, respectively, each oscillating member being arranged in said free chamber portion with the axis of each oscillating member extending substantially parallel to the plane of said base plate means, each oscillating member having an outside diameter greater than the distance between the plane of said base plate means and each of said front and back wall means so that each oscillating member projects across the plane of said base plate means.

8. In a timepiece, in combination, substantially flat front and back wall means forming between themselves a flat timepiece chamber; substantially flat base plate means arranged within said chamber, extending substantially parallel to said front and back wall means and having an area smaller than the sectional area of said chamber in the plane of said base plate means so as to leave a free chamber portion between said front and back wall means which is unoccupied by said base plate means; a timepiece mechanism within said chamber and carried by said base plate means; a tuning-fork type vibrator having a base and a pair of oscillatable tines and being operatively associated with said timepiece mechanism for driving the same during oscillation of said tines, said

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vibrator being attached at said base thereof to said base plate means at a portion thereof spaced from said free chamber portion in such a manner that said tines of said vibrator oscillate in a plane substantially parallel to the plane of said base plate means and that the free end portions of said tines are in the region of said free chamber portion; and electric oscillating means for oscillating said tines of said vibrator and including a pair of substantially cylindrical oscillating members connected to said free end portions of said tines, respectively, each oscillating member being arranged in said free chamber portion with the axis of each oscillating member extending substantially parallel to the plane of said base plate means, each oscillating member having an outside diameter greater than the distance between the plane of each of said base plate means and said front and back wall means so that each oscillating member projects across the plane of said base plate means, at least one of said oscillating members being constituted by a magnetic drum.

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