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Haag

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[54] **BELL TONE APPARATUS FOR A CLOCK**

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[51] **Int. Cl.²** **G04B 21/00**

[58] **Field of Search** ..... 58/8–11, 38, 58/53–55, 126 D

[56] **References Cited**

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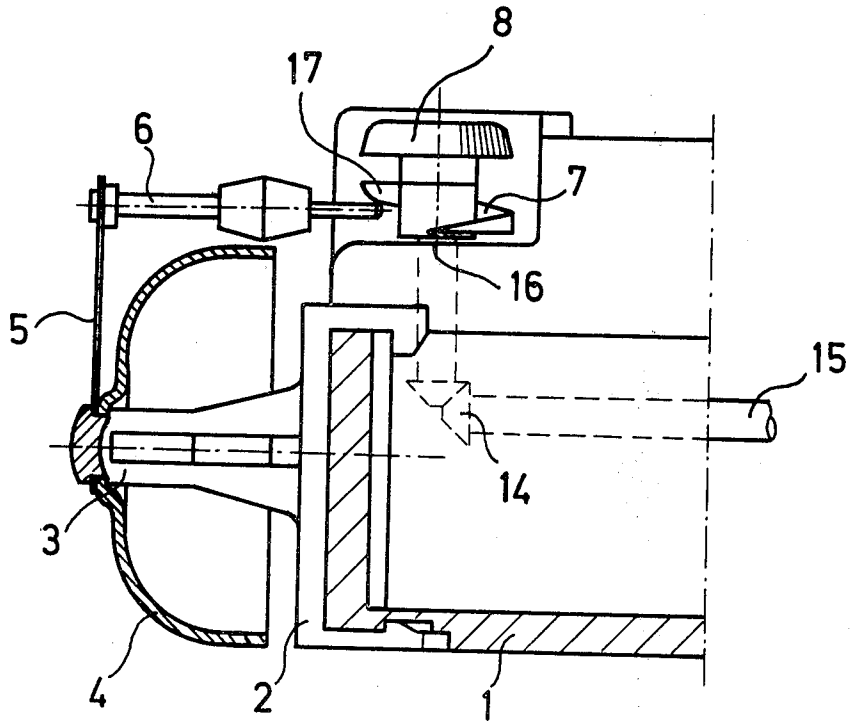
[57] **ABSTRACT**

A clock, having a shaft which rotates in unison with the clock hands, is provided with a bell tone apparatus adapted to be actuated at periodic intervals to provide an audible tone. The apparatus comprises a bell mounted on the clock housing, a hammer supported by a spring adjacent the bell, and a cam mounted on the shaft for rotation with the shaft, the cam being located at a position adjacent the hammer to engage the hammer and move it progressively away from the bell as the shaft rotates. The cam is shaped to release the hammer from engagement therewith at a predetermined angular position of the rotating shaft whereby the released hammer is impelled by the spring back toward the bell to strike the bell and thereby provide an audible tone.

