Nov. 24, 1970 W. GANTER 3,541,776

ELECTRIC MECHANISM FOR SOUNDING THE ALARM OF A CLOCK AT A PRESET TIME

Filed July 15, 1968 4 Sheets-Sheet 1

Fig. 1

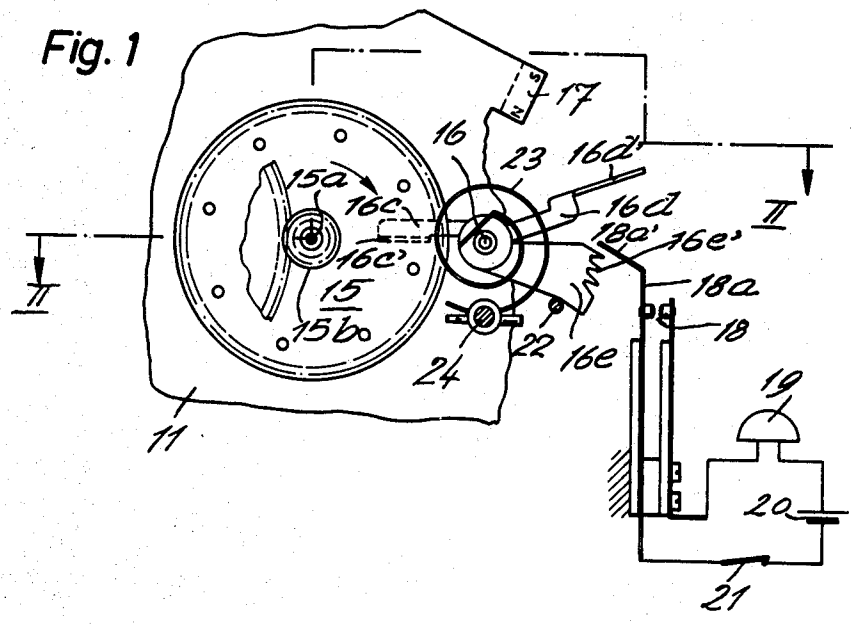
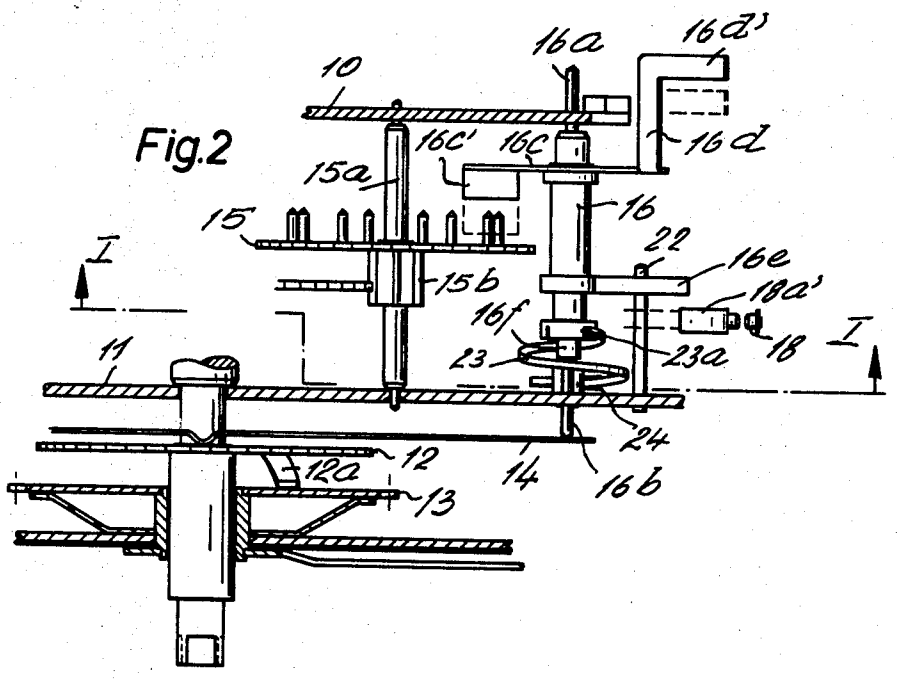


