Aug. 28, 1962 D. FRITSCH 3,050,930

AUTOMATIC STARTING DEVICE FOR AUTOMOBILE CLOCK

Filed July 6, 1959 3 Sheets-Sheet 1

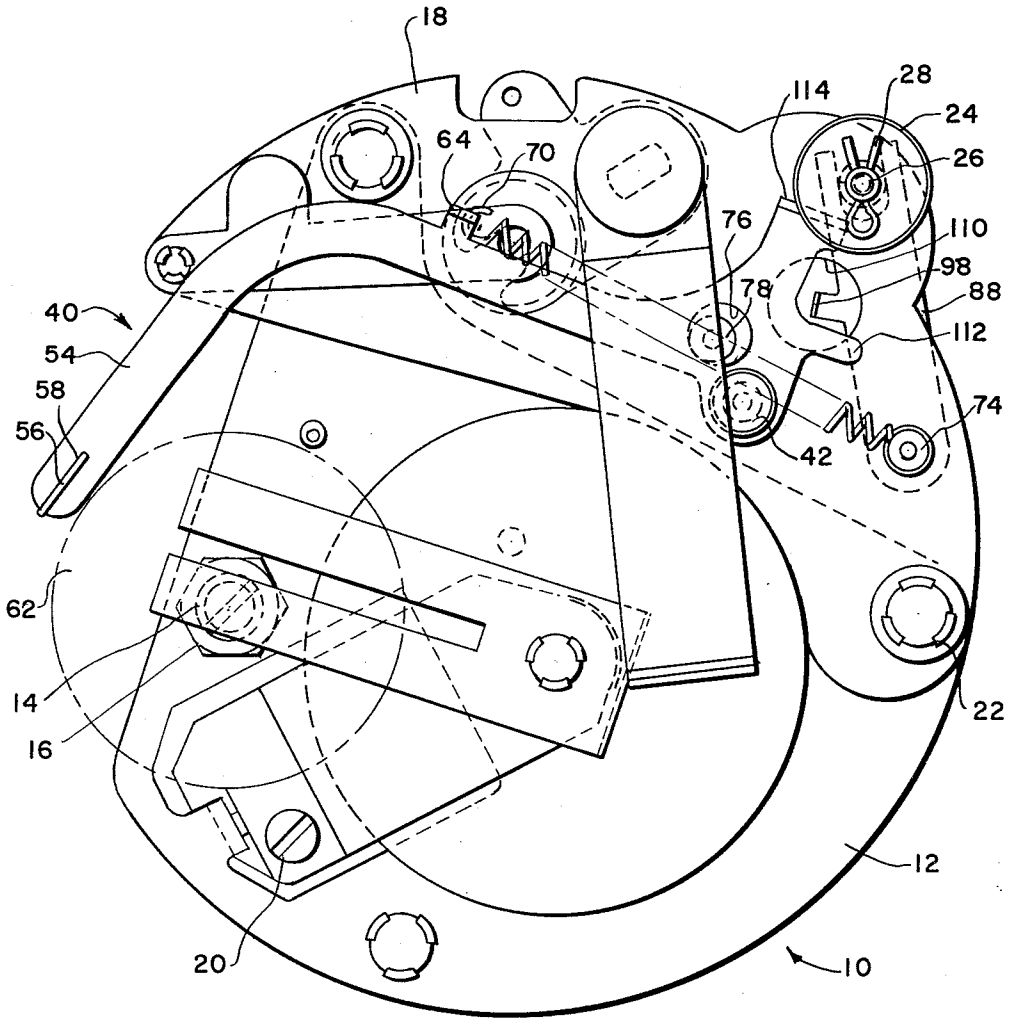

FIG. 1.

