Oct. 26, 1965 E. CIELASZYK 3,213,603

ALARM DELAY MECHANISM FOR ALARM CLOCK

Filed March 4, 1964 4 Sheets-Sheet 1

Fig. 1

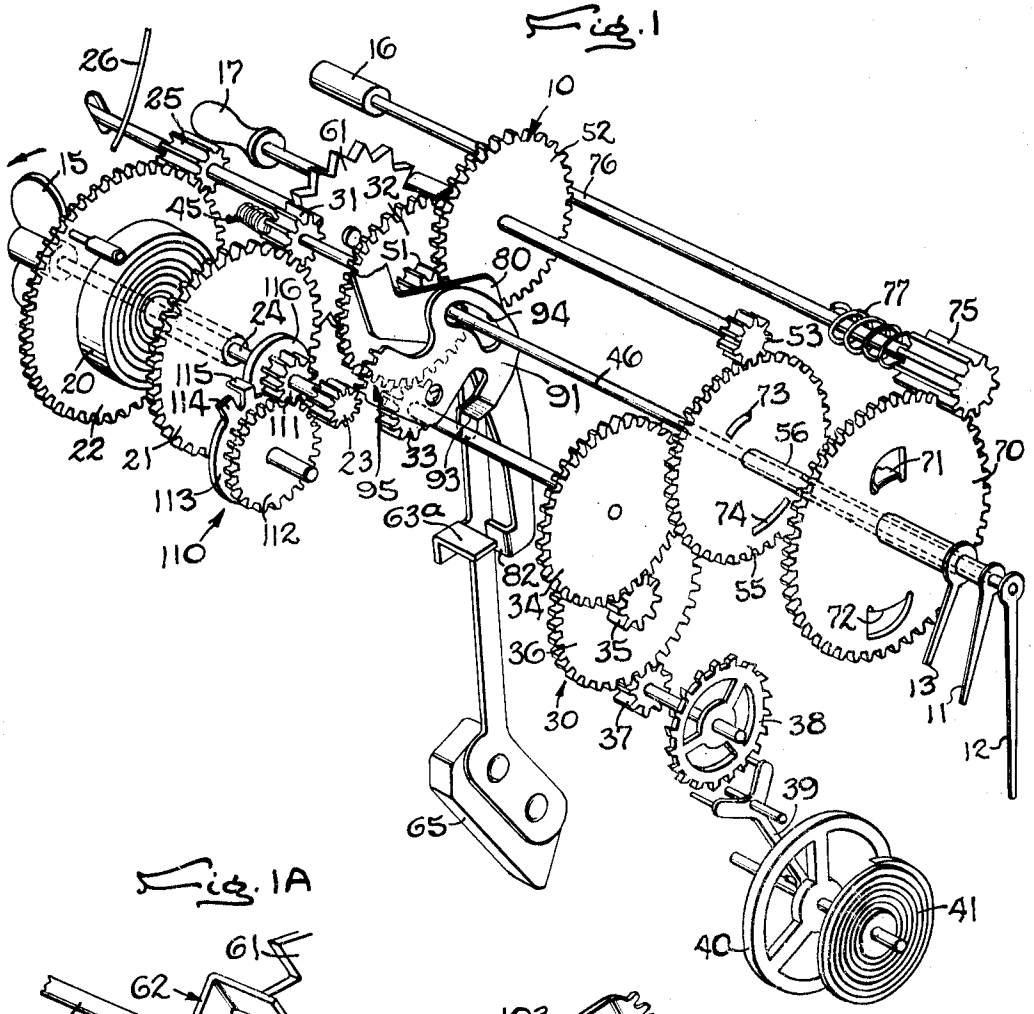
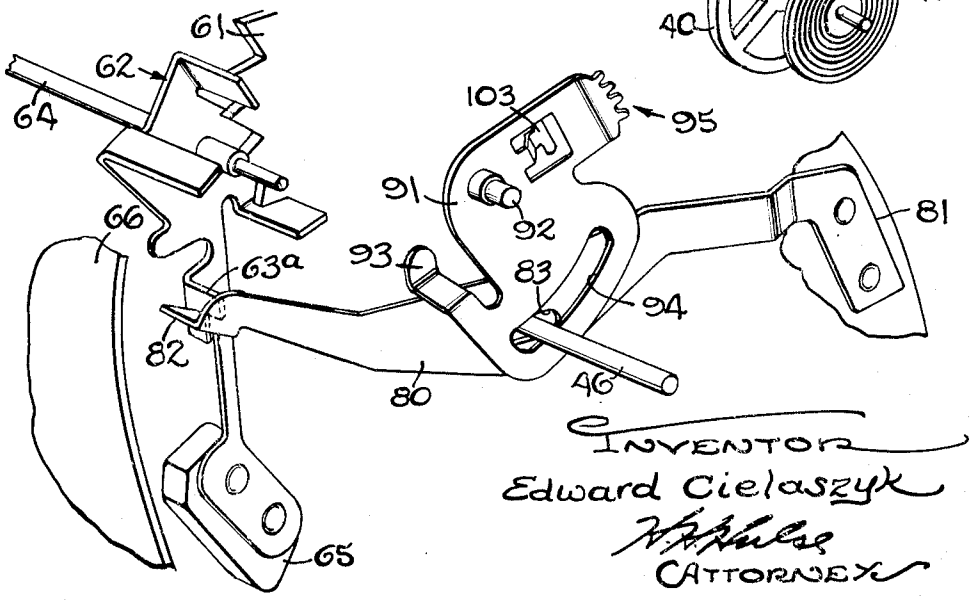


