United States Patent [19]

Bassett

[11] **3,827,232**

[45] **Aug. 6, 1974**

[54] **SPRING DRIVEN TIMER**

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[22] Filed: **Dec. 11, 1972**

[21] Appl. No.: **313,967**

[52] **U.S. Cl.** **58/21.13**

[51] **Int. Cl.** **G04f 3/02**

[58] **Field of Search** 58/21.13, 22.9, 39.5

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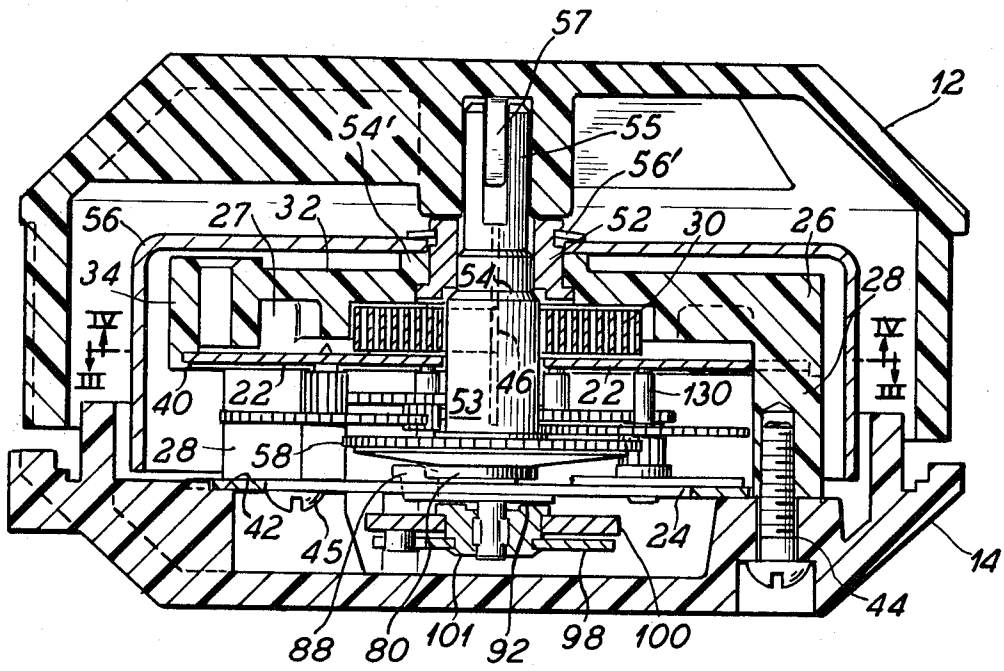
Primary Examiner—Lawrence R. Franklin

Attorney, Agent, or Firm—Hill, Gross, Simpson, Van Santen, Steadman, O'Hara & Simpson

[57] **ABSTRACT**

In a spring driven timer a partially transparent housing is provided for enclosing a main spring, a gear train, an escapement, and a bell-sounding hammer. A drive shaft passes through the housing, supported by a bearing on a wall of the housing. The shaft supports at one end a timing cam and a hammer-cocking cam, and supports at its other end a bell adapted to be sounded by said hammer and an upper case member adapted to be rotated manually for setting said timer by initially adjusting the angular position of said drive shaft. A lost motion connection between a stop lever rotatably mounted on the shaft and a stop dog secured to the shaft for rotation therewith, permits 360° rotation of the shaft during its initial adjustment.

