Jan. 12, 1960 E. A. PHANEUF 2,920,438

ALARM CONTROL MECHANISM

Filed Oct. 13, 1958

Fig. 1.

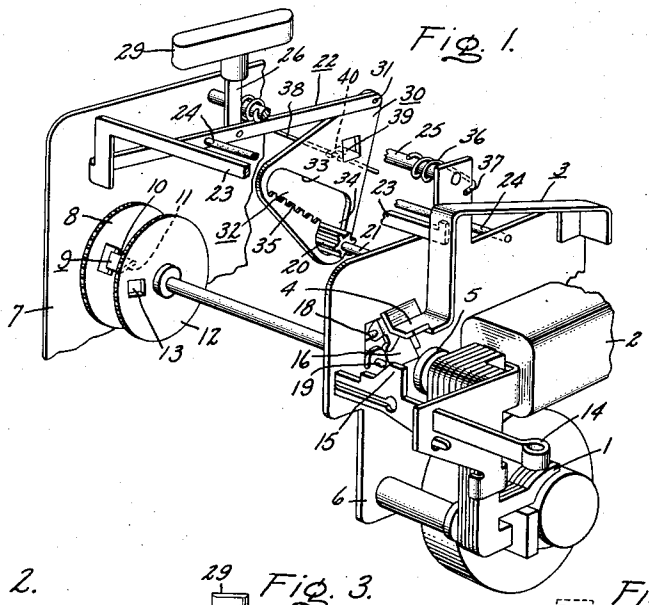


Fig. 2.

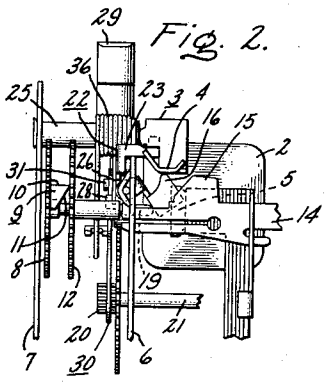


Fig. 3.

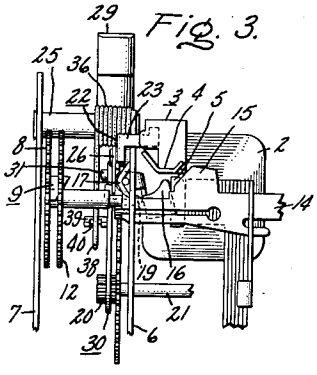


Fig. 4.

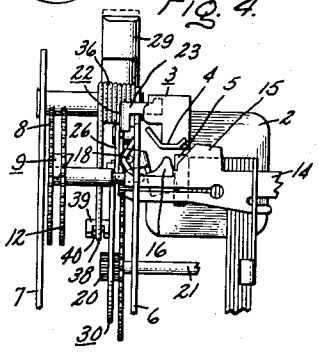


Fig. 5.

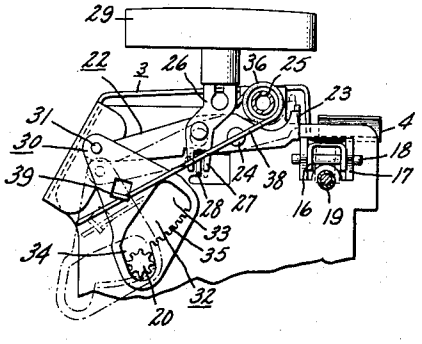
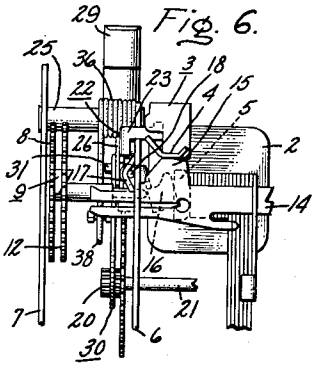


Fig. 6.



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His Attorney.

