June 23, 1953 L. PRINS 2,642,713

CLOCK

Filed June 27, 1949 3 Sheets-Sheet 1

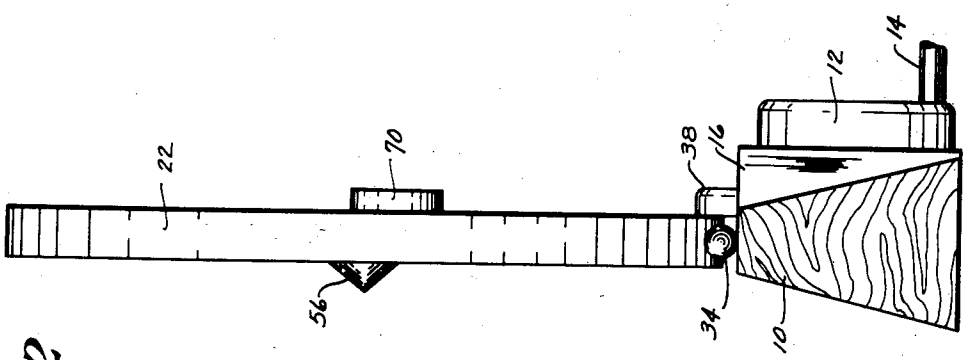

FIG. 2

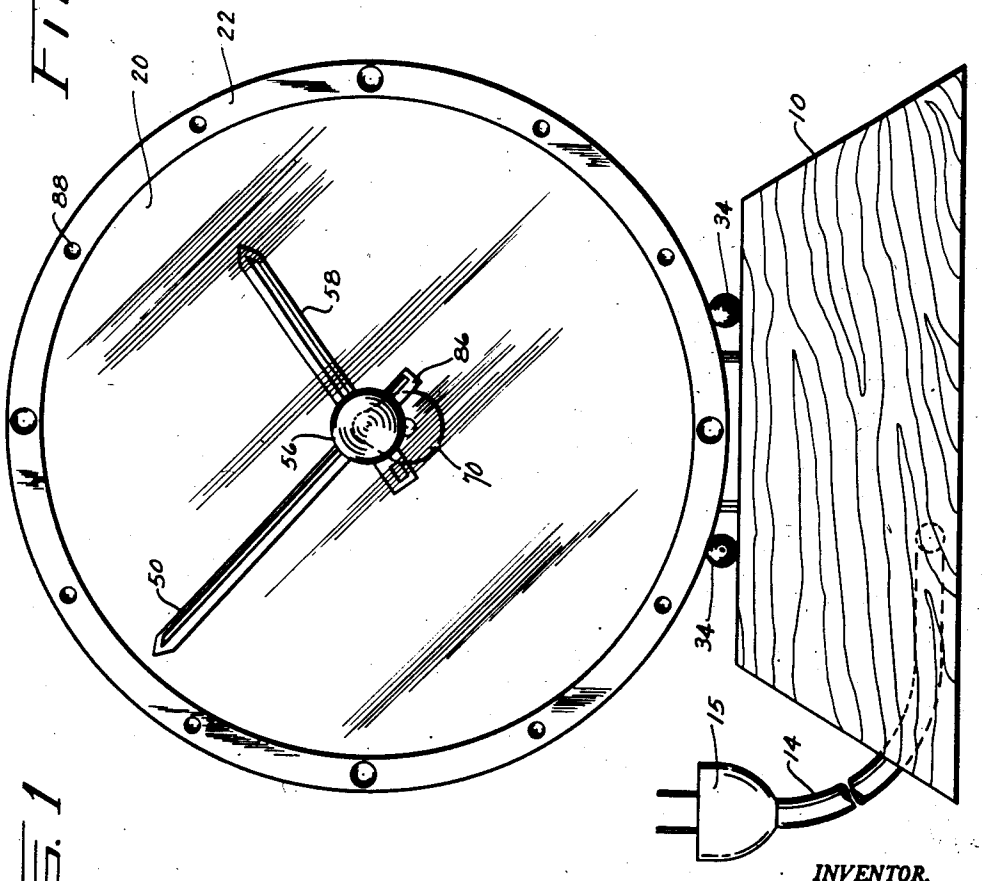

FIG. 1

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CLOCK

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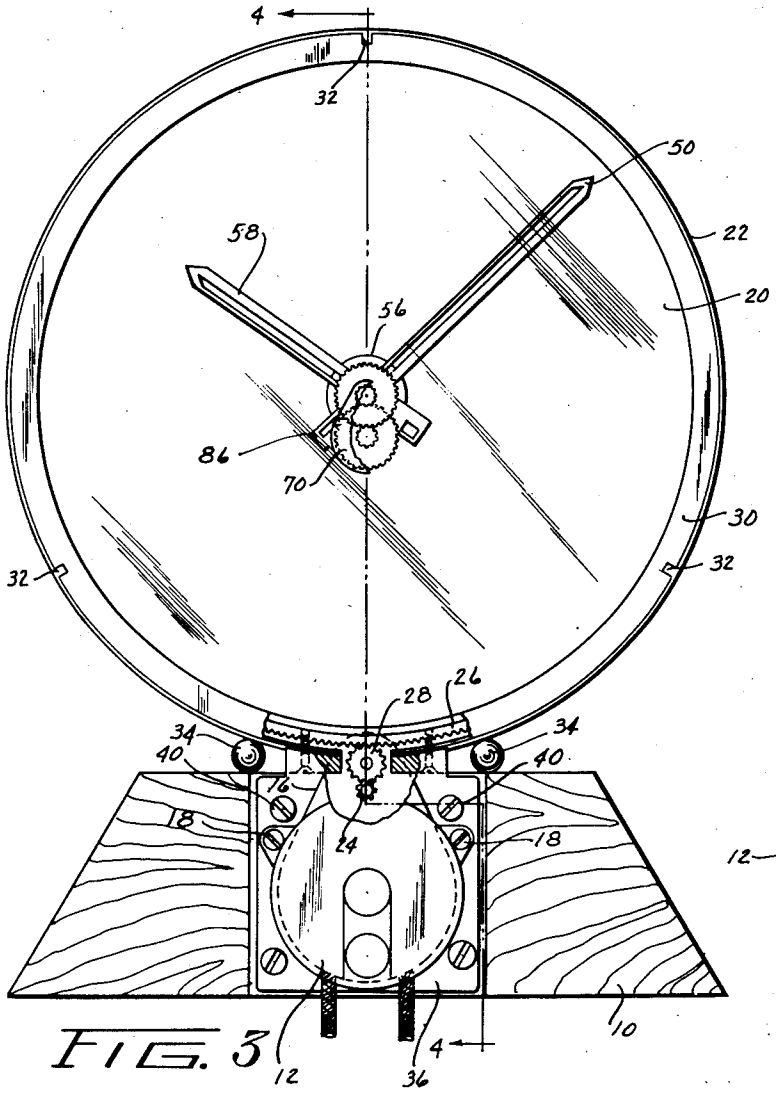