4 Claims, 8 Drawing Figures



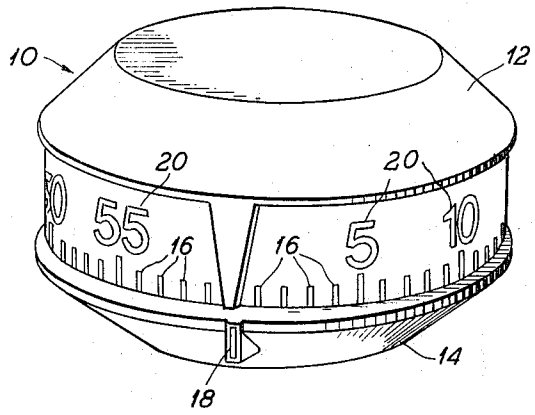


Fig. 1

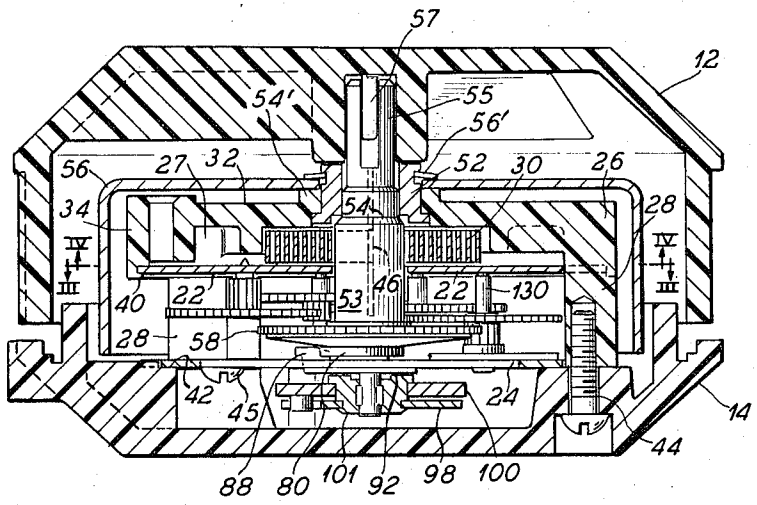


Fig. 2

Fig. 3

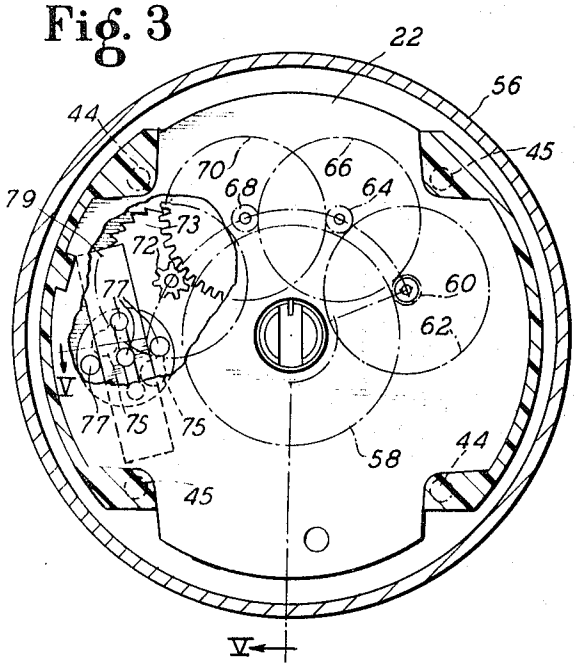


Fig. 4

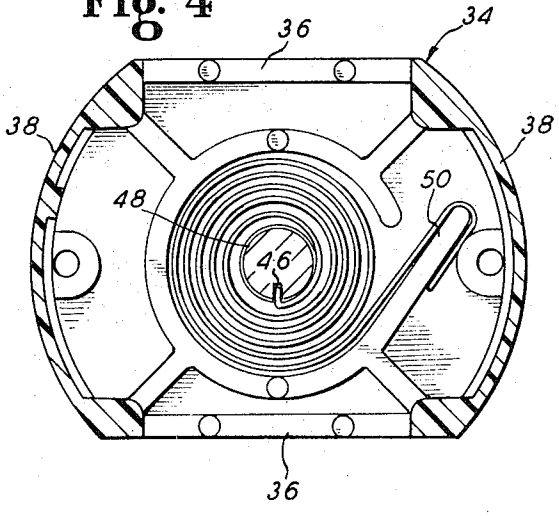