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2,920,438

ALARM CONTROL MECHANISM

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Application October 13, 1958, Serial No. 766,887

7 Claims. (Cl. 58—21.12)

This invention relates to an alarm control mechanism, and more particularly to a short interval alarm mechanism for an alarm clock.

With such a mechanism, when the alarm sounds, a person awakened may actuate the short interval mechanism and return to sleep for a short period of time without fear of oversleeping, since the alarm will sound again after a short time interval.

In devices of this type, it is usually desirable that the alarm actuating movement occur very rapidly. Otherwise, the alarm vibrator arm may commence to vibrate with an objectionable erratic hum. However, it is also desirable that the short interval mechanism be as simple as possible and have low clock motor power requirements. A reliable low cost short interval alarm mechanism which may be readily added to a prior art alarm clock is especially desirable.

Correspondingly, it is a primary object of this invention to provide an improved positive acting short interval alarm mechanism having a minimum number of parts which may be easily incorporated in an alarm clock.

It is a further object of this invention to provide an improved snap acting short interval mechanism which may be readily operated by a conventional low torque clock motor.

In accordance with one aspect of this invention, a vibrator shut-off lever is provided for permitting or restraining motion of a vibrator arm. The shut-off lever has an alarm "on" position in which it is out of engagement with the vibrator arm, and an alarm "off" position in which it is in engagement with the vibrator arm. An interval lever is pivotally mounted on the vibrator shut-off lever and gear means continuously rotated as a function of time by the clock mechanism cooperates with the interval lever to hold the vibrator shut-off lever in the alarm "off" position for a predetermined short time interval. A spring means uniquely engages and cooperates with the interval lever for snapping the vibrator shut-off lever to the alarm "on" position at the end of the predetermined short time interval. By this arrangement, a very simple, yet accurate, short interval alarm is achieved.

Other objects and attendant advantages of this invention will be apparent from the following description taken in connection with the accompanying drawing in which:

Fig. 1 is an exploded perspective view of an alarm clock provided with the improved short interval alarm mechanism;

Fig. 2 is a side elevational view of the mechanism shown in Fig. 1 with the alarm set to be automatically sounded at a preset time;

Fig. 3 is a partial side elevational view of the mechanism as shown in Fig. 1 with the parts indicated in alarm sounding position;

Fig. 4 is a partial side elevational view of the mechanism as shown in Fig. 1 illustrating actuation of the short interval mechanism;

Fig. 5 is a partial front elevational view of the mechanism shown in Fig. 1; and

Fig. 6 is a side elevational view of the mechanism shown in Fig. 1 illustrating the alarm shut-off by a conventional alarm shut-off device.

Referring now to the drawings and first particularly to Fig. 1, the alarm clock in which the improved control device may be used may be driven by a timing mechanism including a self starting synchronous motor. Portions of the motor stator magnet core and energizing coil are shown at **1** and **2**, respectively. A resilient magnetic vibrator arm **3** operated by leakage flux from the motor is arranged to have its free end portion **4** vibrate against stator nut **5** and produce an audible alarm at all times when the motor is energized, unless the vibrator arm is prevented from vibrating by one of the alarm control parts to be described hereinafter.

A supporting structure including a base plate **6** and a front plate **7** spaced from plate **6** and arranged generally parallel thereto is provided for supporting the clock mechanism. A cam gear member **8** having a projecting cam portion **9** located thereon is rotatably mounted on the supporting structure of the clock framework. The cam portion **9** comprises an abrupt axially extending surface **10** located on one side thereof and a sloping surface **11** located on the other. A second cam gear member **12** having abrupt cam surfaces formed by a slot **13** is also rotatably mounted on the clock supporting structure as shown in the drawings, and is axially movable to actuate the alarm mechanism in a manner hereinafter described. The angular position of cam gear member **8** is manually adjustable by means of gearing in a manner well known in the art. In the embodiment shown, cam member **12** is driven by the timing motor of the clock through a suitable gearing arrangement.

