

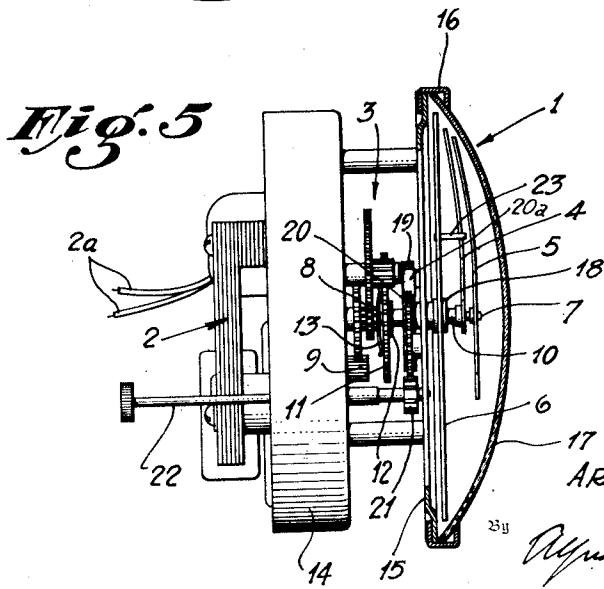
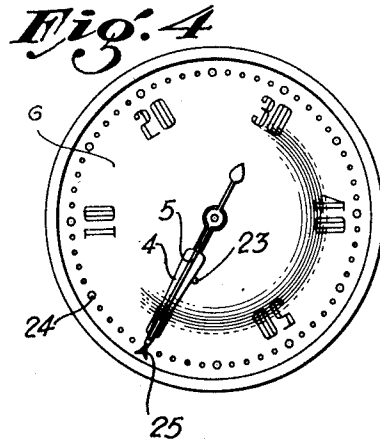
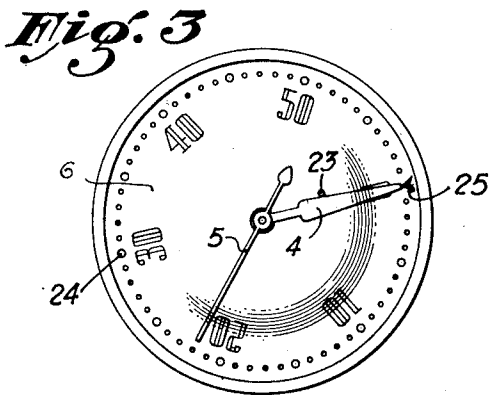
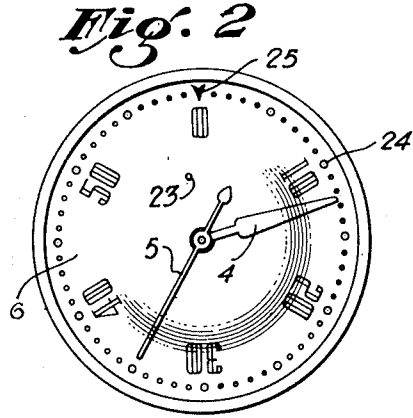
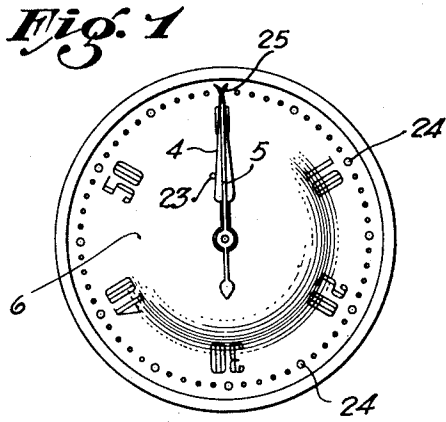
July 15, 1941.

A. E. WIGELSWORTH
ELAPSED-TIME INDICATOR

2,249,072

Filed Feb. 27, 1940

2 Sheets-Sheet 1



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July 15, 1941.

