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FIRE ALARM

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Fig. 1.

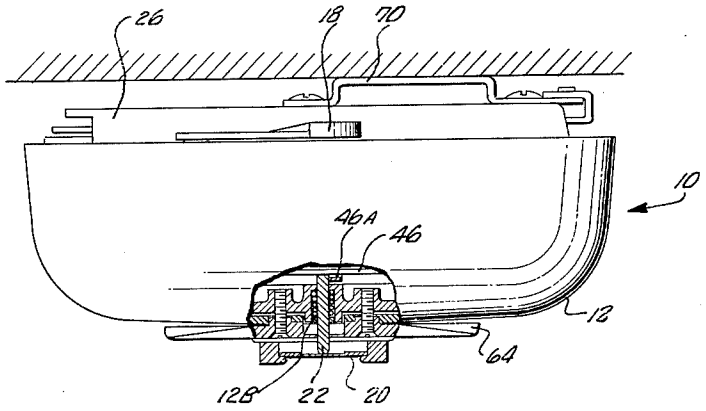

Fig. 2.

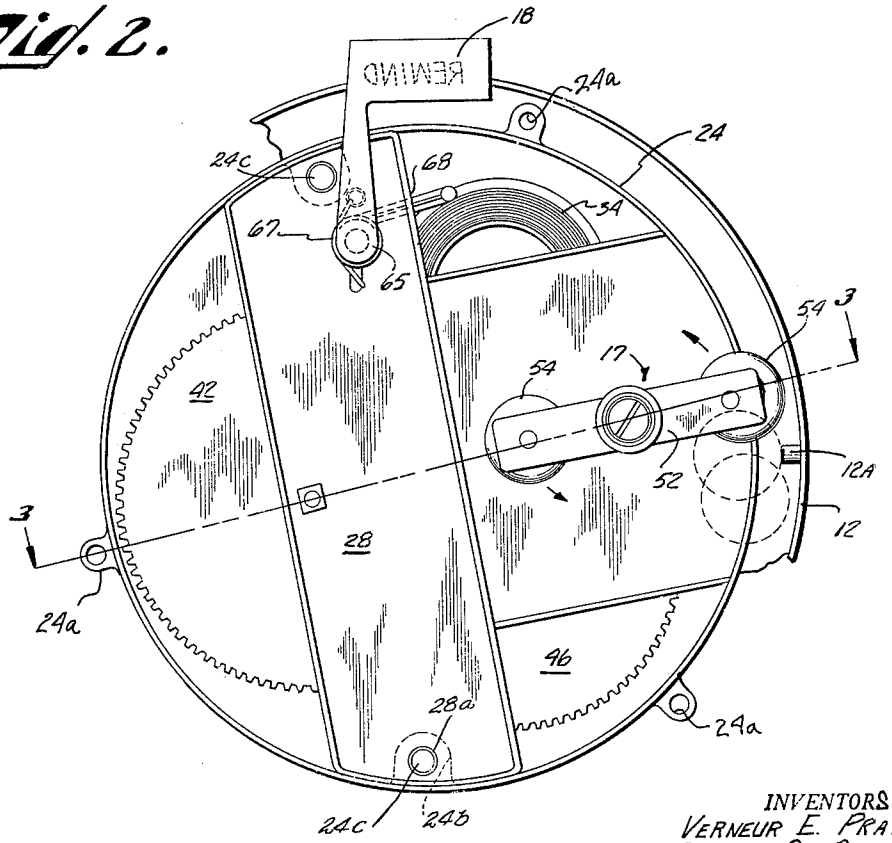

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Fig. 3.