The alarm mechanism is provided with a suitable permanent shut-off device such as a lever **14**, having a projection **15** thereon which is positioned so as to engage vibrator arm **3** and restrain vibratory movement thereof when the lever is moved to the "off" position shown in Fig. 6. The shut-off lever **14** is shown in the "on" position in Figs. 1–4, that is with the projection **15** out of engagement with the free end portion **4** of vibrator arm **3** to permit the free end portion **4** to vibrate against stator nut **5**.

The resilient vibrator arm **3** may be utilized to spring load the axially movable cam gear **12** into engagement with the cam gear **8** through a suitable lever mechanism such as bell crank **16** which is pivoted to base plate **6** by means of ears **17** and pivot pin **18**. As shown in Figs. 2 and 3, bell crank **16** transmits the spring force of vibrator arm **3** to the end of a shaft **19** which is attached to cam member **12**. Accordingly, when the timing mechanism of the clock drives cam **12** to a position where the abrupt cam surface **10** becomes aligned with the abrupt surface formed by slot **13**, the vibrator **3** acting through the bell crank **16** rapidly forces the cam member **12** toward the cam member **8** to the position shown in Fig. 3. In this position the vibrator arm **3** is unrestrained and is free to vibrate under the influence of the continuously applied electro-magnetic forces to give an audible signal. It can be seen that if the shut-off lever **14** were to be moved to the left to the "off" position, shown in Fig. 6, the projection **15** will be brought into engagement with the vibrator arm **3**, forcing it out of engagement with the bell crank lever **16**, thereby restraining further vibratory movement of the vibrator arm **3** and also removing the spring force from the end of shaft **19**.

The structure so far described is illustrated and described in greater detail in Patent No. 2,768,332 covering an invention of Donald E. Protzmann assigned to the assignee of the present invention. Further, prior art alarm clocks may include a pinion gear **20** which may be

fixed to a manually rotatable shaft **21** for adjusting the hands of the clock. (Not shown.) Conventionally, gear **20** is rotated at approximately 1 tooth per minute by the clock motor through a time gear train. Since details of this gear train are unnecessary for disclosure of the invention, such unnecessary conventional elements have been omitted from the drawing.

Short interval mechanism

According to this invention, there is combined with the aforedescribed alarm clock elements, a uniquely designed and positioned short interval mechanism for interrupting vibration of the alarm for a predetermined short interval of approximately ten minutes. This improved short interval mechanism does not interfere with any of the previously described clock elements, except to the extent that the operation of such short interval mechanism temporarily takes over control of audible alarm vibrator **3** after bell crank **16** has been moved to the position shown in Fig. 3 to permit the free end portion **4** of vibrator arm **3** to vibrate against stator nut **5** and produce an audible alarm.

The improved short interval mechanism includes a vibrator shutoff lever **22** for obstructing or permitting vibration of the vibrator arm **3**. As shown more particularly in Fig. 5, vibrator shut-off lever **22** may be formed from a single piece of flat sheet material and is provided with a rearwardly extending lug **23** formed at the right end thereof for cooperating with the end of vibrator arm **3** to obstruct vibration of the arm against field nut **5**. Lever **22** is pivoted to the base plate **6** at **24** and may be rotated to the dotted line alarm "off" position or the solid line alarm "on" position shown in Fig. 5. As shown in Fig. 1, counterclockwise movement of lever **22** beyond the alarm "on" position is restricted by lug **23** abutting the upper surface of base plate **6**. As shown in Fig. 5, the portion of vibrator shut-off lever **22** between pivot **24** and tab **23** may be indented so that the lever will not contact a spacer post **25** when the lever is pivoted counterclockwise to the alarm "off" position.

