May 19, 1936. N. HOGENBIRK 2,041,342

TIME INDICATING MECHANISM

Filed Dec. 8, 1931 2 Sheets-Sheet 1

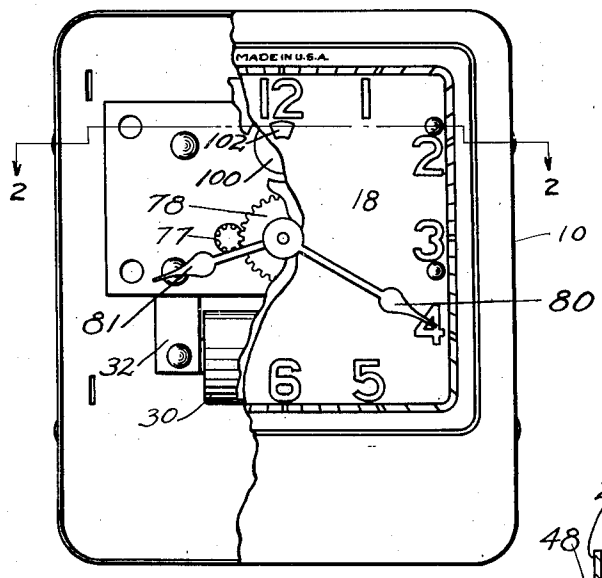

FIG-1

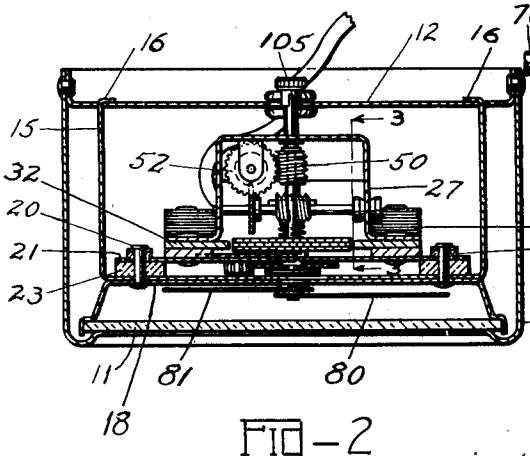

FIG-2

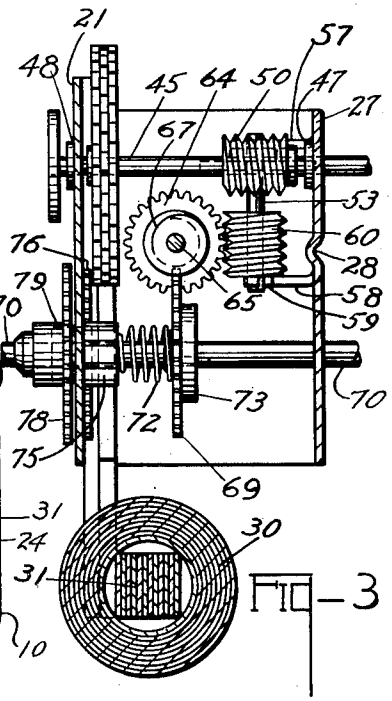

FIG-3

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TIME INDICATING MECHANISM

Filed Dec. 8, 1931 2 Sheets-Sheet 2

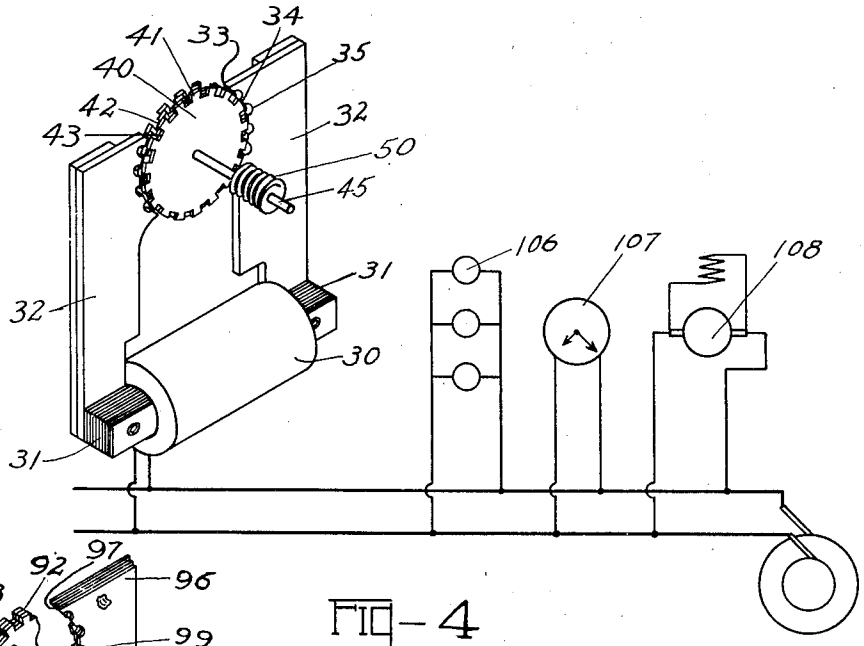
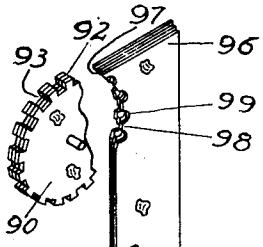