Fig. 5

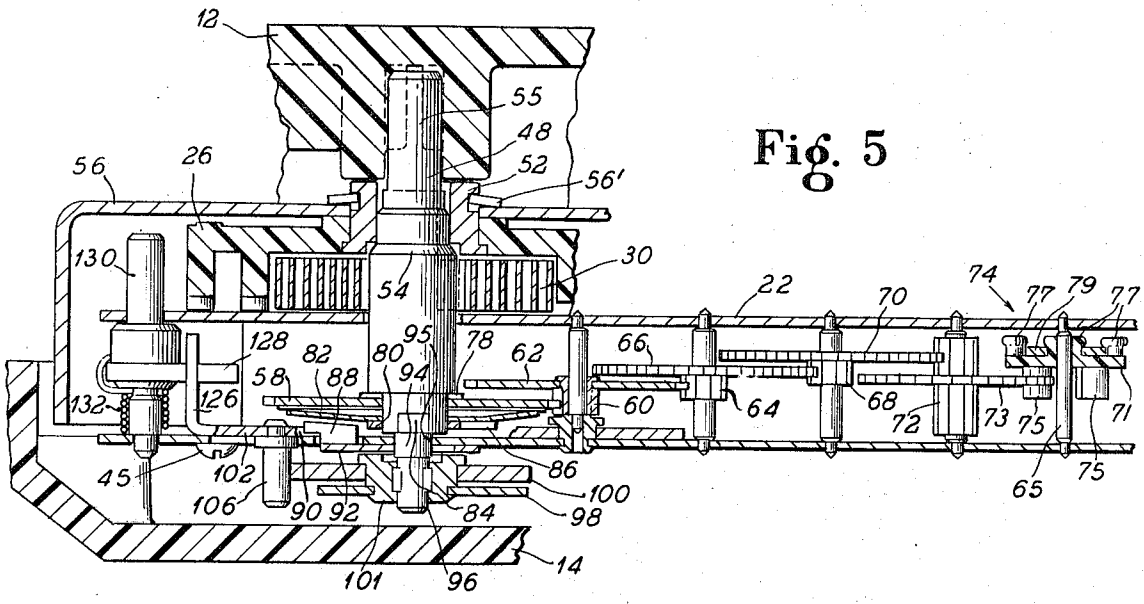


Fig. 6

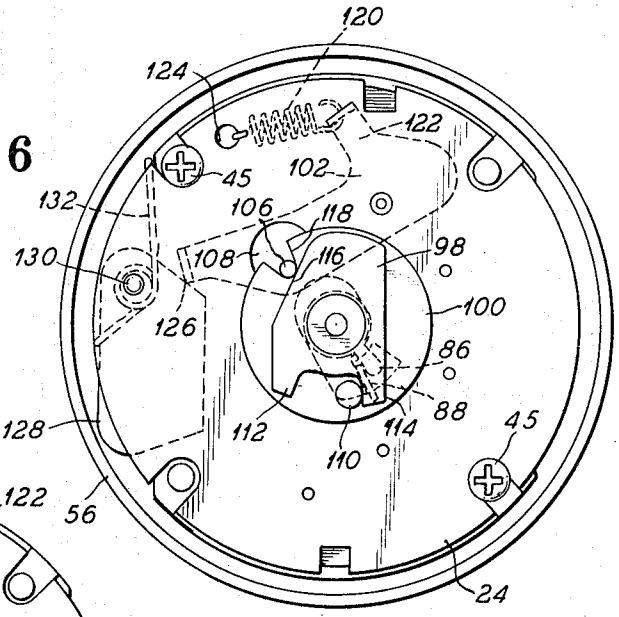


Fig. 7

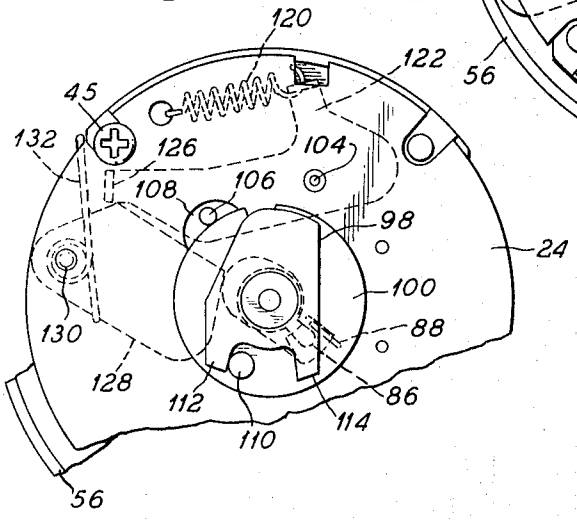
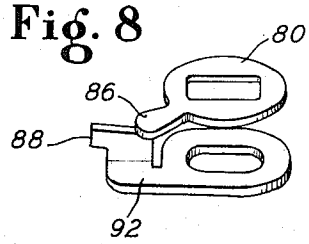