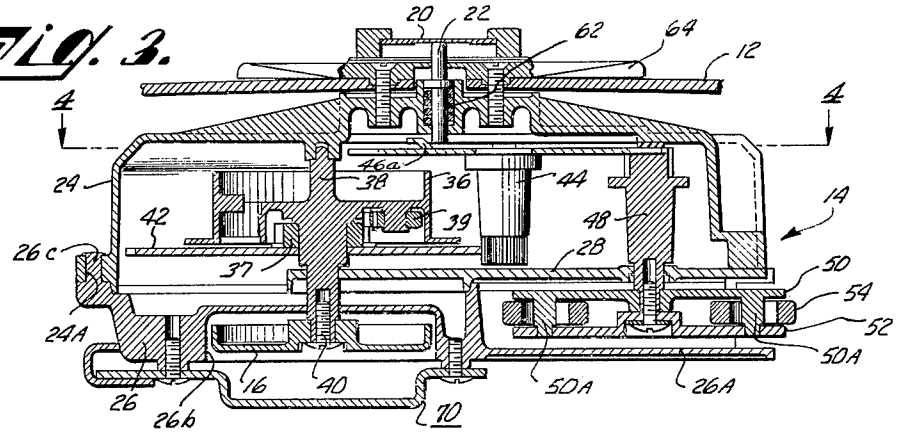
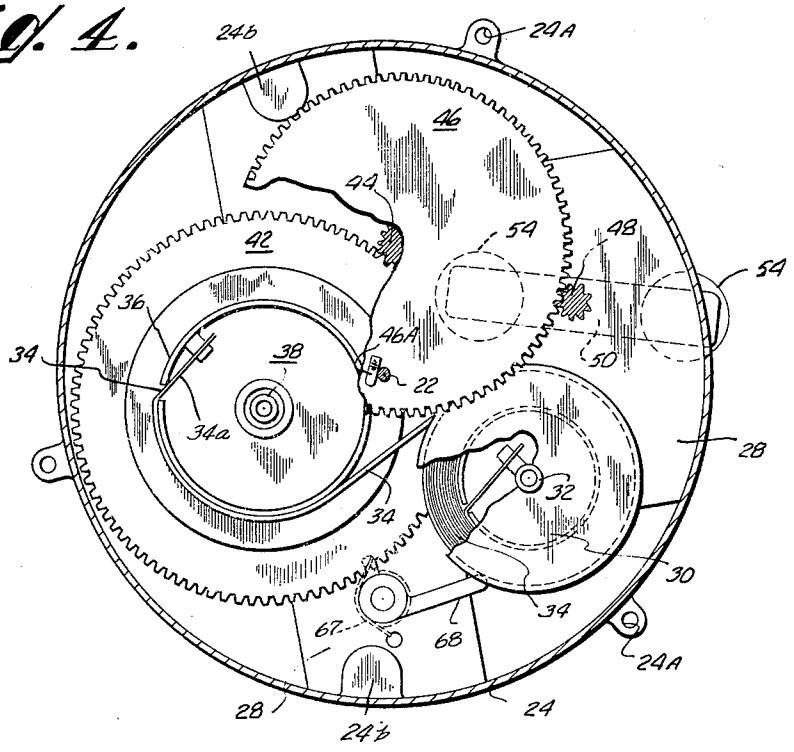


Fig. 4.



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FIRE ALARM

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7 Claims. (Cl. 116—106)

This invention relates to alarms and in one of its more particular aspects to fire alarms.

Many types of alarms have been proposed and/or used in the past. Electrical alarms are the most advanced type of alarm particularly in the fire alarm field. Electrical alarms, however, are relatively expensive and have the disadvantage that they are rendered inoperative by loss of electrical power and which power loss is usually a result of the very fire for which the alarm was installed to detect. As a result, alarms having self-contained power sources, such as spring wound alarms have been proposed to avoid both the difficulties and the expense of the electrical alarms.

This invention relates to an improved and inexpensive and easy to install alarm which is of the self-contained power type and of a light weight construction for use in houses, offices, industrial plants, warehouses, boats and the like. The alarm is substantially housed within the bell therefor and has its operating mechanism further encased to allow the alarm to be used in any environment, including a corrosive environment. This encasing is further arranged to permit the operating mechanism to be free from tampering or being rendered inoperative by foreign matter such as bugs, insects, and the like accumulating therein.