FIG. 3

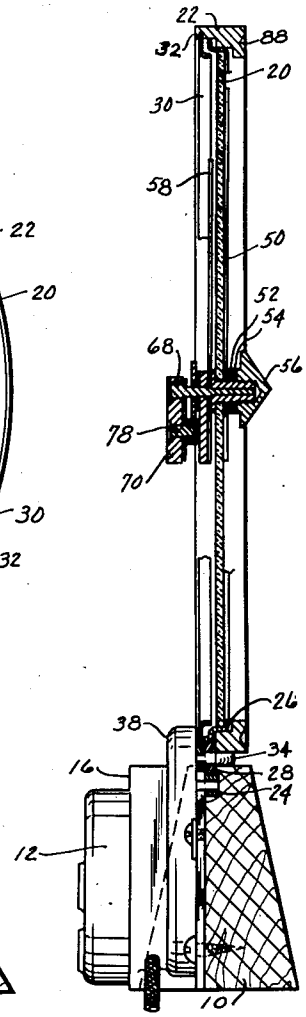

FIG. 4

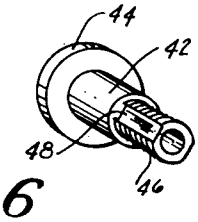

FIG. 6

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CLOCK

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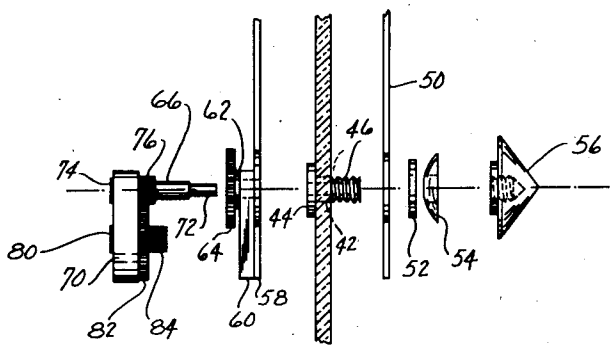