Fig. 8



SPRING DRIVEN TIMER

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a spring driven timer, and more particularly to such a timer which is settable to a selected interval by initially rotating a knob, and which rings a bell at the expiration of the selected interval.

2. The Prior Art

A number of spring driven timers have been developed in the prior art, in which a knob or the like is rotated to select an interval, after which an escapement is driven by a spring through a gear train to permit the knob gradually to rotate back toward its initial position. When the initial position is reached a hammer is released to ring a bell, signifying that the selected interval has expired. It is desirable to produce such spring timing mechanism as economically as possible, and for this reason to arrange the component parts of such a timer so that they are multifunctional, thereby to reduce the total number of parts in the mechanism, and to increase its efficiency of operation, while at the same time reducing its cost of manufacture.

It is also desirable to achieve the maximum accuracy possible, both in setting a selected interval and in timing out the interval. For maximum accuracy in setting an interval, the indicia representing intervals which may be selected (such as minutes, for example) should be as far apart as possible, in terms of degrees of rotation of the selected knob. Then slight errors in the initial manual adjustments of the knob are minimized. To this end, it is desirable to permit the knob to be initially set to any position within 360° of its rotation, so that the indicia are spread completely around the knob and the greatest possible angle per unit of selected time interval is provided. For the same reason, it is desirable to have the control knob as large in diameter as possible, in order to spread out the scale of selectable time intervals as much as possible. However, the use of a larger knob, all other things being equal, increases the cost of the timer.

SUMMARY OF THE INVENTION

Accordingly, it is a principal object of the present invention to provide a timer apparatus in which an internal selecting knob may be initially adjusted to any position within 360° of rotation.

Another object of the present invention is to provide a timer apparatus in which the selecting knob may be made large without increasing the cost of the apparatus.

A further object of the present invention is to provide a timer apparatus which employs the fewest possible component parts, and which therefore can be manufactured efficiently and economically.

Another object of the present invention is to provide a timer apparatus which is fully operative in any position, so that the timer may be placed in any desired attitude.

A further object of the present invention is to provide a design of housing for the drive spring so that its condition can be inspected during an intermediate step in the manufacture of the timer.

These and other objects and advantages of the present invention will become manifest upon an inspection of the following description and the accompanying drawings.

In one embodiment of the present invention there is provided a timer mechanism having a housing for enclosing a timing mechanism, a drive shaft passing through said housing and adapted to be driven by said timing mechanism, a stop dog secured to a first end of said shaft, and a stop lever rotatably secured to said first end of said shaft and having a portion projecting through an aperture in said housing for engagement with said stop dog, said aperture being sized to permit motion between said shaft and said stop lever so as to allow 360° rotation of the shaft, a bell secured to a second end of said shaft, and a cover member secured to said second end of said shaft and rotatable therewith, said cover surrounding said bell and said housing and bearing interval-designating indicia on its outer periphery.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference will now be made to the accompanying drawings which:

FIG. **1** is a perspective view of a spring driven timer incorporating an illustrative embodiment of the present invention;

FIG. **2** is a vertical cross-sectional view, taken through the center of the apparatus of FIG. **1**;

FIG. **3** is a horizontal cross-sectional view of the apparatus illustrated in FIG. **2**, taken through the plane III—III;

FIG. **4** is a horizontal cross-sectional view of the apparatus illustrated in FIG. **2**, taken through the plane IV—IV;

FIG. **5** is a partial vertical cross-sectional view taken through the apparatus of FIG. **1** taken through the cylindrical surface V—V shown in FIG. **3**;

