July 4, 1967 D. W. CLARK 3,328,952

ALARM CLOCK

Filed Aug. 19, 1965 3 Sheets-Sheet 1

FIG. 1

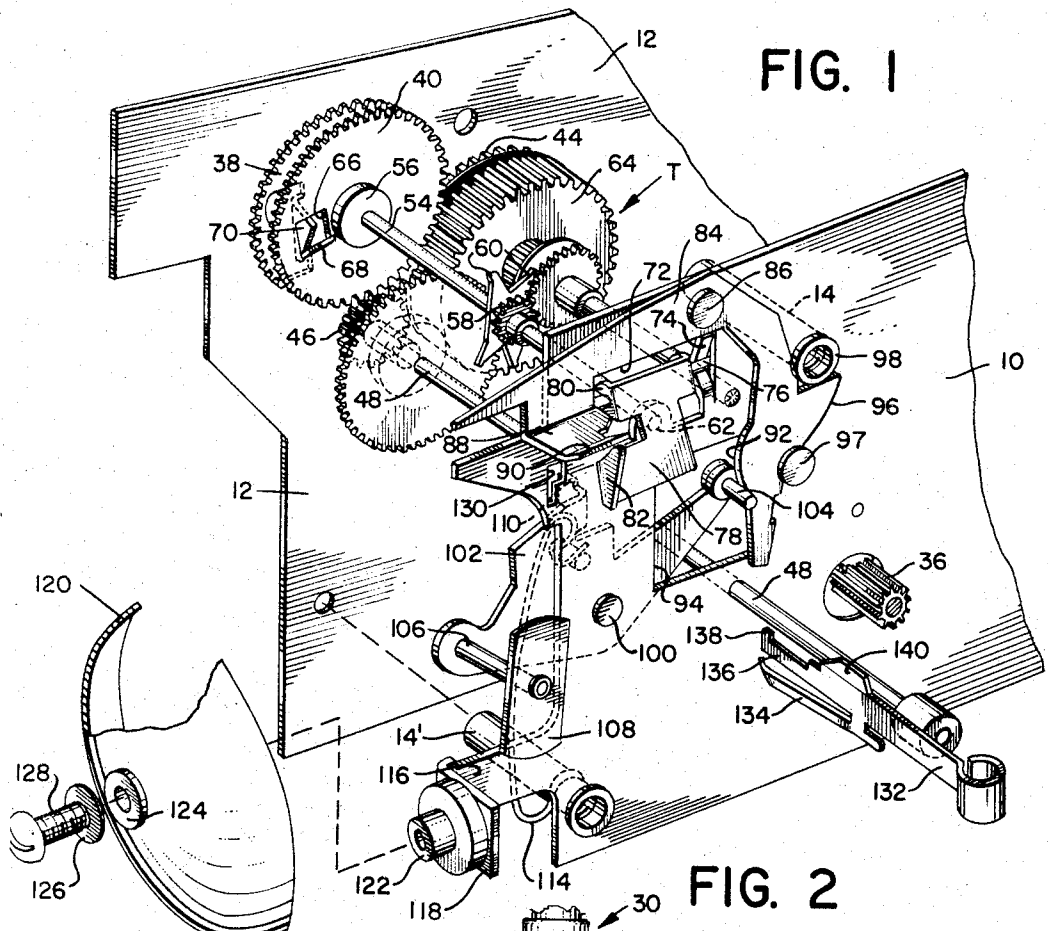
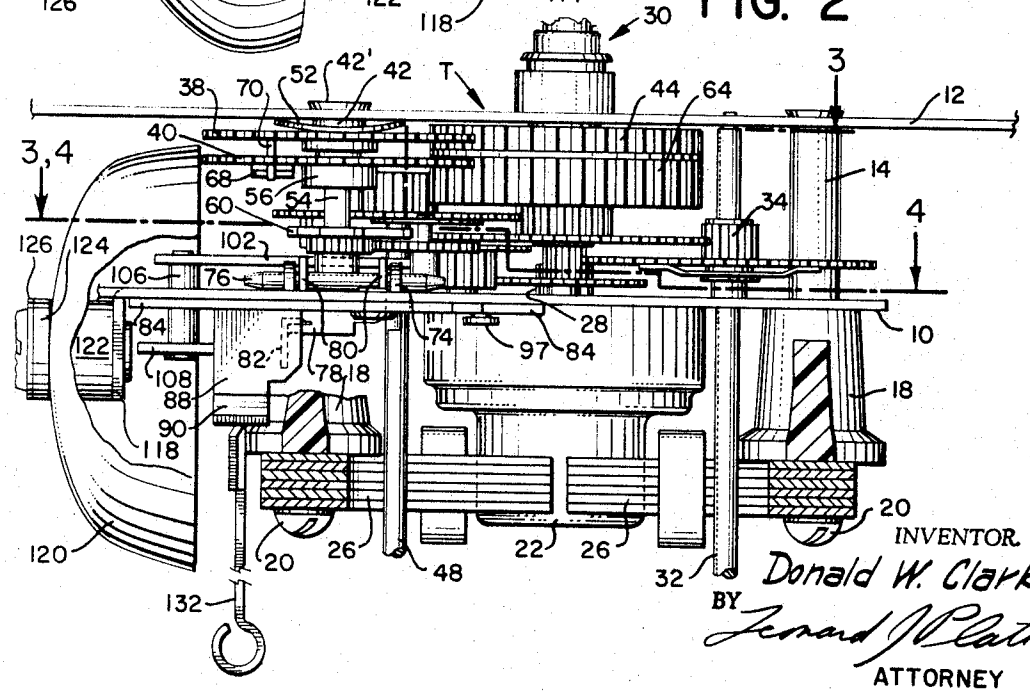


