Aug. 18, 1936. J. I. LINER 2,051,611

DIRECT TIME INDICATING APPARATUS

Filed Aug. 14, 1933

FIG-1

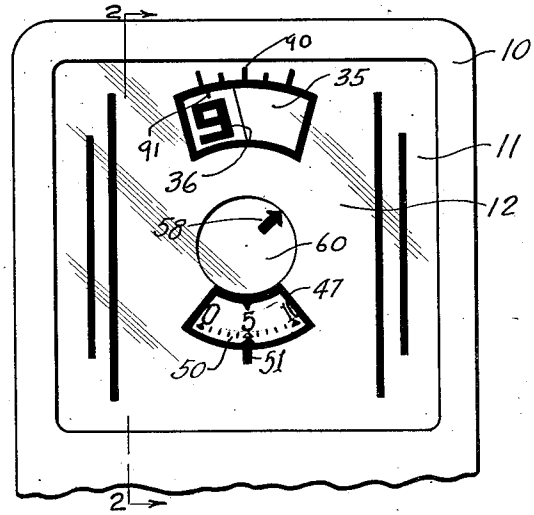


FIG-2

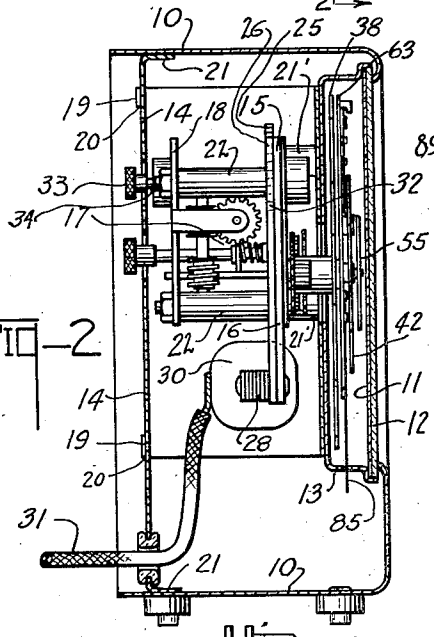


FIG-3

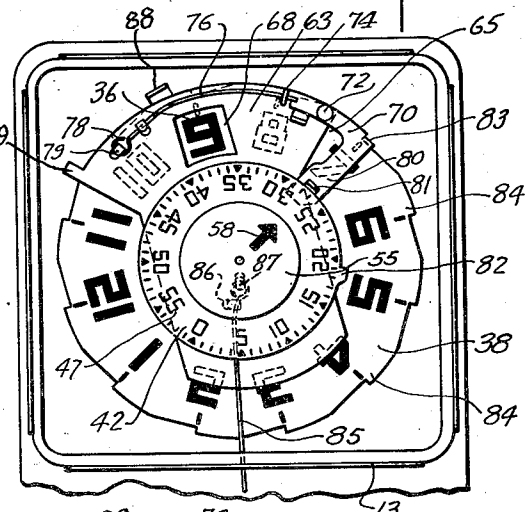


FIG-4

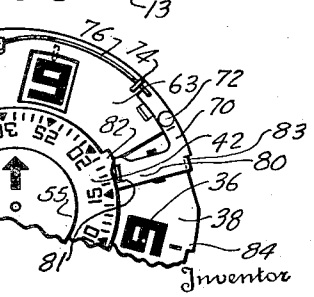
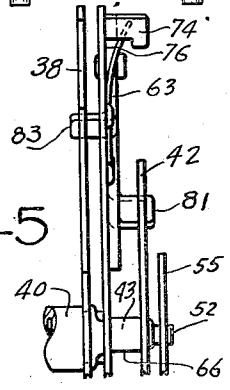


FIG-5



Inventor

JOSEPH I. LINER

By Braselton, Whitcomb & Davis

Attorney

Patented Aug. 18, 1936 2,051,611

UNITED STATES PATENT OFFICE

2,051,611

DIRECT TIME INDICATING APPARATUS

Joseph I. Liner, Toledo, Ohio, assignor to The Electric Auto-Lite Company, Toledo, Ohio, a corporation of Ohio

Application August 14, 1933, Serial No. 684,951

17 Claims. (Cl. 58—125)

This invention relates to a time indicating arrangement wherein the time indicating means give a direct visual indication.

