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3,290,875

DIAL TRAIN ARRANGEMENT FOR AN ELECTRIC WATCH

Filed Jan. 18, 1965

3 Sheets-Sheet 1

Fig. 1

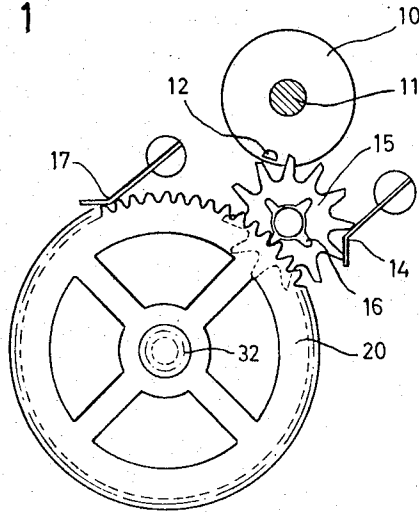
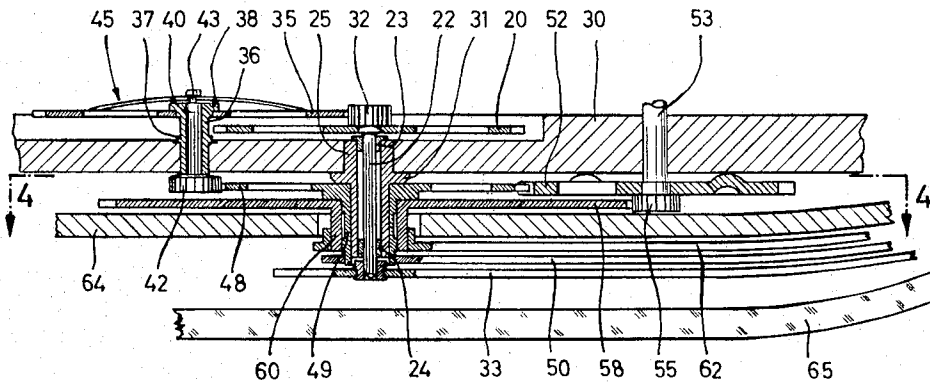


Fig. 2



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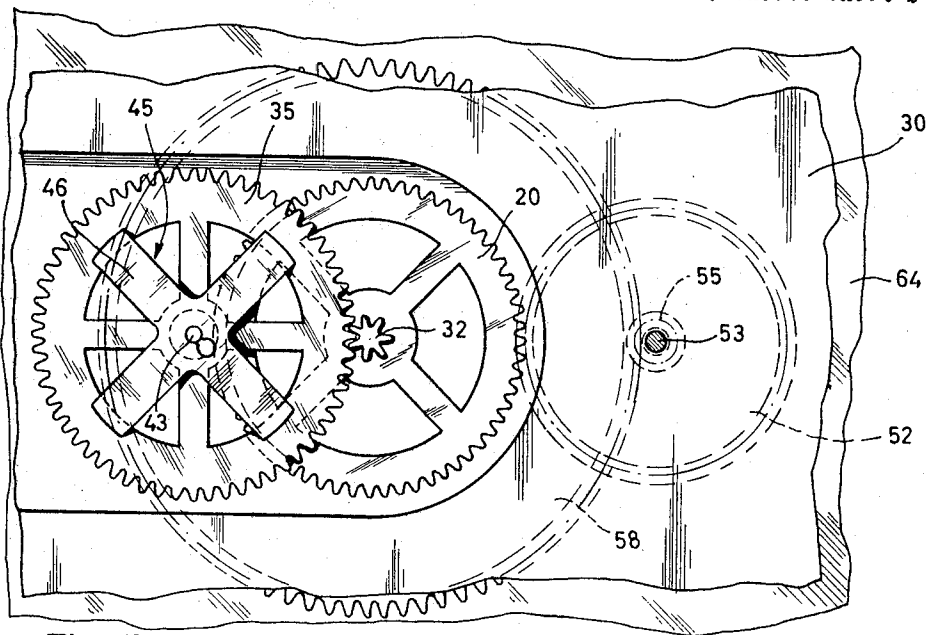