FIG. 5

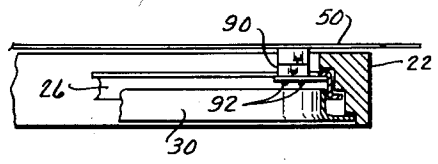

FIG. 8

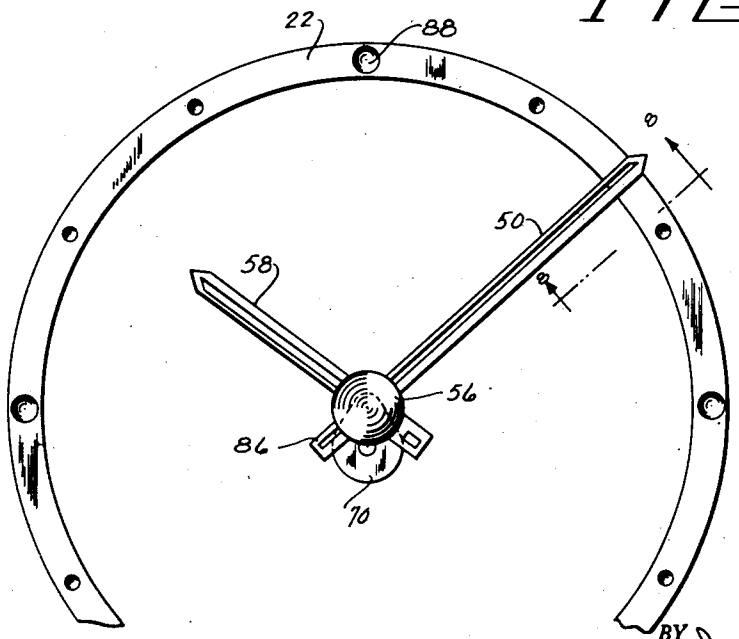

FIG. 7

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UNITED STATES PATENT OFFICE

2,642,713

CLOCK

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Application June 27, 1949, Serial No. 101,510
In France September 10, 1948

23 Claims. (Cl. 58—2)

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The present invention relates to clocks and the operating mechanism therefor and is a continuation-in-part of application 645,998 filed February 7, 1946, now abandoned.

The invention contemplates the provision of a clock in which there is no apparent visible means for driving the time indicating hands thereof, such as the clock illustrated in Pat. No. Reissue 22,640, granted to me.

The clock of that patent is provided with two transparent rotating glass disks, on one of which the minute hand is mounted and on the other of which the hour hand is mounted. The peripheral edges of these disks are provided with gear teeth and the disks are mounted for rotation in a frame between two stationary glass disks.

In order to set the hour and minute hands of such a clock, it is necessary to provide a means which operates the hour and minute hands and moves them to the selected position required to indicate the time desired. In the construction heretofore found in most clocks, the hour and minute hands are operatively connected and dependent upon each other, this operation becomes comparatively tedious and lengthy since both the hour and minute hand are moved together.

With the clock here contemplated, in distinction thereto, a single preferably transparent glass disk is mounted for rotation in a stationary frame and by which glass disk the minute hand may be driven. This single rotating glass through a train of gears which is readily accessible from the rear and which train of gears is freely suspended on the driving shaft thereof, rotates the hour hand in timed synchronism with the minute hand.

As a result of this proposed construction, the hour hand may be set independently of the minute hand to the exact hour desired. Thereafter the minute hand may be set to the exact minute and since it is connected to the hour hand by the train of gears, the hour hand will be correspondingly moved to the proper position relative to the minute hand.

Thus, the clock, which is the subject matter of the present invention, may be set easily and quickly in a manner not heretofore contemplated or possible with clocks of the prior art.