Fig.2



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Fig.3

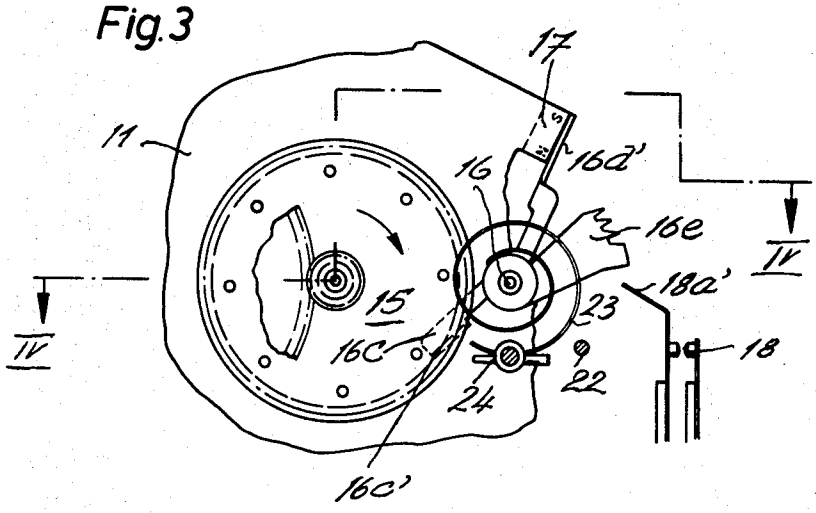
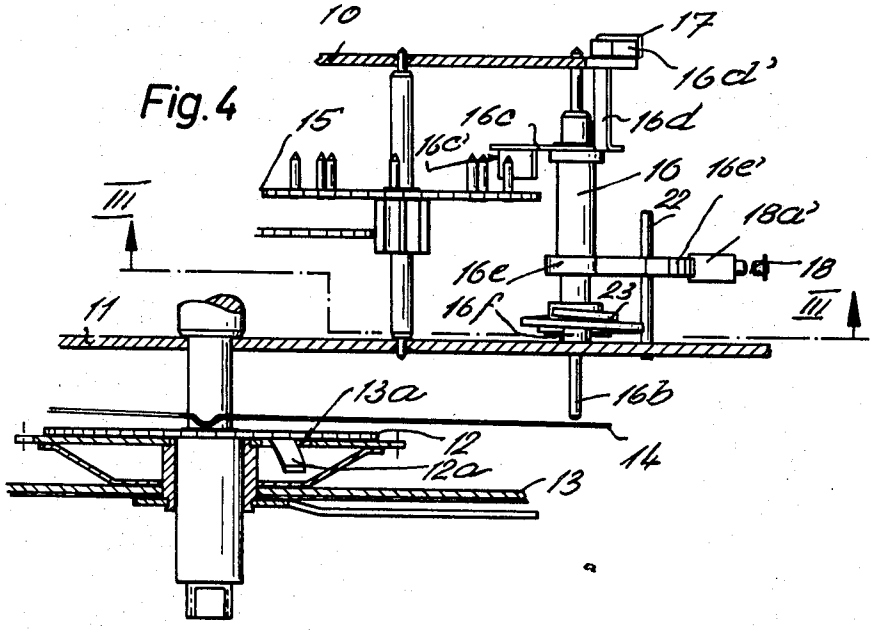


Fig.4



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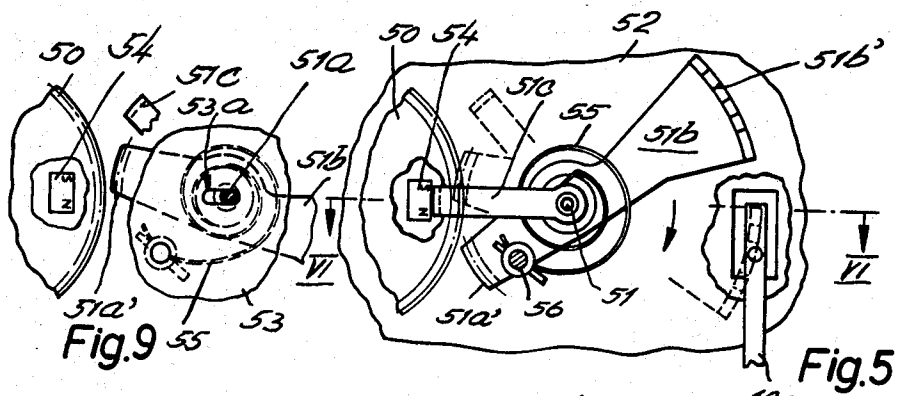


