May 11, 1954 B. CHAPMAN 2,678,095

RESETTABLE TIMING DEVICE

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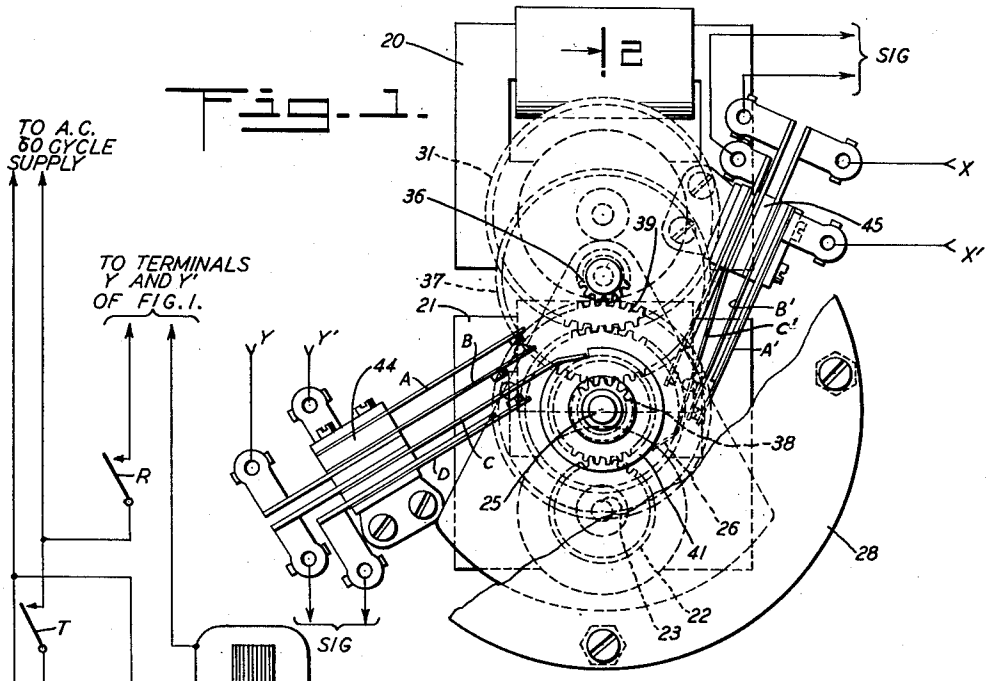


Fig. 1.

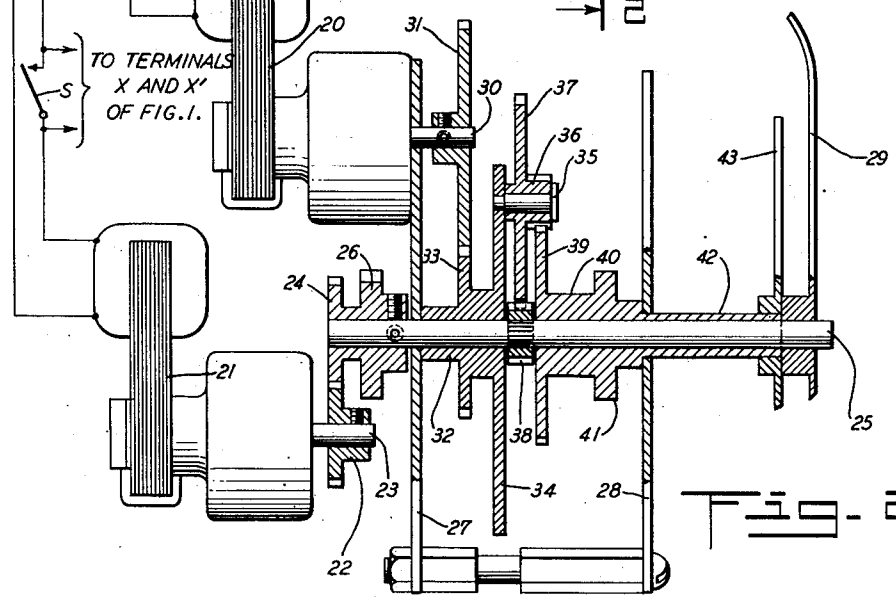


Fig. 2.

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RESETTABLE TIMING DEVICE

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This invention relates to resettable timing devices wherein at the duration of a predetermined period of time, the time indicating components may quickly be reset to their original positions.