In a further modification of my invention, the single rotating disk itself may be omitted and the minute hand connected to the rotating gear which is mounted in the clock frame and masked from view thereby. As with the first mentioned embodiment of my invention, a rotating shaft is secured at the center of the clock to the minute hand and through the train of gears suspended

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on the said shaft for free rotation thereon correspondingly drives the hour hand.

Thus, the hour hand of this modification may in the same manner be set independently of the minute hand and the latter thereafter also set as desired and yet the illusion of a mysterious drive is retained or even heightened.

These, other and further objects and advantages of the present invention will be clear from the following description and from the drawings appended thereto, in which

Fig. 1 is a front elevation of a clock according to my invention.

Fig. 2 is a side elevation thereof.

Fig. 3 is a rear elevation thereof.

Fig. 4 is a section on the line 4—4 of Fig. 1.

Fig. 5 is an exploded view showing the rotating disk and the means for translating motion therefrom to the hour hand.

Fig. 6 is a perspective view of the member connecting the driving shaft of the train of gears and the minute hand to the rotating disk, to enlarged scale.

Fig. 7 is a front view of a modification of my invention, omitting the base.

Fig. 8 is a section on the line 8—8 of Fig. 7.

Referring now to the drawings, in which like reference characters refer to like elements and more particularly to Figs. 1 to 6 showing an illustrative embodiment of my invention to enable those skilled in the art to practice the same, the clock is mounted on the base 10, which may be made from any suitable material, such as wood, and in the shape illustrated.

Although the clock may be operated by any means, I have illustrated a conventional electric driving motor 12 which is coupled to a conventional electric outlet by means of the conventional cable 14 and plug 15.

The housing 16 of the motor 12 is mounted on the base 10 at the rear thereof by any satisfactory means such as the set screws 18.

The single rotating glass disk 20, to which reference will be further made and by means of which the clock hands are rotated, is loosely mounted for rotation in the frame 22, preferably in the form of a ring.

In order to suitably drive the glass disk 20, the driving motor 12 may be provided with the pinion 24, which has six teeth and makes one revolution per minute.

Around the rim of the glass disk 20, I cement thereto the gear ring 26, which has three hundred and sixty teeth cut therein.

This gear ring 26 meshes with the idler gear 28 which latter in turn meshes with the pinion

24, so that the glass disk 20 is rotated one revolution in one hour by the driving motor 12.

While I have not illustrated in the modification now being described any stationary glass disks, it will of course be understood that a stationary glass in the front or rear or both may be provided and mounted on the frame in a conventional manner so that they can be swung away from the rotating disk 20 to make it, the hands of the clock and the train of gears accessible to set the clock in the manner which I shall hereinafter describe.

In order to hold the rotating glass disk 20 in the frame 22, I mount the retaining ring 30 therein against the disk 20 in the rear of the clock. On the rear of the frame 22, I provide preferably three lugs 32, equally spaced around the periphery of the frame, and in each of which lugs an undercut is made. Thus, the retaining ring 30 may be resiliently snapped into position to hold the glass disk 20 in place.

The frame 22 may be mounted on the base 10 in any satisfactory manner, as by the spheroids 34, which are designed to enhance the appearance of the clock.

The pinion 24 and the idler gear 28 are preferably covered by the plate 36 and the shoulder 38 extending up therefrom against the lower part of the frame 22 and retaining ring 30 and which plate 36 is mounted on the rear of the base 10 as by the screws 40.

In order to drive the hands of the clock by means of the rotating glass disk 20, I mount the minute and hour hand on the translating mechanism illustrated in the exploded view shown in Fig. 5.

Referring now particularly to Figs. 4, 5 and 6, in order to assemble the parts together so that the hands of my clock are driven in timed relation by the glass 20, I arrange in a corresponding opening in the glass disk the connecting member 42 in the rear of which is provided the collar 44 against which the glass disk 20 is held in the manner that I shall describe.

On the threaded finger 46 extending from the member 42 and which finger is provided with the flats 48, I mount the minute hand 50. The minute hand has a hole to receive said threaded portion 46, and said hole is formed with flats to contact the flats 48 so that the minute hand must rotate with the shaft or connecting member 42.

In order to tightly and frictionally hold the minute hand 50 against the glass disk 20 and the glass disk against the shoulder or collar 44, I mount the washer 52 and the spring washer 54 against it on the finger 46 and tighten the assembly together by means of the internally threaded cone 56.