FIG. 2



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FIG. 3

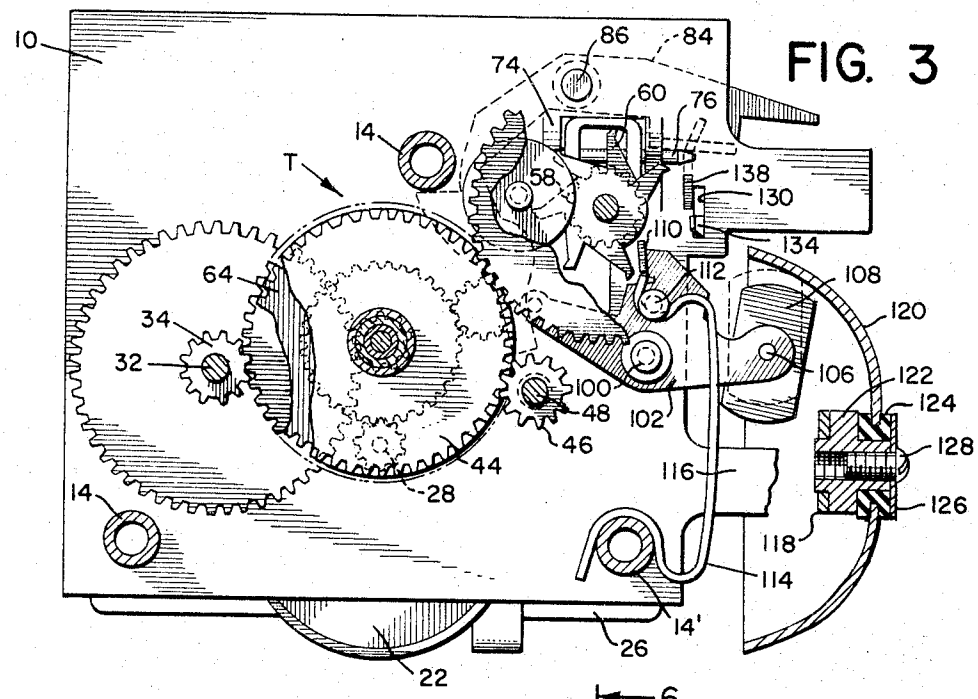
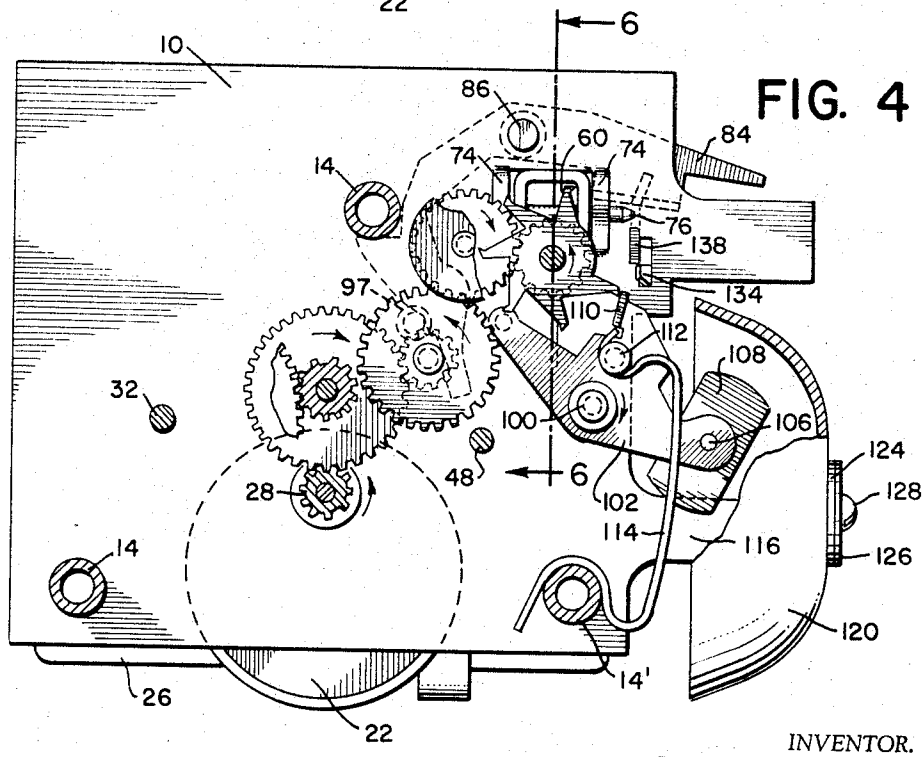


