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ALARM CLOCK

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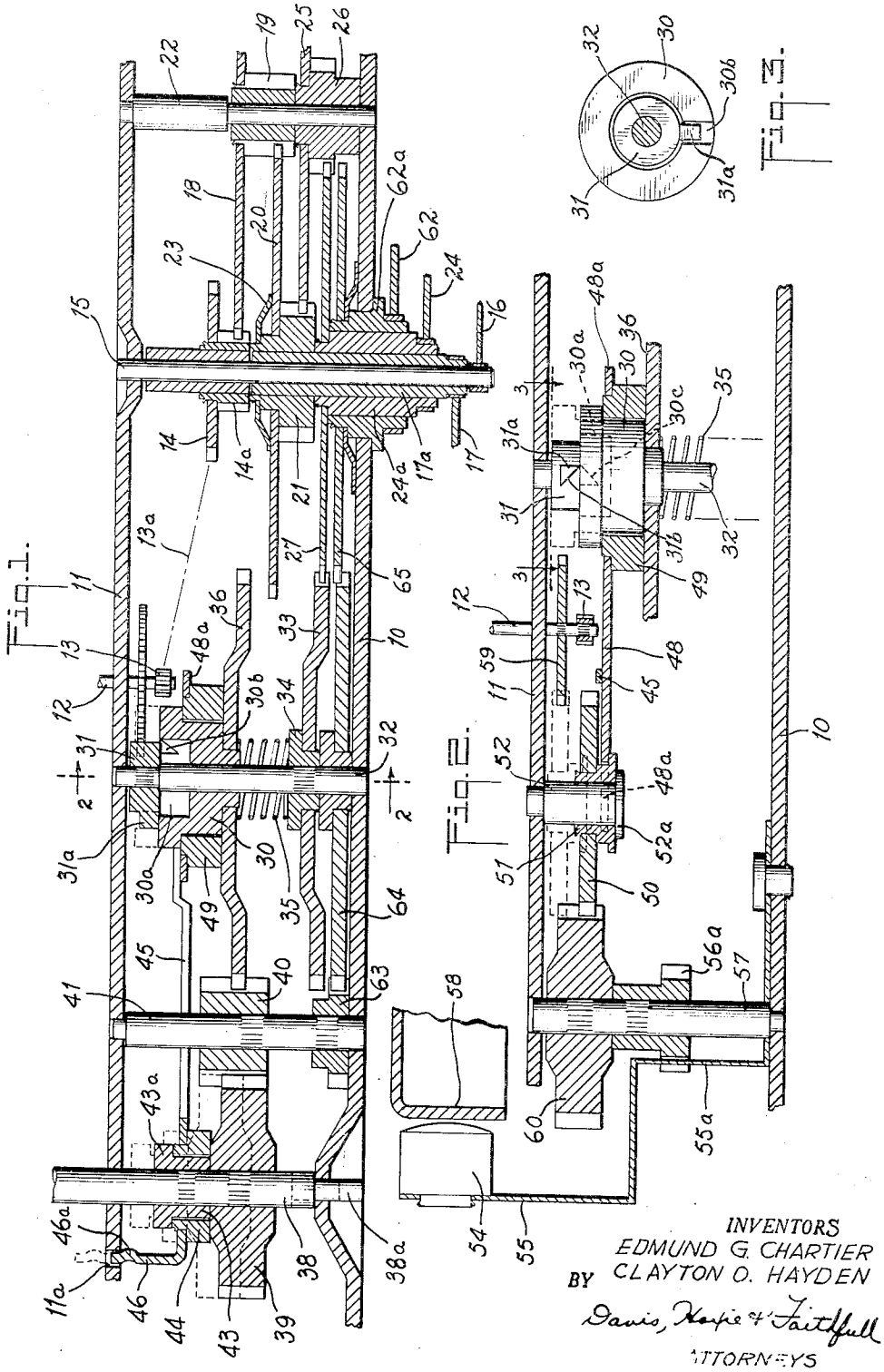


Fig. 1.

Fig. 3.

Fig. 2.

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ALARM CLOCK

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The invention relates to alarm clocks and particularly to an alarm mechanism having a single control which serves for time-setting of the alarm and also for off-and-on turning of the alarm.