9 Claims, 4 Drawing Figures



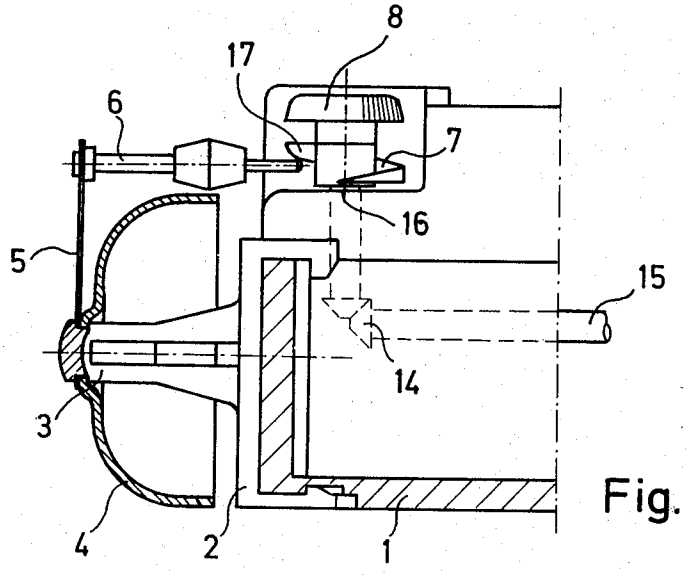


Fig. 1

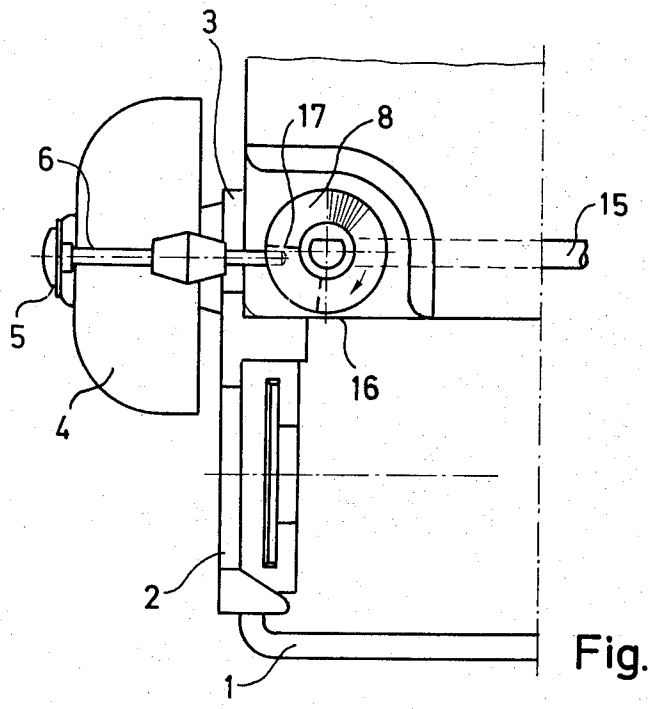


Fig. 2

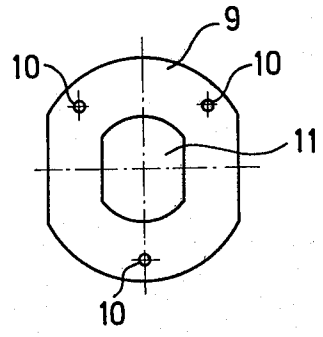


Fig. 4

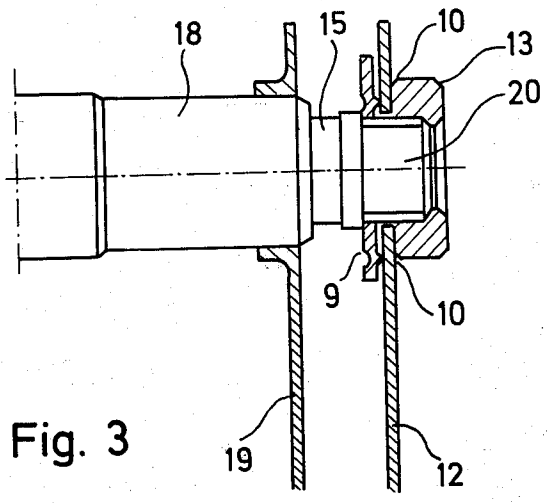


Fig. 3

BELL TONE APPARATUS FOR A CLOCK

BACKGROUND OF THE INVENTION

The present invention relates to a bell tone apparatus for a clock, of the type employing a hammer or striker disclosed adjacent the bell and operative to be actuated at periodic time intervals by the clockwork mechanism to provide an audible tone which announces the elapse of each such time interval.

Bell tone mechanisms of the general type described are already known and customarily comprise a separate mechanism which employs its own driving spring and which operates independently of the main clockwork mechanism. In these known arrangements, an actuating wheel is customarily provided which is released by the main clockwork mechanism at periodic time intervals to turn, under the influence of the separate driving spring, so as to actuate the hammer and cause the hammer to strike the bell. By appropriate design, the actuating wheel can be released every **15** minutes, or every **30** minutes, or on the hour to cause the bell to provide an audible tone at the selected time interval. These known arrangements are, in general, comparatively complex and expensive, and, moreover, are usually so designed that they constitute an integral portion of the main clockwork mechanism.

The present invention relates to a bell tone apparatus which is far simpler in construction, and less expensive, than bell tone apparatuses of the type described above, and which, moreover, can be readily attached to a preexisting clockwork mechanism to provide that preexisting clock with a bell tone sounding capability.

SUMMARY OF THE INVENTION

In accordance with the present invention, a self-contained bell tone apparatus is provided which can be readily attached, as an additional component, to a standard clockwork mechanism to cause the clockwork mechanism to actuate the added bell tone apparatus at periodic intervals during operation of the clock thereby to provide an audible tone at a desired time interval. The bell tone apparatus comprises a bell which is associated with a mounting structure for attaching the bell, usually by snap connection, to a portion of the clock housing. A hammer is supported for movement adjacent the bell. A cam is attached to a rotating shaft in the clockwork mechanism, which turns continuously in unison with the hands of the clock, e.g. the cam may be attached to the shaft which is provided for manually regulating the positions of the clock hands, for engaging the hammer to move it progressively away from the bell as the main clockwork operates, and to release the hammer at each selected periodic time interval so as to cause the released hammer to bounce back toward the bell and strike it.