FIG. 4



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FIG. 5

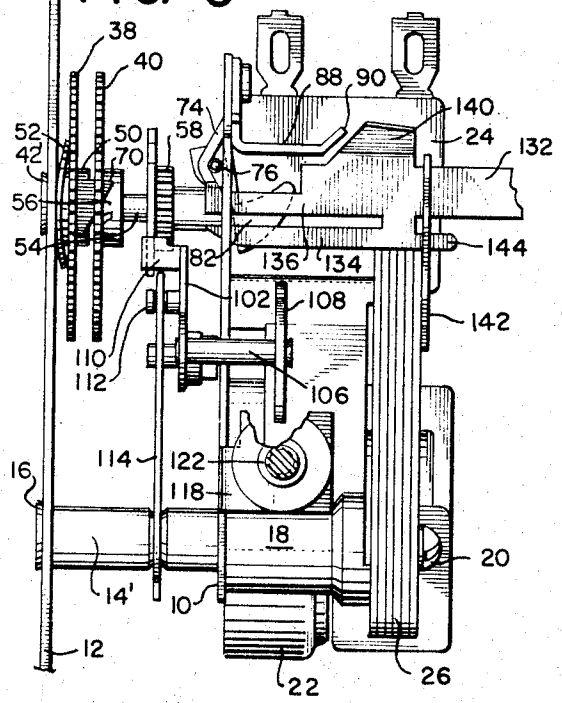


FIG. 6

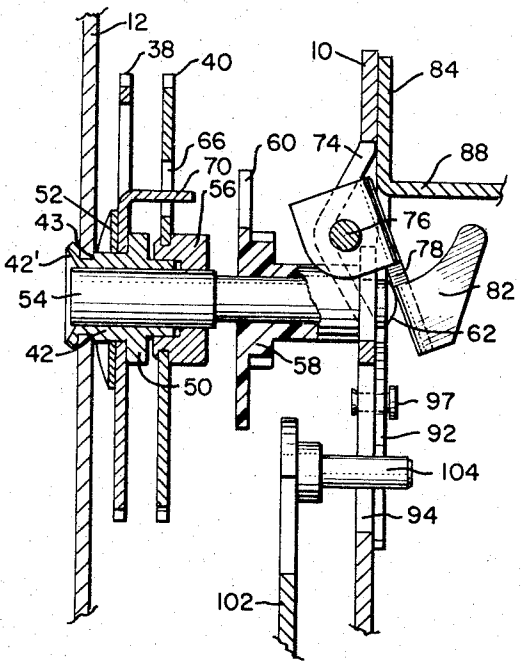


FIG. 7

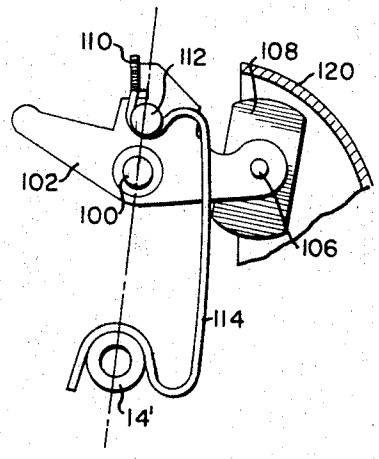


FIG. 8

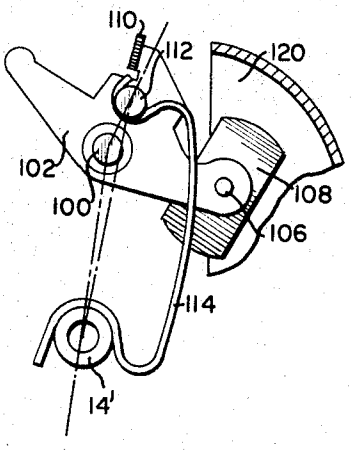
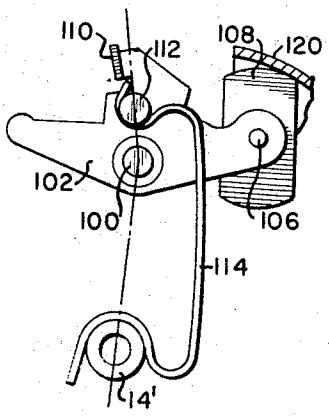


FIG. 9



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3,328,952

ALARM CLOCK

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2 Claims. (Cl. 58—16)

ABSTRACT OF THE DISCLOSURE

An improved bell striking mechanism for an alarm clock wherein a lever having a bell striking hammer portion mounted thereon is pivoted for movement by a rotating cam actuator. A unique single wire bow spring is positioned to exert a resilient force against the lever, the line of this force passing through the lever pivot point.

This invention relates to an alarm clock and, more particularly, to an improved bell striking mechanism for such a clock.

It is often desirable to provide an alarm clock which rings by relatively widely spaced strokes. This type alarm allows a more gradual awakening than is provided by the conventional rapid ringing alarm. Furthermore, the spaced ringing may be the first stage of a two step ringing sequence. In such a two step sequence, the spaced ringing may be followed by rapid ringing.

A number of mechanisms have been provided by the prior art to accomplish the spaced ringing of an alarm bell. However, each of these mechanisms has certain disadvantages which it would be desirable to overcome. Certain of these devices, for example, require the use of a relatively complex escapement mechanism for activating the alarm striking mechanism. Other types of alarms are spring actuated but, in these devices, certain of the moving elements are caused to strike structural portions of the clock as wel as the