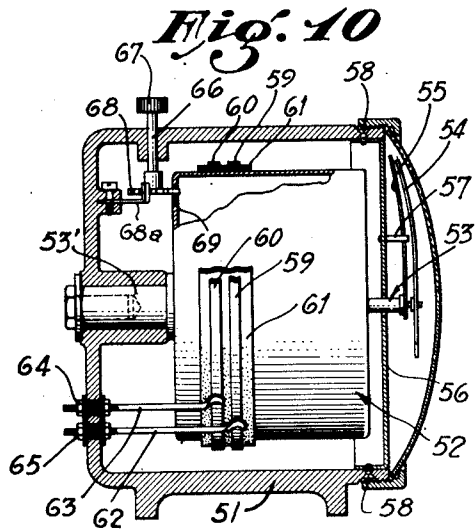
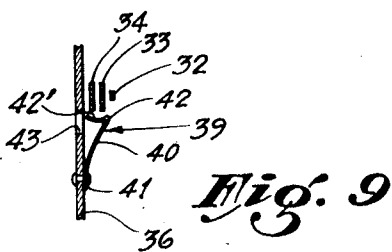
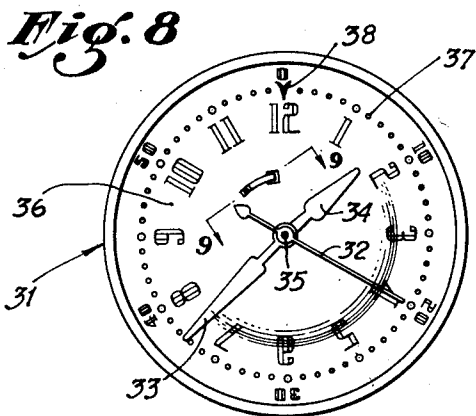
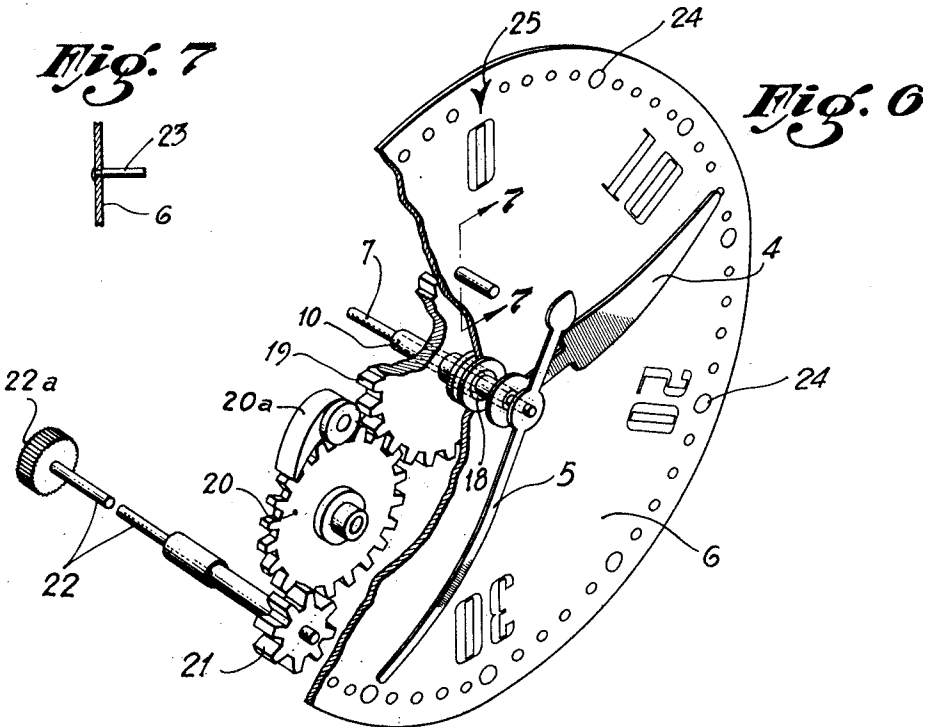
A. E. WIGELSWORTH

2,249,072

ELAPSED-TIME INDICATOR

Filed Feb. 27, 1940

2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,249,072

ELAPSED-TIME INDICATOR

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Application February 27, 1940, Serial No. 321,064

8 Claims. (Cl. 161—15)

My invention relates to elapsed-time indicators and pertains more particularly to a dial mechanism and reset device for such indicators.