Thus, the connecting member or driving shaft 42 is tightly secured and frictionally held on the rotating disk 20 so that it is driven thereby. The minute hand can be rotated independently of the glass disk 20 upon overcoming the friction between said hand and said disk.

The hour hand 58 is driven by the glass disk 20, connecting member or shaft 42 and the train of gears, which are suspended in the rear of the preferably transparent glass 20, in the manner which I shall now describe.

It will be noted that the clock hands, as desired, may be positioned in front or in back of the rotating glass disk 20, but at any event, they are accessible for setting the clock in the manner that I shall hereinafter describe.

A unitary assembly (see Fig. 5) is formed from

the hour hand 58, the counterweight 60, the washer 62 and the gear 64, all of which are secured together by any satisfactory means.

This assembly is mounted on the intermediate bearing 66 extending from the shaft 68, which shaft is mounted for rotation in the counterweight 70.

Extending from the bearing 66, I provide the reduced in diameter pin 72, which pin is fitted into a corresponding opening in the collar 44 with a tight press fit.

Thus, a driving shaft is formed by the connecting member 42, the pin 72, the bearing 66 and the shaft 68 which are rotated as a single unit by the rotating disk 20.

The counterweight 70 is provided with a recessed opening in which the shaft 68 is held between the head 74 and the pinion 76 mounted on the shaft 68 and rotatable therewith.

Inserted through another opening in the counterweight 70 and seated therein, I provide the countershaft 78 which is held therein between the head 80 and the gear 82, which gear 82 is driven by the pinion 76 to rotate the countershaft 78.

Mounted on the countershaft 78, I provide the pinion 84 which drives the gear 64 and thereby the hour hand 58.

The unitary assembly formed by the hour hand 58, its counterweight 60, washer 62 and gear 64 are formed with an interior bore or bushing which is somewhat larger in diameter than the bearing 66 so that the hour hand 58 is thereby mounted on the driving shaft 68 for free rotation thereon.

Thus, the hour hand 58 is driven by the rotating disk 20 through the shaft 66 by means of the train of gears just described in timed synchronism with the minute hand 50.

It will of course be understood that this train of gears is properly designed to cause rotation of the hour hand 58 one revolution in every twelve hours, the glass disk 20 and therefore the shaft 68 and minute hand 50 rotating one revolution in one hour.

The counterweight 70 provides support for the countershaft 78 and is loosely suspended on the driving shaft 68 and will always gravitate into a vertical position thereby retaining the gears of the train thereof and the hands of the clock always in the proper relative position.

The smaller counterweight 60 is mounted at the lower end of the hour hand 58 and serves to hold the hour hand in proper position relative to the minute hand. A similar counterweight 86 for the same purpose is provided at the lower end of the minute hand 50.

Around the periphery of the frame 22, I inscribe conventional time indicia 88 to which the hands 50 and 58 point to indicate the proper time.

By means of the construction just described, it is possible to very easily and quickly set or reset the clock in a manner not heretofore possible by other known clock structures.

To set the clock of my invention, the counterweight 70 is turned around by hand in either a clockwise or counterclockwise direction and for every rotation thereof, the hour hand through the train of gears is moved one complete hour. Care is not required because the hour hand will spontaneously swing into position either one hour before or after the hour which it had previously indicated before turning the counterweight 70. The counterweight 70 spontaneously gravitates

into position upon the completion of each revolution thereby, as stated, eliminating the necessity of carefully setting the hour hand.

To illustrate the operation, assume that the clock indicated twelve thirty (12:30). Depending on whether the counterweight was rotated in a clockwise or counterclockwise direction, the clock will now indicate one thirty (1:30) or eleven thirty (11:30) (upon rotating the counterweight once.) This is possible because the hour hand is geared independently of the minute hand.

Assume now that it is desired to indicate one forty-five (1:45) or eleven forty-five (11:45), the minute hand is then turned to indicate the forty-five minutes. Turning of the minute hand manually will be independent of the disk **20** upon overcoming friction between the minute hand and the disk. Turning of the minute hand, however, will cause rotation of the hour hand.

The minute hand is rotated preferably in a clockwise direction and since it drives the hour hand through the train of gears (not being independent of the hour hand), it (the minute hand) correspondingly moves the hour hand.

Thus, my clock can be set or reset within a space of a few seconds to indicate any desired time and yet the two hands will always be in true relation to each other.