Alarm clocks as made heretofore have a rotatable control for setting the time at which the alarm is to operate, and a separate control (usually in the form of a push-pull button) for off-and-on turning of the alarm. The principal object of the present invention is to avoid the use of such dual means for controlling the alarm mechanism.

An alarm clock made according to the invention has a timing mechanism including a drive shaft, which may be electrically or mechanically operated. The alarm mechanism comprises two interengaging rotatable members arranged coaxially, the first of these members being movable axially in one direction only when in a certain angular relation to the second member. A manual control shaft is mounted for both rotary and axial movement in the clock, and there is a driving connection from this control shaft to one of the coaxial members for setting its angular position by rotation of the control shaft. The other coaxial member is driven continuously through a driving connection from the timing mechanism; and when this member attains the certain angular relation to the member which has been set from the control shaft, the axially movable member can be shifted axially in one direction by a biasing means, such as a spring.

An alarm clapper is adapted to be operated from the drive shaft of the clock through a normally inoperative connection including a gear or other driving element shiftable between a non-driving position in which the clapper is idle and a driving position wherein the clapper is operated by the drive shaft. Through a shift connection from the axially movable member to this driving element, the latter is shifted to its driving position by the biasing means when the above-mentioned angular relation of the coaxial members is attained, whereby the alarm clapper is operated. An alarm stop is also connected to the control shaft and is operable by axial movement thereof in one direction to shift the driving element from its driving to its non-driving position against the action of the biasing means, thereby stopping the clapper operation. Axial movement of the control shaft in the opposite direction operates the stop to release the driving element and thereby place it under control of the coaxial members.

In the preferred form of the invention, the control shaft is provided with releasable holding means for preventing axial movement of this shaft by the biasing means, that is, in the direction for releasing the driving element associated with the alarm clapper. In this way, the stop is adapted to hold the driving element against shifting to its clapper-driving position when the coaxial members attain their certain angular relation at the time set by rotation of the control shaft. The shaft holding means preferably includes a holding member connected to a collar mounted on the control shaft and which, in turn, is connected to the alarm stop. The control shaft is

rotatable relative to the collar to time-set the alarm, but axial movement of this shaft moves the collar and alarm stop with it. The control shaft extends from the interior of the clock through a plate of the clock frame, so that the shaft is accessible for manual adjustment. The holding member on the collar extends into an opening in this plate near the control shaft so as to prevent rotation of the collar, and the holding member has releasable means coacting with the plate to retain the control shaft and the alarm stop against movement by the biasing means.

For a better understanding of the invention, reference may be had to the accompanying drawing in which:

Fig. 1 is a lay-out view of a clock embodying a preferred form of the invention;

Fig. 2 is a sectional view on line 2—2 in Fig. 1, and

Fig. 3 is a sectional view on line 3—3 in Fig. 2.

Referring to the drawing, the clock comprises a front plate 10 and a rear plate 11 forming the main parts of a frame or casing for the timing and alarm mechanisms. The timing mechanism, as shown, is driven electrically from the constant speed drive shaft 12 of a synchronous electric motor (not shown) mounted on the rear plate 11. The drive shaft 12 extends from the motor through the rear plate 11 and into the casing, where it carries a main pinion 13. This pinion drives a gear 14 on the main shaft 15 through reduction gearing shown schematically by the dot-dash line 13*a* in Fig. 1.

The main shaft 15 rotates with gear 14 and is provided with a second or sweep hand 16 located in front of the clock face (not shown) on plate 10. Behind the sweep hand 16 is a minute hand 17 secured to a sleeve 17*a* on shaft 15. This sleeve is driven from gear 14 through a pinion 14*a* and reduction gearing 18, 19, 20 and 21, the gearing 18—19 being mounted loosely on a separate shaft 22. Pinion 21 is secured to the minute sleeve 17*a* and is driven from gear 20 through the usual friction disc 23 which permits slippage between the parts 20 and 21 for setting the minute hand. The hour hand 24 is secured to a sleeve 24*a* on sleeve 17*a* and is driven from pinion 21 through reduction gearing 25, 26 and 27. The gearing 25—26 is loosely mounted on shaft 22, and gear 27 is secured to the hour sleeve 24*a*.

The clock as described so far is conventional, the timing mechanism 12—27 being typical of electrical clocks as commonly made.