Fig.9 Fig.5

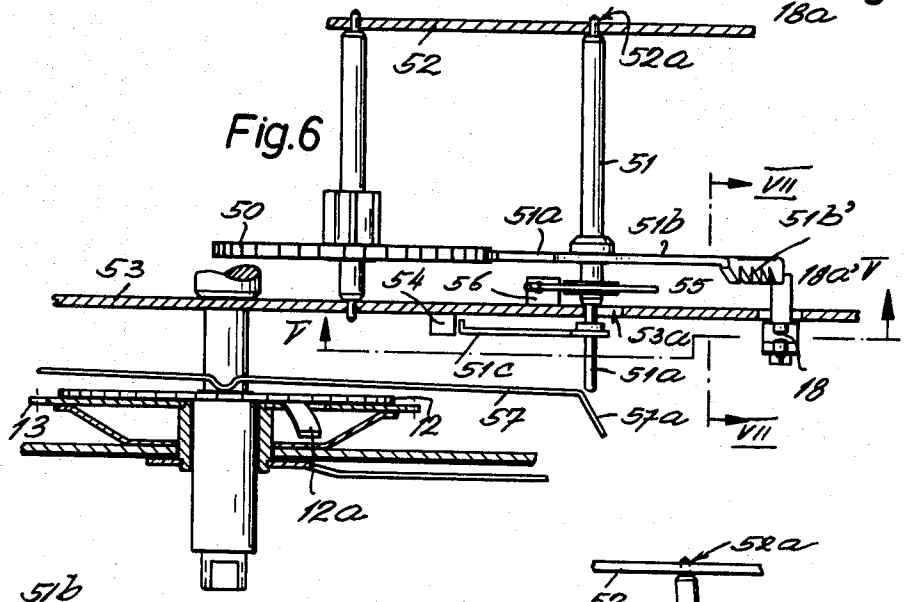


Fig.6

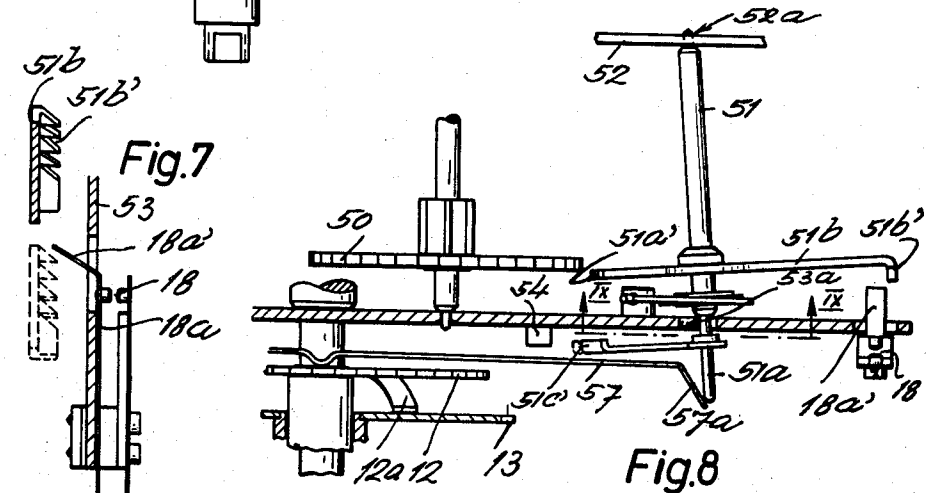


Fig.8

Fig.7

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Fig.10

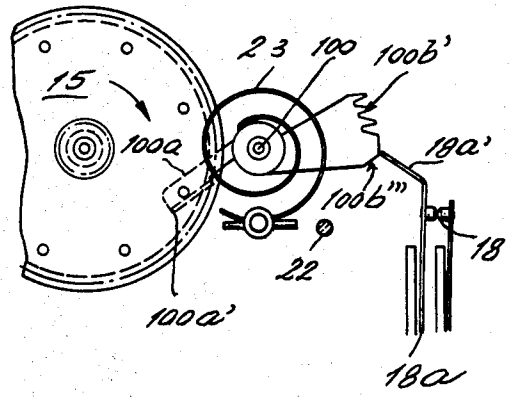
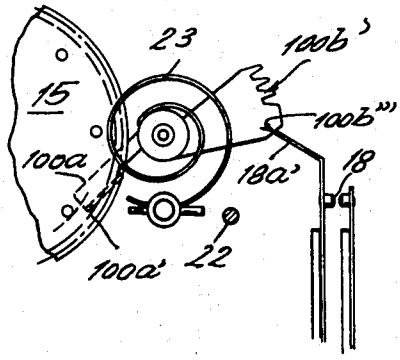


Fig.11



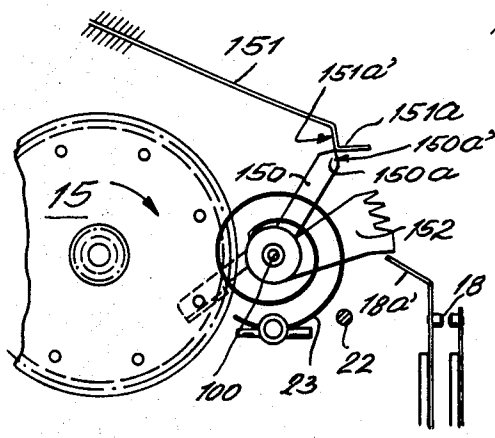


Fig.12

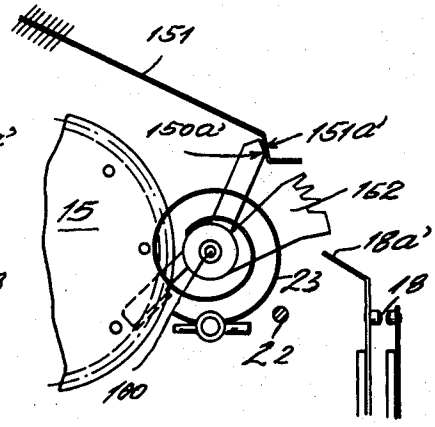


Fig.13

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3,541,776

ELECTRIC MECHANISM FOR SOUNDING THE ALARM OF A CLOCK AT A PRESET TIME

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Int. Cl. G04c 21/16
U.S. Cl. 58—19 7 Claims

ABSTRACT OF THE DISCLOSURE

A single cycle alarm mechanism is briefly actuated at a preset time by a clock gearwheel by means of a rotating shaft operated through a desired angle and detented until release for an additional cycle by the clock timing mechanism. The load on the clock mechanism is present only during the time the alarm is being actuated.

This invention relates to alarm clocks, especially battery operated clocks customarily having a reset alarm mechanism in which at least one wheel moves electric contacts for completing and releasing an alarm energizing circuit.

If the stop is not operated on a spring wound clock, the alarm lasts for a period until the spring storage device is exhausted. Furthermore, an electric alarm clock may ring during a thirty to forty-five minute period until the alarm mechanism is released, unless the shut off regulator is actuated.

This invention stems from a known clock mechanism equipped with a camshaft carrying an operating lever, which in combination with movement of an ordinary mechanical release mechanism and with an alarm release set for predetermined timing. The operating lever includes a toothed wheel with an extended cam portion coupled to close a movable switching contact spring with a fixed contact as the lever moves through a single cycle between two operating limits, to thereby operate the alarm, lock it, and conversely to release the alarm mechanism with normal clock movement as the cam turns over its prescribed angle.

The invention is concerned with the basic problem of the ringing device, that is the construction of the mechanism for the alarm, when there is a cam actuating arm operated only during a preset period until the cam advances to an unoperated position, so that during the alarm period after the alarm is actuated, the load on the gear train caused by cam contact is removed.

A feature of this invention is the movement by a clock mechanism of a pivot arm which has alarm sounding means at a position on the end of the arm so that it is coupled to the clockwork gears only during alarm and swings through a single cycle to a detent position out of contact with the drive means. The guided arm is mounted to move outside the working region of the clock gear train and its cam surface contact can no longer rub to load the clock mechanism when the alarm is not being sounded.