Fig. 3

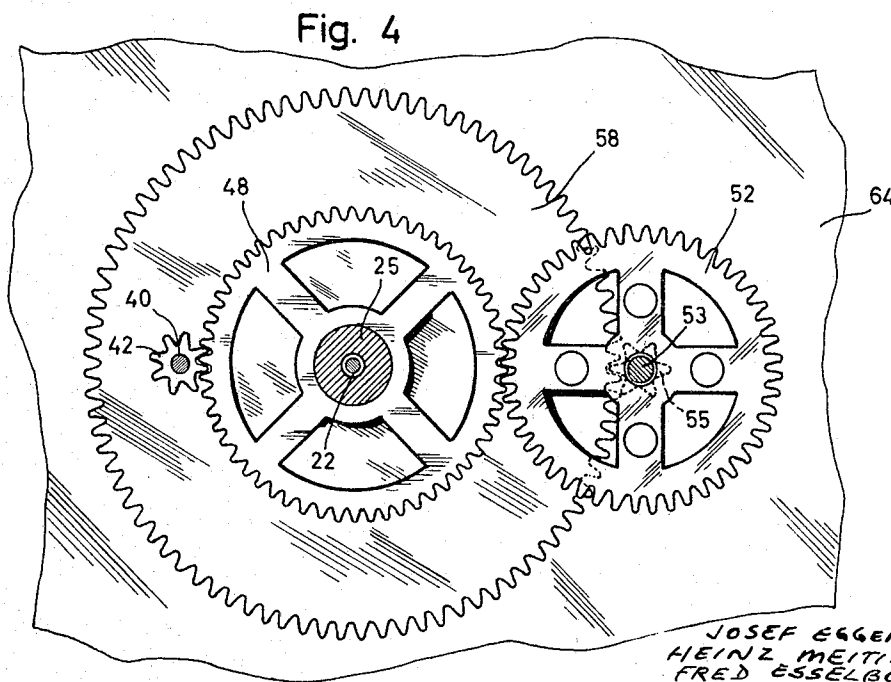


Fig. 4

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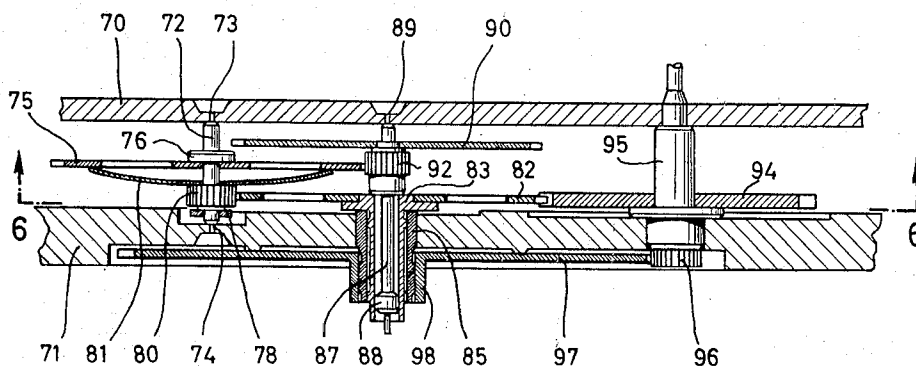
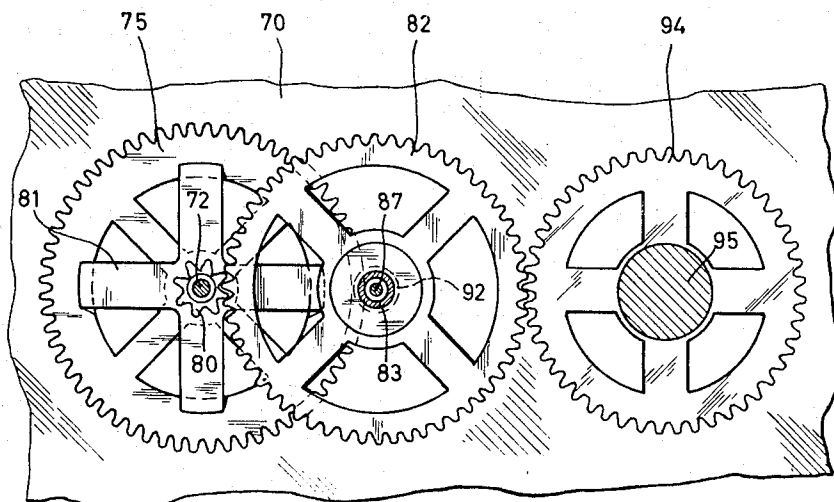
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3 Sheets-Sheet 3



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DIAL TRAIN ARRANGEMENT FOR AN ELECTRIC WATCH

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U 10,429

7 Claims. (Cl. 58-125)

The present invention relates to watches and more particularly to a dial train arrangement for electric watches.

In the usual electric watch an index wheel is driven by a balance and the index wheel drives a fourth wheel, a center wheel, an intermediate wheel and finally the hour wheel.

It is the objective of the present invention to provide a dial train arrangement in which only a minimum of wheels and pinions is used and which has a relatively small thickness of the entire dial train arrangement.