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AUTOMATIC STARTING DEVICE FOR AUTOMOBILE CLOCK

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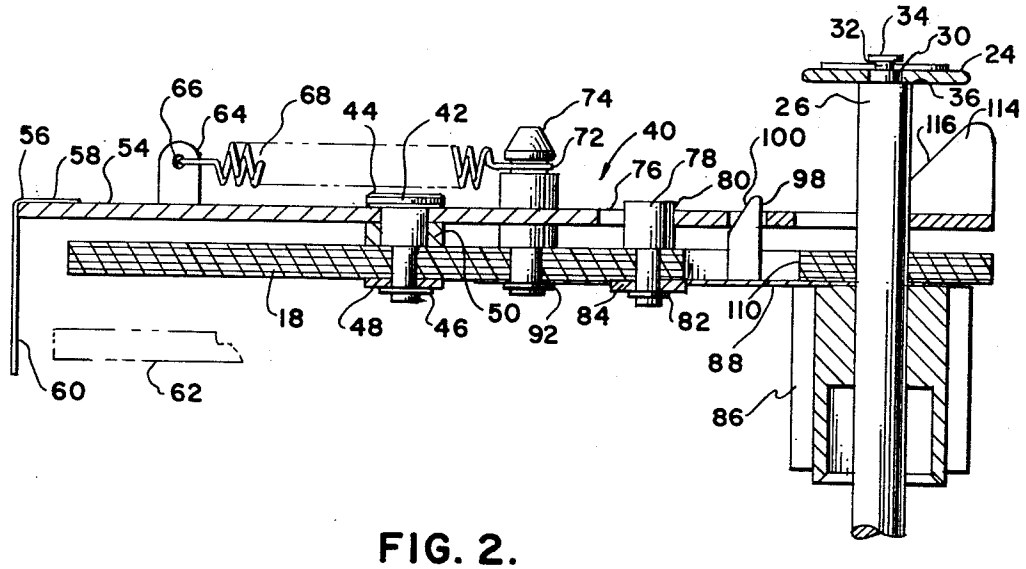

FIG. 2.

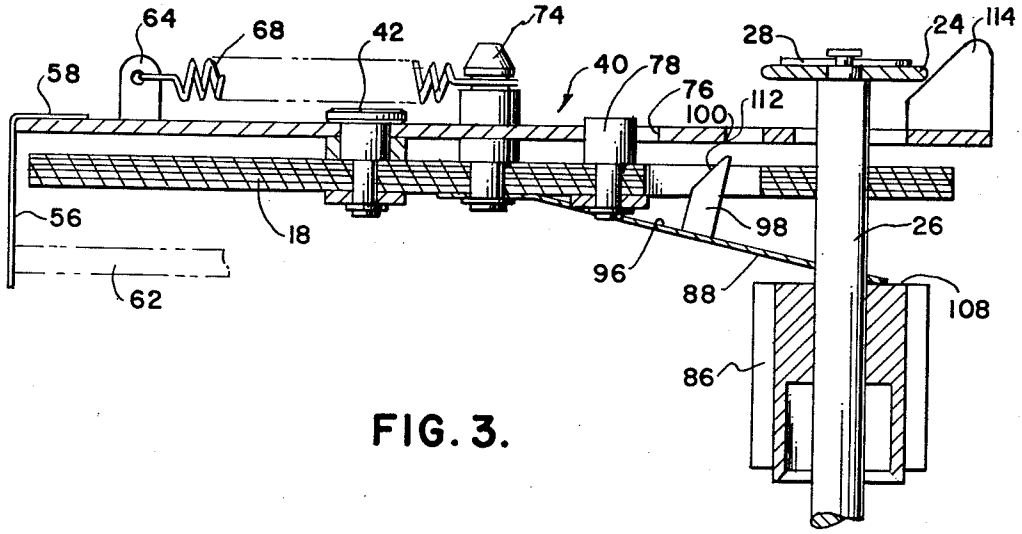

FIG. 3.