To the other features of the invention a holding magnet may be added which detents the operating arm located on the camshaft after moving through a working angle where an electrical contact set is operated by the movable arm. If as is of itself known, a camshaft is mounted parallel or coaxial with an alarm actuating shaft now in accordance with the invention is provided with an extending drive arm and a further axial camming movement in order to mesh the camshaft drive arm into hobnails or the like extending from a clockwork wheel; a

permanent magnet also may be used as a detent magnet to hold a detent part on an arm driven from the camshaft to hold it away from the drive position as the drive arm rotates out of mesh.

The invention also permits, in the manner described, for the camshaft to be tilted by means of an elongation thereon rather than axially cammed in order to swing out of the clock driven position. An alarm timing spring may operate to tilt the camshaft so that a toothed segment thereon located on an extending detent arm will be moved and detented by a magnet positioned on a straight line drawn between the axes of the clock drive wheel and the camshaft.

In one such embodiment a feature of the invention moves the camshaft from its limiting angular position by a return spring such as a spiral spring, which also serves to return the shaft to a parallel position with the necessary clockwork.

Another example of the invention resides in replacing a latch magnet with a mechanical device, in which the camshaft latching arm is turned with a contact bearing arm to a position where a latching spring detent is located and the camshaft is unmeshed from the clockwork drive arrangement until the selected time of the clockwork returns the camshaft to the meshed position.

Further objects and examples of the invention follow from the following description and examples which are shown in the drawings and specification.

In the drawings:

FIG. 1 is a plan view through section I—I of FIG. 2 of the mechanism for setting the alarm time limits in its ready to ring position, with omission of the clockwork drive elements unnecessary to an understanding of the invention;

FIG. 2 is an elevation view of FIG. 1 through section II—II illustrating with a phantom view the alarm engagement mechanism positions;

FIGS. 3 and 4 are a mechanism similar to FIGS. 1 and 2 with sections III—III and IV—IV respectively taken through the figures to illustrate the operation at the end of the awakening in the turned off position;

FIG. 5 is a second embodiment with a detented contact cam lever in plan view as taken through section V—V through FIG. 6, illustrating with phantom view the positions of operation through the end of the awakening;

FIG. 6 is an elevation view through section VI—VI of FIG. 5 in a similar operating position as FIG. 5;

FIG. 7 is a partial view of the contact operating mechanism taken through section VII—VII of FIG. 6;

FIG. 8 corresponds to the display in FIG. 6 illustrating the disengaged position of the alarm engagement mechanism;

FIG. 9 shows a partial plan view taken through section IX—IX in FIG. 8;

FIGS. 10 and 11 are a third embodiment in plan view illustrating a first variation of the mechanically operable detent mechanism in positions near the end of the ringing period; and

FIGS. 12 and 13 are a second variation of the third embodiment in similar relationship as FIGS. 10 and 11.

Considering first the embodiments of FIGS. 1 through 4, 10 and 11 show two frame members of the clock mechanism. Built upon the frame member 11 is a conventional alarm drive mechanism including a timewheel **12** with catch tab **12***a* and alarm dial wheel **13**, which is furnished with an aperture to catch tab **12***a* at the set position for operating the alarm on the side opposite the alarm actuating spring **14**.

Between the frame members **10** and **11** is journalled shaft **15***a*, which carries hobnail wheel **15**, and receives its drive by way of gear **15***b* from clockwork not necessary to show on the drawing to clarify this invention.

Parallel to the shaft **15***a* is journalled in a time operated position the camshaft **16**, whose elongated pins **16***a* and **16***b* are journalled for axial movement. The camshaft **16** carries a cam actuating arm **16***c*, which by way of an extending lobe **16***c'* can be brought into contact with the hobnails of wheel **15**. The pivotable cam actuating arm **16***c* is an elongated single piece with a handle piece **16***d* attached to one end and a tabbed end **16***d'* at the other end to hold it against frame member **10** by the permanent holding magnet **17** affixed thereto when the tab is moved near it.