It will be apparent that the gear ring **26** and the motor and driving gears therefrom are masked from view and since the glass disk **20** is transparent and its movement cannot be seen, an illusion is created that there is no connection between the base and the hands of the clock.

Further, since the cone **56** preferably comes to a point which is located at the center of the driving shaft and since it moves very slowly making a complete rotation but once in an hour, its movement also cannot be discerned and the illusion of mystery is further heightened.

Referring now to Figs. 7 and 8, I have there illustrated a modification of my invention in which the rotating disk **20** is omitted and in which the minute hand **50** is secured to the gear ring **26** in the manner that I shall now describe.

In all other respects, the construction of this modification is the same as that described with respect to the embodiment illustrated in Figs. 1 to 6 incl. The minute hand is held on the finger **46** and a train of gears and counterweight **70** such as that illustrated in Fig. 5 operatively connects the minute hand to the hour hand **58**.

The minute hand of this modification is preferably somewhat longer than that of the first described embodiment and extends just beyond the frame **22**.

At the rear of the clock, I secure the minute hand **50** to the gear ring **26** by any suitable means, such as the spacers or blocks **90** and the rivets **92**.

Thus, as the gear ring **26** is driven by the motor **12**, the minute hand is correspondingly rotated to indicate time and in turn through the train of gears, such as that illustrated in Fig. 5, correspondingly rotates the hour hand **58** to indicate the hour.

This modification is in the same manner set or reset by manually rotating the counterweight **70** and thereby moving the hour hand **58** to position and then moving the minute hand manually to the selected position.

The gear ring **26** of this modification and its connection to the minute hand **50** is masked from view by the frame **22** and by the minute hand itself.

While I have illustrated a specific embodiment of my invention, I do not intend to be limited to the details of construction illustrated but intend to claim my invention as broadly as the state of the art and the scope of the appended claims permit.

I claim:

1. In a clock of the character described, driving means for the hour hand of the clock comprising in combination, a minute shaft, a minute shaft pinion secured thereto for rotation therewith, a balanced hour hand assembly rotatably mounted on said minute shaft and an unbalanced change gear assembly rotatably mounted on said minute shaft at a point adjacent said hour hand assembly for driving the latter from said minute shaft, said hour hand assembly comprising an hour hand, an hour gear, and a counterweight at one end of the hour hand for balancing said hour hand assembly whereby said hour hand assembly tends to remain in any angular position with respect to said minute shaft without reacting on said change gear assembly, said change gear assembly comprising a plate of substantial thickness and mass, and a change gear rotatably mounted on said plate and meshing with said minute shaft pinion and said hour gear, said plate being rotatably mounted on said minute shaft at a point offset from the center of gravity of said change gear assembly whereby said change gear assembly tends to seek a constant position irrespective of the angular position of said hour hand assembly, said plate being thereby adapted to be manually rotated out of said constant position in order to shift the position of said hour hand.

2. The clock of claim 1, in which said plate is provided with countershaft means, one end of said countershaft means being mounted in said plate and the other end thereof being unsupported whereby said other end does not interfere with said hour hand assembly, said change gear comprising a gear and a change pinion being mounted on said countershaft means for rotation with respect to said plate, said gear meshing with and being driven by said minute shaft pinion and said change pinion meshing with and driving said hour wheel.

3. A clock comprising a circular ring gear, synchronous motor means for rotating said ring gear, an annular disk fixed to said ring gear for rotation therewith, a minute hand, means for frictionally attaching said minute hand to one side of said disk whereby the minute hand may be rotated independently of the disk and ring gear but rotation of the ring gear and disk will cause rotation of said minute hand, an axial shaft mounted for rotation with the minute hand, a weighted member freely suspended from said axial shaft, a pinion on said axial shaft rotating therewith, a gear mounted for rotation on said weighted member about an axis parallel to the axial shaft and meshing with said pinion, a second pinion mounted for rotation with said gear about its axis, an hour hand mounted for rotation about the axis of said axial shaft and disposed on the other side of said disk, a gear mounted for rotation with the hour hand about the axis of said axial shaft and meshing with said second pinion, said weighted member being rotatable about the axis of said axial shaft for moving said hour hand and said hour hand being movable upon moving the minute hand either independently of the disk or by said disk

through said gears and pinions, and said weighted member being rotatable about said axial shaft for moving said hour hand independently of the minute hand, said minute hand being exposed and accessible for hand turning from one side of the disk, and said hour hand being exposed and accessible for hand turning from the other side of said disk.