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AUTOMATIC STARTING DEVICE FOR AUTOMOBILE CLOCK

Filed July 6, 1959 3 Sheets-Sheet 3

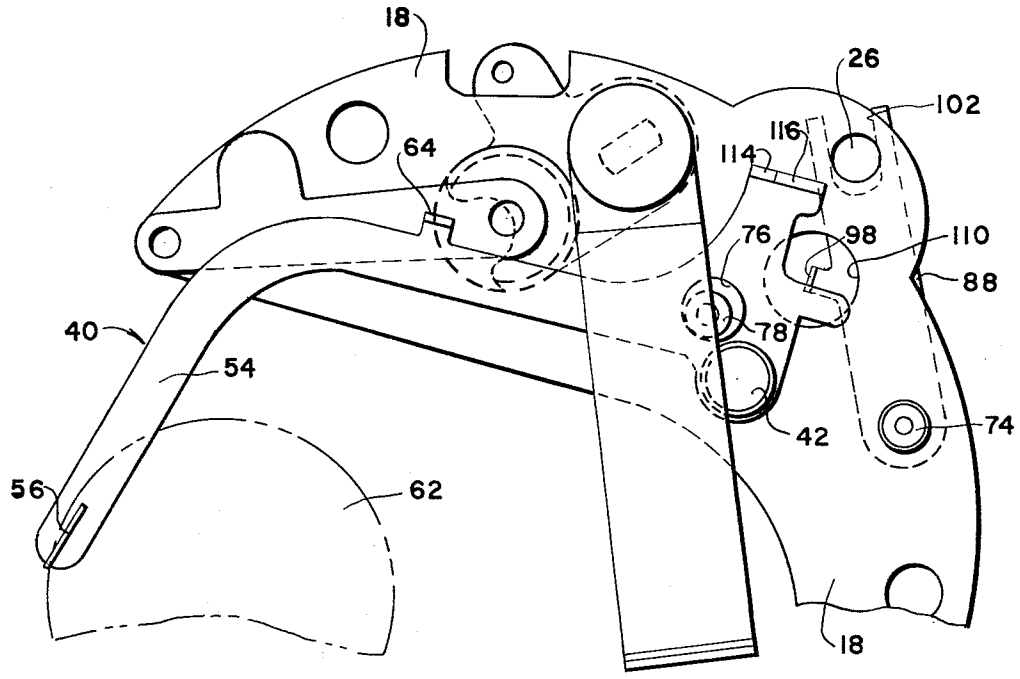

FIG. 4.

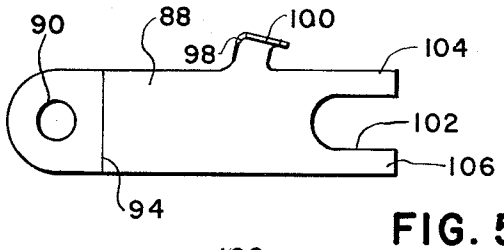

FIG. 5.

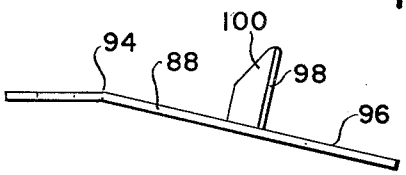

FIG. 6.

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AUTOMATIC STARTING DEVICE FOR AUTOMOBILE CLOCK

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14 Claims. (Cl. 58—28)

The present invention relates to a self-starting mechanism for timepieces and more particularly to a self-starting mechanism for electric clocks wherein movement of a setting shaft in a direction perpendicular to the plane of the clock balance wheel serves to automatically start the timepiece.

In electric watches and clocks wherein an oscillating balance wheel assembly is energized once during each oscillation period, the energizing impulse is usually supplied to the balance wheel assembly at or near its point of rest, which during operation is also approximately the point of maximum angular velocity. It is therefore necessary in timepieces of this type to provide means for starting the watch or clock whenever it is stopped, either for time adjustment, mechanical adjustment, or perhaps for the replacement of batteries or other electrical energizing means.

The present invention is directed to a novel automatic starting device for electrical watches and clocks particularly suited for use in conjunction with automobile clocks. The novel starting construction of the present invention makes it possible to utilize the setting shaft of the clock to automatically start the mechanism if for any reason, it has stopped. The clock construction of the present invention includes means for stopping the balance wheel during the setting operation with the mechanical starting impulse being applied to the balance assembly upon movement of the setting shaft back to the normal position it assumes during clock operation.