The camshaft **16** also carries a contact operating cam surface arm **16***e* whose function is to operate the alarm contact set **18** when in the proper position. A bell **19** is connected from contacts **18** with battery **20** through a manually operated switch **21**, which permits the alarm to be shut off. On contact spring **18***a*, a sloping tongue **18***a'* is carried. It engages teeth surface **16***e'* on the contact operating cam surface **16***e* as they come together so that the single teeth operate as cams to close contact set **18** and to let the contact operating tongue **18***a'* to open in the spaces between teeth.

This mechanical construction provides the so-called repeating action interrupting the alarm signal. The three pointed teeth on the teeth surface **16***e'* give short signals, while the last wide tooth a longer continued signal. The main signal lasts over a period of about twenty to thirty seconds.

In the ready to operate position of FIGS. 1 and 2, the cam surface arm **16***e* lies against a stop post **22** by force of the return spring **23** attached to cylinder **23***a* of the camshaft **16** at one end and held on the other end by a clamp **24** on the frame member **11**.

It is seen also from FIGS. 2 and 4 that the spiral spring **23** in the ready to operate position when pushed moves vertically to its spiral plane, as adjusted with camshaft **16** under pressure of the alarm actuating spring **14**.

The holding magnet **17** and the holding arm **16***d*, hold in place the cam shaft **16** and its cam arm parts **16***c*/**16***c'* at the end of the alarm period after the contact spring **18***a'* glides over the last broad tooth on the contact cam arm **16***e* so that the cam tab **16***c'* lies outside the influence of hobnails of the clockwork by contact of cam arm **16***c* with the hobnails.

The mechanism afforded by this invention operates in the following manner: At the beginning of the alarm period (FIGS. 1 and 2) the parts **12, 13, 14** and **16** are in ready to operate position, that is the detented tongue **12***a* rests on the part of the alarm mechanism **13** and upon wheel **12** (FIG. 2) so that the alarm actuating spring **14** is in its raised position. This raises camshaft **16** so that the camshaft arm **16***c* and the tab **16***c'* clear the points of the hobnails on the clockwork wheel **15**. The return spring **23** returns the contact cam arm **16***e* on the camshaft **16** against the stop **22** to a position in which the first tooth of the tooth surface **16***e'* (FIG. 1) stands ready to move against contact spring **18***a'*. Also, the holding arm **16***d* is removed from the influence of holding magnet **17** so that the return influence of spring **23** on the camshaft **16** is not overcome.

At the start of the alarm period the alarm tab **12***a* falls in opening **13***a* in the alarm conditioning wheel **13** under the time wheel **12** to shove the alarm actuating spring **14** and the camshaft **16** with the action of spiral return spring **23** moves (FIG. 4) until the cylinder shoulder **16***f* on the camshaft contacts the frame member **11**. During this forced movement, the cam tab **16***c'* on camshaft **16** drops into operating position between hobnails on clockwork wheel **15**, and with its turning in the direction of the arrow, the hobnails turn the camshaft **16** by cam arm **16***c* through a predetermined angle that is large enough to permit the toothed surface **16***e'* on cam contact arm **16***e* to pass across the contact spring **18***a'*. As the contacts perform their duty with the brushing of the spring **18***a'* on the edge of the last broad tooth of contact

cam arm **16***e*, the cam tab **16***c'* is released from the engagement with a hobnail in such a position that the detent part **16***d'* of the holding arm **16***d* is near enough to be attracted to holding magnet **17**. In this limiting position of camshaft **16** the cam tab **16***c* is moved outside the turning range of the hobnails so that the undesirable loading contact is no longer a problem.

Accordingly, the signal period ends and is cleared so that after termination of the signal period of about thirty seconds initiated by the alarm actuating mechanism **12/13** no other takes place. However, much more time is needed, such as a time period of thirty to forty-five minutes. Until the expiration of this time the camshaft remains in the position of FIGS. 3 and 4. Only with the positioning of the timewheel **12** in the ready for alarm position of FIG. 2 is the camshaft **16** again axially shoved by the alarm actuating spring **14**. With this action the detent part **16***d'* of the holding arm moves over the face of the permanent magnet **17** and as soon as the magnet and detent are moved out of the influencing position the return spring **23** may return the camshaft into its starting position (FIG. 1), so that contact arm **16***e* rests at stop post **22**. This return cycle can only be accomplished in the next alarm position.