FIG-4



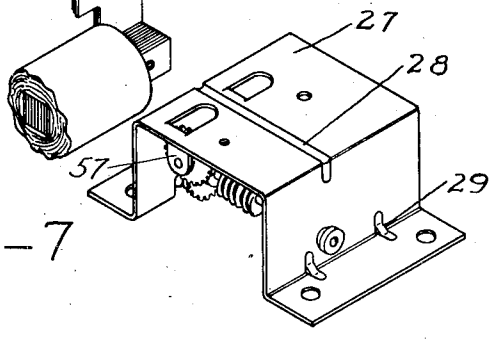


FIG-7

FIG-5

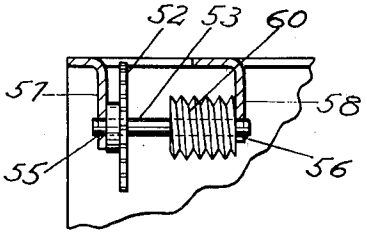


FIG-6

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TIME INDICATING MECHANISM

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Application December 8, 1931, Serial No. 579,676

7 Claims. (Cl. 58—26)

The invention relates to time indicating mechanism and has particular application to time indicating means responsive to electric currents.

The invention has for an object the provision of means adapted to give time indication which are dependent for their operation upon some characteristic of the current supply.

The invention also embraces the provision of a prime mover responsive to electric current for driving time indicating means constituting a synchronous motor, the same having novel functional and constructional characteristics and embodying an arrangement wherein the motor is successfully brought into synchronism.

The invention contemplates the inclusion of means for damping any mechanical or magnetic vibrations and the propagation or transmission of such vibrations to other elements of the mechanism thus eliminating any objectionable audible noises.

Further objects and advantages are within the scope of this invention such as relate to the arrangement, operation and function of the related elements of the structure, to various details of construction and to combination 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 drawings of a form of the invention, which may be preferred, in which:

Figure 1 is an elevational view illustrating an electric time indicating means of my invention with a portion of the outer casing being removed;

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

Figure 3 is an enlarged sectional view taken substantially on a line 3—3 of Figure 2;

Figure 4 is a diagrammatic view illustrating the circuit connection of the prime mover and detail construction of the same;

Figure 5 is an isometric view showing the gearing supporting frame of my invention;

Figure 6 is an enlarged detail view of a portion of the gear supporting frame;

Figure 7 is a modification of the motor illustrated in Figure 4.

I have illustrated my invention as incorporated in a time indicating device particularly a clock, but it is to be understood that I contemplate the use of the invention whenever the same may be found applicable.

Referring particularly to Figures 1 and 2 one embodiment of my time indicating mechanism here illustrated as a clock comprises an outer casing 10 preferably of metal provided with a transparent or glass front 11 and a back cover 12 riveted to the casing 10. Supported on the back plate 12 is a frame piece 15 suitably secured in place by the ears 16, the frame 15 extending to the front of the clock and carrying the calibrated time clock face 18 which in the illustration shown acts as means for supporting the front glass 11.

A plurality of studs 20 are secured to the subframe 15 which in turn carry a substantially non-magnetic plate 21 insulated or resiliently carried thereby by resilient means such as rubber pads or bushings 23 constituting vibration damping means. It will also be noted that the plate 21 is further resiliently supported and insulated from each of the studs by rubber bushings 24.

The resilient rubber pads and bushings materially damp magnetic and mechanical vibrations and the transmission of said vibrations to the stationary plate 21 and to any other relatively stationary members, thus eliminating any objectionable audible noises.

The plate 21 directly carries the electric motor elements as well as a bracket 27 preferably of a substantially non-magnetic material, the bracket forming a gearing and bearing supporting means, one embodiment being particularly illustrated in Figure 5 where it will be seen that the bracket or gear frame is stamped of a sheet metal with a substantially transverse integral rib 28 and integral braces 29.