In accordance with the present invention the center wheel is directly fixed on the cannon pinion. The center wheel engages the minute wheel. The minute pinion, which is directly fixed on the minute wheel, engages the hour wheel. This arrangement omits the usual cannon wheel. The hour wheel is driven by a single intermediate wheel (the minute wheel) and by a single pinion. These driving wheels and pinions can be arranged in only two levels so that the thickness of the total drive train can be correspondingly reduced.

The present invention will be better understood from a consideration of an embodiment thereof, described in conjunction with the attached drawings, in which:

FIG. 1 is a top schematic view showing the drive of the fourth wheel by the balance wheel;

FIG. 2 is a partial cross-section of the dial train arrangement beginning from the fourth wheel and going to the drive of the hands;

FIG. 3 is a top plan view looking down on the mechanism shown in FIG. 2;

FIG. 4 is a section taken along the line 4-4 of FIG. 2;

FIG. 5 is a partial section, corresponding to the section shown in FIG. 2, and showing a second form of construction according to the invention; and

FIG. 6 is a partial section taken along the line 6-6 of FIG. 5.

In FIG. 1 a balance wheel roller disk 10 is arranged on a balance staff 11 and carries a roller jewel 12. In case of electrically driven watches the balance wheel, which is not shown but which is also mounted on staff 11, can be driven in any manner by electric means. For instance, the balance wheel can carry a coil which, during the balance wheel oscillation, receives an electrical impulse from a battery by means of a contact system. The coil co-operates with a stationary permanent magnet to give a driving impulse to the balance at each oscillation or semi-oscillation. U.S. Patent No. 3,046,460 by Ewald Zemla, Pforzheim, West Germany, published on July 24, 1962, shows and describes this form of construction of an electric drive.

The driving impulse is transmitted from the roller jewel 12 to the index wheel 15, which is shifted by partial steps. A locking spring 14 retains the index wheel 15 in its final step position between the times it is shifted. The index wheel 15 has fixed on it the index wheel pinion 16 and pinion 16 is engaged with the fourth wheel 20. The fourth wheel 20 is therefore rotated by defined steps and is held by locking devices, such as the locking spring 17. Alternatively, the fourth wheel 20 can be retained in its positions between driving motions by the index pinion 16.

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The drive from the fourth wheel 20 to the several hands is described in detail in connection with FIGS. 2, 3 and 4.

The fourth wheel 20 is fixed on a fourth wheel staff 22 which is pivoted in the bearings 23 and 24 of a carrying bushing 25, see FIG. 2. The carrying bushing 25 is fixed in a frame plate 30, for instance by press fitting, and its axial position is determined by its ring shoulder 31 resting against the surface of the frame plate. The second hand 33 is fixed on the outer end of the fourth wheel staff (the lower side in FIG. 2).

The fourth wheel staff 22 carries a fourth pinion 32 which is fixed on the staff above the fourth wheel 20. The fourth pinion 32 is engaged (meshes) with the third wheel 35 which is rigidly fixed on a third wheel tube 36. The third wheel tube 36 rotates in the frame plate 30 and has a ring shoulder 37 in a counter-sink of the frame plate 30 to maintain tube 36 in the axial direction. The third wheel tube 36 rests against the third wheel 35 with its ring shoulder 38 so that wheel 35 is positioned axially relative to the third wheel tube 36.

A third wheel staff 40 is rotatably arranged in the third wheel tube 36. Staff 40 carries on its lower end (see FIG. 2) a third pinion 42. Staff 30 is loosely connected on its other end with a spring plate 45 by a pivot 43. This spring plate has, for instance, four spokes 46 and presses with these spokes against the third wheel 35. The spring plate 45 pulls the third pinion 42 against the bottom surface on the third wheel tube so that the dial train friction is created between the top shoulder of pinion 42 and the bottom of the tube 36. The third pinion 42 is taken along by the third wheel 35 during the drive due to this friction. However, the hands can be moved in either direction without moving the third wheel backwards as the friction is not great enough to overcome the force with which the fourth wheel is held during hand setting.

The third pinion 42 meshes with the center wheel 48 which is integral with a center tube 49. Center tube 49 is rotatably arranged upon the carrying bushing 25 and rests against its ring shoulder 31. A minute hand 50 is fixed on the outer lower end (FIG. 2) of the center tube 49.

The center wheel 48 also engages with a minute wheel 52 which is fixed on an arbor 53. The arbor 53 is rotatably arranged in the frame plate 30. This arbor 53 serves to set the minute hand. The setting device is preferably a crown exterior to the case, which, when pulled outward, engages the arbor 53. However, since the connected setting device does not form a part of the invention, it will not be further detailed. A minute pinion 55 is rigidly fixed on the arbor 53 and is engaged with the hour wheel 58. Hour wheel 58 is integral with hour wheel tube 60 which is rotatably arranged over the center tube and rests against the shoulder of the cannon tube. The outer lower end of the hour tube (FIG. 2) carries the hour hand 62. In the preceding description (FIGS. 2 to 4) the drive from the center wheel to the hour wheel occurs in only two levels so that, for the transmission, only a minute wheel and minute pinion are needed. An especially advantageous thinness of the watch drive is thereby obtained.