The apparatus is designed to drive two hands or pointers for indicating the amount of elapsed time, and means is provided for resetting such hands or pointers either manually or automatically. Two synchronous motors are provided for the operation of the device. One motor is used for operating the device to accumulate time and for resetting the minor time increment shaft and the other motor is used for rapid reset operation of the major time increment shaft. Included in the mechanism are cam-operated contacts, together with exterior switches and wiring, for providing a means for resetting the device at the duration of a predetermined time cycle. Other contacts, similarly cam-operated, may be provided for operating a visible or audible signal to indicate the end of the said predetermined cycle. One of the aforementioned synchronous motors is geared to a "seconds" shaft and in the mode of the invention which is illustrated, moves a "seconds" indicator hand at a speed of one revolution per minute. By means of gearing, a "seconds" shaft drives a "minutes" sleeve according to a predetermined gear ratio corresponding to the major time increments which are desired. By means of the aforementioned contacts, the device may be started and permitted to run for a predetermined period of time which may be interrupted by manual operation of switches which are included in the circuit components. In other words, the circuit may be interrupted manually any number of times; however, at the end of the predetermined period, an automatic resetting operation will occur whereby the timing device is restored to its normal condition and the time indicators to their original positions.

The principal object of this invention is to provide a resettable timer wherein the time indicating elements may be rapidly and automatically reset to their original positions without the use of clutches or gear shifting arrangements and the like.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a front elevation view of the timing mechanism and includes certain cam-operated contact assemblies.

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Fig. 2 is a partial, sectional view of the drawing of Fig. 1 along lines 2—2 with certain components such as the synchronous motors shown in more detail and including one version of electrical wiring circuits which may be utilized in the device.

Now referring to the drawings, a synchronous motor 20 is secured to a plate 27 so that the motor shaft 30 projects through the plate 27 to carry a gear 31 fixed thereto. A second synchronous motor 21, having a shaft 23, to which is fixed a gear 22, is spaced from the plate 27 so that gear 22 engages with another gear 24 fixed to a shaft 25, which is journalled in plate 27 and a second plate 28. The motor 21 is arranged so that, together with the gears 22 and 24, the shaft 25 rotates one revolution per minute; i. e. shaft 25 may be called a "seconds" shaft. A "seconds" hand 29 is fastened to the free end of shaft 25. Loosely journalled also on shaft 25 is a hub 32 to which is fixed a gear 33 and a differential gear carrier 34. The gear 33 meshes with gear 31. A hub 40 having an extension sleeve 42 is also loosely journalled on shaft 25, to which also is fastened a gear 38. The hub 40 carries a gear 39 fixed to it in a manner to engage with another gear 36 carried loosely on a stud 35 fixed near the periphery of the carrier 34 as shown particularly in Fig. 2. A gear 37, integral with gear 36, is also carried by the stud 35 in such a way as to mesh with gear 38. A "minutes" hand 43 is fastened to the free end of the extension sleeve 42.

The gear ratios of gears 36, 37, 38, and 39 may be chosen so that the hub 40 and its sleeve 42 make one revolution for every sixty revolutions of shaft 25 or in any desired ratios.

When the switches S and T are closed so that the motor 21 is energized, and provided that the hub 32 is held from revolving, shaft 25 will be rotated at one revolution per minute via gears 22 and 24, and hub 40 and sleeve 42 will be rotated at a lesser speed via the gears 38, 37, 36, and 39. When either switch S or switch T is opened rotation of these components will cease since motor 21 is thereby deenergized.

Since motor 20 is normally deenergized, shaft 30 remains stationary; consequently, the hub 32 is held stationary via the engagement of gears 31 and 33, and the operation of the mechanism follows as described in the preceding paragraph. However, when motor 20 is energized the shaft 30 will rotate and gear 31 will drive gear 33 so that

the differential gear carrier 34 will revolve around gear 38 imparting rotation to hub 40 and sleeve 42 via gears 36, 37, and 39 at a greater rate than is imparted to it from the rotation of shaft 25. Consequently the hub 40 and its sleeve 42 can be very rapidly reset to its original position.

In order to provide automatic resetting of the hub 40 (and sleeve 42) a cam 41 fixed to rotate with the hub 40. The cam 41 is provided with a single drop-off (see Fig. 1) so that a follower C, which constantly rides the cam 41, will enter the drop-off when the hub 40 and sleeve 42, together with the hand 43, are in their normal positions. In its normal position the follower C coacts with a contact strap D to close a circuit to a signalling device via connections SIG and, at the same time the contact straps A and B are kept in open circuit relationship (see Fig. 1). When cam 41 rotates, the straps A and B become actuated by follower C riding out of the drop-off to close a circuit through the connections Y—Y' of Fig. 1. Now referring to the circuit diagram of Fig. 2 it is readily ascertained that the motor 20 will be energized only when a switch "R" is closed and a circuit is established through Y—Y'. Hence if the hub 40 is in any position except its normal (or zero) position, the closing of switch R will bring about rotation of hub 40 until its normal position is reached.