Fig. 1A



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ALARM DELAY MECHANISM FOR ALARM CLOCK

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Fig. 2A

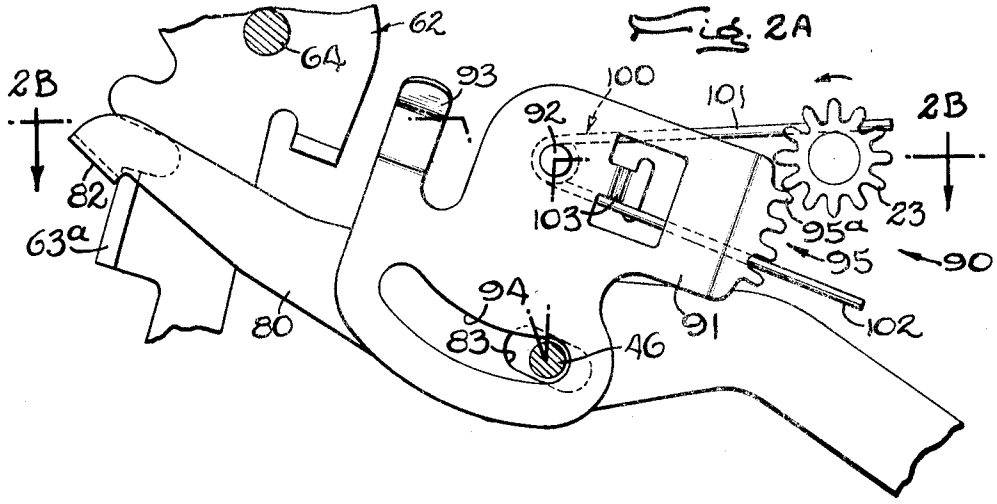


Fig. 2B

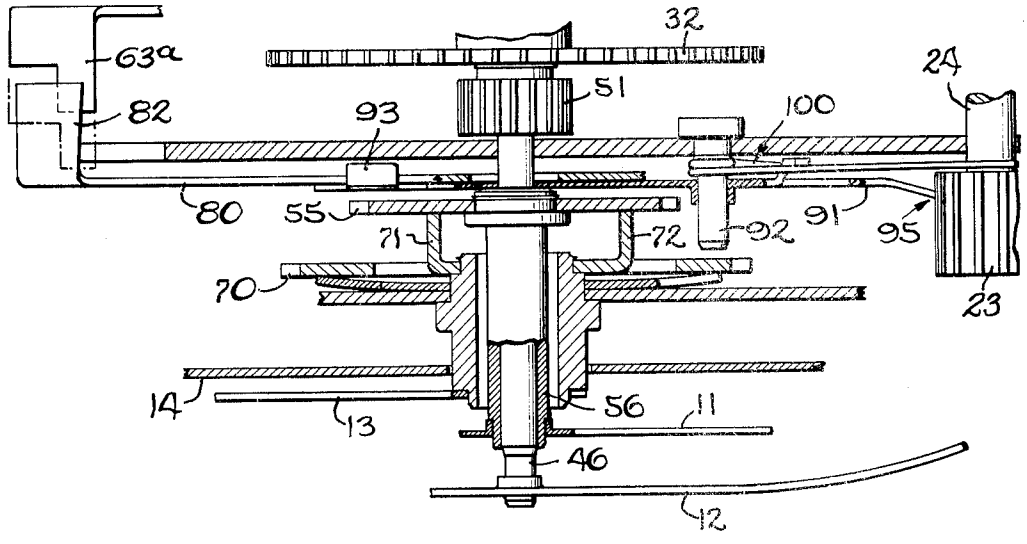