The invention is best described in its embodiment as a fire alarm and which fire alarm includes a cup-shaped bell defined to house the complete mechanical operating mechanism within the bell. The heat sensitive element for detecting the preselected increase in ambient temperature, such as produced by a fire, is mounted on the outside of the bell in a position to be readily visible as well as accessible. The self-contained operating mechanism for the alarm is encased within a sub-assembly defined to completely seal off the mechanism. The mechanism is powered by means of a spring motor arranged to provide a continuous driving action for a hammer to sound or ring the bell.

In one specific embodiment of the invention spring means in the form of a constant tension spring is normally wound on a rotatable storage drum and connected to a rotatable drive drum to be wound thereon whereby the stored energy thereof is utilized to continuously drive a hammer with a constant torque for sounding the alarm. The spring is wound on the drive drum by manually winding the spring thereon through the provision of a winding knob accessible at the back of the alarm. The storage and drive drums are both rotatably mounted on shafts with the shaft for the latter drum being provided with a drive gear to be rotatably responsive to the unwinding of the spring from the drive drum and thereby through suitable gearing transmit this driving action to the hammer for sounding or ringing the bell.

The hammer is rotatably mounted to be continuously responsive to the driving action of the gearing and is constructed and arranged to thereby continuously sound the bell at substantially the same sound level. The hammer includes an arm having heads very loosely mounted at opposite ends thereof. The hammer is mounted on the sub-assembly but outside of the sealed interior or chamber housing the operating mechanism proper and which sub-assembly is defined to provide a hammer chamber wherein the hammer rotates. The bell is provided with a sounding or striking pin arranged opposite the hammer chamber, whereby the hammer heads may merely strike the pin a glancing blow to sound the bell. The loose arrangement of the hammer heads allows the bell to be quickly struck without any sound dampening and yet avoiding the necessity to construct the operating mechanism to rebound the hammer from the bell. The spring motor is adapted to continuously drive the thus arranged hammer at a high rotary speed to produce a loud and distinctive ringing sound and which ringing sound is easily distinguished from the usual environmental noises or sounds.

The high rotary driving speed of the hammer is achieved by the provision of step-up gearing arranged intermediate the drive gear and the driven shaft mounting the hammer. The driving action of this transmissive gearing is selectively controlled by a control means including a control member engageable and disengageable with the gearing and which locks or unlocks the spring wound on the drive drum. This control operation is affected, in this instance, through the provision of a stop-member or lip defined on the face of a transmitting gear to restrain the rotation thereof. This control member is further arranged to extend outwardly of the sub-assembly and through the bell proper where it cooperates with a latch which may be centrally mounted on the outside of the bell. The operation of the latch governs whether the spring is locked or unlocked. When the alarm is to be used for detecting fires the latch may be in the form of a heat responsive link arranged to deform at a preselected temperature and allow the control member to disengage from the gearing and thereby allow the spring to unwind for sounding the alarm.

The alarm also includes means for visually indicating when the alarm is not in operating condition and the spring should be wound onto the drive drum. This indicating means measures the length of spring wound on the storage drum and signals the need for a rewinding operation when all of the spring is wound on the storage drum whereby the alarm is inoperative. This indicating means comprises a spring biased arm engaging the outer wrap of the spring on the storage drum and mounting a flag which is rotatable into a visible position when the spring is stored on the storage drum and is in a non-visible position within the bell when substantially all of the spring is stored on the drive drum. This indicating means signals the operating condition of the alarm independently of the condition or position of the heat responsive element which may be readily detected by an observer.

The invention is explained in more detail in the following description and in the accompanying drawings, in which:

FIG. 1 is a side elevational view, with the bell partially broken away and the exposed control mechanism shown in cross-section of the alarm embodying the invention shown mounted in a horizontal position;

FIG. 2 is a bottom plan view of the alarm of FIG. 1, with the back cover removed, and showing a portion of the bell and the positions of the visual indicating means and of the hammers in dotted outline;

FIG. 3 is a partial, cross-sectional view taken along the line 3—3 of FIG. 2 with the spring removed from the drive drum, the bell broken away and the back cover shown in position; and

FIG. 4 is a sectional view, with parts in section and parts broken away, taken along line 4—4 of FIG. 3.