The invention comprehends the provision of means whereby an indicia is readily visible and the observer looking at the indicating mechanism immediately receives a direct time indication without searching for the relative position of other instrumentalities, such as pointers or hands.

An object of the invention is the provision of a simple and compact mechanism wherein a member carrying a plurality of time indicating indicia is continuously moved and has means associated therewith for rendering visible one of said time indicating indicia for a certain predetermined period.

The invention contemplates the use of indicia preferably observable through the face of a time indicating device, the indicia occupying different relative positions with reference to the face of the time indicating device in order to readily disclose the increment time elapsed since such indicia has been rendered visible.

Another object of the invention is the provision of an improved mechanism wherein a member carrying a plurality of time indicating indicia is moved at a uniform rate, the member being provided with means for rendering observable one of said time indicating indicia, by moving simultaneously with said member for a predetermined period and also moving relative to said member.

The invention includes a time indicating mechanism having direct time indicating means thereof associated with a synchronous motor construction exceedingly compact having a very low cost and especially adapted for large scale production, the time indicating mechanism and associated parts constructed as a unit usable with time indicating housings or clock cases of various shapes and sizes.

Further objects and advantages are within the scope of the invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combinations of parts, elements per se, and to economies of manufacture and numerous other features as will be apparent from a consideration of the specification and drawing of a form of the invention, which may be preferred, in which:

Figure 1 is a front elevational view illustrating the element of the visible time indicating means of the invention;

Figure 2 is a cross sectional view taken substantially on a line 2—2 of Figure 1;

Figure 3 is a view illustrating in detail the time indicating arrangement of the invention;

Figure 4 is a detailed view of certain of the elements of the time indicating arrangement shown in Figure 3;

Figure 5 is a side elevational view showing the arrangement illustrated in Figure 4.

The invention may be included in any type of time indicating apparatus, and for practicable application of the principles embodied I have selected to illustrate the same as incorporated in a clock having an electric motor as a driving means. It is to be understood that I do not wish to limit the invention to the particular embodiment illustrated and that I contemplate the use of the invention wherever the same may be found to be applicable.

The form of the invention illustrated in the drawing is intended particularly for use with a constant speed motor and preferably an electric clock motor, and comprises an outer open ended case or housing 10 with a front opening which is covered by a clock face 11 in close proximity to a transparent member or glass cover 12. A back plate or supporting wall 14 serves as an end closure for the clock case 10 thus forming a dust proof housing for the removable clock mechanism. The clock face 11 and glass plate 12 are removably carried by supporting member 13 of a suitable configuration to accommodate the time indicating mechanism hereinafter described. Supporting member 13 is fixedly secured by any suitable means or by rivets (not shown) to main frame 15 which in turn is secured and carried by back plate 14 by the use of projecting ears 19 engaging cooperating slots 20. Back plate 14 has a flange portion 21 snugly fitting the clock casing and serving as a back supporting wall for the clock mechanism, thus forming a unitary structure removable from the clock casing 10. Fixedly secured within main frame 15 and back supporting wall 14 is the clock driving mechanism, the latter being carried by a plurality of stud or spacing members 21' fixedly secured to frame 15.

The clock driving mechanism consists of metal plates preferably of non-magnetic material 16 and 18 retained in spaced relationship by members 22. Between plates 16 and 18 is suitably supported a gear train 17 formed by a plurality of intermeshing worms and worm wheels, the

plates supporting bearings acting as journals for the several shafts of the gear train. The gear train obtains its driving movement in the embodiment illustrated by an electric motor, preferably of the synchronous type, consisting primarily of a toothed rotor 25 and stator 26, the stator including a plurality of laminations 28 forming a magnetizing core member upon which is supported an energizing winding or coil 30 adapted to be connected with an alternating current source, as for example, with the ordinary commercial sixty cycle alternating current supply by means of leads 31 passing through back plate 14. The core 28 supporting energizing winding 30 is magnetically coupled to the rotor element by a plurality of pole pieces 32, these pole pieces adapted to normally lie in close proximity with the toothed peripheral portion of the rotor 25. Energization of the coil 30 connected to the alternating current supply of proper frequency drives the clock mechanism. The synchronous motor illustrated is launched into synchronism by means of a knurled finger piece or member 33 fixed to a shaft 34 which projects exteriorly of casing back wall 14.