bell. This creates an objectionable metallic sound which is quite audible when coupled with the relatively low sound level of a small bell. In spite of this disadvantage, prior art clocks are often designed with such a feature in order to provide a mechanism in which the hammer will retract fom the bell immediately after the strike, and then be prevented from restriking until the drive mechanism positively initiates such action. Furthermore, prior art striker mechanisms often include considerable "rattle" due to various parts of the mechanism making and breaking contact with one another.

Accordingly, it is a primary object of the present invention to provide an improved striking mechanism for an alarm clock. Other objects are to provide such a mechanism which is simple and economical to construct, which is rattle-free, wherein the hammer mechanism makes contact only with the bell, which is self-damping and which is operated.

The manner in which these objects are achieved will be more apparent from the following description, the appended claims and the figures of the attached drawings, wherein:

FIG. 1 is an exploded isometric view of a clock mechanism in accordance with this invention, the motor and certain other portions being removed to reveal certain features of the mechanism;

FIG. 2 is a top view of an alarm clock mechanism constructed in accordance with this invention;

FIG. 3 is a cross section taken substantially along the line 3—3 of FIG. 2;

FIG. 4 is a cross section taken substantially along the line 4—4 of FIG. 2;

FIG. 5 is a left side view of the mechanism of the invention with the bell removed to disclose details of the construction;

FIG. 6 is an enlarged cross section of a portion of the mechanism of this invention; and

FIGS. 7–9 are details illustrating the operation of the striking mechanism.