It has been discovered that it is not necessary to contact the detent tab **16***d'* against the holding magnet **17**. A small air space can intervene, to permit putting a spacer on the detent tab **16***d'* such as used to reduce noise on impact.

Also, this invention makes it possible to make in one piece the arm **16***c*, **16***d*, **16***e* of the camshaft **16** for example by stamping and bending sheet metal. The holding magnet **17** can also be mounted on detent arm **16***d*, or cooperating magnets can be on both detent pieces. The spiral return spring **23** may be replaced by a simple leaf spring which permits camshaft **16** to attain both an axial and rotary movement. Also, the spring forced movement can be replaced by gravity operated means or magnetic devices to perform the necessary axial displacement as well as the return swing. Replacement of hobnail wheel **15** with an equivalent wheel with magnetic or electric cam means or the camshaft **16***c* may be geared by a Geneva movement or the like for operation by the clockwork gear **15**. One such gearwheel could be the sweep wheel, second wheel or some other convenient driven element of the clockwork. Also, the camshaft **16** could be positioned axially by the timewheel **12** by moving the camshaft nearer the dial works. In some cases the alarm actuating spring **14** between the timewheel **12** and frame member **11** could be replaced by an electrically operated spring, such as a bimetallic member. In any case, the actuating spring **14** may be strong enough to overcome the axial force of the spiral spring **23** in order to remove detent tab **16***d'* from the permanent magnet **17**. After the actuation of timewheel **12** at the alarm time, the spiral spring **23** must be brought into position so that the camshaft **16** with cam arm **16***c* is in gripping engagement with the hobnail wheel **15**. Furthermore, the spiral spring **23** should provide such a turning movement to the camshaft **16**, that it is returned to the starting position (FIGS. 1 and 2) after the retention by detent arm **16***d* on holding magnet **17** is overcome.

The contact cam arm **16***e* and contact set **18** can also be modified, so that part **16***e* is a wiping electrical contact moving over an insulating plate with separated contacts.

The second embodiment (FIGS. 5 through 9) is distinguished from the first in that the camshaft is not axially moved but is tilted. Similar parts in the first embodiment are cross-referenced for comparison and the description is not repeated. In place of the hobnail wheel **15** is a rotating toothed gear **50**. The camshaft **51** meshes therewith, and is mounted in frame members **52** and **53** to both rotate and tilt. For this purpose an elongated peg **51***a* is journalled in a slit in the frame member **53**, with

the slit orientation lying on a straight line from the axes of the clockwork gearwheel **50** and the shaft **51**. The upper journal **52***a* for the camshaft **51** is fashioned to let shaft **51** tilt. The shaft **51** carries a cam member **51***a* with gear teeth **51***a'* which mesh with teeth on gearwheel **50**, as heretofore described, and a contact arm **51***b* with spaced teeth **51***b'* on the lower surface, and finally a detent arm **51***c*, which in detented position is held near permanent magnet **54**. This is located, as the slit **53***a* in frame member **53**, and a straight line drawn through the axes of gearwheel **50** and camshaft **51**. The contact teeth **51***b'* on the contact arm **51***b* are constructed for this purpose with crown like teeth and coact with the slope of tongue **18***a'* carried on contact spring **18***a*.

This apparatus operates in such a way that by tilting the teeth are removed from the contact spring tongue **18***a'*. In the normal operation of the alarm cam, the simple teeth of the first embodiment could serve this purpose. However, by provision of the points in the preceding contact cycle, when the contact spring tongue **18***a'* contacts teeth **16***e'* (FIGS. 1 through 4), it might happen that the cogs would bind with the spring tongue.

The camshaft **51** also is operated by a return spiral spring **55** with its inner end affixed to the camshaft and the outer end to the frame member **53**. The spring **55** is so proportioned that it conforms with the camshaft movement in each position (FIGS. 8 and 9) with the shaft in its tilted position (FIG. 8) and its return to its working position (FIGS. 5 and 6).