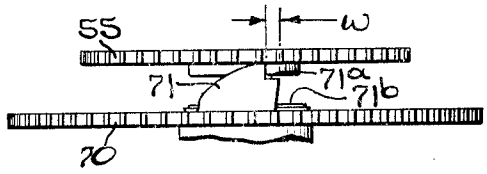


Fig. 2C



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ALARM DELAY MECHANISM FOR ALARM CLOCK

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Fig. 3A

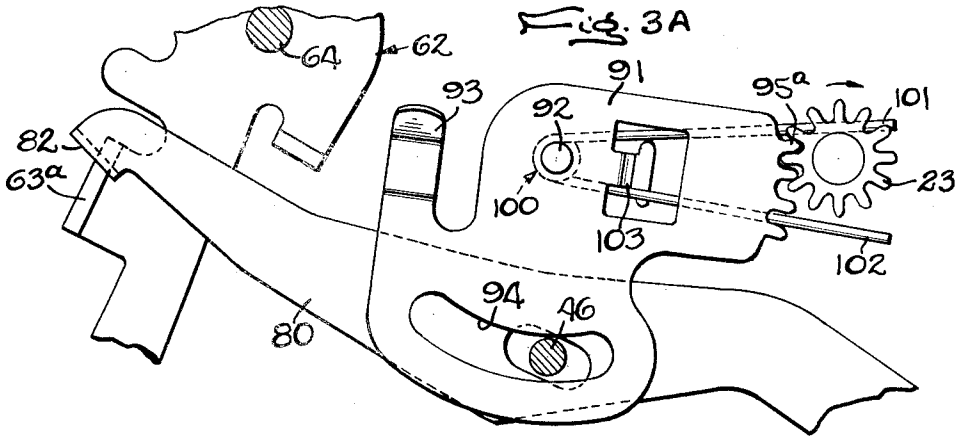
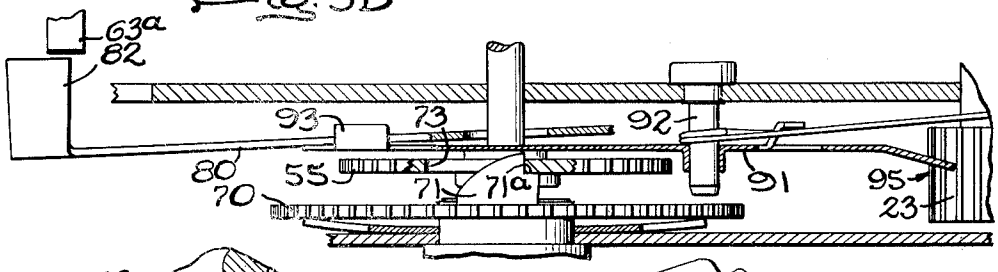