The objects of this invention are achieved by incorporating into an audible alarm clock a timing movement, a bell, and a hammer lever which is pivotally mounted for rotation about an axis. A spring is positioned to normally exert resilient force against the hammer lever, the line of the force passing through the axis of rotation, the striking portion of the lever thus being spaced from the bell. An actuator which is driven by the timing movement, periodically rotates the lever to a position wherein the striking portion is further retracted from the bell, and thereafter releases the lever. This permits the spring to advance the lever through the line of force, allowing the striking portion to strike the bell.

With particular reference to the drawings, there is illustrated an alarm clock mechanism constructed upon a framework comprising a base plate **10** and a front plate **12**. The base and front plates are held in separated relationship by means of spacers **14**, **14'** which are staked at both ends. Mounted against the back of base plate **10**, by means of insulating spacers **18** and screws **20** is a clock motor **22**, including a field winding **24** and a magnetic field structure **26**. The motor shaft extends through the base plate **10** and supports a drive pinion **28** which drives a standard gear train T. The output of the gear train controls the clock hands (not shown) by means of a standard center stack assembly **30** which protrudes through the front of front plate **12**. The clock hands are set in the usual manner by means of a time set shaft **32** coupled to the gear train T by means of a pinion **34** and having a knurled knob **36** at its outer end.

Mounted adjacent the inner surface of front plate **12** are an alarm set gear **38** and an alarm timing gear **40**. The alarm set gear **38** is securely mounted on a hollow stub shaft **42** (FIG. 6), so as to mesh with an intermediate set of gears **44** (FIGS. 1, 2) which is freely rotatable on the inner surface of the front plate **12** around the center stack assembly **30**. The intermediate gear **44** is operable by an alarm set pinion **46**, manually controllable from an alarm set shaft **48**, which extends through base plate **10** to the rear of the clock.

From FIGS. 5 and 6 it will be observed that stub shaft **42** extends through an opening in front plate **12** and includes a circumferential flange **50** against which the alarm set gear **38** is slidably positioned by means of a bent friction washer **52**. The outer end is of reduced diameter to form a shoulder **43** which engages the inner surface of front plate **12**. The extreme end **42'** of the stub shaft is riveted over to secure it in the front plate. A two diameter shaft **54** is mounted with its large end rotatably and axially movable within the hollow stub shaft **42**. The alarm timing gear **40** is mounted on a hub **56** which, in turn, is secured to the shaft **54**. Rotatably mounted on the smaller diameter portion of shaft **54** is a plastic gear **58** having six radially extending arms **60**. The inner end **62** of shaft **54** extends through a supporting opening in base plate **10**.

The alarm timing gear **40** is in mesh with the hour hand gear **64** in the gear train T. The alarm timing gear is cut and formed to provide a cam opening **66** and a short, angled camming plate **68** extending rearwardly therefrom. The alarm set gear **38** is cut and a portion bent inwardly to form an alarm cam **70** which is positioned on the same radius as the cam opening **66** in alarm timing gear **40**.

The base plate **10** defines a generally rectangular opening **72** with an integral strap **74** at either end of the opening which is deformed to receive the ends of a pivot pin **76**. The straps retain the pivot pin **76** securely against

base plate **10** and across the opening **72**. A flipper plate **78** is pivotally mounted on the pivot pin **76** by means of a pair of spaced ears **80**. The flipper plate **78** extends through the opening **72** and is in contact with the end **62** of shaft **54**. A portion of the flipper plate is offset and angled upwardly to form a latching tab **82**.

A generally L-shaped shutoff lever **84** is pivotally mounted on the back surface of base plate **10** by means of a stud **86**. One leg of the shutoff lever extends across the top of opening **72** and carries a rearwardly extending latch plate **88** which is curved upward at its end to provide a came surface **90**. The downwardly extending leg of shut-off lever **84** includes a curved inner edge **92** which is position across a further opening **94** provided in base plate **10**. A curved outer edge **96** forms a circular arc having its center at the pivot point of shutoff lever **84**. The edge **96** slides beneath the enlarged head of a stud **97** which is spaced from base plate **10** and retains lever **84** against the base plate.