The clock or time indicating indicia may be conveniently driven from any source of power rotating at a regulated rate through a conventional gear drive, in a manner well known to those skilled in the art. In the embodiment illustrated, I employ an electric motor of the synchronous type and a plurality of worms and worm gears to secure the desired ratio of speed between the electric motor and clock indicating indicia which type of drive gives the proper speed ratio with the use of a least number of elements.

As particularly shown in Figure 1, the clock face 11 is provided at its upper central portion with a transparent section or opening 35, covered by plate 12 of transparent material through which selected indicia serving to indicate the hour is rendering visible. The hour indicating indicia 36 in the embodiment illustrated is carried on the face portion of a disc 38 which is suitably mounted on a hollow shaft or bushing 40 driven by the electric motor through gear train 17, providing a proper speed so that the rate of movement imparted by the electric motor to disc 38 carrying the hour indicating indicia 36 is such that the disc gives a complete revolution every twelve hours. Adjacent to the disc 38 is mounted a smaller circular member or disc 42 which is centrally mounted on a hollow shaft 43 concentric with the shaft 40 and also driven by the electric motor through suitable gearing associated with the gear train 17, giving a suitable ratio or rate of movement so that a complete revolution of the disc 42 takes place every hour. Disc 42 is provided in its face with a plurality of calibrated portions bearing numerals or time indicia 47 serving to indicate the minutes of time.

The indicia 47 or numeral serving to indicate minutes can be readily observed through an opening or translucent portion 50 appearing at the lower central portion of clock face 11 which opening is also covered by plate 12.

Concentric with hollow shaft 43 is a shaft 52 upon which is fixedly mounted a disc-like member 55. Shaft 52 carrying member 55 is suitably driven from the electric clock motor through gearing 17 capable of rotating member 55 at a speed corresponding to one revolution per minute. Member 55 has in its front face and adjacent to its periphery a pointed arrow or marking 58 which is readily observable through the circular opening or translucent portion 60 associated on clock face 11. The arrow 58 serves the dual purpose of indicating that the clock is in operation and also served to indicate approximately the seconds of time. Preferably located between the planes of rotation of discs 38 and 42 is a segmental member or shutter 63. Shutter 63 is loosely mounted for oscillatory movement at 65 on shaft 43 and is suitably spaced from disc 42 by spacing washer 66. Shutter 63 is provided with an opening 68 which coincides with the hour indicia 36, the opening being of such configuration as to permit a single element of the time indicia 36 to be readily observable therethrough. Adjacent to the outer portion of member or shutter 63 is an L-shaped arm 70 pivoted as at 72 on shutter 63. Arm 70 is provided with a forwardly extending or bent portion 74, the latter being in engagement with one end of a spring or retractile member 76. Spring 76 is secured at its other end to shutter 63 by a loop 78 engaging ear 79 integrally formed on shutter 63. Arm 70 is provided with a depending portion 80 having a struck portion or projection 81 located in plane of rotation of disc 42 and being engageable with a cam 82 formed in the outer periphery of dis 42.

The L-shaped arm 70 is also provided with a rearwardly bent portion or lug 83 which is in engagement by the tension of spring 76 with the notches or serrations 84 formed on the edge of disc 38, carrying the hour indicating indicia 36. In order to retain shutter 63 in its extreme left position, a spring member or retractive element 85 is fixedly secured to ear 86 formed adjacent to the pivoted point of shutter 63. Suitably spaced from ear 86 is a struck up portion 87 bent to surround and which tightly embraces the spring member 85 holding the same in fixed relation to the shutter element 63. The extreme end of spring element 85 projects loosely through an opening in supporting member 13 the latter serving to support the clock face 11. Spring element 85 tends to oppose the rotation or movement of shutter 63 produced by the engagement of lug 83 of arm 70, with the serration 84 of disc 38 carrying the hour indicating indicia. In order to prevent that shutter 63 will be carried by the rotation of disc 38 beyond the desired travel I provide on the supporting member 13 a stop member preferably in the form of stuck-up projection 88 which will engage projections 89 forming part of shutter 63 when the latter is accidentally moved beyond its predetermined travel.