In accordance with one embodiment of the invention, the hammer is so mounted that, after it has been moved away from the bell and then released by the aforementioned cam, the hammer bounces back toward its neutral or starting position under the influence of gravitational forces. In a different embodiment of the invention, the hammer can be supported on the bell mounting apparatus by a leaf spring which is placed under increasing tension as the hammer is moved progressively away from the bell by the cam, the spring being operative to forcibly impel the hammer back toward the bell to strike the bell when the hammer is released from engagement with the cam. In order to assure that the bell is sounded at a precise time, e.g. on the hour, the cam and/or the hands of the clock can be arranged for angular adjustment relative to one another, so that, after the bell tone mechanism of the present invention has been attached to the clock housing, the resultant composite mechanism can be readily adjusted to provide the desired audible tone at predetermined, precise time intervals.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing objects, advantages, construction and operation of the present invention will become more readily apparent from the following description and accompanying drawings wherein:

FIG. **1** is a side view, in partial section, of a bell tone apparatus constructed in accordance with one embodiment of the present invention;

FIG. **2** is a plan view of the apparatus illustrated in FIG. **1**;

FIG. **3** shows an adjustable clock hand arrangement which may be employed in conjunction with the bell tone apparatus of the present invention; and

FIG. **4** is a detail of a coupling plate which may be employed in the arrangement of FIG. **3**.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIGS. **1** and **2**, the bell tone apparatus of the present invention comprises a bell **4** which is supported by a mounting structure **3** having a resilient clamping structure **2** comprising a pair of spaced arms adapted to snap over and engage complementarily shaped support portions of the clock housing **1**. Clamp **2** may be fabricated of any appropriate resilient material, e.g. metal or plastic, and, when attached to the clock housing **1**, supports the bell **4** at a position adjacent to but spaced from said clock housing.

The mounting structure further includes a leaf spring **5** which is attached at one end to bell mount **3** and which supports, at its other end, a hammer **6** at a position adjacent bell **4**. The hammer **6** is provided, moreover, with a free end which protrudes beyond the bell **4** to a position adjacent a cam **7** which is mounted on a shaft **8** associated with the main clockwork mechanism, and which operates, in a manner to be described hereinafter, to periodically actuate hammer **6** so as to cause it to strike bell **4**.

In the form of the invention illustrated in the drawings, shaft **8** constitutes a manually rotatable shaft which is provided to regulate the position of the clock hands. To that effect, shaft **8** is connected by a beveled gear **14** to the minute hand shaft **15** of the clock. As the minute hand shaft **15** is rotated by the mainspring of the clockwork mechanism, shaft **8** will similarly be caused to rotate in unison with the clock hands. It will be appreciated, however, that some clockworks are designed in such a manner that a separate shaft **8**, for manually regulating the hands of the clock, is omitted and, instead, a manual adjustment knob is attached directly to the outermost end of minute hand shaft **15**. When the bell tone apparatus of the present invention is to be attached to a clock of this latter type, the cam **7** is mounted directly on the minute hand shaft **15** so as to rotate with shaft **15**.

Cam **7** includes an inclined ramp surface which commences at a relatively narrow edge **16** located below

the free end of hammer **6**, and which extends therefrom in an inclined circular arc to ramp edge **17**. The angular distance between edges **16** and **17** of cam **7** is less than **360°** whereby, after the free end of hammer **6** has been engaged by edge **16** of the cam during rotation of cam **7** and shaft **8**, the free end of hammer **6** will remain in engagement with the inclined ramp surface of cam **7** until it reaches cam edge **17**, at which time the free end of hammer **6** is released.

More particularly, as the main clockwork operates, the shaft **8**, provided for manual regulation of the hands of the clock, turns in the direction shown by the arrow in FIG. **2**. During this rotation, the comparatively narrow edge **16** of cam **7** moves under the free end of hammer **6** to cause the free end of the hammer to engage the inclined ramp surface of cam **7**. As shaft **8** and cam **7** continue to rotate, the inclination of the cam ramp surface causes the free end of hammer **6** to be moved progressively away from bell **4**, thereby placing leaf spring **5** under progressively increasing tension, and causing the spring **5** to be bent increasingly outwardly. When the rotation of cam **7** and shaft **8** have advanced to the position shown in FIG. **2**, the free end of hammer **6** will be released by the cam and will drop from the end **17** of said cam, and hammer **6** is then forcibly impelled by spring **5** back toward bell **4** to strike the bell and generate an audible tone. Continued rotation of shaft **8** and cam **7** beyond this operating point will then cause the leading edge **16** of the cam to again pass under the free end of hammer **6**, to repeat the operation described.