Pivotally mounted against the inner surface of base plate **10** by means of a pivot shaft **100** is a cam lever **102**. The cam lever **102** includes a main body portion and two oppositely extending radial arms. At the extremity of one of the arms there is mounted a camming pin **104** which extends rearwardly through opening **94** adjacent the curved edge **92** of the shutoff lever **84**. The other leg of the cam lever also carries a rearwardly extending pin **106** upon which is fixedly mounted a bell hammer **108**. Extending forwardly from the main body portion of cam lever **102** is a trigger plate **110** which is positionable in the path of the arms **60** extending outwardly from plastic gear **58**. Also extending forwardly from the main body portion of cam lever **102** and above the pivot shaft **100** is a lug **112**, having a peripheral groove which receives one end of a compression spring **114**. The opposite end of spring **114** engages a similar peripheral groove in spacer **14'**. It will be noted that, with cam lever **102** in the rest position, as shown in FIGS. 3 and 7, the lug **112**, pivot shaft **100**, and spacer **14'** are in line with one another.

The base plate **10** includes a sideward extension **116** which is bent rearwardly to form a mounting plate **118** which supports a bell **120** by means of a mounting stud **122**, a rubber grommet **124**, a washer **126**, and a screw **128**.

A slot **130** is defined by base plate **10** adjacent opening **72**. One side of slot **130** is cut away at its upper end to form an offset as shown in FIGS. 3 and 4. A manual shutoff plunger **132** is mounted with its forward end within the slot **130**. The forward end of the plunger is bifurcated and the lower fork **134** is sprung outwardly and then inwardly at its extremity to form a spring latch tending to retain the plunger in either its outermost or innermost position. The upper fork **136** terminates in an upwardly extending keeper **138** which prevents the plunger from being completely withdrawn from the slot. Extending upwardly from the top edge of the plunger **132** is a camming projection **140** which is positioned to engage the cam surface **90** of latch plate **88** when plunger **132** is forced inwardly in slot **130**. A support bracket **142** is mounted on field structure **26** (FIG. 5) and includes a slot for guiding the plunger **132** and also includes a circular opening positioned just below the slot for receiving a rearwardly extending guide lug **144** which extends rearwardly along the plunger **132** in alignment with the lower fork **134**.

Operation

During normal operation of the alarm clock mechanism, the shutoff plunger **132** is forced inwardly from the rear of the clock causing the camming projection **140** to raise the cam surface **90** of shutoff lever **84**, thus rotating the lever clockwise, as viewed in FIG. 1, or counterclockwise, as viewed in FIGS. 3 and 4. In this rotated position, the curved edge **92** of the shutoff lever forces the camming pin **104** of the cam lever **102** upward, rotating the camming lever about its pivot shaft **100** and causing

the hammer **108** to be retracted from the inner surface of bell **120**. Also, during normal operation of the clock, the alarm set gear **38** is so positioned that alarm cam **70** is not aligned with cam opening **66** in alarm timing gear **40** so that these gears remain spaced from one another by the height of the cam.

In order to activate the alarm, the alarm set gear **38** is rotated to a preselected setting by means of the alarm set shaft **48** and pinion **46** in the usual manner for setting the alarm time. The shutoff plunger **132** is then retracted toward the rear of the clock and the camming projection **140** disengages from the cam surface **90** of shutoff lever **84**. It will be remembered from the foregoing description that the alarm timing gear **40** is secured to the shaft **54**, which is axially slidable in base plate **10**. As the alarm timing gear **40** and alarm set gear **38** are separated by the height of the cam **70**, the shaft **54** is forced to the rear so that its inner end **62** abuts against the flipper plate **78**, causing it to pivot upward about the pivot pin **76**. This raises the latching tab **82** against the latch plate **88** of shut-off lever **84**, causing it to remain in its clockwise position (as seen in FIG. 1).

As the hour hand gear **64** continues to rotate, it advances the alarm timing gear **40** until the cam opening **66** becomes aligned with the alarm cam **70**. This releases the force exerted by the inner end **62** of shaft **54** against the flipper plate **78** so that the latching tab **82** will no longer support the latch plate **88**. This permits the cam lever **102** to rotate under the influence of spring **114** to its normal "at rest" position illustrated in FIG. 3 so that the trigger plate **110** is positioned in line with the arms **60** of the plastic gear **58**.