Although constructions are known wherein the setting shaft is utilized to provide a starting impulse to a watch structure, these devices are not satisfactory for use in conjunction with automobile clocks and the like wherein the vertical mounting in an automobile dashboard makes it desirable to employ a setting shaft at right angles to the balance wheel. By means of the construction of the present invention, it is possible to have the setting shaft extend outwardly from the clock face in a direction perpendicular to the dashboard of an automobile and at the same time utilize the clock setting mechanism for providing an automatic starting impulse to the clock movement.

It is therefore a primary object of the present invention to provide an automatic starting construction for electrically driven timepieces.

Another object of the present invention is to provide a self-starting construction for horological devices wherein the starting impulse is supplied from the setting shaft of the device.

Another object of the present invention is to provide automatic starting means for clocks, watches and the like wherein the starting impulse is initiated by axial movement of a setting shaft substantially perpendicular to the plane of the balance wheel.

Another object of the present invention is to provide a reliable improved and fully automatic starting device for watches, clocks and the like.

These and other objects and advantages of the invention will be more apparent upon reference to the following specification and claims and appended drawings wherein:

FIGURE 1 shows a view of the train side of a clock showing the coil and third plates of a conventional electric clock construction incorporating the novel self-starting arrangement of the present invention;

FIGURES 2 and 3 are composite cross-sectional views through a watch construction of the type shown in FIGURE 1;

FIGURE 4 shows a portion of the watch structure of FIGURE 1 with the starting device in engagement with the balance wheel to stop the timepiece; and

FIGURES 5 and 6 are plan and elevation views of the return spring of the present invention.

Referring to the drawings, FIGURE 1 shows a typical electric clock structure embodying the novel automatic starting device of the present invention.

More specifically, FIGURE 1 represents a view of the coil plate and third plates of an electric clock movement as viewed from the train side of the clock. The clock structure generally indicated at 10 includes the conventional third plate unit 12, a jewel screw unit 14 including a jewel screw nut 16 and a coil plate unit 18. Also shown are a shunt bridge screw 20 and a staking washer 22.

Incorporated in the watch in cooperation with the aforesaid elements is the novel automatic starting structure of the present invention including a setting washer 24 secured to the top end of a setting shaft 26 as best seen in FIGURES 2 and 3 by means of a wire pin 28 passing through the end of the shaft. As shown in FIGURE 2, washer 24 fits over a reduced portion 30 at the end of shaft 26 and clip 28 passes around a second reduced portion 32 in abutment with a flange 34 at the extreme end of the setting shaft. Wire clip 28 is suitably bent and possesses sufficient resiliency in the pressing against the flange 34 on one side and the washer 24 on the other to hold the washer securely in engagement with the shoulder 36 at the end of shaft 24 and defined by the reduced portion of the shaft indicated at 30.

The novel automatic starting mechanism of the present invention further includes a starting lever generally indicated at 40 pivoted about a pivot post 42 mounted in the coil plate 18. Pivot post 42 includes an upper flange 44 engaging starting lever 40 and a lower flange 46 spaced from the underside of coil plate 18 by a staking washer 48. A pivot spacer 50 surrounds the upper portion of pivot post 42 and acts to properly space the starting lever 40 above the coil plate 18.

Starting lever 40 includes elongated end 54 to which is secured a starting wire 56. As best seen in FIGURES 2 and 3, starting wire 56 extends for a short distance along the top surface of starting lever 40 as indicated at 58 and is bent around the edge of the starting lever to extend downwardly as indicated at 60 adjacent the balance wheel of the clock which is indicated by dotted lines at 62. The upper portion 58 of starting wire 56 may be spot welded or otherwise suitably secured to the elongated end of starting lever 40.