Now, referring to the drawings, the alarm **10** will be described in more detail. The alarm **10** comprises a bell **12** housing a sub-assembly **14** for the operating mechanism and which sub-assembly is substantially housed within the bell. The sub-assembly **14** is defined to mount

a winding knob 16 and a visual indicating means or flag 18 in a manner to render them readily accessible when the alarm 10 is unmounted. A hammer 17 for sounding the bell 12 protrudes from one side of the sub-assembly 14. The sub-assembly 14 and the bell 12 are interconnected by means including control operating means arranged on the exterior of the bell 12 to allow the bell to be either manually or automatically sounded depending on the application thereof. When the alarm is to be used as a fire alarm, the control operating means includes a heat sensitive latch 20. The alarm 10 is controllably locked or unlocked to an operating relationship by means of the heat sensitive element 20.

The bell 12 is of a cup-shaped construction with a skirt of sufficient length to house the sub-assembly 14 almost completely therein. The bell 12 is constructed of a material that will provide a loud sound upon being struck. The bell 12 includes a sounding or striking pin 12^a formed integral with the bell or firmly fastened thereto. The provision of the striking pin 12^a allows the bell 12 to be sounded without striking the bell proper as will become more apparent hereinafter. A central aperture for the bell 12 is defined to receive an operating control member or pin 22 cooperating with the heat sensitive element 20 as will be more evident hereinafter.

The sub-assembly 14 is arranged to house the operating mechanism for the alarm 10 in a sealed chamber defined by a substantially cup-shaped member 24 and a cover member 26 cooperating therewith. The cup-shaped member 24 is of a smaller diameter than the inside diameter of the bell 12 to allow the sub-assembly 14 to be readily positioned therein. The cup-shaped member 24 is also provided with a central aperture to slidably receive the operating control member 22 when it is axially aligned with the bell 12.

The sealed chamber for the operating mechanism is defined by enclosing the cup-shaped member 24 with the cover 26 and which cover carries a plurality of securing pins 26^c disposed at spaced points around its outer periphery. The cup-shaped member 24 is also provided with sockets 24^a to receive the pins 26^c. The ends of the pins 26^c are of a length to protrude from the sockets 24^a and may be peened over to connect the cup-shaped member 24 and cover 26. The thus arranged cover 26 closely fits the cup-shaped member 24 to enclose the latter for sealing the operating mechanism proper, except for an opening through which only the hammer 17 protrudes. The operating mechanism, however, is sealed from this hammer opening by the provision of a mounting plate 28.

The mounting plate 28 is flush with the outer periphery of the cup-shaped member 24. The mounting plate 28 is mounted in this fashion through the provision of three feet or posts similar to the one identified by the reference character 24^b integral with the member 24 and defined to receive and support the plate 28. The three supporting feet formed have pins 24^c at the ends to be received in the openings 28^a for the mounting plate 28 and which pins secure the mounting plate to the cup-shaped member 24 when their ends are suitably peened. The mounting plate 28 not only seals off the operating mechanism within the chamber but also cooperates with an upraised portion 26^a defined on the cover 26 to define a hammer chamber wherein the hammer 17 rotates.

It will now be seen that any operating mechanism housed within this sealed chamber will be free of corrosives in the ambient air and will not allow insects to enter.

The operating mechanism enclosed within the above-described sealed chamber when a spring motor for providing a constant torque is employed includes the illustrated storage drum 30 having a rotatably mounted shaft 32. The storage drum shaft 32 is rotatably mounted between the cup-shaped member 24 and the mounting plate 28 through the provision of a socket defined on the cup-shaped member 24 to rotatably receive the storage drum shaft 32 and which shaft has its opposite end defined with a socket to receive a pin provided on the adjacent side of the mounting plate 28 (not shown). A commercially available constant tension spring 34 is wound on the storage drum 30 and which storage drum normally stores the spring when the alarm 10 is rendered inoperative. The essential characteristic of the spring 34 is that it provides a constant torque throughout its entire length to thereby provide a constant driving action. The spring 34 is mounted on the storage drum 30 in a manner whereby when it is unwound therefrom it will quickly return thereto.