4. The combination of claim 3 in combination with a retainer ring surrounding said disk and ring gear and forming a housing in which said ring gear and disk rotate.

5. The combination of claim 4, said disk being disposed between the minute and the hour hands and being made of light transmitting material.

6. The combination of claim 4, said synchronous motor means being mounted in a base and said retainer ring being fixedly mounted on said base.

7. An electric clock comprising a base, a frame ring fixed to the base, an annular ring gear rotatably mounted within said frame ring, a synchronous motor within the base, gearing interconnecting said motor with said ring gear to rotate said ring gear one revolution every hour of operation of the synchronous motor, a circular disk having its periphery fixed within said ring gear and rotatable therewith within said frame ring, said disk being formed with an axial through-opening, shaft means extending through said opening in the disk, and comprising a portion projecting to one side of said disk, a minute hand mounted on said portion of said shaft means for rotation therewith and disposed at said side of said disk, means for frictionally attaching said shaft means to said disk whereby rotation of the ring gear and disk will cause accompanying rotation of said minute hand but permitting said minute hand to be rotated without accompanying rotation of said ring gear and disk, a second shaft means coaxial with said first shaft means and fixed with respect thereto, said second shaft means having a bearing portion disposed on the opposite side of said disk, a pinion fixed on said second shaft means and located on said opposite side of said disk, a weighted member rotatably mounted on said second shaft and freely suspended therefrom, a gear rotatably mounted on said weighted member and meshing with said pinion, a second pinion rotatable together with said gear, an hour hand rotatably mounted on said bearing portion of said second shaft means, a gear fixed for rotation with said hour hand and rotatable with said bearing portion and meshing with said pinion on said countershaft, the first side of said disk being exposed so that the minute hand may be readily engaged and turned for adjusting the minute hand and the hour hand therewith, and said opposite side of said disk being exposed so that the weighted member may be engaged and rotated about said second shaft to advance the hour hand or turn back the hour hand one hour for each revolution of the weighted member, and said hour hand also being engageable from said opposite side of said disk and rotated freely without affecting the minute hand to advance or turn back said hour hand.

8. The combination of claim 7, said frame ring having clock dial means thereon visible from the first side of the disk.

9. The combination of claim 7, and a counterweight on said hour hand.

10. The combination of claim 7, said disk being transparent.

11. A clock comprising a base, a frame ring fixed to the base and extending above the base, an annular ring gear rotatably mounted within the frame ring, a synchronous motor within the base, gearing interconnecting the motor with the ring gear to rotate the ring gear one revolution for every hour of operation of said motor, a circular disk having its periphery fixed within the ring gear and rotatable therewith within said frame ring, said disk being formed with an axial through-opening, a tubular shaft extending through the opening in the disk, a collar at the rear end of the tubular shaft contacting the rear end of the disk, a portion of the tubular shaft projecting forwardly of the disk and being formed with external screw threads, a minute hand mounted on the forwardly projecting portion of the tubular shaft for rotation therewith, a nut screwed on the external screw threads of the tubular shaft to frictionally attach said tubular shaft to the disk, a second shaft having a portion projecting into the tubular shaft and fixed thereto, said second shaft having a bearing portion disposed rearwardly of the disk, a pinion fixed to the second shaft, a weighted member freely suspended from the rear end of the second shaft, a gear rotatably mounted on said weighted member and meshing with the pinion, a second pinion rotatable with the gear, an hour hand freely rotatable on the bearing portion and located between the pinion on the second shaft and said collar, and a gear fixed for rotation with said hour hand on said bearing portion and meshing with said second pinion.

12. The combination of claim 11, said disk being exposed at its opposite sides so that the minute hand as well as the hour hand and weighted member may be engaged and rotated.

13. The combination of claim 12, said disk being transparent.

14. The combination of claim 11, and a counterweight on said hour hand.

15. The combination of claim 12, said disk being transparent, and clock dial means on the frame ring visible from the front of the clock.