The plastic gear is driven from the gear train T so that each of the arms **60** sequentially engages the trigger **110**, periodically tilting the cam lever **102** against the force of spring **114** to the position illustrated in FIG. 4. As each arm **60** continues past the trigger plate **110**, the cam lever **102** is released. This sequence is illustrated in FIGS. 7 and 8. FIG. 7 represents the normal at rest position of cam lever **102** with the lug **112**, pivot shaft **100**, and spacer **14'** in line. This is the natural position assumed by cam lever **102** due to the force exerted by the spring **114**. The rotation of the cam lever **102** by the arm **60** is illustrated in FIG. 8. In this position it will be noted that the lug **112** is rotated away from its in-line position so that a force moment is exerted by the spring **114** about the pivot shaft **100**. As soon as the trigger plate **110** is released by the arm **60**, this moment exerts itself to rapidly rotate the cam lever **102** in a counterclockwise rotation. Inertia then carries cam lever **102** beyond the in-line position and the hammer **108** strikes the bell **120** as shown in FIG. 9. The counterforce of spring **114** then returns cam lever **102** to the position of FIG. 7. Inertia may thereafter result in some slight oscillation about the in-line position. The degree of oscillation is controllable by the friction and mass distribution of the moving parts. However, the mechanism is basically self-damping. It will be noted that all the elements of the striker mechanism illustrated in FIGS. 7–9 remain in contact with one another throughout the entire striking sequence so that the only sound generated is that of the hammer **108** striking the bell. This sequence repeats itself each time one of the arms **60** releases the trigger **110** so that the bell chimes slowly at periodic intervals. In the particular plastic gear which is illustrated, the arms **60** are positioned so that the bell is struck six times, followed by a short interval, after which the ringing sequence is repeated.

In order to stop the alarm, the shutoff plunger **132** is forced inwardly from the back of the clock. This causes the camming projection **140** to once again raise the cam surface **90** and rotate the shutoff lever **84** into contact with camming pin **104** to retract the hammer **108** from the bell.

It will now be apparent to those skilled in the art that the above described invention accomplishes all the ob-

jectives hereinbefore set forth. It will also be apparent that a number of variations and modifications may be made in this invention. Accordingly, the foregoing description is to be construed as illustrative only rather than limiting. This invention is limited only by the scope of the following claims which are to be interpreted to include all variations and modifications which fall within the true spirit and 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:
(a) a base plate;
(b) spring support means connected to said base plate;
(c) a timing mechanism including a driving gear mounted for rotation between said front plate and said base plate;
(d) a cam lever pivotally mounted on said base plate to rotate about an axis generally perpendicular to said base plate, said lever including a spring support lug arranged generally parallel to said spring support means;
(e) a single wire bow spring, said spring being formed with a bowed central portion and two generally U-shaped end portions, one of said end portions being positioned over said spring support means and the other end portion being positioned over said spring support lug so that said spring is placed under compression to apply a resilient force against said spring support lug and said cam lever in a direction extending radially outward from the pivot axis of said cam lever;
(f) trigger plate means integrally formed on said cam lever;
(g) rotatably mounted actuator means including an integrally formed driven gear and a plurality of radially extending arms positioned to sequentially contact said trigger plate to pivot said cam lever arm in a first direction against the force of said spring means and thereafter release said cam lever, said timing mechanism driving gear being arranged to rotate said driven gear;
(h) hammer means on said cam lever;
(i) a bell positioned to be struck by said hammer means when said cam lever is released by each of said radially extending arms, said wire bow spring resiliently forcing said hammer portion against said bell.

2. An alarm clock comprising:
(a) a base plate;
(b) a front plate arranged generally parallel to said base plate;

(c) a generally cylindrical spacer post positioned between said front plate and said base plate for holding said front plate in spaced relationship to said base plate;
(d) a timing mechanism including a driving gear mounted for rotation between said front plate and said base plate;
(e) a cam lever pivotally mounted on said base plate to rotate about an axis generally perpendicular to said base plate, said lever including a spring support lug arranged generally parallel to said spacer post;
(f) a single wire bow spring, said spring being formed with a bowed central portion and two generally U-shaped end portions, one of said end portions being positioned over said spacer post and the other end portion being positioned over said spring support lug so that said spring is placed under compression to apply a resilient force against said spring support lug and said cam lever in a direction extending radially outward from the pivot axis of said cam lever;
(g) trigger plate means integrally formed on said cam lever;
(h) rotatably mounted actuator means including an integrally formed driven gear and a plurality of radially extending arms positioned to sequentially contact said trigger plate to pivot said cam lever arm in a first direction against the force of said spring means and thereafter release said cam lever, said timing mechanism driving gear being arranged to rotate said driven gear;
(i) hammer means on said cam lever;
(j) a bell positioned to be struck by said hammer means when said cam lever is released by each of said radially extending arms, said wire bow spring resiliently forcing said hammer portion against said bell.

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