A drive drum 36 mounted adjacent to the storage drum 30 is connected with an end 34^a of the spring 34; see FIG. 4. The drum 36 is mounted on a rotatable shaft 38 journaled in the same general fashion as the storage drum 30. The drive drum shaft 38 is rotatably positioned in a socket on the cup-shaped member 24 (see FIG. 3) and extends therefrom through the mounting plate 28 and the cover 26 to receive the winding knob 16; see FIG. 3. The cover 26 is defined with a socket 26^b arranged adjacent the raised portion 26^a to receive the winding knob 16 which is connected to the drive drum shaft 38 by means of a screw 40 threaded thereto. The rotation of the knob 16 will cause the spring 34 to be unwound from the storage drum 30 and onto the drive drum 36 to place the alarm 10 in an operating condition. A drive gear 42 is mounted on the rotatable shaft 38 intermediate the drive drum 36 and the winding knob 16 within the sealed chamber to be rotatable therewith. The unwinding of the spring 34 from the drive drum 36 will cause the shaft 38 to rotate and thereby rotate the drive gear 42. The drive gear 42 is arranged in driving engagement with the splined end of a stub shaft 44 mounting an intermediate or transmitting gear 46 rotatable therewith. This transmitting gear 46 is defined to step up the rotary speed of the drive gear 42 and includes a stop member or lip 46^a defined integral therewith on the face adjacent the bell 12.

The drive drum shaft 38 may also be arranged to mount a control mechanism to lock the gearing and thereby the hammer when the spring 34 is being wound onto the drive drum 36. This control mechanism may be a ratchet 37 mounted to be rotatable with the drive shaft 38 cooperating with a detent 39 mounted on the drive drum 36 and engaging the ratchet 37. It will be recognized that this mechanism will prevent the driving of the gearing and hammer while the spring 34 is being wound onto the drive drum 36 but yet allows the driving of the hammer when the spring 34 is being unwound from the drive drum 36.

The hammer 17 is mounted to be rotated by a stub shaft 48 having a splined end arranged in driving relationship with the transmitting gear 46. The hammer 17 is defined by means of a pair of spaced arms 50 and 52, one of which is defined with a pair of pins adjacent the opposite ends to be received in suitable apertures in the other arm, as shown in FIG. 3. The arm 50 is defined with the pins 50^a to be received in a suitable aperture of the arm 52; as shown in FIG. 3. The pins 50^a mount hammerheads 54 in a very loose relationship. This arrangement is clamped together by the provision of a screw threaded into the end of the shaft 32.

The hammerheads 54 are tubular members having a large internal diameter relative to the diameter of the pins 50^a whereby they will move outwardly relative to the arms 50 and 52 under the influence of centrifugal force and inwardly in response to an inwardly directed force. The hammer 17 is mounted over the mounting plate 28 and within the hammer chamber whereby the heads 54 may extend beyond the outer peripheral edge of the cup-shaped member 24 so as to engage the striking pin 12^a to sound the bell 12; see FIGS. 2, 3, and 4.

It should be noted that this hammer and bell arrangement is useful to provide a governing action to control the release of the stored energy of the spring. The action of the hammerheads 54 upon striking the pin 12^a and traveling beyond the pin under the urging of the spring

is such as to govern or delay the release of the energy stored in the spring. This coaction causes the energy of the spring to be released at a lower rate and the speed of the hammer 17 to be reduced relative to a bell not provided with a striking pin. This governing action causes the bell 12 to be sounded over a longer period of time for a given length of spring, whether the spring be a coiled spring, constant tension spring or otherwise. Accordingly, a long sounding period may be provided with a length of spring readily housed within the bell proper.

The operating control means for sounding the alarm 10 includes the control pin 22 and the heat sensitive latch 20. The control member 22 is arranged with a spring 62 seated in a central socket for the cup-shaped member 24 and abutting a shoulder defined intermediate the ends of the pin whereby the spring constantly urges the control pin through the central aperture for the cup-shaped member 24 and on the outside of the bell 12. The stop member 46[a] is located on the transmitting gear 46 whereby it will be rotated into engagement with the control pin 22 when the latter is in a depressed position. This depressed or locked position is achieved by securing the latch 20 between the clips defined on an ornamental star 64 mounted on the outside face of the bell 12. The star 64 is secured to the bell 12 by means of a pair of screws connected to the cup-shaped member 24. The latch 20 when clipped forces the control pin 22 to the depressed position whereby the transmitting gear is prevented from rotating until the control pin 22 is positioned out of the path of the gear 46.