Approximately midway of the starting lever 40 is an upwardly extending bent over flange 64 having an aperture 66 which receives one end of tension type toggle spring 68 which end is bent over to form a hook 70 received in aperture 66. The other end of tension spring 68 is wrapped around the reduced diameter portion 72 of a spring post 74 mounted in the coil plate 18.

Adjacent the other end of the starting lever 40 near pivot post 42 the starting lever is formed with a circular aperture 76 as best seen, for example, in FIGURE 1, which aperture receives a stop post 78 also mounted in the coil plate 18. As shown in the drawings, aperture 76 is substantially larger than stop post 78 to allow a limited amount of movement of the starting lever 40 about the pivot post 42 before stop post 78 comes in contact with one of the wall surfaces of aperture 76 to stop further pivotal movement of the starting lever in either rotational direction about the pivot post 42. Stop

post 78 is secured to coil plate 18 by the shoulders defined by enlarged portion 80 of the pivot post and the lower annular flange 82 formed near the lower end of stop post 78. The flange 82 retains a staking washer 84 in a manner similar to washer 48 of pivot post 42.

Carried near the other end of setting shaft 26 is a setting pinion 86 adapted to engage a suitable idler gear (not shown) in the conventional manner so that rotation of shaft 26 between the fingers will provide the desired rotational adjustment to the various hands of the clock.

Restrained between the setting pinion 86 and the underside of coil plate 18 is a return spring 88 shown in detail in FIGURES 5 and 6. One end of the return spring 88 is provided with an aperture 90 which receives the lower end of spring post 74 so that the return spring 88 is firmly secured to the coil plate 18 by flange 92 formed at the lower end of spring post 74. Return spring 88 is bent at 94 and in its normal unstressed position extends downwardly away from a horizontal plane as indicated at 96 in FIGURES 3 and 6. Included approximately midway of the downwardly sloping portion 96 of the return spring is a bent over upwardly extending flange 98 tapered toward its top as indicated at 100. The extreme end of downwardly sloping portion 96 is provided with a slot 102 defining spaced fingers 104 and 106 which straddle the shaft 26 and are engaged by the upper surface 108 of setting pinion 86.

The upwardly extending tapered flange 98 of the return spring passes through a circular aperture 110 in coil plate 18 and extends upwardly alongside and beyond a projection 112 on the end of starting lever 40.

The extreme end of starting lever 40 terminates in a tapered camming flange 114 having a downwardly sloping surface 116 adapted to engage the edge of the setting washer 24.

During normal operation of the clock the position of the starting structure described above is that shown in FIGURES 1 and 2. It should be emphasized that FIGURES 2 and 3 represent composite cross sectional views and show in a general way the relationship of the various components of the coil plate, starting lever, and return spring, which are shown in a composite view for the sake of simplicity to illustrate the operation of the novel construction of the present invention. During the normal operation of the timepiece with the starting mechanism in the position shown in FIGURES 1 and 2 end 60 of starting wire 56 is spaced outwardly away from the edge of balance wheel 62 as clearly seen in FIGURES 1 and 2 and setting stem or shaft 26 is in its innermost position towards the interior of a conventional watch case which as shown in FIGURE 2 is represented by the uppermost position of the setting shaft 26 and washer 24. At this time the tension spring 68 acting between flange 64 and spring post 74 positively urges pivotably mounted starting lever 40 into the extreme clockwise position so that the interior of aperture 76 engages one edge of post 78. At the same time return spring 88 is retained under stress against the undersurface of coil plate 18 by the setting pinion 86.

When it is desired to adjust the setting of the watch, setting shaft 26 is pulled outwardly away from the watch case as represented by the downward movement of the shaft or stem 26 to the extreme downward position illustrated in FIGURE 3. In this position the setting pinion 86 is engaged with suitable gear means to adjust the hands of a watch in the conventional manner. At the same time return spring 88 is released and is free to assume its normal downwardly sloping position as also illustrated in FIGURE 3.