In the preferred embodiment of the invention, shaft **8** completes a single revolution every hour so that hammer **6** is released to provide an audible tone every hour on the hour. It will be apparent to those skilled in the art, however, that by appropriate design, e.g. by appropriate selection of gears **14** and/or the shape of cam **7**, the bell tone apparatus can be caused to sound every **30** minutes, or even every **15** minutes.

In order to assure that the bell tone is sounded precisely at the moment when the minute hand of the clock points at the numeral **12** on the clock face, the cam **7** is preferably made angularly adjustable relative to shaft **8**. When the bell tone apparatus has been attached to a clock housing, the clock hands may then be regulated so that they indicate a full hour, whereafter cam **7** is rotated about its associated shaft (e.g. shaft **8**) until the hammer just drops from the end **17** of the cam, and the cam is then locked to the shaft at the position so found, e.g. by a set screw.

FIGS. **3** and **4** show an alternative adjustment arrangement which can be provided to assure that the bell tone apparatus of the present invention sounds at a desired precise time interval. In this particular arrangement, the hour hand shaft of the clock takes the form of a sleeve **18** upon which the hour hand **19** is adjustably mounted, and the minute hand shaft **15** extends through sleeve **18** to support an adjustable minute hand **12** adjacent its forward most end **20**. The end **20** of the minute hand shaft **15** is threaded, and is provided with a profile which corresponds to that of the hole **11** (see FIG. **4**) of a coupling plate **9** which is slipped over the end **20** of shaft **15**, i.e. coupling plate **9** will rotate with shaft **15**.

The coupling plate **9** is provided with a plurality of outwardly protruding, sharp-edged projections **10** which engage the rear surface of minute hand **12**. Minute hand **12** in turn is provided with a circular opening through which the end **20** of shaft **15** extends. As a result, minute hand **12** can be angularly adjusted relative to shaft **15** until a desired position is reached, at which time minute hand **12** is locked into place by screwing a nut **13** onto the threaded end **20** of shaft **15** to force the minute hand **12** into engagement with projections **10** thereby to lock minute hand **12** to shaft **15**. The hour hand **19** is pressed-fit onto hour hand shaft **18** so that it too can be moved relative to the hour hand shaft **18** for purposes of adjustment if desired.

In the form of the invention shown in FIGS. **3** and **4**, the rotatable shaft **15** is turned until a bell tone occurs. At this position, the clock hands **12** (and **19** if necessary) are adjusted relative to the corresponding shafts and relative to the clock face to indicate a full hour, whereafter the clock hands are locked into place.

Having thus described my invention, I claim:

1. A bell tone apparatus for attachment to a clock housing and adapted to be actuated at periodic intervals during the operation of the clock to provide an audible tone, the clock having at least one shaft which rotates in unison with the hands of the clock and having a portion which is accessible from the exterior of said housing, said apparatus comprising a bell, mounting means for attaching said bell to said clock housing, a hammer supported by said bell mounting means for movement adjacent said bell, a cam mounted on said accessible portion of said shaft for rotation with said shaft, said cam being located at a position adjacent said hammer for engaging said hammer to move said hammer progressively away from said bell as said shaft rotates, said cam being shaped to release said hammer from engagement therewith at a predetermined angular position of said rotating shaft whereby said released hammer is impelled back toward said bell to strike said bell and thereby provide an audible tone when said rotating shaft reaches said predetermined angular position.

2. The apparatus of claim **1** wherein said cam is mounted on a manually rotatable shaft which is provided to regulate the positions of the hands of the clock.

3. The apparatus of claim **2** wherein said manually rotatable shaft is connected by gear means to the shaft which supports the minute hand of the clock.

4. The apparatus of claim **1** wherein said cam surrounds said shaft and is provided with an inclined ramp surface which extends through an arc less than **360°**.

5. The apparatus of claim **1** wherein said hammer is supported on said bell mounting means by a spring which is placed under increasing tension as said hammer is moved progressively away from said bell, said spring being operative to forcibly impel said hammer toward said bell when said hammer is released from engagement with said cam.

6. The apparatus of claim **5** wherein said bell mounting means comprises attachment means for removably attaching said bell and its associated spring-supported hammer to the housing of the clock.

7. The apparatus of claim **6** wherein said attachment means includes resilient means for snap connecting said apparatus to the housing of the clock.

8. The apparatus of claim **1** wherein said cam is adapted to be angularly displaced about said shaft, and means for locking said cam to said shaft at a desired angular position on said shaft to correlate the angular po-

sitions of said cam and the minute hand of the clock.

9. The apparatus of claim 1 wherein the minute hand of said clock is adapted to be angularly displaced relative to the minute hand shaft of the clock, and means for selectively locking said minute hand at a desired angular position on the minute hand shaft of the clock to correlate the angular positions of said cam and minute hand.

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