A manually operated actuating mechanism is provided for rotating vibrator shut-off lever **22** to the alarm "off" position. As shown in Fig. 5, the actuating mechanism includes an actuator lever **26** which is pivoted at the central portion thereof to vibrator shutoff lever **22**. This pivot connection is made to the left of pivot **24**, as viewed in Fig. 5, so that downward movement of lever **26** will rotate vibrator shut-off lever **22** in a counterclockwise direction to the dotted line alarm "off" position shown in Fig. 5. In order to guide lever **26** and to limit downward movement of the lever, the lower end portion **27** thereof is bifurcated for receiving a tab **28** which may be forwardly bent from base plate **6**. The upper end portion of the lever **26** is connected to a manually movable plunger **29** in a manner known in the art. With this arrangement, should plunger **29** be struck with a blow of the fist instead of by reasonably gentle finger pressure, downward movement of lever **26** is restricted by tab **28** and the parts of applicant's improved device are protected against damage.

A generally triangular interval lever **30** forms a unique interconnecting link between continuously rotatable pinion gear **20** and vibrator shut-off lever **22**. As shown in Fig. 5, the upper portion of interval lever **30** is pivoted at **31** to the left end of vibrator shut-off lever **22** and a generally L-shaped slot **32** having a long arm **33** and a short arm **34** is provided in the lower portion of interval lever **30** for receiving pinion gear **20** to accomplish a plurality of functions. A plurality of gear teeth **35** are provided in interval lever **30** along the lower side of the long arm **33** of L-shaped slot **32** for permitting pinion gear **20** to rotate interval lever **30** counterclockwise for a predetermined short time interval. At the end of the interval, when gear **20** drives out of engagement with teeth **35**, interval lever may be snapped upwardly in the alarm "on" direction in a manner to be more fully described hereinafter, and the interval lever will be guided during this movement by the cooperation of pinion gear **20** with short arm **34** of L-shaped slot **32**. As shown in Fig. 5, lug **23** cooperates with the upper surface of base plate **6** to prevent the lower end of the short arm **34** of L-shaped slot **32** from contacting pinion gear **20** thereby precluding friction drag between the lower edge of slot **34** and pinion gear **20**. In addition, the left portion of slot **32** at the juncture of short arm **34** and long arm **33** is curved and positioned with respect to pivot **31** and pinion gear **20** so that downward movement of plunger **29** and interval **30** will cause the interval lever **30** at the left portion of slot **32** to bear against the periphery of pinion **20** to pivot interval lever **30** clockwise about pivot **31**. By this arrangement, the interval lever **30** is not only moved as a function of time by pinion gear **20** to provide short time cycle actuation of vibrator shut-off lever **22**, but the elements of this improved short interval mechanism are also positively guided and controlled at all times by the unique pinion and L-shaped slot arrangement. Furthermore, with this arrangement, the length of the short time interval may be accurately predetermined by merely selecting the necessary number of teeth in interval lever **30** to provide the desired time interval.

An arrangement for providing unique snap acting movement of the vibrator shut-off lever **22** without necessitating an increase in the torque output requirements of the clock motor will now be more particularly described. This improved snap action is achieved by uniquely combining a spring **36** as shown in Fig. 5, with interval lever **30** and the other elements of the improved short interval mechanism. The primary purpose of spring **36** is to urge interval lever **30** upwardly and to the left as viewed in Fig. 5. However, it is also desirable that the leftward component of this spring force be such that it may be easily overcome by the counterclockwise driving force of pinion **20** without increasing the torque output requirements of the clock motor. As shown more particularly in Figs. 1 and 5, spring **36** is in the form of a coil which surrounds a spacer post **25**. One end **37** of the spring is placed over the upper surface of base plate **6**, and a generally straight portion **38** of the spring extends from the spacer post **25** toward interval lever **30** for slidable engagement with a forwardly bent tab **39** formed from the interval lever **30**. As shown more particularly in Fig. 1, tab **39** may be suitably slotted at **40** for receiving and guiding the straight portion **38** of the spring with respect to the tab.