In the embodiment illustrated the disc 38 carrying the hour indicating indicia is provided with the same number of notches or serrations as time indicating numbers or indicia are carried or moved by said disc, the serrations being properly spaced in accordance to the desired travel of disc 38 through which each of the time indicating numerals 36 is presupposed to be rendered visible through the suitable transparent section or opening 35 on clock face 11. I also provide that the opening 35 appearing on clock face 11 is so proportioned with respect to the size or space occupied by the hour indicating indicia 36 that the relative position of the hour indicating indicia with respect to the clock face opening will disclose the time elapsed since such indicia has been rendered visible. In order to aid the observer to readily determine at a glance the minutes elapsed by observing only the hour numeral, I provide a plurality of markings 90 cooperating with a pointer 91 forming part of the hour indicating indicia. In the embodiment

illustrated, fine marking or relatively stationary indicating means are shown, thus calibrating the space between the first and last in intervals of fifteen minutes. It is understood that other calibrations are embraced without departing from the spirit of the invention.

The operation of the time indicating mechanism of my invention previously disclosed can be summarized as follows:

With the proper circuit connection to a regulated source of alternating current supply made from the field coil winding **30** by leads **31**, the energization of the stator element of the electric rotary synchronous motor is obtained. The synchronous motor illustrated is launched into synchronism by means of the knurled finger piece of member **33** fixed to the rotor shaft **34** and by the twirling of said knurled piece by the operator, the rotor is launched into synchronism and will rotate at the proper synchronous speed, driving through the gear or time train **17**, the disk **38** carrying the hour indicating indicia, the speed of rotation of disk **38** being such that one complete revolution is obtained every twelve hours. At the same time the rotor element through the gear or time train will rotate disk member **42**, carrying the minute indicia **47**, so that disk **42** will complete one revolution every hour. In addition, the small disk **60** carrying the second indicating indicia or arrow **58**, will be rotated through the time train so that the disk **60** will complete one revolution every minute. Disk **38** will drive in the same direction shutter **63** through a predetermined period by the lug **83** urged into contact with serrations **84** provided in the periphery of disk **38**. The rotation of disk **42** carrying the cam element **82** will cause the cam **82** to engage projection **81** carried on the pivoted arm **70** moving outwardly said arm against the tension of spring member **76**, producing the disengagement of lug **83** with serration **84**. Due to the tension of spring **85**, the shutter member will be instantaneously moved in the opposite direction until the lug **83** engages another serration **84** appearing on disk **38**, the engagement being produced by the tension of the spring member **76**, thus causing instant exposure of the next hour indicating indicia through opening **68** centrally located on shutter **63**.

The extent of travel of the shutter **63** in either direction is so proportioned with respect to the opening **35** on clock face **11**, that the hour indicating indicia **36** uncovered by opening **68** is rendered visible through one hour period. The hour indicating indicia will take relative positions with respect to said opening so that an observer can readily determine, by glancing at the position of the hour indicating indicia with respect to the clock face opening **35**, the time elapsed since the hour indicating indicia has been rendered visible, and by the aid of fifteen minute markings **90**, the minutes can be readily ascertained without careful scrutiny of the position of the minute indicating indicia with respect to the central marking or pointer **51** adjacent to opening **50** appearing on clock face **11**. The arrow pointer **58** will serve to indicate that the clock is in operation by the observer noticing the rotation of the same.

In order to properly set the clock, I provide a friction drive interposed between one of the gears receiving its driving motion from the rotor element so that the setting of the clock can be obtained without transmitting any rotation to the synchronous motor or to the gear train.

While I have referred above to the time indicating mechanism and particularly illustrated a clock as driven by an electric motor, it will be understood that my invention is capable of utilization in other devices and that I contemplate its use with any kind of driving means including spring wound or actuated driving movements.