16. The combination of claim 15, and a counterweight on said hour hand.

17. In a clock of the character described comprising a base, driving means disposed in said base, a single rotatable transparent disk driven by said driving means, an hour hand, and a minute hand, the combination of means for transmitting the rotation of said single disk to both of said hands and for permitting the setting of said hour hand independently of the rotation of said disk, comprising, a minute shaft supported from said disk and rotating therewith, said minute hand being secured thereto whereby said minute hand is rotatable with said disk, an hour hand assembly, including said hour hand, freely suspended from said shaft, a weighted change gear assembly freely suspended from said shaft and driven thereby and engaging said hour hand assembly for driving the same whereby relative rotation of said weighted change gear assembly with respect to said disk will cause rotation of said hour hand with respect to said disk, and a frame ring mounted on said base and surrounding said disk for maintaining the same upright and in operative engagement with said driving means and having flange means overlapping said flange means defining an opening whereby said change gear assembly is accessible for manual rotation with respect to said disk.

18. In a clock of the character described hav-

ing a base, driving means disposed in said base, and a single upright transparent disk rotatably driven by said driving means, the combination of means for maintaining said disk upright and in operative engagement with said driving means and for causing the motion thereof to be transmitted to both hands of the clock, comprising a frame ring mounted on said base and surrounding said disk, said frame ring having flange means which overlaps the periphery of said disk, a shaft supported in said transparent disk at substantially the center thereof and rotating therewith, said disk and said shaft comprising a drive assembly, an hour hand assembly freely suspended from said shaft, and a change gear assembly freely suspended from said shaft, said hour hand assembly being disposed between said change gear assembly and said disk and including an hour hand and an hour wheel affixed thereto, and said change gear assembly including a weight in the form of a plate, a cantilevered countershaft mounted at one end in said plate and projecting towards said disk, and a change wheel mounted on said countershaft for rotation with respect to said plate, said change wheel having a portion engaging said hour wheel, and a pinion on said minute shaft engaging another portion of said change wheel.

19. A clock as claimed in claim 18 including means for frictionally securing said minute shaft to said disk to permit rotation thereof with respect to said disk, said minute hand being keyed to said shaft whereby angular adjustment of said minute hand with respect to said disk will cause corresponding movement of said minute shaft and corresponding angular adjustment of said hour hand.

20. In a clock of the character described having a base, driving means disposed in said base, and a single upright transparent disk rotatably driven by said driving means, the combination of means for maintaining said disk upright and in operative engagement with said driving means and for causing the motion thereof to be transmitted to both hands of the clock, comprising a frame ring mounted on said base and surrounding said disk, a shaft supported in said transparent disk at substantially the center thereof and rotating therewith, said disk and said shaft comprising a drive assembly, a minute hand secured to and rotating with said drive assembly, an hour hand assembly freely suspended from said shaft, and a change gear assembly freely suspended from said shaft, said hour hand assembly being disposed between said change gear assembly and said disk and including an hour hand and an hour wheel affixed thereto, and said change gear assembly including a weight in the form of a plate, a cantilevered countershaft mounted at one end in said plate and projecting towards said disk, and a change wheel mounted on said countershaft for rotation with respect to said plate, said change wheel having a portion engaging said hour wheel, and a pinion on said minute shaft engaging another portion of said change wheel, said frame ring and said base being a structurally independent unit, said frame ring having flange means which overlaps the periphery of said disk whereby said disk may be rotatably supported by said frame ring, and said flange means defining an opening whereby said change gear assembly is accessible for manual rotation with respect to said disk for changing the setting of said hour hand.

21. A clock comprising a minute shaft, a minute hand mounted on said minute shaft for rotation therewith, a minute shaft pinion mounted on said minute shaft for rotation therewith, a weighted member freely suspended on said minute shaft, a gear rotatably mounted on the weighted member and meshing with the minute shaft pinion, a second pinion rotatable with said gear, an hour hand freely rotatable on said minute shaft, a gear fixed for rotation with the hour hand on said minute shaft about the axis of the minute shaft and meshing with the second pinion, and a counterweight on the hour hand for counterbalancing the same.

22. The combination of claim 21 in combination with bearing means for supporting said shaft between the minute hand and the hour hand.

23. The combination of claim 22, said bearing means comprising a transparent disk located between said minute hand and said hour hand, means for frictionally pressing said minute hand against said disk whereby said minute hand will rotate with the disk when the disk is rotated and whereby said minute hand may be rotated independently of said disk, and means for rotating said disk one revolution per hour.

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