Referring now to Fig. 5, it can be seen that manual downward movement of plunger **29** in the alarm "off" direction will lower pivot **31** thereby moving the shorter arm **34** of L-shaped slot **32** downwardly and sliding the interval lever at the curved left juncture of slot arms **33** and **34** on the periphery of gear **20** to pivot interval lever **30** in a clockwise direction until the pinion gear **20** is positioned in slot arm **33**. When the parts are in this position, a line drawn perpendicular to generally straight portion **38** of the spring at its point of engagement with tab **39** will pass to the left of pivot **31**. Thus, as viewed in Fig. 5, spring **36** will cause interval lever **30** to snap clockwise about pivot **31**, resulting in tab **39** sliding further toward the end of spring portion **38** to the dotted line position shown in Fig. 5. When the manual downward force is released from plunger **29**, spring **36** urges the right-most teeth of the interval lever into engagement with the teeth of pinion gear **20**. Since the major component of the force of the straight spring portion **38** on tab **39** is upward, rather than to the left as viewed in Fig. 5, a conventional clock motor may easily drive continuously rotatable pinion **20** in opposition to the force of spring **36** to move interval lever **30** counterclockwise about pivot **31**. Further, as the pinion gear **20** drives interval lever **30** counterclockwise, the force of spring **36** in opposition to the driving force of pinion **20** decreases

since the direction of the spring force, as represented by a line drawn perpendicular to spring portion **38** at its intersection with tab **39** approaches pivot point **31**. When pinion **20** drives out of engagement with teeth **35** at the end of the predetermined short interval the force direction of spring **36** passes through pivot **31** and spring **36** snaps the interval lever **30** and the vibrator shut-off lever **22** upwardly to the alarm "on" position to permit the vibrator arm **3** to vibrate against field nut **5**. Simultaneously, plunger **29** is moved upward to the dotted line position shown in Fig. 4. It can be seen that with this unique arrangement substantial spring force is provided for snapping vibrator shut-off lever **22** in a clockwise direction at the end of the predetermined short interval to thereby quickly remove the vibrator shut-off lever lug **23** from the vibrator arm **3** thus, allowing the vibrator arm **3** to snap down on the field nut **5** and commence to vibrate clear and distinctly. It should also be apparent that although spring **36** is ararnged to also snap the interval lever from the solid line position to the dotted line position shown in Fig. 5 when manual plunger **29** is depressed, a conventional low torque clock motor may easily rotate pinion gear **20** counterclockwise as viewed in Fig. 5 against the force of spring **36**.

From the foregoing description, it will also be appreciated that the improved short interval mechanism may be uniquely combined with a prior art alarm clock by the addition of only five easily manufactured and assembled parts. Interval lever **30**, vibrator shut-off lever **22**, and lever **26** may be formed in a simple stamping operation and readily assembled. Manually operated plunger **29** may be formed from plastic in a manner known in the art, and coil spring **36** may be easily formed and positioned over the spacer post **25**. Thus, an exceedingly simple, yet positive short interval mechanism is obtained.

Operation

For operation of the alarm, the manual shut-off lever **14** is pulled outwardly to the position shown in Fig. 2, thus allowing the end portion **4** of vibrator arm **3** to drop onto bell crank lever **16**. In this position, bell crank lever **16** holds vibrator arm **3** up and away from field nut **5** The alarm is set to the required time by rotating cam gear **8** to the proper angular location in a manner known in the art. As the preset time is approached, the cam portions on gears **8** and **9** come into alignment and cam portion **9** drops into hole **13**. Vibrator arm **3** acting as a spring through bell crank lever **16** rapidly forces cam gear **12** toward cam gear **8**. As shown in Fig. 3, vibrator arm **3** snaps down on field nut **5** and starts buzzing. The buzzing will continue until shut-off lever **14** is pushed inwardly so that projection **15** thereon contacts end portion **4** of the vibrator arm **3** to thereby permanently restrain further motion of vibrator arm **3** or the buzzing may be temporarily shut off by actuation of the improved short interval mechanism.