The alarm mechanism comprises two interengaging rotatable members 30 and 31 arranged coaxially on a shaft 32 journalled at its ends in the plates 10—11. The first rotatable member 30 is loosely mounted on shaft 32 and is movable axially thereof, while the second member 31 is secured tightly to this shaft. The axially movable member 30 has a cylindrical recess 30*a* facing the other member 31 and adapted to receive the latter, which is also cylindrical except for a radial protrusion 31*a* on its periphery. When the members 30 and 31 are in a certain angular relation to each other, the protrusion 31*a* is aligned with a notch 30*b* in the periphery of recess 30*a*, so that member 30 can be moved axially toward the other member 31 (rearward on shaft 32) until the latter is seated against the bottom of recess 30*a*.

The member 31 is rotated continuously from the timing mechanism through a driving connection comprising a gear 33 meshing with the gear 27 on the hour sleeve 24*a*, these gears having a one-to-one ratio. Gear 33 is secured to a collar 34 fixed to shaft 32, so that the member 31 is rotated through one complete revolution every twelve hours. The axially movable member 30 is urged against the rotating member 31 by biasing means in the form of a compression spring 35 coiled around the shaft 32 between collar 34 and a gear 36 secured to the front end of the member 30. Except when the members 30

and 31 are in the certain angular relation mentioned above, rotation of member 31 will cause its protrusion 31*a* to ride around the adjacent end of the other member 30, thereby holding the latter in its forward position against the spring 35. However, when this certain angular relation of the members 30—31 is attained, which will be at a time determined by the angular setting of member 30, the alignment of protrusion 31*a* with notch 30*b* allows spring 35 to shift the member 30 rearward on shaft 32, as indicated by the broken lines in Figs. 1 and 2.

The axially movable member 30 is adapted to be set in any desired angular position by rotation of a manual control shaft 38. This shaft is mounted in the frame plates 10 and 11 for both rotary and axial movement. At its front end, the shaft 38 has a reduced portion 38 extending through and beyond an indented part of the front plate 10 and forming a shoulder which rests against the inner surface of this plate in the forward position of the shaft. The shaft 38 projects through the rear plate 11 and is provided at its rear end with a knob (not shown) for rotating the shaft and moving it axially in either direction. Angular setting of member 30 from the control shaft is effected through a driving connection comprising a gear 39 secured to this shaft and meshing with a pinion 40 fixed to a shaft 41 journalled in the frame. The pinion 40 meshes with gear 36 on the axially movable member 30 and is of sufficient length to remain in mesh with each gear 36 and 39 throughout its range of axial movement.

The control shaft 38 has a collar 43 secured on it directly behind the gear 39. A sleeve 44 is rotatably mounted on the collar 43 between an end flange 43*a* thereof and the gear 39, so that the sleeve moves axially with the control shaft but permits rotation of the latter relative to the sleeve. Secured to the sleeve 44 is an alarm stop in the form of an arm 45 and also a releasable holding means 46. The latter, as shown, is a member integral with the arm 45 and bent at right angles thereto so as to extend into an opening 11*a* located in the rear plate 11 near shaft 38. The holding member 46 has a detent 46*a* which, in the forward position of shaft 38, engages the inner face of plate 11. Because of the inherent resiliency of the member 46, which is in effect a leaf spring, the detent 46*a* constitutes a releasable means coacting with the plate 11 for retaining the control shaft against rearward movement except when it is pulled out manually. When it is so pulled, the holding member 46 is projected rearward through opening 11*a*, as indicated by the broken lines in Fig. 1, so that detent 46*a* now engages the outer face of plate 11 and prevents return movement of the control shaft except by manual operation thereof.

It will be understood that the holding member 46 not only prevents accidental axial displacement of the control shaft 38 but also holds the stop arm 45 in a fixed angular position relative to the control shaft. Also, the member 46 indicates the axial positioning of shaft 38, according to whether this member is projecting through or withdrawn into the plate opening 11*a*.

The stop arm 45 is engageable with a shift arm 48 having at one end an annular part 48*a* surrounding a collar 49 to which the shift arm is secured. The collar 49 loosely surrounds the axially movable member 30 between a flange at the rear end of this member and the gear 36 at its front end. Consequently, the member 30 is rotatable relative to the collar 49 and arm 48 through the gearing 39, 40 and 36, but the axial movements of member 30 are imparted to the shift arm 48 through collar 49.