Similarly, a cam 26 is fixed to the seconds shaft 25 whereby a similar contact follower C' controls the opening and closing of a pair of contact straps A' and B' to establish a circuit via connections X—X'. Note that in Fig. 1 the shaft 25 is out of its normal position (zero position) while the hub 40 and sleeve 42 is in its normal position (zero position).

By way of illustration, let it be assumed that both shaft 25 and hub 40 (and sleeve 42) are in their normal (zero) positions so that circuits cannot be established through X—X' and Y—Y' respectively. Let it be assumed further that it is desired to time an operation wherein the "minutes" hub 40 (and sleeve 42) will be automatically reset to its original position after the completion of a fractional rotation, and the "seconds" shaft 25 will be similarly reset to its original position. In order to operate the timer switch R will remain open and both switch S and switch T closed. Synchronous motor 21 will thereby be energized and the time indicator hands 29 and 43 will indicate the elapsed time for the period of operation, at the end of which neither hand 29 or 43 is in its original position. Since switch T is opened at the end of the timing period, neither motor 20 nor 21 is energized. To reset the shaft 25 including hand 29, it is only necessary to open switch S and close switch T whereupon motor 21 becomes energized through connections X—X' and contact straps A' and B'. When the hand 29 reaches its original position the contacts A' and B' open as the follower C' enters into the drop-off portion of cam 26. To reset hub 40 (and sleeve 42) including hand 43, it is only necessary to close switch R whereupon motor 20 becomes energized through connections Y—Y' and contact straps A and B. When hand 43 reaches its original position the contacts A and B open as the follower C enters into the drop-off portion of cam 41 and motor 26 becomes deenergized.

As illustrated in Fig. 1, the contact assemblies 44 and 45 respectively are provided with contact straps such as C and D whereby a signal may be electrically controlled to indicate whenever the

hands 29 and 43 are precisely in their respective original (zero) positions. Normally, the inertia of the gear reduction mechanism of the synchronous motors will be sufficient in a device of this kind to prevent coasting beyond the original positions of the hands 29 and 43 during reset operations; however, it may be necessary in some instances to provide suitable braking means against motor-drift. A simple expedient may be provided in this respect by equipping switch T with a transfer point in its "off" position (not shown) whereby the motor 21 is connected across the alternating current line through a selenium oxide or copper oxide rectifier thereby providing electro-dynamic braking of a kind well known in the art.

While there have been shown and described and pointed out the fundamental novel features of the invention as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art, without departing from the spirit of the invention. It is the intention, therefore, to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. A timing device, comprising a first synchronous motor, a first time indicating shaft driven thereby and having an initial position from which it is movable to indicate elapsed time, a second time indicating shaft also having an initial position from which it is movable to indicate elapsed time, a second synchronous motor, differential gearing connected between the said shafts and the said second motor, first circuit means including a manual switch and means responsive to the movement of the first-named time indicating shaft away from the initial position for energizing said first motor to automatically restore said first shaft to said initial position while said manual switch is closed, further circuit means including a manual switch and means responsive to the movement of said second time indicating shaft away from the initial position for energizing said second motor to restore said second shaft to said initial position, and means for rendering said means responsive to the movement of said first shaft inoperative so as to enable said first synchronous motor to drive both time indicating shafts when elapsed time is to be accumulated.

2. A timing device comprising first and second time indicating shafts each having an initial position from which it is movable to indicate elapsed time; a first synchronous motor gear-coupled to said first shaft; a planetary gear differential including two sun gears, a planet carrier, and planet gears meshed with both sun gears, one of said sun gears being connected to said first shaft, the other sun gear being connected to said second shaft; a second motor gear-coupled to the planet carrier of said differential; first circuit means including a manual switch and means responsive to the movement of the first-named time indicating shaft away from the initial position for energizing said first motor to automatically restore said first shaft to said initial position while said manual switch is closed; further circuit means including a manual switch and means responsive to the movement of said second time indicating shaft away from the initial position for energizing said second motor to restore said second shaft to said initial position;

and means for rendering said means responsive to the movement of said first shaft inoperative so as to enable said first synchronous motor to drive both time indicating shafts when elapsed time is to be accumulated.

3. The timing device as set forth in claim 2 wherein the means responsive to the movement of said first shaft away from the initial position comprises a cam on said first shaft and a pair of contacts closed by the cam when said first shaft moves away from the initial position, and the means responsive to the movement of said second shaft away from the initial position com-

prises a further cam on said second shaft and a pair of contacts closed by said further cam when said second shaft moves away from the initial position.

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