An object of the invention is to provide a simple mechanism for alining the hands of an elapsed-time indicator so that all of the hands will start from the same starting index at the beginning of an elapsed-time measurement. Another object of the invention is to provide a simple mechanism for alining all of the hands of an elapsed-time indicator at the beginning of a measurement, which mechanism is so constructed as to allow all of the hands to describe more than one complete revolution of the dial during an elapsed-time measurement.

A further object of the invention is to provide a reset mechanism of the above type which may be easily adapted to conventional clock construction.

Further objects and advantages of the invention will either be specifically brought out in the following description or will be apparent therefrom.

An elapsed-time indicator according to my invention, in its broadest aspects, comprises a clock mechanism which is provided with at least one clock-hand, along with suitable dial means for said hand having time indices including starting index means. My indicator further comprises detent means which is fixedly mounted with respect to the dial means and is preferably mounted thereon. The detent means is adapted to engage the hand and is so positioned with respect to the starting index means and the hand as to bring the hand into alinement with the starting index means when the hand is in engagement with the detent means. And means are also provided for producing relative rotation of the dial means and the mechanism to bring the detent means into engagement with the hand.

As one specific example, the clock mechanism may be provided with at least two hands and adapted to drive one at a relatively low speed, such as a minute-hand, and one at a relatively high speed, such as a second-hand. With this arrangement the detent means may be adapted to engage the low-speed hand without engaging the high-speed hand. Relative rotation of the dial and the mechanism will first cause the detent means to engage the low-speed hand and aline it with the starting index means, and further relative rotation will cause the low-speed hand to rotate relative to the mechanism and the high-speed hand whereby the two hands

may be brought into alinement with one another and with the starting index means.

In its more specific aspects my invention contemplates conventional clock constructions utilizing self-starting synchronous electric motors as timing mechanism since they may be conveniently stopped and started and are therefore readily adapted to elapsed-time measurements. With conventional mechanisms the time-indicating hands are for the most part mounted substantially coaxially, and for that reason the relative rotation of the dial and the mechanism used to obtain the desired positioning of the dial and hands is produced substantially about the same axis. I also contemplate constructions in which the hand or hands which are engageable by the detent means make more than one complete revolution of the dial during any one elapsed-time measurement. To accomplish this the detent means may be mounted for limited movement toward and away from the plane of the dial and is adapted to move out of hand-engaging relation to allow the hands to overtake and pass by when said hands are moved by the clock mechanism.

It is generally preferable, but not necessary, to mount the indicator in a relatively fixed position as a component of an apparatus, for example, in which case it is within the contemplation of this invention to arrange the indicator so that the dial is maintained in a fixed position so as to always be viewed in the same aspect, or, alternatively, to mount the dial so as to be movable with respect to the apparatus. With the last arrangement the dial may be viewed in a different aspect at the beginning of each measurement or it may be returned to the same position at the beginning of each measurement, as will be brought out more fully hereinafter. In the first arrangement the clock mechanism is mounted so as to be rotatable with respect to the dial and the apparatus, and in the second arrangement the mechanism is mounted in a fixed relation to the apparatus and the dial is mounted so as to be rotatable with respect to the mechanism and the apparatus.

The above and other features of my invention will appear in the ensuing description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is a front elevation of an elapsed-time indicator according to my invention showing the hands (minute- and second-hands, in this instance) alined on the starting index preparatory to the measurement of elapsed time;

Fig. 2 is a view thereof with the hands indicating an elapsed time at the end of a measurement;

Fig. 3 is a view thereof during the process of resetting the hands, with the detent means just engaging the minute-hand;

Fig. 4 is a view thereof showing the completion of the resetting operation, with the hands again in alinement with the starting index;

Fig. 5 is a partly sectional side elevation of the complete elapsed-time indicator illustrated in Figs. 1-4;

Fig. 6 is a perspective view of the dial illustrated in Figs. 1-5, showing the resetting mechanism in greater detail;

Fig. 7 is a sectional detail taken along line 7-7 in Fig. 6, illustrating one form of detent means;

Fig. 8 is a front elevation of a modified form of my invention, illustrating an arrangement adapted to make elapsed-time measurements when at least two of the hands are adapted to make more than one complete revolution of the dial during any measurement;

Fig. 9 is a sectional detail taken along line 9-9 in Fig. 8, illustrating the modified form of detent means used therein with the clock hands shown in alinement with one another; and

Fig. 10 is a partly sectional elevation of a modified form of indicator according to my invention, which is provided with a fixed dial so as to be viewed in one aspect at all times.