As shown in Fig. 4, the improved short interval alarm mechanism may be actuated by simply moving plunger **29** downwardly from the dotted line position to the solid line position. This lowers the left end of vibrator shut-off lever **22** which in turn pushes interval lever **30** downwardly. During this movement the right end of vibrator shut-off lever **22** is raised to engage lug **23** with the end of vibrator arm **3** to obstruct vibration of arm **3** against field nut **5** to shut off the alarm. During its downward travel, the portion of interval lever **30** at the left juncture of the arms of L-shaped slot **32** comes to bear against the periphery of pinion gear **20**. This action causes interval lever **30** to pivot slightly clockwise about pivot pin **31** overcentering the force applied by spring **36** with respect to pivot **31**, thereby permitting spring **36** to snap interval lever **30** clockwise to the dotted line position shown in Fig. 5. When the manual downward force is released from the plunger **29**, spring **36** forces the right-most teeth **35** in interval lever **30** into engagement with the teeth

of pinion gear **20**. The clock motor rotates gear **20** in a counterclockwise direction, as viewed in Fig. 5, and causes counterclockwise movement of interval lever **30** about pivot **31**. At the end of the short time interval, lever teeth **35** become disengaged from pinion **20**. Then spring **36** snaps interval lever **30** to the solid line position shown in Fig. 5, and simultaneously lug **23** of vibrator shut-off lever **22** is moved downward to permit the alarm vibrator to resound. This operation can be repeated to obtain several other similar short intervals of silence, or the alarm may be permanently shut off by moving lever **14** inwardly to the position shown in Fig. 6.

While there has been shown and described a particular embodiment of this invention, it will be obvious to those skilled in the art that various other changes and modifications can be made therein without departing from the invention, and more specifically, for example, that the improved interval mechanism may be incorporated in many different alarm clock arrangements other than the one disclosed, and therefore it is aimed in the appended claims to cover all such changes and modifications as fall within the true scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. An alarm clock comprising an alarm vibrator arm; a vibrator shut-off lever having an alarm on position out of engagement with said vibrator arm, and an alarm off position in engagement with said vibrator arm; an interval lever pivotally mounted on said vibrator shut-off lever; gear means continuously rotated as a function of time by said clock cooperating with said interval lever to hold said vibrator shut-off lever in said alarm off position for a predetermined short interval; and spring means engaging said interval lever for snapping said vibrator shut-off lever to said alarm on position at the end of said predetermined short interval.

2. In an alarm clock comprising a supporting structure, an alarm mechanism having a resilient vibrator arm, and a pinion gear continuously rotated as a function of time by said clock, the improvement comprising a vibrator shut-off lever pivoted to said supporting structure, said vibrator shut-off lever having an alarm on position out of engagement with said vibrator arm, and an alarm off position in engagement with said vibrator arm; manual means for moving said vibrator shut-off lever from said alarm on position to said alarm off position; an interval lever pivotally mounted on said vibrator shut-off lever; a generally L-shaped slot formed in said interval lever for receiving said pinion gear, a plurality of teeth formed in said interval lever along one of the arms of said L-shaped slot for permitting said pinion gear to move interval lever as a function of time; and spring means for moving said interval lever to position the teeth formed in said interval lever in engagement with said pinion gear when said manual means moves said vibrtaor shut-off lever to said alarm off position.