A preferred embodiment of the electric motor of the synchronous type is illustrated in Figure 4 where it will be seen that the field windings 30 having the proper number of turns of wire are carried by a laminated field structure 31 which in turn is riveted to the stator pole piece 32 terminating in the pole faces 33. It should be noted that the pole faces are notched to provide a plurality of salient portions or teeth 34 separated by recesses 35, and attention is also called to the fact that the pole pieces 32 are formed of a plurality of members terminating in a narrowed portion at the pole face proper.

The rotor 40 of the electric motor preferably comprises an assembly of disc-like laminations 41 provided with salient portions or teeth 42 and recesses 43 adjacent the periphery, the discs preferably assembled into a substantially compact formation. In the embodiment illustrated in Figure 4 it will be seen that each disc 41 is slightly offset from the adjacent disc so that the teeth and recesses are staggered or located on a skew. I have also provided that the longitudinal width of the discs particularly adjacent the pole faces

33 shall be of a width substantially greater than that of the pole faces which are narrowed as above referred to. This construction constitutes one embodiment for providing a greater tooth area on the adjacent faces of the armature as compared with the tooth area of the faces of the pole pieces. The rotor 40 is fixedly secured to shaft 45 supported at one of its extremities by plain bearing 47 on bracket 27 at the other end by plain bearing 48 (see Figure 3) in the frame plate 21 thus allowing considerable lateral motion to the rotor structure as can be seen by examination of Figure 3. It should be noted that the recesses 43 on the disc-like laminations 41 are formed having substantially parallel walls, and thus provide a slightly larger area to the outer periphery of the teeth 42 than the area adjacent to the termination of the recesses. It should be understood, however, that I do not want to limit my invention to this specific construction of recesses.

The time indicating mechanism here illustrated comprises a calibrated time face and a minute hand and an hour hand driven through a gear train. In the embodiment illustrated the arrangement of parts and gearing mechanism is of great simplicity without sacrificing accuracy and the speed reduction from the prime mover or motor to the time indicating hands has been accomplished with a minimum of moving parts. Referring particularly to Figures 2 and 3, it can be seen that the rotor element of the electric motor drives shaft 45 which in turn carries a worm 50 fixedly secured thereto, the worm 50 drives gear 52 carried by shaft 53. Shaft 53 is journally supported on bearings 55 and 56 carried by the struck-up projections 57 and 58. The struck-up projections form integral parts of the supporting bracket 27. It can be seen that gear 52 slightly projects through the opening resulting by the stamping of projecting ear 57 on bracket 27 as particularly illustrated in Figure 6. This construction materially decreases the size of the bracket 27 and affords substantial clearance for gear 52 and attention is called to the fact that one of the projections 57 and 58 is provided with a slot 59 in order to facilitate assembly of shaft 53. The slot could be dispensed with and the projections can be flexed or bent to permit the ready assembly of shaft 53. Fixedly secured to shaft 53 is a worm 60 which is in driving engagement with worm wheel 64 fixedly supported by shaft 65 suitably supported in bearings carried by the lateral walls of the supporting bracket 27. Secured to shaft 65 is a worm 67 which in turn drives worm wheel 69. Worm wheel 69 is supported on shaft 70 and drives the latter by frictional engagement resulting from the pressure of spring 72 against gear 69 holding the latter in driving engagement with a fixed disc 73 fixedly secured to shaft 70. Shaft 70 also carries a gear 75 which drives gear 76 carrying a small pinion 77 which is in driving engagement with pinion 78 fixedly secured to sleeve 79 journalled on shaft 70. Shaft 70 supports the minute hand 80 of the clock element and sleeve 79 carries the hour hand 81. The frictional engagement of gear 69 with shaft 70 permits the accurate setting of the clock without interfering with the driving or effecting the operation of the gear train connected to the motor rotor element.

Referring particularly to Figure 7 in which a modification of the electric motor is illustrated, it can be seen that the rotor element in this instance comprises a plurality of laminated discs 96 also provided with salient portions or teeth 92 and recesses 93, the teeth and recesses being in substantial alignment with each other. The stator element of the motor in this instance comprising a plurality of laminated pole piece elements 96 terminating into pole faces 97 the pole faces being provided with a plurality of salient portions or teeth 98 and recesses 99. The laminated members 96 are slightly offset from each other so that the teeth are staggered and the recesses are slightly out of registration with each other providing a slight angularity with a horizontal plane contacting with one edge of the tooth element of a single lamination. In this construction, as well as in the one illustrated in Figure 4, it will be seen that the salient portions of the rotor and the salient portions of the pole faces of the stator element have portions out of alignment or registration with each other and that the salient portions of the rotor with respect to those of the stator are not in alignment and are out of registration with respect to each other. This construction being one of the features that aids materially in the successful starting of the motor and its launching into synchronism with the energizing magnetic field produced by the windings. In addition I have found that this construction materially increases the torque produced by the rotor element. In order to determine that the time indicating device is in operation I have provided visible means for indicating such fact, the same comprising a disc element 100 fixedly secured to shaft 45, the disc element being provided with portions of different colors or indicia and the same being rendered visible through opening 102 in the clock face 18.