Referring now to Figs. 1-7, particularly to Fig. 5, my elapsed-time indicator is indicated generally at 1 and is shown as comprising a clock drive mechanism which includes a clock motor 2 such as a self-starting synchronous electric motor, suitable reduction gears 3 which connect the motor 2 with clock hands 4 and 5, which are adapted to rotate at different speeds in the same direction with respect to a clock dial 6 to give elapsed-time indications. In accordance with conventional practice, the high-speed hand 5, which is a second-hand, is directly connected through a shaft 7 to a gear 8 which meshes with a pinion 9 which is directly geared to the clock motor 2. Thus, manual rotation of the hand 5 requires the rotation of the clock motor 2. This usually requires more force than can be applied to the hand 5 without bending, and as a consequence it is usually not feasible to reset the second-hand manually. The low-speed hand 4, which may be a minute-hand, is usually mounted coaxially with respect to the second-hand on a hollow shaft or sleeve 10 through which the shaft 7 extends. The sleeve 10 is adapted to be driven at a speed of one revolution per hour by means of a gear 11 which is suitably meshed in the mechanism 3. This gear drives the sleeve by frictional engagement with a flange 12 provided on the sleeve. A spring washer 13 is provided for pressing the gear 11 against the flange 12 to provide the necessary frictional engagement for driving the hand 4. At the same time, this frictional coupling permits manual setting of the minute-hand 4. The above construction is conventional and is outlined merely to show the adaptation of my invention to such conventional structures.

The above-described clock mechanism and hands are all mounted on a suitable base structure 14 which is adapted for mounting in a fixed relation on a piece of apparatus or in a suitable casing or stand. The base structure 14 is provided with suitable means for supporting and

journaling the gears 3 and the clock shafts 7 and 10, including a plate 15 to which is attached a bezel ring 16 for holding a cover glass 17. The dial 6 is mounted between the plate 15 and the glass 17 and is adapted for rotation about the axis 7 by being mounted on a hollow shaft or sleeve 18 which surrounds the sleeve 10 and is independently rotatable with respect to said sleeve. In conventional constructions a sleeve corresponding to the sleeve 18 is provided for rotating the hour-hand. This sleeve may be used for rotating the dial by removing the hour-hand and the gearing linking the minute- and hour-hands and attaching the sleeve to the dial by suitable means as shown. Suitable means are provided for independently and manually rotating the sleeve 18 and the dial 6 which is connected thereto, with respect to the sleeve 10.

Such means may comprise a gear 19 which is affixed to the sleeve 18 and located beneath the dial 6, an intermediate gear 20 meshing with the gear 19, and a pinion gear 21 which meshes with the gear 20 and is provided with a shaft 22 which is adapted to be manually rotated, as through the agency of a knurled knob 22a which may be located exteriorly of any casing means provided to enclose the clock structure. A pawl 20a may be provided to prevent counter-clockwise movement of the dial by the operator. This prevents the operator from placing the detent on the right-hand side of the hand 4 where it would interfere with the measurement.

My indicator further comprises detent means such as a pin 23, which is fixedly mounted with respect to the dial 6—mounted directly on the dial in this instance—and is adapted to engage the minute-hand 4 without engaging the second-hand 5 (the hand 4 being more closely spaced to the plane of the dial than the hand 5). Thus, upon rotation of the dial 6 by rotating the shaft 22, the detent means 23 may be rotated to a position where it engages the hand 4, and subsequent rotation of the dial 6 will cause rotation of the minute-hand 4 whereby this hand may be set in any desired relation with respect to the second-hand 5.