In conjunction with the downward movement of setting stem 26, washer 24 engages the sloping surface 116 of camming flange 114 imparting a pivotal thrust to the starting lever to cause it to pivot in a counterclockwise direction about the pivot post 42 to the extreme counterclockwise position shown in FIGURE 4. Movement of the lever about pivot post 42 during the latter part of its pivotal movement in both the clockwise and counterclockwise direction is aided by tension spring 68 which acts as an over-center toggle spring to securely lock starting lever 40 in either of the two desired rotational positions.

With starting lever in the extreme counterclockwise position as illustrated in FIGURES 3 and 4, starting wire 56 frictionally engages the outer peripheral surface of balance wheel 62 and prevents the balance wheel from oscillating. Hence, during the time the hands of the clock are being set, the balance wheel is securely retained against oscillating movement by the starting wire 56 as it frictionally engages the edge of the balance wheel. At this time the watch movement is completely stopped.

After the hands of the clock have been adjusted to the desired position by rotation of setting stem 26 and setting pinion 86 the stem is pushed inwardly of a conventional watch case back to the normal operating position of the clock as illustrated in FIGURES 1 and 2. Upward movement of setting pinion 86 is accompanied by the upward movement of return spring 88 bearing on the upper surface 108 of the setting pinion. Further upward movement of return spring 88 brings the tapered surface 100 of flange 98 into engagement with the projection 112 on the starting lever which flange imparts a clockwise thrust or impulse to the starting lever 40. As discussed above, the latter part of the clockwise motion of starting lever 40 is aided by the over-center action of tension spring 68. However, the initial clockwise thrust imparted to lever 40 by surface 100 of the return spring 88 is accompanied by the frictional release of the balance wheel 62 by starting wire 56. As starting wire 56 begins its clockwise movement, it frictionally engages the edge of balance wheel 62 for a brief instant and frictionally imparts to the balance wheel a sufficient clockwise thrust to initiate movement of the balance wheel 62, which initial movement of the balance wheel against the action of a conventional hairspring is sufficient to start the proper operation of the electric clock in a well known manner.

As can be seen, the present invention provides a novel structure for use in timepieces wherein a setting shaft or stem is utilized to impart an automatic starting impulse to the timepiece. Unique features of the present invention include this automatic starting feature in a clock construction wherein movement of the setting stem is in a direction perpendicular to the plane of the balance wheel and major clock support elements. This arrangement is particularly suited to use in automobile dashboard clocks wherein the setting stem projects outwardly from the vertical surface of the automobile dashboard horizontally towards the operator of the automobile.

The novel starting structure of the present invention is of relatively simple construction and completely reliable in operation and may be simply and readily incorporated in existing watch constructions. While the present invention has been described in conjunction with an electric clock for automobiles, it will be apparent that the invention is not so limited but it may be incorporated in a wide variety of timepiece structures wherein perpendicular projection of the setting stem as well as the simplified and reliable operation of the starting mechanism shown is desired.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A self-starting mechanism for timepieces having a

setting stem and a balance wheel comprising a starting lever pivotally mounted in said timepiece, a starting wire carried by said starting lever for engaging said balance wheel when said lever is pivoted about its mount, means engaged and energized by said setting stem upon longitudinal displacement thereof from its normal operating position for pivoting said starting lever to bring said starting wire into engagement with said balance wheel, means energized by return of said setting stem to its initial longitudinal poistion for pivoting said lever and said starting wire away from said balance wheel with sufficient initial contact between said starting wire and said balance wheel to start said timepiece, and an over-center tension spring connected to said starting lever for securely locking said starting lever in either of its two extreme pivoted positions.

2. A self-starting mechanism for timepieces having a setting stem and a balance wheel lying in a plane substantially perpendicular to the longitudinal axis of said setting stem comprising a starting lever pivotally mounted in said timepiece, a starting wire carried by said starting lever for engaging said balance wheel when said lever is pivoted about its mount, means energized by longitudinal displacement of said setting stem from its normal operating position for pivoting said starting lever to bring said starting wire into engagement with said balance wheel, means energized by return of said setting stem to its initial longitudinal position for pivoting said lever and said starting wire away from said balance wheel with sufficient initial contact between said starting wire and said balance wheel to start said timepiece, and an over-center tension spring connected to said starting lever for securely locking said starting lever in either of its two extreme pivoted positions.