FIG. **6** is a plan view of the bottom of the gear housing, illustrating the timing cam and the hammer-cocking cam in their initial positions;

FIG. **7** is a view similar to view **6** but with the cams in a different position; and

FIG. **8** is an exploded, perspective view of the stop lever and the stop dog.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring first to FIG. **1** a perspective view of a spring wound timer **10** is illustrated. The timer **10** comprises an upper cover member **12** and a lower cover member **14**, the lower cover member serving as a base of the unit, and the upper cover member being rotatable about a central vertical axis with respect to the lower cover member. The upper cover member **12** is provided with indicia or marks **16** equally spaced around the periphery thereof and which represents minutes of time to which the timer may be set with reference to an index mark **18** provided on the lower cover member **14**. Numerals **20** are also provided on the upper cover member **12** to give meaning to the indicia **16**.

The upper cover member is rotatable through 360° in order to set the timer for any period up to 60 minutes, and the numerals **20** representative of 5 minute intervals up to 55 minutes duration are spaced equally around the periphery of the upper cover member **12**. The timer **10** is set by rotating the upper cover **12** until the index **18** is aligned with the indicia **16** corresponding to a selected time interval. Subsequently the time

remaining before the expiration of the selected interval is continuously indicated by the indicia **16** adjacent the index mark **18.**

FIGS. **2** through **5** illustrate the manner in which the various components of the timer are assembled. The gear train of the timer is maintained in position between an upper frame plate **22** and a lower frame plate **24.** A transparent plastic housing cover **26** encloses a space **27** above the upper frame plate **22,** and four legs **28,** which are formed integrally with the housing cover **26,** serve to support the frame plates **22** and **24** in fixed relation to the housing cover **26.** The main spring **30** is disposed above the upper frame plate **22,** within the space **27** enclosed by the cover **26.** The cover **26** has an upper surface **32** and a peripheral sidewall **34** surrounding the space **27.** The shape of the cover **26** is elongated, with the wall **34** having straight side portions **36** and arcuate end portions **38.** The side portions **36** overlie the upper frame plate **22,** to maintain it in spaced parallel relation with the upper surface **32,** and the end portions **38** are juxtaposed with the edge of the circular upper frame plate **22,** and heat staked to form a lip **40** below opposed sections of the frame plate **22** to maintain it in position relative to the upper surface **32.** The lower frame plate **24** is maintained in position by virtue of being trapped between the lower ends of the legs **28** and a surface **42** provided within the lower cover member **14.** A pair of screws **44** secure two legs **28** to the lower cover member **14,** while another pair of screws **45** secure the other two legs **28** to the lower frame plate **24.**

The gear train is mounted between the two frame plates **22** and **24** in conventional fashion, and the main spring **30** which is maintained in coiled relation within the space **27** has one end thereof engaged in a notch **46** within the drive shaft **48,** and another end hooked about the end of an interior wall **50** of the housing cover **26.** The wall **50** forms a circular loop which encircles the spring **30** and holds it in place during assembly. The spring **30** is pre-wound approximately three turns prior to assembly so that there is a substantial torque constantly conveyed to the shaft **48.** The fact that the housing **26** is transparent aids in the assembly of the timer, as the position and condition of the spring may be inspected until a bell **56** is placed in position.

The main bearing **52** is supported within an aperture disposed in the housing cover **26** and a boss **54'** surrounds the aperture in which the bearing is located and projects upwardly from the upper surface **32,** to support the central portion of the bell **56.** The bell **56** has a U-shaped cross-section and surrounds the housing cover **26,** the spring **30,** and the gear train supported between the plates **22** and **24.**

The main bearing **52** has a central aperture which receives the shaft **48,** the central aperture having a counterbore at the lower portion thereof, and the shaft **48** being provided with an enlarged portion **53** joining with the upper portion **55** of the shaft by a shoulder **54** located in juxtaposition with the shoulder formed at the end of the counterbore of the bearing **52.** A bowed E-ring **56'** is disposed in an annular notch surrounding the outside of the bearing **52** and functions to urge the bearing **52** upwardly relative to the housing cover **26,** to take up axial play within the bearing **52,** and to maintain the bell **56** tightly engaged with the housing cover **26.**