Referring now more particularly to Figs. 1-4, the dial 6 is shown as provided with time indices 24, being in this case graduated in 60 divisions to show the number of seconds in a minute and the number of minutes in an hour, through which the hands 4 and 5 have moved. The dial is also provided with starting index means 25 which is opposite the zero index and is provided for alining the hands 4 and 5 at the zero index at the beginning of an elapsed-time measurement, as shown more particularly in Fig. 1. The index 25 per se may be omitted, and the zero index itself may be considered the "starting index." The additional index 25 is included merely to facilitate the resetting operation.

Assuming now that the clock hands are pointing to the starting index 25, as shown in Fig. 1 and that it is desired to make an elapsed-time measurement, the clock motor 2 is put in operation as by connecting motor leads 2a across a suitable power source. This sets the hands in operation and they will continue to operate until the motor is disconnected. Assuming that the motor was disconnected 12 minutes and 35 seconds after it was started, the hands will occupy the position shown in Fig. 2. Before starting the next elapsed-time measurement it is desired to return all of the hands to the starting index. This may be accomplished by rotating the shaft

22 which rotates the dial 6 and the detent means 23 in a clockwise direction. In Fig. 3 the dial 6 has been rotated to a position where the detent means 23 just engages the hand 4. Further rotation of the dial will bring the hand 4 in alignment with the hand 5, in which position both hands will be in alignment with the starting index means at 25, as shown in Fig. 4. The detent member 23 is so positioned as to align the minute-hand 4 with the starting index 25 when the detent member is in engagement with the hand 4, as shown in Figs. 1, 3, and 4, i. e., being rotatively displaced from the radial line passing through the index 25 a suitable amount to accommodate for the lateral width of the hand 4 at the position of engagement therewith.

The particular arrangement illustrated in Figs. 1-7 is primarily adapted for the measurement of elapsed times of somewhat less than one hour. This limitation is imposed by the particular construction of the detent 23 which prevents the minute-hand 4 from traveling much beyond the 55 minute index. For numerous applications this limitation is not serious. However, for some applications it is desirable to measure elapsed time in excess of one hour, in which case the minute-hand describes more than one complete revolution of the dial. In order to allow the minute-hand to describe more than one complete revolution, the detent member may be mounted for limited movement toward and away from the plane or face of the dial and is adapted to allow the minute-hand to overtake and pass by when the hands are driven by the clock mechanism.

Referring now to Figs. 8 and 9, a clock 31 is illustrated which is adapted to measure elapsed times of greater than one hour. This clock is shown provided with a plurality of hands movable at different time-related speeds, such as a second-hand 32, a minute-hand 33, and an hour-hand 34, all of which are mounted for rotation substantially about the same axis 35 in accordance with conventional clock practice. The mechanism for operating the hands is not shown and may be the same as illustrated in Fig. 5 with the exception that additional gearing is provided to operate the hour-hand, in accordance with well-known practice. The dial 36 is provided with angularly spaced time indices 37 adapted to give minute, hour, and second indications, and a starting index 38 with which all of the hands are to be alined before the beginning of a measurement. The clock is further provided with a detent means 39 which is fixedly mounted with respect to the dial 36 and is adapted for limited movement with respect to the face of the dial. The detent means may comprise a spring arm 40 which has one end 41 secured to the dial plate 36 and its other end 42 projecting in an inclined relation outwardly from the face of the dial in a clockwise direction and provided with a downwardly extending portion 42' which is adapted to engage the hands 33 and 34 in such manner as to place both of these hands in alignment when it is in engagement therewith and without engaging the second-hand 32. From an inspection of Figs. 8 and 9 it may be visualized that when the hands 33 and 34 are being rotated in a clockwise direction by the clock mechanism they will overtake and engage the inclined spring arm 40 of the detent means 39 and cause said detent to spring downwardly so that they may pass by, a suitable opening 43 being provided in the dial 36 to accommodate the end 42' when the detent means is depressed by the hand 33 or 34.