The frame plate 30 is arranged between the fourth wheel on one side and the center wheel on the other side. This permits the third wheel, the third pinion, the fourth wheel staff, the center wheel tube and the hour wheel tube to be pivoted in a simple and reliable manner without strong bearing forces being exerted on these bearings.

FIG. 2 shows, schematically, a dial 64 and a crystal 65. The faces of both parts are not detailed since they are not relevant to the present invention.

In FIGS. 5 and 6 another form of construction of the present invention is shown. The inner frame plate 70 is attached to the outer frame plate 71 by pillars (not shown). A third wheel staff 72 is pivoted in frame

plates 70 and 71 with pivots 73 and 74, respectively. A third wheel 75 is rigidly connected to this staff. The third wheel 75 rests against the ring shoulder 76 on the third wheel staff 72. A shoulder disk 78 is rigidly fixed on the third wheel staff, for example by press fitting. A third wheel pinion, freely rotatable on staff 72, rests against the shoulder disk 78. A spring plate 81, which rests with its outer edge against the third wheel 75, presses on the top of pinion 80. The third pinion 80 is consistently pressed against the shoulder disk 78 and spring friction between pinion and wheel exists so that during the normal watch drive the third pinion will be taken along when the third wheel is rotated.

The third pinion 80 is engaged with a center wheel 82 which is rigidly fixed on a center tube 83. The center tube 83 is rotatably pivoted in the carrying bushing 85 which is stationary arranged in the outer frame plate 71 and protrudes from it. A fourth wheel staff 87 is pivoted within center tube 83 with its one outer end 88 having a cylindrical part. The other end of staff 87 has its pivot 89 in the inner frame plate 70. The fourth wheel staff 87 has the fourth wheel 90 rigidly fixed on its inner end. The fourth pinion 92 is fixed to staff 87 and is engaged with the third wheel 75. The center wheel 82 is engaged with the minute wheel 94. Minute wheel 94 is rigidly fixed on the minute wheel staff 95 which is simultaneously formed as a setting staff and is connected with the setting mechanism. For example, staff 95 can be turned when a crown is pulled outward. The minute wheel staff 95 is pivoted in both frame plates and carries on its lower end (FIG. 5) a minute pinion 96. Pinion 96 is engaged with the hour wheel 97 which is integral with the hour wheel tube 98. Tube 98 pivots on the carrying bushing 85.

The drive of FIGS. 5 and 6 and its general advantages are the same as those of its first form of construction. However, it should be noticed that, different from the first form of construction, the outer frame plate 71 is arranged between the minute wheel and hour wheel and, therefore, also between the center wheel and the hour wheel. The center wheel tube is arranged inside of the stationary carrying bushing and the hour wheel tube outside of this carrying bushing so that the center wheel tube and the hour wheel tube are not directly in contact and an especially advantageous driving condition results.

Modifications may be made in the above-described embodiments within the scope of the claims.

What is claimed is:

1. In an electric watch having a frame, an index wheel and a fourth wheel driven by the index wheel; a dial train arrangement comprising a third wheel, a third wheel staff pivoted in the frame and a third pinion, the third pinion and the third wheel arranged on the said third wheel staff; a center wheel connected to a center wheel tube pivoted in said frame; an hour wheel connected to an hour wheel tube; and a minute wheel and a minute pinion arranged on a staff pivoted in said frame; wherein the center wheel directly engages with the minute wheel and the minute pinion engages directly with the hour wheel.

2. Dial train arrangement according to claim 1 wherein the frame includes a frame plate positioned between the fourth wheel and the center wheel and in which plate the third wheel staff and the minute wheel are pivoted.

3. Dial train arrangement according to claim 1 wherein the frame includes a frame plate having fixed therein a carrying bushing in which the fourth wheel staff is pivoted whereby the center wheel tube and the hour wheel tube can both be rotatably arranged outside of the carrying bushing.

4. Dial train arrangement according to claim 1 wherein the center wheel and the minute wheel have the same number of teeth.

5. Dial train arrangement according to claim 1 wherein the third wheel and the third pinion are tensionally connected to each other by means of a spring.

6. Dial train arrangement according to claim 5 wherein the third wheel is fixed on its third wheel staff and the third pinion is rotatably arranged on the same third wheel staff.

7. Dial train arrangement according to claim 1, wherein the staff on which the minute pinion is arranged is a setting staff.

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