The end of the upper portion **55** of the shaft **48** is slotted and received in an aperture within the upper cover member **12,** which is provided with a central spline **57** received within the slot of the shaft **48.** In this manner rotation of the upper cover member **12** functions to rotate the shaft **48.**

The shaft **48** passes through the housing defined by the frame plates **22** and **24** and the cover **26.** The gear train is disposed between the frame plates **22** and **24** and is connected to the enlarged portion **53** of the shaft **48,** by means of a main drive gear **58,** which encircles the shaft **48** and is adapted for rotation about the shaft **48.** The gear **58** is in engagement with a gear **60** secured coaxially to a larger gear **62.** The gear **62** is in engagement with a gear **64** which is secured coaxially to a larger gear **66.** In similar fashion, the gear **66** is in engagement with gear **68** which is connected for rotation with a larger gear **70.** The larger gear **70** is in engagement with a pinion **72,** which bears a saw toothed escapement ratchet wheel **73,** forming a part of an escapement mechanism **74.** As a result of the action of the spring **30** urging the shaft **48** to rotate back toward its initial position, all of the gears **60–72** are urged to rotate, but the action of the escapement **74** limits the speed of rotation of the members of the gear train in the manner well understood by those skilled in the art. The escapement **74** serves to control the precise speed of the gear train, so that the rotation of the shaft **48** back to its initial condition takes place at a constant angular velocity.

The escapement **74** comprises, in addition to the ratchet wheel **73,** a pawl **71** having a pair of dogs **75** for alternately engaging teeth of the ratchet wheel **73.** The pawl is mounted for oscillating rotation on a shaft **65,** supported between the plates **22** and **24,** and a plurality of lugs **77** grip a weighted bar **79,** which is provided to add mass to the pawl **71.** Three of the lugs **77** are disposed within a centrally located slot in the bar **79,** and two others engage the side edges of the bar. The pawl **71** is formed of plastic material, and the lugs **77** are heat staked to retain the bar **79** firmly in position.

The various gears **60–72** are supported for rotation on shafts which are engaged in aligned apertures in the two frame plates **22** and **24.**

The gear **58** is connected to the shaft **48** by means of a clutch which will now be described. The shaft **48** has a shoulder **76** and a washer **78** is in engagement between the shoulder **76** and the gear **58.** A second washer **80** is disposed below the gear **58** and a resilient member **82** which functions as a spring clutch is disposed on the shaft **48** above the washer **80.** The washer **80** and the resilient member **82** have rectangular apertures which are adapted to receive a rectangular cross-section portion **84** of the shaft **48,** thereby keying the resilient member **82** to the shaft for rotation therewith. The washer **80** is fixed firmly co-rotatably to the shaft **48** and a projection or dog **86** projects radially outwardly from the remainder of the washer **80.** The dog **86** functions as a stop dog, as described below. The resilient member **82,** which is keyed to the shaft **48,** exerts a sufficient force acting on the gear **58** so as to prevent the shaft **48** from overriding the gear **58,** as the latter slowly rotates by the action of the escapement **74.** The force is low enough, however, so as to allow the shaft **48** to slip relative to the gear **58** as the shaft is initially rotated to select a time interval.

The stop dog **86** cooperates with a stop lever **88**, which extends upwardly through an aperture **90** provided in the lower frame plate **24**. The stop lever **88** is integrally connected with a washer **92** which is mounted for rotation about a lower terminal portion **94** of the shaft **48** which lies just below the rectangular cross-section portion **84**. Accordingly, the stop lever **88** is adapted for free oscillatory rotation relative to the shaft **48** within the limts of the aperture **90**. The size of the aperture **90** is selected to permit 360° rotation of the shaft **48**, such rotation being limited in both directions by engagement of the dog **86** against one side or the other of the stop lever **88**. The angular extent of the aperture **90** is, therefore, approximately equal to the angular extent of the dog **86**, plus twice the thickness of the lever **88**.