To reset the hands from the position shown in Fig. 8 so that all of the hands are in alignment with one another and with the starting index 38, the dial 36 is rotated in a clockwise direction. Rotation of the dial causes the detent means to first engage the hour-hand 34 and to rotate this hand about the axis 35 until it comes in alignment with the minute-hand 33, at which time the portion 42' of the detent engages the minute-hand and further rotation of the dial causes rotation of both the minute- and hour-hand in alined relation to a point where they align with the second-hand. The detent means 39 is so positioned with respect to the time indices and the hands 33 and 34 as to align these hands with the starting index 38 when the detent means is in engagement with the hands. The dial 36 may be rotated with respect to the mechanism in any convenient manner, as by means of a gear arrangement such as illustrated in Fig. 6. Although the minute- and hour-hands are usually positively geared to one another, they may be moved independently of one another, since it is conventional to frictionally secure these hands to their operating shafts so that although they are secured to the shaft sufficiently to be moved by the clock mechanism they may still be moved manually independently of one another.

The same considerations apply to the second hand, and it should be appreciated that this hand may be mounted in such manner as to be moved manually independently of the other hands, in which case the detent means 39 may project far enough from the plane of the dial to also engage the second hand. Under such circumstances the relative rotation of the dial and the mechanism will cause the detent means to engage all of the hands, and the hands may then be rotated independently of the mechanism to a position where they are all in alignment with one another and with the starting index. Since any desired rotation of the hands may be obtained, it should be obvious that all of the hands may be alined with the starting index in any desired position and that the starting index may thus be placed in the same position at the beginning of each measurement. To provide for manually rotating the second hand independently of the mechanism, this hand may be frictionally mounted on its shaft in the same manner as described in connection with the minute and hour hands, or it may be frictionally coupled to the driving mechanism in a manner comparable to that of the minute hand, as shown at 11, 12 and 13 in Fig. 5, for example.

Referring to Fig. 10, I have illustrated an embodiment of my invention in which the dial always remains in the same position. With this arrangement, a clock mounting or outer casing 51 is shown which is adapted to be fixedly secured to an apparatus or may be adapted in itself to act as a stand for the timer. A complete clock mechanism may be encased in a casing 52, which casing is provided with a stub shaft 53' which is secured to the case and is journaled in a suitable bearing provided in the case or stand 51. Clock shafts 53 are shown extending from the case 52 to a second-hand 54 and a minute-hand 55. A dial 56, for example a dial like that shown in Fig. 6, is provided with suitable time indices and with a detent member or pin 57. In this embodiment the dial 56 is secured to the casing 51, as by means of screws 58. Assuming that a synchronous motor is used to drive the clock mechanism, the motor leads (not shown) are brought out to slip rings 59 and 60, which extend about

the clock mechanism casing 52 and are suitably insulated from one another and from casing 52 by a ring of insulating material indicated at 61. Suitably insulated spring contact arms 62 and 63 are provided for contacting the slip rings 59 and 60 respectively and are secured to casing 51 and are insulated from one another and from the casing. The contacts are brought out to terminals 64 and 65 respectively, which may be connected to a suitable source of current. To reset the hands, with this embodiment, the clock mechanism is rotated counter-clockwise with respect to the dial. Rotation of the mechanism causes the minute-hand to be engaged by the detent means 57 and thus to be alined with the starting index. Further rotation of the mechanism brings the second-hand into alinement with the minute-hand and the starting index. Obviously, the same form of detent means as shown in Figs. 8 and 9 may be used with this embodiment of my invention along with an hour-hand. In both cases the necessary slippage is provided between the minute-hand and the clock-driving mechanism, as well as between the clock-driving mechanism and the hour-hand in the second case, so that the clock-driving mechanism may be rotated independently of these hands during the resetting operation, as previously brought out. To provide for the rotation of the mechanism with respect to the dial, I have shown a shaft 66 journaled in outer casing 51 and provided at one end with a knob 67 which may be manually rotated and at the other end with a pinion 68 which meshes with suitable gear tooth means 69 provided on the mechanism casing 52.

A pawl 68a may be provided to prevent rotation of the pinion 68 in such direction as to cause counter-clockwise rotation of the clock casing 52. This pawl may be pivotally mounted on the interior of the outer casing 51 and suitably biased against the pinion 68.

Obviously, my invention is subject to considerable modification; hence I do not wish to be restricted to the illustrative examples shown and described herein, but rather to the scope of the appended claims.