It is apparent that, within the scope of the invention modifications and different arrangements may be made other than is herein disclosed, and the present disclosure is illustrative merely, the invention comprehending all variations thereof.

What I claim is:

1. An electric clock comprising a synchronous rotary electric motor; a time-train driven by said motor; a member connected to said time train driven thereby having a plurality of time indicating indicia; a second member cooperating with said first mentioned member, said second member being formed to render visible one of said time indicating indicia, said second member having means fixed thereto adapted to engage the first mentioned member whereby the two members move in the same direction; and a relatively stationary member having an opening formed thereon whereby the time elapsed since the indicia has been rendered visible can be readily determined by its relative position with respect to the opening formed on said stationary member.

2. A time indicating mechanism, comprising a synchronous rotary electric motor, a time-train driven by said motor; a member connected to said time train for being driven thereby, having a plurality of time indicating indicia; a second member cooperating with said first mentioned member and having an opening for rendering visible one of said time indicating indicia, said second member carrying means to establish a driving connection with the first mentioned member whereby the two members move together; and a relatively stationary member having an opening thereon whereby the time elapsed since the indicia has been rendered visible can be readily determined by its relative position with respect to the opening of said stationary member.

3. In an alternating current electric clock, a synchronous rotary electric motor having a field structure and a rotor structure; a time-train driven by said rotor structure; a member driven by said time-train, said member carrying a plurality of time indicating indicia; shutter means for rendering visible a selected time indicating indicia for a predetermined period, including a second member driven with said first mentioned member by said time train through a predetermined period and a relatively stationary element having an opening through which said indicia is observable, the arrangement being such that relative position of said indicia with respect to the opening in said element determines the time elapsed since the indicia has been rendered visible.

4. A time indicating mechanism comprising a gear train; means for driving said gear train; a member connected to said gear train and driven thereby, having a plurality of time indicating indicia; means including a shutter for rendering visible one of said time indicating indicia, said second means being driven by said member for a predetermined period; and a rotatable element having a plurality of time indicating indicia driven by said gear train and having means for interrupting the driving connection between said member and said means.

5. A time indicating mechanism comprising a

gear train; means for driving said gear train; a member connected to said gear train and driven thereby having a plurality of time indicating indicia; means including a shutter for rendering visible one of said indicating indicia, said second means being driven by said member; a rotatable element driven by said gear train at a different speed rate than said member; and means actuated by said element for interrupting the driving connection of said member to said means.

6. A time indicating mechanism comprising a gear train; means for driving said gear train; a member connected to said gear train and driven thereby, having a plurality of time indicating indicia; means for covering a portion of said member and rendering visible one of said time indicating indicia, said second means being driven by said member; a rotatable element operable through said gear train, said element having a plurality of time indicating indicia; means carried by said element for causing the interruption of the driving connection of said means by said member; and a stationary member having means thereon whereby the time elapsed since the indicia has been rendered visible can be readily determined by the position of the visible indicia with respect to the stationary member.

7. A time indicating mechanism in combination, a member having a plurality of time indicating indicia; a prime mover to move said member at a regulated rate; shutter means cooperating with said member for rendering observable a selected time indicating indicia; means to establish a driving connection between said first mentioned means and said member; rotary means having time indicating indicia thereon for interrupting said driving connection between said first mentioned means and said member; and a stationary member having an opening thereon for rendering visible said selected indicia through its range of movement.

8. A time indicating device for use with a chronometric prime mover including a rotatable hour dial having a plurality of time indicating indicia thereon; a member having an opening for rendering visible a selected hour indicating indicia; coupling means carried by said member for driving said member by said dial; a rotatable member carrying a plurality of minute indicating indicia having a projection for rendering the said coupling means ineffective; means for moving said member relative to said dial; an opaque face plate covering said dial having an opening through which said hour indicia is observable; and another opening through which portions of said minute indicating indicia are observable.