The relative location of the spring 34, that is, whether it is stored on the storage drum 30 or on the drive drum 36 is indicated through the provision of the flag 18. The flag 18 is mounted to be rotatable with a shaft 65 carrying a sensing arm 68 adjacent its other end. The shaft 65 extends through the mounting plate 28 and the cover 26. This exposed end of the shaft 65 is threaded to secure the flag 18 thereto by means of a screw. A biasing spring 67 is wound around the portion of the shaft 65 extending between the mounting plate 28 and the cover 26 to urge the spring sensing arm 68 continuously against the outer wrap of the spring 34 wound on the storage drum 30. The sensing arm 68 arranged in this fashion also functions as a stop to prevent the winding of spring 34 in such a manner so as to disengage it from drum 30 and from deforming it by reverse bending. The flag 18 is in this manner positioned to be within the outer peripheral edge of the bell 12, when the spring 34 is completely wound on the drive drum 36 and is rotated outwardly beyond the peripheral edge of the bell 12 when the sensing arm 68 is moved away from the storage drum 30 as a result of the spring 34 being rewound thereon; as shown in FIG. 2 in dotted outline. The flag 18 may be marked with a legend such as "Rewind" to indicate even more readily the condition of the alarm.

A mounting clip 70, as shown in FIG. 1, is connected to the cover 26 by means of a pair of screws over the socket 26[b] defined for the winding knob 16. This mounting clip 70 allows the alarm 10 to be readily mounted and dismounted in either a horizontal or vertical position.

With the above structure in mind, the operation of the alarm 10 will now be described assuming the latch 20 is a heat sensitive element selected to deform at an elevated temperature in a manner to allow the control pin 22 to disengage the transmitting gear 46. The spring 34 is manually wound onto the drive drum 36 by rotating the knob 16. The flag 18 at this time will be rotated within the periphery of the bell 12 and therefore not visible when the spring 34 is stored on the drum 36. When the ambient temperature of the room in which the alarm 10 is to protect reaches a preselected elevated temperature, the latch 20 will allow the control pin 22 to disengage the transmitting gear 46 and thereby allow the spring 34 to wind back onto the storage drum 30. The unwinding of the spring 34 from the drive drum 36 provides the rotary driving action of the drive gear 42. The rotation of the drive gear 42 drives the stub shaft 44 which in turn rotates the intermediate gear 46. Since the control pin 22 is disengaged from the transmitting gear 46 this driving action is coupled to the shaft 48 for driving the hammer 17. The hammer 17 is then rotated at a high speed whereby the hammerheads 54 are driven to their outer extreme under the influence of centrifugal force and upon being rotated into engagement with the sounding pin 12[a] strike it a glancing blow, are then forced inwardly by the pin 12[a], and in passing by the pin, once again are forced outwardly under the influence of centrifugal force; see FIG. 2. This glancing blow of the sounding pin 12[a] is effective to loudly sound the bell 12. The hammer 17 continuously sounds the bell in this fashion as the hammerheads 54 are rotated to strike the pin 12[a]. This sounding action continues at high speed and at the same loudness until the spring 34 is wound back on the storage drum 30. After the spring 34 is relocated on the storage drum 30 the sensing arm 68 will have moved the flag 18 to indicate a rewind is necessary. It should be noted that this rewind signal provided by the flag 18 is in addition to the indication of the condition of the alarm which is revealed by the condition of the latch or heat sensitive element 20.

The continuous sound of the bell 10 in this fashion has been arranged to provide an extremely loud sound level of a nature readily distinguished by a normal sleeper from other environmental sounds emanated by sirens, telephones, buzzers, whistles, doorbells and the like. The bell 10 provides this continuous sound for many minutes.