The arm 48 forms a shift connection from the member 30 to an alarm operating element in the form of a gear 50. This gear is fixed to a collar 51 loosely mounted on a stub shaft 52 secured to the rear plate 11. Forward movement of collar 51 is limited by a head 52*a* on the shaft 52. The end of arm 48 remote from the member 30 has bifurcations, one of which is shown at 48*a*, fitting closely into a reduced portion of collar 51, so that axial movements of member 30 are imparted to the gear 50.

With the alarm stop 45 in its forward position as shown in Fig. 2 (the control shaft 38 pushed in), it engages arm 48 so as to prevent the spring 35 from shifting the parts 30 and 48 rearward even when the protuberance 31*a* is aligned with notch 30*b*. The arm 48 is released by the stop 45 when the control shaft 38 is pulled out or drawn rearward, so that upon alignment of protuberance 31*a* with notch 30*b*, the spring 35 shifts the parts 30, 48 and 50 rearward. By pushing the shaft 38 back to its forward position, the stop 45 is actuated to return the parts 30, 48 and 50 to their forward positions against the action of spring 35.

When the gear 50 is in its rearmost position (indicated by the broken lines in Fig. 2), it forms part of an operating connection between the drive shaft 12 of the clock and an alarm clapper. This clapper comprises a button 54 on the free end of a spring-metal strip 55 secured to the front plate 10. The strip 55 has a leg 55*a* engageable by lobes 56*a* on a collar 56 secured to a rotatable shaft 57. Upon rotation of shaft 57, the lobes 56*a* vibrate the button 54 against a bell 58 mounted on the clock frame, thereby sounding the alarm. The operating connection to the shaft 57 comprises a gear 59 on shaft 12, the shiftable gear element 50, and a gear 60 on shaft 57. This connection is operative only when the gear element 50 has been shifted rearward, as previously mentioned, so as to mesh with gear 59 and thereby drive gear 60.

To set the alarm mechanism for the desired ringing time, the control shaft 38 is rotated to adjust the angular position of the axially movable member 30 through gearing 39, 40 and 36. This movement turns an alarm indicating hand 62 on an outer sleeve 62*a* on main shaft 15, thereby indicating on the clock face the alarm-ringing time corresponding to any setting of member 30. The hand 62 is actuated from a pinion 63 secured to shaft 41 and meshing with a gear 64 loosely mounted on shaft 32. The gear 64 also meshes with a gear 65 secured to sleeve 62*a*.

To release the alarm mechanism for ringing at the set time, the control shaft 38 is pulled out so as to withdraw the alarm stop 45 from arm 48. It will be noted that this manual release of the alarm mechanism can be effected either before or after the time-setting of the alarm mechanism, as the control shaft can be rotated in either of its axial positions to adjust the member 30. At the time for which the member 30 has been set by shaft 38, the proturberance 31*a* will move into alignment with notch 30*b*, whereby spring 35 shifts the gear 50 into mesh with gear 59, as previously described, to operate the alarm clapper.

To stop the alarm, the control shaft 38 is pushed back to its forward position, causing stop 45 to shift gear 50 out of mesh with gear 59. This manual operation of the stop also returns member 30 to its forward position and recompresses the spring 35. Thereafter, continued rotation of member 31 will move its protuberance 31*a* out of line with notch 30*b*, so that stop 45 can be released again by shaft 38 to place the alarm mechanism under control of the members 30—31. Failure to push the control shaft 38 inward promptly after operation of the alarm clapper will not result in damage to the mechanism but will merely allow the member 31 to cam the member 30 in a forward axial motion against spring 35, thereby moving arm 48 forward to disengage gear 50 from gear 59 and stop the alarm. For this purpose, the protuberance 31*a* has a sloping bottom forming a cam surface 31*b* adapted to seat against a sloping bottom or cam surface 30*c* of the notch 30*b* (Fig. 2). Accordingly, when the member 30 is thrust rearward by spring 35 in response to alignment of protuberance 31*a* with notch 30*b*, the cam surface 31*b* will be seated against the sloping bottom 30*c* of the notch so that subsequent rotation of member

31 will cause the forward camming of member 30. Thus, if the control shaft 38 is left in its retracted or rearward position, the alarm will ring at the time for which the member 30 has been set by rotation of shaft 38 but will be automatically shut off when this forward camming of member 30 has progressed sufficiently to disengage the gears 50 and 59. The protuberance 31*a* will then ride along the adjacent end of member 30 until it is again aligned with notch 30*b*, at which time the ringing is repeated over the interval allowed by the camming means 30*c*—31*b*.