3. A self-starting mechanism for timepieces comprising a setting stem, a balance wheel lying in a plane substantially perpendicular to the longitudinal axis of said setting stem, a starting lever pivotally mounted in said timepiece, a starting wire carried by said starting lever for engaging said balance wheel when said lever is pivoted about its mount, cam means actuated by longitudinal displacement of said setting stem from its normal operating position for pivoting said starting lever to bring said starting wire into engagement with said balance wheel, and second cam means actuated by return of said setting stem to its initial longitudinal position for pivoting said lever and said starting wire away from said balance wheel with sufficient initial contact between said starting wire and said balance wheel to start said timepiece.

4. A self-starting mechanism for electric timepieces having a supporting plate, a balance wheel, and a setting stem substantially perpendicular to the plane of said balance wheel comprising a washer secured to the inner end of said setting stem, a starting lever pivotally mounted on said supporting plate, a starting wire carried at one end of said starting lever for frictionally engaging the edge of said balance wheel when said lever is pivoted about its mount, a camming surface carried at the other end of said starting lever in the path of movement of said washer whereby longitudinal displacement of said setting stem from its normal operating position causes said washer to bear on said camming surface, said washer thereby imparting a pivotal movement to said lever to bring said starting wire into engagement with said balance wheel, and means energized by return of said setting stem to its initial longitudinal position for pivoting said lever and said starting wire away from said balance wheel with sufficient initial contact between said starting wire and said balance wheel to start oscillation of said balance wheel.

5. A self-starting mechanism according to claim 4

wherein said starting wire and said camming surface are angularly spaced about said mount approximately 180°.

6. A self-starting mechanism according to claim 4 wherein said supporting plate is the coil plate of an electric clock.

7. A self-starting mechanism according to claim 4 including an over-center tension spring connected to said starting lever for securely locking said starting lever in either of its two extreme pivoted positions.

8. A self-starting mechanism according to claim 7 including a return spring mounted adjacent said starting lever, said return spring having one end normally biased away from said starting lever and means carried by said setting stem for engaging said return spring during return movement of said setting stem whereby said return spring imparts pivotal movement to said starting lever in a direction to carry said starting wire away from said balance wheel.

9. A self-starting mechanism according to claim 8 wherein said means carried by said setting stem is a setting pinion for adjusting the hands of a timepiece and said one end of said return spring is retained between said pinion and said support plate.

10. A self-starting mechanism according to claim 9 wherein said return spring is secured to the side of said support plate opposite from said starting lever, said support plate includes an aperture, and said one end of said return spring includes a camming surface for projection through said aperture to bear against said starting lever when said setting stem is returned to its normal longitudinal position to impart pivotal movement to said lever in a direction resulting in the movement of said starting wire away from said balance wheel.

11. A self-starting mechanism according to claim 10 wherein said support plate is the coil plate of an electric clock.

12. A self-starting mechanism according to claim 11 in which said one end of said return spring is slotted to define spaced fingers which encircle said setting stem and are engaged by the inner surface of said setting pinion.

13. A self-starting mechanism according to claim 12 wherein the normal operating position of said setting stem is its innermost position with respect to the face of said clock.

14. A self-starting mechanism for timepieces having a setting stem and a balance wheel comprising a starting lever pivotally mounted in said timepiece, a starting wire carried by said starting lever for engaging said balance wheel when said lever is pivoted about its mount, means energized by longitudinal displacement of said setting stem from its normal operating position for pivoting said starting lever to bring said starting wire into engagement with said balance wheel, means energized by return of said setting stem to its initial longitudinal position for pivoting said lever and said starting wire away from said balance wheel with sufficient initial contact between said starting wire and said balance wheel to start said timepiece, and an over center tension spring connected to said starting lever for securely locking said starting lever in either of its two extreme pivoted positions.

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