The portion **94** of the shaft **48** is received in a circular aperture **95** in the frame plate **24**.

A hub **96** is secured to the bottom of the shaft **48**, and a hammer-cocking cam **98** is fixed to the hub **96** for rotation therewith and with the shaft **48**. A timing cam **100** is supported on the hub for free rotation thereabout, between the hammer-cocking cam **98** and a flange **101** of the hub **96**. The function of the hammer-cocking cam **98** is to cock a hammer arrangement, while the function of the timing cam **100** is to permit release of the hammer at the proper time, after the expiration of the selected timing interval.

A bellcrank **102** is mounted for rotation relative to the lower frame plate **24** on a stud **104**. The bellcrank **102** has secured to it a cam follower pin **106** which extends downwardly through an aperture **108** provided in the lower frame plate **24** and is adapted to bear on the periphery of the timing cam **100**.

A spring **120** is interconnected between an arm **122** of the bellcrank **102**, and an aperture **124** provided in the lower frame plate **24**. It urges the bellcrank **102** in a counterclockwise direction (as viewed in FIGS. **6** and **7**), but normally the crank **102** is prevented from rotating by virtue of the follower pin **106** bearing against the periphery of the timing cam **100**. When a notch **118** of the timing cam **100** is aligned in a position shown in FIG. **6**, the follower pin **106** bears against the end of the notch **118**, as illustrated in FIG. **6**. When an interval has been selected and the timer is operating, the follower pin engages a circular portion of the timing cam **100** and the bellcrank assumes the position illustrated in FIG. **7**.

At the end of the selected interval, the notch **118** again becomes aligned with the pin **106** and the bellcrank **102** is quickly rotated to the position of FIG. **6**. As the bellcrank **102** rotates, a foot **126** supported thereon engages a hammer **128** supported on a stud **130** extending between the upper and lower frame plates **22** and **24**. A spring **132** is wound about the stud **130** and has one end hooked around the hammer **128** and the other end trapped behind one of the legs **28**, to maintain the hammer **128** rotated fully in its counterclockwise direction (as seen in FIG. **7**) against the foot **126**. When the bellcrank **102** rotates in a counterclockwise direction, the foot **126** bears against the hammer **128**, urging it in a clockwise direction, and causing it to rotate about its stud **130** sharply against the inner surface of the bell **56**. In this manner the bell **56** is caused to sound when the timing cam **100** has reached the position illustrated in FIG. **6**. In this position, the shaft **48** has been rotated fully to its extreme clockwise position (as viewed in FIG. **6**), where rotation is stopped by engagement of the stop lever **88** against the stop dog **86**.

The timing cam **100** is constrained to rotate with the shaft **48** by virtue of the interconnection between the hammer cocking cam **98** and a stud **110** disposed on the surface of the timing cam **100**. The stud **110** is interposed between two limiting fingers **112** and **114** on the hammer-cocking cam **98**, so that as long as the stud **110** is adjacent one of the fingers **112** and **114**, the timing cam **100** is constrained to rotate with the cam **98** in the direction which urges the limit finger into closer engagement with the stud **110**.

The hammer-cocking cam **98** has an inclined cam surface **116** adapted to bear on the follower pin **106** when the shaft **48** is initially rotated to select a timing interval, thereby to cam the pin **106** out of engagement with the notch **118**.