We claim:

1. In a clock having a timing mechanism including a drive shaft, an alarm mechanism comprising two interengaging rotatable coaxial members the first of which is movable axially in one direction only when in a certain angular relation to the second member, biasing means urging the axially movable member in said one direction, a manual control shaft mounted for both rotary and axial movement, a driving connection from the control shaft to one of said members for setting the angular position thereof by rotation of the control shaft, a driving connection from the timing mechanism to the other member for continuously varying its angular position, an alarm clapper, a normally inoperative alarm connection from said drive shaft to the clapper including an element shiftable between a non-driving position in which the clapper is idle and a driving position in which the clapper is operated by the drive shaft, a shift connection from the axially movable member to said element through which said element is shifted to its driving position by the biasing means when said angular relation of said members is attained, an alarm stop connected to the control shaft and operable by axial movement thereof in one direction to shift said element from its driving to its non-driving position against the action of the biasing means, the stop being operable by axial movement of the control shaft in the opposite direction to release said element and thereby place it under control of said coaxial members, a plate through which the control shaft projects from the interior of the clock, whereby the control shaft is adjustable manually, the plate having an opening near the control shaft, and a holding member connected to the control shaft within the alarm clock and extending into the opening, said holding member having releasable means coacting with the plate for retaining the control shaft against axial movement in said opposite direction by the biasing means.

2. An alarm mechanism according to claim 1, in which said holding member is so proportioned that it is projected outwardly through and retracted into the plate opening by said axial movements of the control shaft, whereby the holding member indicates the axial position of said last shaft.

3. In a clock having a timing mechanism including a drive shaft, an alarm mechanism comprising two interengaging rotatable coaxial members the first of which is movable axially in one direction only when in a certain angular relation to the second member, biasing means urging the axially movable member in said one direction, a manual control shaft mounted for both rotary and axial movement, a driving connection from the control shaft

to one of said members for setting the angular position thereof by rotation of the control shaft, a driving connection from the timing mechanism to the other member for continuously varying its angular position, an alarm clapper, a normally inoperative alarm connection from said drive shaft to the clapper including an element shiftable between a non-driving position in which the clapper is idle and a driving position in which the clapper is operated by the drive shaft, a shift connection from the axially movable member to said element through which said element is shifted to its driving position by the biasing means when said angular relation of said members is attained, an alarm stop connected to the control shaft and operable by axial movement thereof in one direction to shift said element from its driving to its non-driving position against the action of the biasing means, the stop being operable by axial movement of the control shaft in the opposite direction to release said element and thereby place it under control of said coaxial members, said driving connection from the control shaft including a gear rotatable with the control shaft, and a collar mounted on the control shaft and movable axially therewith, the alarm stop being connected to the control shaft through said collar, said gear being rotatable relative to the collar.

4. An alarm mechanism according to claim 3, in which the alarm stop is an arm, the alarm mechanism comprising also means for holding the collar against rotation on the control shaft.

5. An alarm mechanism according to claim 3, in which the alarm stop is an arm, the alarm mechanism comprising also a holding member connected to the collar for holding the same against rotation on the control shaft, the holding member having releasable means for preventing axial displacement of the control shaft in said opposite direction by the biasing means.

6. An alarm mechanism according to claim 3, in which the alarm stop is an arm, the alarm mechanism comprising also a plate through which the control shaft projects from the interior of the clock, whereby the control shaft is adjustable manually, the plate having an opening near the control shaft, a holding member connected to the collar and extending into the opening to hold the collar against rotation on the control shaft, said holding member having releasable means coacting with the plate for retaining the control shaft against axial movement in said opposite direction by the biasing means.

7. An alarm mechanism according to claim 6, in which said holding member is so proportioned that it is projected outwardly through and retracted into the plate opening by said axial movements of the control shaft, whereby the holding member indicates the axial position of said last shaft.

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