What is claimed is:

1. An alarm comprising a bell having a sounding pin formed integral therewith, a sealed sub-assembly substantially housed within said bell comprising a cup-shaped member and a cover member enclosing the latter, a storage drum rotatably mounted in said sub-assembly for storing a spring, a constant tension spring normally stored on said storage drum and adapted to return to same when unwound therefrom, a drive drum rotatably mounted in said sub-assembly and having one end of the spring connected thereto for winding the spring onto same from said storage drum, a hammer having movable sounding heads at opposite ends thereof and rotatably mounted in said sub-assembly adjacent the sounding pin to allow a sounding pin to extend outwardly therefrom for striking the pin, step-up transmission gearing mounted in said sub-assembly in a driven relationship with said drive drum to be responsive to the rotation of same provided by the unwinding of the spring from said drive drum and having a driving connection with the hammer for continuously driving same at a constant rate throughout substantially the whole length of the spring, means mounted externally of said sub-assembly and connected to the drive drum for winding the spring thereon, and control means extending outwardly of said sub-assembly and said bell engageable and disengageable with the gearing to selectively control the operation of the gearing, and latch means mounted on the bell operable to lock and unlock the control means into and out of engagement with the gearing to selectively control the sounding of the bell.

2. An alarm as defined in claim 1 wherein said latch means includes a heat sensitive element visibly mounted on the bell to be completely exposed to the ambient air and engageable with the control means to position the latter into engagement with the gearing at normal ambient temperatures and responsive to a preselected ambient temperature to disengage the gearing.

3. An alarm comprising a bell having a sounding pin formed integral therewith, a constant tension spring ,a storage drum rotatably mounted for storing said spring, a drive drum rotatably mounted and having one end of the spring connected thereto for winding the spring onto same from said storage drum, means connected to the

drive drum for winding the spring thereon, a rotatably mounted hammer having a pair of striking heads loosely mounted thereon, said hammer being mounted adjacent the sounding pin for striking the pin and thereby sounding the bell, transmission gearing mounted in a driven relationship to be responsive to the rotation of said drive drum provided by the unwinding of the spring therefrom and having a driving connection with the hammer for rotating same at a constant rate, said gearing including at least a single gear having a stop member defined thereon, and control means engageable and disengageable with the stop member for locking and unlocking the transmission gearing to selectively control the sounding of the bell.

4. A fire alarm comprising a bell, a rotatable drum having a constant tension spring wound thereon, a rotatable drive drum connected with one end of the spring, means connected to said drive drum for manually winding the spring thereon, a rotatable hammer for sounding the bell, gearing arranged in a driven relationship with said drive drum to be responsive to the unwinding of the spring therefrom and in a driven relationship with said hammer for continuously rotating same at a substantially constant rate to thereby sound the bell, and heat sensitive control means operatively connected with said gearing to control the unwinding of the spring from the drive drum.

5. A fire alarm as defined in claim 4 including a separate housing for sealing said rotatable drums including the spring and the gearing from corrosive environments.

6. A fire alarm as defined in claim 5 including means

responsive to the length of spring wound on the storage drum for visually indicating the operating condition of the alarm.

7. A fire alarm including a bell having a striking pin formed integral therewith; a sealed sub-assembly substantially housed within the bell comprising a rotatable hammer extending therefrom for sounding the bell, and spring means connected to said hammer for continuously rotating same; said hammer having an arm loosely mounting striking members adjacent each end of the arm, the striking members being mounted on the arm whereby upon rotation of the hammer under urging of the spring means the members move relative to the arm into the path of the striking pin to strike the bell a glancing blow and are moved out of the path of the pin by the pin to govern the release of energy stored in the spring and thereby extend the length of time the bell is sounded, and heat sensitive control means within the sealed sub-assembly connected to the spring means for controllably actuating the release of energy from said spring means.

References Cited in the file of this patent

UNITED STATES PATENTS

565,306	Strain	Aug. 4, 1896
815,111	Meyers et al.	Mar. 13, 1906
1,415,207	Swanberg	May 9, 1922
2,625,902	Sorensen	Jan. 20, 1953
2,871,815	Krieger	Feb. 3, 1959

FOREIGN PATENTS

526,262	France	June 28, 1921