When the upper cover member **12** and the shaft **48** are rotated to set a selected timing interval, the hammer-cocking cam **98** is rotated in a counterclockwise direction (as viewed in FIG. **6**) so that the cam surface **116** forces the follower pin **106** outwardly. The timing cam **100** is prevented from rotating during this period because the follower pin **106** is in engagement with one of the sidewalls of the notch **118**. By the time the limit finger **112** reaches the stud **110**, however, the follower pin **106** has been cammed outwardly beyond the outer surface of the timing cam **100**, so that the timing cam is then rotated by means of the limit finger **112** bearing against the stud **110**. This occurs during the first few degrees of rotation of the upper cover member **12**, and afterwards, the timing cam is rotated with the cam **98** as far as necessary to select the appropriate time interval. Then the upper cover member is released and the spring **30** is effective to return the shaft **48** and the upper cover member **12** to their initial positions, under the control of the gear train and the escapement, rotating the shaft **48** in a clockwise direction (as viewed in FIGS. **6** and **7**). The timing cam **100** is initially prevented from rotating because of the frictional force resulting from the follower pin **106** bearing against its periphery, but when the finger **114** engages the stud **110**, the friction between the cam **100** and the following pin **106** is overcome and the timing cam **100** is forced to rotate with the cam **98**. This pause in the rotation of the timing cam **100** is for the same angle of rotation of the shaft **48** as during cocking of the hammer, and therefore does not affect the accuracy of the timer. Rotation of the cam **100** continues until the notch **118** reaches the position illustrated in FIG. **6**, whereupon the pin **106** falls into the notch **118** and causes the hammer **128** to strike the bell **56**.

It will be seen from the foregoing description that the timer described above accomplishes the function of permitting 360° rotation of the cover member **12** in order to set a selected time period for the timer, and, as the indicia are located on the extreme periphery of the upper cover member **12**, their angular separation is a maximum, resulting in the maximum accuracy of repeatability of time interval settings. Economy is achieved in the present apparatus by enabling the upper cover member **12** to doube as a cover and as a knob. There is, therefore, no need for a separate interval-selecting knob.

The embodiment described above requires only a single main bearing **52**, rather than the conventional ar-

rangement in which two spaced bearings are required. Axial alignment of the shaft **48** is assured because the flange **101** of the hub **98** is spaced just far enough to accomodate the thickness of the stop lever washer **92** and the thickness of the lower frame plate **24.** The follower pin **106** bearing heavily on the timing cam **100** prevents any lateral play in the mechanism.

Because of the spring **132,** which keeps the hammer **128** against the foot **126,** the timer apparatus may assume any attitude and the hammer **128** remains operative to sound the bell. Preferably the flat outer surface of the lower cover member **14** is provided with an aperture to accomodate a nail head or a screw head when the timer is to be wall-mounted.

What is claimed is:

1. In a spring driven timer which is manually settable to select a time interval: an upper inverted cup-shaped cover having means centrally therein securing it to the top of a vertically extending shaft; a base member having a housing cover member mounted thereon and defining a mechanism space above said base member and below said housing cover member; timer mechanism comprising spaced upper and lower frame plates supporting a timer gear train, the upper plate being mounted on said housing cover member and said lower plate being mounted on said base member; said shaft extending downwardly through and being journaled in said housing cover member and in said lower plate and having a lower terminal portion extending below said lower plate into a space within said base below said lower plate; a gear mounted corotatably on said shaft in limited spaced relation above said lower plate and coupled with said gear train; a main spring coiled about said shaft above said upper plate and anchored at one end to said shaft and at its opposite end to said housing cover member; a bell carried by said housing cover member outside of said mechanism space; means for sounding said bell in one rotary position of said shaft and including actuating cam structure carried by the lower terminal portion of said shaft below said lower plate and effecting releasable coupling with a bell striker and actuator mounted on said lower plate; and means for limiting rotation of said shaft to about 360° during manual setting of the timer by rotation of said shaft through said upper cover and including a first limit member corotatably secured to said shaft between said gear and said housing cover member and a second limit member comprising a plate mounted about said shaft below said lower plate and above said actuating cam structure, said second limit member having a stop lever projecting upwardly through an aperture in said lower plate and being engageable by a stop dog on said first limit member, said aperture being of a width to limit movement of said lever in either rotary direction to about equal the angular extent of said dog plus twice the thickness of the lever whereby to permit the 360° rotation of the shaft.

2. A timer according to claim **1,** wherein said upper cover has an annular generally vertically extending periphery carrying interval signifying indicia, and said base member has an index reference mark with respect to which said indicia are settable by turning of said upper cover member.

3. A timer according to claim **1,** wherein said housing cover member is of transparent plastic and permits the position and condition of said main spring to be inspected therethrough.

4. A timer according to claim **3,** said bell comprising a U-shaped inverted cup-shaped member which surrounds said housing cover member and the timer mechanism.

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