3. In an alarm clock comprising a supporting structure, an alarm mechanism having a resilient vibrator arm, and a pinion gear continuously rotated as a function of time by said clock, the improvement comprising a vibrator shut-off lever pivoted to said supporting structure, said vibrator shut-off lever having an alarm on position out of engagement with said vibrator arm, and an alarm off position in engagement with said vibrator arm; manual means for moving said vibrator shut-off lever from said alarm on position to said alarm off position; an interval lever pivotally mounted on said vibrator shut-off lever; a generally L-shaped slot formed in said interval lever for receiving said pinion gear, a plurality of teeth formed in said interval lever along one of the arms of said L-shaped slot for permitting said pinion gear to move said interval lever as a function of time for a predetermined short interval, said pinion gear cooperating with said interval lever to hold said vibrator shut-off lever in the alarm off position when the

teeth formed in said interval lever are in engagement with said pinion gear; spring means for moving said interval lever to position the teeth formed in said interval lever in engagement with said pinion gear when said manual means moves said vibrator shut-off lever to said alarm off position; said other arm of said L-shaped slot permitting said spring means to also snap said interval lever and said vibrator shut-off lever to the alarm on position when the pinion gear becomes disengaged with said interval lever teeth at the end of said predetermined short interval.

4. In an alarm clock comprising a supporting structure, an alarm mechanism having a resilient vibrator arm, and a pinion gear continuously rotated as a function of time by said clock, the improvement comprising a vibrator shut-off lever pivoted to said supporting structure, said vibrator shut-off lever having an alarm on position out of engagement with said vibrator arm, and an alarm off position in engagement with said vibrator arm; manual means for moving said vibrator shut-off lever from said alarm on position to said alarm off position; an interval lever pivotally mounted on said vibrator shut-off lever; a generally L-shaped slot formed in said interval lever for receiving said pinion gear; a plurality of teeth formed in said interval lever along one of the arms of said L-shaped slot for permitting said pinion gear to move said interval lever as a function of time; and spring means for moving said interval lever to position the teeth formed in said interval lever in engagement with said pinion gear when said manual means moves said vibrator shut-off lever to said alarm off position, said gear cooperating with said interval lever teeth to hold said vibrator shut-off lever in said alarm off position for a predetermined short interval.

5. An alarm clock comprising an alarm vibrator arm; a vibrator shut-off lever having an alarm on position out of engagement with said vibrator arm, and an alarm off position in engagement with said vibrator arm; an interval lever pivotally mounted on said vibrator shut-off lever; a manually operated actuator lever pivoted to said vibrator shut-off lever for moving said vibrator shut-off lever from said alarm on position to said alarm off position; gear means continuously rotated as a function of time by said clock cooperating with said interval lever to hold said vibrator shut-off lever in said alarm off position for a predetermined short interval; and spring means engaging said interval lever for snapping said vibrator shut-off lever to said alarm on position at the end of said predetermined short interval.

6. An alarm clock comprising a supporting structure, an alarm vibrator arm; a vibrator shut-off lever having an alarm on position out of engagement with said vibrator arm, and an alarm off position in engagement with said vibrator arm; an interval lever pivotally mounted on said vibrator shut-off lever; a manually operated actuator lever pivoted to said vibrator shut-off lever for moving said vibrator shut-off lever from said alarm on position to said alarm off position; a vertically positioned tab formed on said supporting structure, the end of said actuator lever being bifurcated for cooperating with said tab to guide the actuator lever for vertical reciprocating movement; gear means continuously rotated as a function of time by said clock cooperating with said interval lever to hold said vibrator shut-off lever in said alarm off position for a predetermined short interval; and spring means engaging said interval lever for snapping said vibrator shut-off lever to said alarm on position at the end of said predetermined short interval.

7. An alarm clock comprising a supporting structure including a post; an alarm vibrator arm; a vibrator shut-off lever having an alarm on position out of engagement with said vibrator arm, and an alarm off position in engagement with said vibrator arm; an interval lever pivotally mounted on said vibrator shut-off lever; gear means continuously rotated as a function of time by said clock for moving said interval lever; a spring positioned over said post and connected at one end thereof to said supporting structure; and a tab having a slot formed on said interval lever; the other end of said spring being generally straight and positioned in said slot for slidable movement therein as said pinion gear moves said interval lever.

No references cited.