I claim:

1. In an elapsed-time indicator including a clock mechanism having a low-speed hand and a high-speed hand driven thereby at different time-related speeds, the combination which comprises: a dial for said hands provided with time indices including starting index means, said dial being relatively rotatable with respect to said mechanism; detent means mounted to rotate with said dial relative to said mechanism and adapted to engage said low-speed hand at a position such as to aline said hand with said starting index means and without engaging said high-speed hand; and means for producing relative rotation of said dial and said mechanism to cause said detent means to engage and rotate said low-speed hand, whereby said hands may be brought into alinement with said starting index means.

2. In an elapsed-time indicator including a clock mechanism having substantially coaxially mounted minute- and second-hands driven thereby, the combination which comprises: a dial for said hands provided with angularly spaced time indices including a starting index; a detent member mounted on said dial and adapted to engage said minute-hand without engaging said second-hand; and means for producing relative rotation of said dial and said mechanism about the axis of said hands to cause said detent mem-

ber to engage said minute-hand and rotate said minute-hand relative to said second-hand to bring said hands into alinement, said detent member being so positioned as to aline said minute-hand with said starting index when said detent member is in engagement with said minute-hand.

3. An indicator as set forth in claim 2, said detent member being mounted for limited movement toward and away from the plane of said dial and being adapted to move out of engaging relation to allow said minute-hand to overtake and pass by when said minute-hand is moved by said mechanism.

4. In an elapsed-time indicator including a clock mechanism having substantially coaxially mounted hour-, minute-, and second-hands driven thereby, the combination which comprises: a dial for said hands provided with angularly spaced time indices including a starting index; a detent member secured to said dial and mounted for limited movement toward and away from the plane of said dial, said detent member being adapted to engage said hour- and minute-hands without engaging said second-hand; and a means for producing relative rotation of said dial and said mechanism about the axis of said hands to cause said detent member to engage said hour- and minute-hands and rotate said hands relative to said second-hand to bring all of said hands into alinement, said detent being so positioned as to aline said hour- and minute-hands with said starting index when said detent is in engagement with said hands and being adapted to move out of engaging relation to allow said minute- and hour-hands to overtake and pass by when said hands are moved by said mechanism.

5. In an elapsed-time indicator including a relatively fixedly mounted clock mechanism having substantially coaxially mounted minute- and second-hands driven thereby, the combination which comprises: a dial for said hands provided with angularly spaced time indices including a starting index; a detent member attached to said dial and adapted to engage said minute-hand without engaging said second-hand; and means for rotating said dial substantially about the axis of said hands, to cause said detent member to engage said minute-hand and rotate said minute-hand relative to said second-hand, whereby said hands may be brought into alinement, said detent member being so positioned as to aline said minute-hand with said starting index when said detent member is in engagement with said minute-hand.

6. In an elapsed-time indicator, the combination which comprises: a body member; a clock mechanism provided with a plurality of hands movable at different time-related speeds and including a second-hand, said clock mechanism being mounted for rotation on said body member about substantially the same axis as the axis of movement of said hands; a dial for said hands mounted in fixed relation to said body member and provided with angularly spaced time indices including a starting index; a detent member attached to said body member and positioned to engage the hand or hands other than said second-hand upon rotation of said mechanism and said hands in a counter-clockwise direction to bring all of said hands into alinement at said starting index.

7. An indicator as set forth in claim 6, said detent member being mounted for limited move-

ment toward and away from the plane of said dial and being adapted to move out of engaging relation with said hand or hands other than said second-hand to allow said hands to overtake and pass by when said hands are moved by said mechanism.

8. In an elapsed-time indicator including a clock mechanism having substantially coaxially mounted time-designating hands driven thereby, the combination which comprises: a dial for said hands provided with angularly spaced time indices including a starting index; a detent member adapted to engage said hands and mounted for

5 limited movement toward and away from the plane of said dial; and means for producing relative rotation of said dial and said mechanism about the axis of said hands to cause said detent member to engage said hands and bring them into alignment with one another, said detent being so positioned as to aline said hands with said starting index when said detent is in engagement with said hands and being adapted to move out of engaging relation to allow said hands to overtake and pass by when said hands are moved by said mechanism.

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