9. In a time indicating mechanism, in combination: a continuously rotating synchronous electric motor; a time indicating indicia driven by said synchronous motor including a member continuously rotated by said synchronous motor; a second member associated therewith, a spring actuated pawl, said second member supporting said spring actuated pawl; said pawl engaging said first member whereby the two members move simultaneously; and means whereby said second member is periodically moved relative to said first member.

10. In a time indicating mechanism, in combination: a continuously rotating synchronous electric motor; a direct visual time indicating indicia driven by said synchronous motor; an element and means associated therewith to move the same for a predetermined period with said time indicating indicia; a member continuously rotated by said synchronous motor; and means to produce relative motion between the time indicating indicia and said element rendered effective by said continuously rotated member.

11. A time indicating mechanism, in combination, a movable member having a plurality of time indicating indicia; a second member cooperating with the first mentioned member and having an aperture for rendering observable one of said time indicating indicia; a resiliently actuated pawl carried by one of said members to establish a driving connection with the other member whereby both members move together; means to actuate said pawl whereby one of said members is disengaged from the other; and resilient means associated with the second member for producing relative movement between said members.

12. A time indicating mechanism, in combination, a member having a plurality of time indicating indicia; a prime mover adapted to move said member at a regulated rate; shutter means cooperating with said member for rendering observable a time indicating indicia; means to cause the engagement of said first mentioned member and said first mentioned means to move both in the same direction; rotary means actuated by the prime mover to cause disengagement of said member and said first mentioned means; and resilient means for producing relative movement between said first mentioned means and said member.

13. A time indicating mechanism, in combination, a member movable at a regulated rate having a plurality of time indicating indicia; a second member cooperating with said first mentioned member and having an aperture for rendering observable one of said time indicating indicia; said second member having means secured thereto and adapted to engage the first mentioned member whereby the two members move together; a movable element; means carried by said movable element for causing the disengagement of the two mentioned members; and means carried by the second mentioned member for producing relative movement between the members.

14. A time indicating mechanism, in combination, a movable member having a plurality of time indicating indicia; a second movable member having an opening therein for rendering observable one of said time indicating indicia for a predetermined period of time; means to cause both members to move at the same rate for a predetermined portion of the movement of said first mentioned movable member, including a resiliently mounted element; a stationary member provided with an opening cooperating with the opening in said second named member for rendering visible one of said time indicating indicia; and means associated with said stationary member whereby the time elapsed since the selected indicia has been rendered visible can be readily determined by its relative position with respect to the opening in said stationary member.

15. A time indicating mechanism, in combination, a movable member having a plurality of time indicating indicia; a second member located over said first mentioned member and having means for rendering visible one of said time indicating indicia, said second member carrying resiliently actuated pawl means to establish a driving connection with the first mentioned member where-

by the two members move together for a predetermined period; and a stationary member having an opening thereon whereby the time elapsed since the indicia has been rendered visible can be readily determined by its relative position with respect to the opening on said stationary member.

16. In an alternating current clock comprising a synchronous rotary electric motor; a time train driven by said motor; a member driven by said time train, said member having a plurality of time indicating indicia; a second member cooperating with said first mentioned member, said second member having an aperture for rendering visible one of said time indicating indicia; means on the second member to establish a driving connection between said members for a predetermined period whereby the two members move in the same direction; a rotatable member driven by said time train having means for interrupting said driving connection; a relatively stationary member having means thereon whereby the time elapsed since the indicia has been rendered visible can be readily determined by its relative position with respect to said stationary member; and a spring means for moving one of said first two named members in an opposite direction with respect to the movement of the other.

17. In an alternating current electric clock, in combination, a synchronous rotor electric motor having a stator and a rotor structure; a time train driven by said rotor; a member driven by said time train, said member carrying a plurality of time indicating indicia; shutter means cooperating with said member for rendering observable a selected time indicating indicia, such shutter means being adapted to be periodically driven by said time train; means operated by said time train for causing the interruption of said periodic driving; and a relatively stationary member having an opening for rendering visible said time indicating indicia, the arrangement between said time indicating indicia and the opening on the stationary member being such that the relative position of the indicia with respect to said opening determines the time elapsed since the observable indicia has been rendered visible.

JOSEPH I. LINER.