A knurl element 105 fixed to shaft 45 projects through back cover 12 and slight twirling of the knurl element 105 will start the motor and launch the same into synchronism. Adjacent to the knurl element 105 projects a knurl element (not shown). The knurl element is fixedly secured to shaft 70 and serves the purpose of accurately setting the hands to indicate the proper time.

The synchronous motor herein illustrated is adapted to be driven in synchronism with a current whose frequency is substantially uniform and in the present embodiment the number of the teeth of the rotor and the gear speed reduction train have been properly designed to be responsive to a current substantially maintained at sixty cycles. The time indicating device being so designed as to be capable of obtaining energization from commercial systems supplied by a central station to which other elements, such as lights 106, secondary clocks of similar nature to the one particularly described 107 and electric motors 108 are connected or to an alternator adapted to supply current of uniform frequency to independent installations.

The operation of the clock described may be reviewed as follows: with the normal circuit connections energizing the windings 30 and the setting of the clock hands to the proper hour by the operator a twirling of the knurl member 105 will start the rotor element 40 launching it into synchronism thus a uniform rate of speed is imparted to the mechanism, the driving motion being transmitted from the rotor element to the hand indicating mechanism of the clock through a suitable gear train. The gear train comprises a worm gear 50 driving worm wheel 52 which in turn drives worm wheel 60 and imparts motion to worm wheel 64, the latter drives worm 67 which

imparts motion to resiliently supported worm wheel 69 driving shaft 70 which drives minute hand 80. Shaft 70 also carries gear 75 driving gear 76, pinions 77 and 78 adapted to drive hour hand 81.

While I have referred above to a time indicating mechanism and particularly illustrated a clock as driven by the synchronous motor of my invention, it will be understood that my invention is capable of utilization where constant speed motion to any desired means is desirable.

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 alternating current motor comprising in combination, a supporting plate; a stator carried thereby; said stator including a plurality of toothed pole pieces carried by said plate; a winding carried by said pole pieces adapted to produce a magnetic field in said pole pieces; a substantially U-shaped support carried by said pole pieces; a rotor having a shaft carried by said support and said plate and including a toothed disk carried by said shaft and located between said pole pieces; and a second shaft driven by said rotor and rotatably carried on the side walls of said U-shaped support.

2. In an alternating current electric clock having a stationary clock face comprising a flanged plate, a minute hand and an hour hand; a plate of non-magnetic material connected to but insulated from said flanged plate; a synchronous motor comprising a plurality of pole pieces carried by said plate of non-magnetic material; a winding supported by said pole pieces; a bracket casing of non-magnetic material on the other side of said pole pieces; a rotor having a plurality of teeth thereon and a shaft journaled in said non-magnetic plate and bracket; and gearing between said shaft and said minute and hour hands.

3. In an electric clock having a stationary calibrated face and minute and hour hands; a rotor element geared to said hands; supporting means for said gears, said supporting means including a U-shaped bracket, the bight portion of said bracket having a plurality of struck-up projections forming bearing supports for one of said gears.

4. In an electric clock having a stationary calibrated face and minute and hour hands; a rotor element geared to said hands; supporting means for said gears comprising a U-shaped bracket of sheet metal having a plurality of integral projecting means sheared from the bight portion of said bracket and struck up therefrom forming bearing supports for one of said gears.

5. In an electric clock having a stationary calibrated face and minute and hour hands; a rotor element geared to said hands; supporting means for said gears comprising a bracket of sheet metal having a plurality of integral projecting means sheared and struck up from the main body portion of said bracket, said struck-up portions forming bearing supports for a shaft carrying one of said gears, one of said projections having a slotted portion for receiving said shaft.

6. An alternating current electric clock including an open ended casing; a plate closing one end of said casing; a supporting structure carried by said plate; a stator element resiliently supported on said structure; a bracket of non-magnetic material carried by said stator; a rotor cooperating with said stator and having a shaft journalled at one end on said bracket; and a plurality of shafts driven by said rotor shaft and rotatably supported on said bracket.

7. An alternating current electric clock including an open ended casing; a plate closing one end of said casing; a supporting structure carried by said plate; a stator element comprising spaced pole pieces supported on said structure; a bracket of non-magnetic material secured to said pole pieces; a rotor partially surrounded by said pole pieces, said rotor having a shaft journalled at one end on said bracket; and a plurality of shafts driven by said rotor shaft journalled on said bracket.

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