In order to move the camshaft from its limiting position as in ready position (FIG. 8) to its working position (FIG. 6), an alarm conditioning spring **57** is provided with a ramp **57***a*. This contacts pin **51***a* of the camshaft so that in ready position the ramp **57***a* pushes against the camshaft **51** to force the return spring **55** into a tilted position. In this position the camshaft arm teeth **51***a'* are not in mesh with the clockwork gear wheel **50**, and the contact teeth **51***b'* are removed from their working position against contact spring tongue **18***a'*. Also, the detent part **51***c'* on holding arm **51***c* is removed from the holding field of holding magnet **54**.

Operation of this example is as follows: In the ready position (FIGS. 8 and 9), the alarm actuating spring **57** is held on alarm conditioning wheel **13** by time wheel **12** so that the ramp **57***a* tilts the camshaft **51** by contact with its elongated pin **51***a* with its members out of contact with the intermediate gearwork wheel **50** and the contacts **18**. Also, the detent arm **51***c* is held out of the holding power of magnet **54**. When the alarm conditioning tab **12***a* falls into the apertured alarm position wheel **13** (FIG. 6), which moves the alarm actuating spring **57***a* far enough away from the camshaft **51** that it by force of the return spring **55** assumes a parallel position (FIG. 6) to the shaft of the gearwork wheel **50**. Therefore, the camshaft teeth **51***a'* mesh with the gear wheel **50** (FIGS. 5 and 6), and at the same time the first tooth of the camshaft contact surface **51***b'* is positioned to operate contact spring tab **18***a* as illustrated in phantom positions of FIGS. 5 and 7.

Gear wheel **50** drives camshaft **51**, as shown in FIG. 5 in phantom and full line views, so that contact set **18** is intermittently operated until the last broad tooth passes over contact spring tongue **18***a*. This places detent arm **51***c* close enough to the holding magnet **54**, which is strong enough to hold the detent arm in detented position,

so that the camshaft makes a single such cycle (FIG. 5) to remove the camshaft teeth **51***a'* out of driving influence from the teeth of the gearwheel **50**.

At a time after the alarm, when the alarm actuating mechanism **12**, **12***a*, **13** and **57** again return to their inactivated position, the alarm conditioning spring ramp **57***a* rests on the camshaft end **51***a* and removes the camshaft **51** from influence of the magnetic detent works **54/51***c*, **51***c'* to return the mechanism to its ready position (FIG. 8).

As shown in FIGS. 10 and 11 the detent mechanism holding the camshaft in position after the end of its single movement comprises a ramp **100***b'''* on the switch operating cam arm **100***b'* which engages contact spring tab **18***a'*. In FIGS. 12 and 13 a separate leaf spring **151** engages detent tab **150** carried about camshaft **100** for the same purpose.

What is claimed is:

1. Apparatus coupled with a clock mechanism for sounding an alarm when directed by an alarm conditioning mechanism at a preset time by electrical means, comprising in combination, a rotating shaft which moves in cooperation with said alarm conditioning mechanism and carries an actuating arm, means including a clockwork wheel operable with said shaft to initiate a single movement between limits defining a predetermined angle in response to said alarm conditioning mechanism, a contact set operated to sound an alarm as the shaft traverses said angle, means holding the shaft after said single movement in a position out of frictional contact with said clockwork wheel and means operable by said clock mechanism releasing and returning the shaft to a starting position where a further movement will be initiated by said alarm conditioning mechanism.

2. Apparatus as defined by claim **1**, wherein said means holding the shaft comprises a holding magnet and detent means on said shaft positioned to come under the influence of the field of the magnet at the limiting position at the end of said movement.

3. Apparatus as defined by claim **1**, with said shaft journalled for tilting movement to move it into and out of driving engagement with said clockwork wheel.

4. Apparatus as defined by claim **3**, wherein said shaft is tilted along a straight line drawn between the axes of said clockwork wheel and said shaft.

5. Apparatus as defined by claim **2**, wherein the magnet is located along a straight line drawn between the axes of said clockwork wheel and said shaft.

6. Apparatus as defined by claim **1**, wherein said means returning the shaft comprises a spiral spring operable to bias the shaft in both a rotary and an axial direction.

7. Apparatus as defined in claim **3**, wherein the means holding the shaft after said movement comprises a leaf spring and detent structure coupled for rotation with said shaft.

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