Fig. 3B



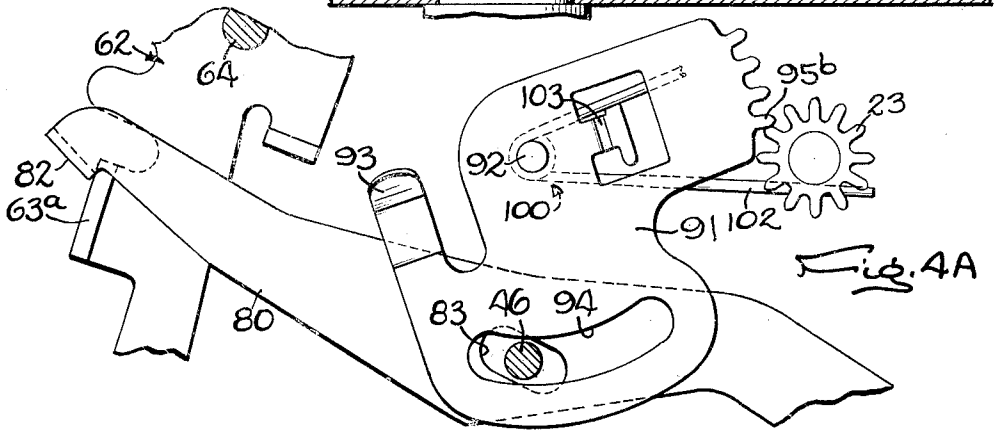
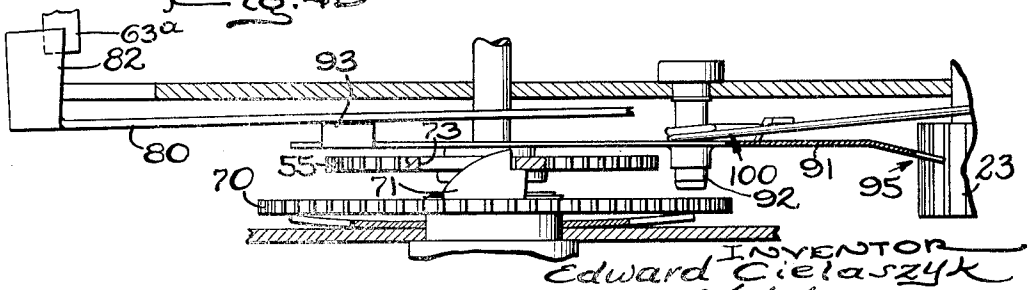


Fig. 4A

Fig. 4B



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ALARM DELAY MECHANISM FOR ALARM CLOCK

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Fig. 5A

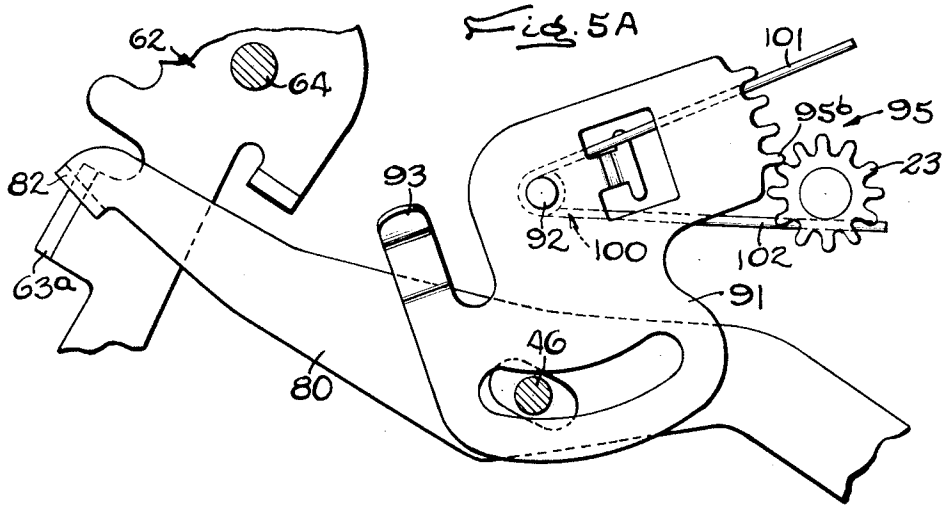


Fig. 5B

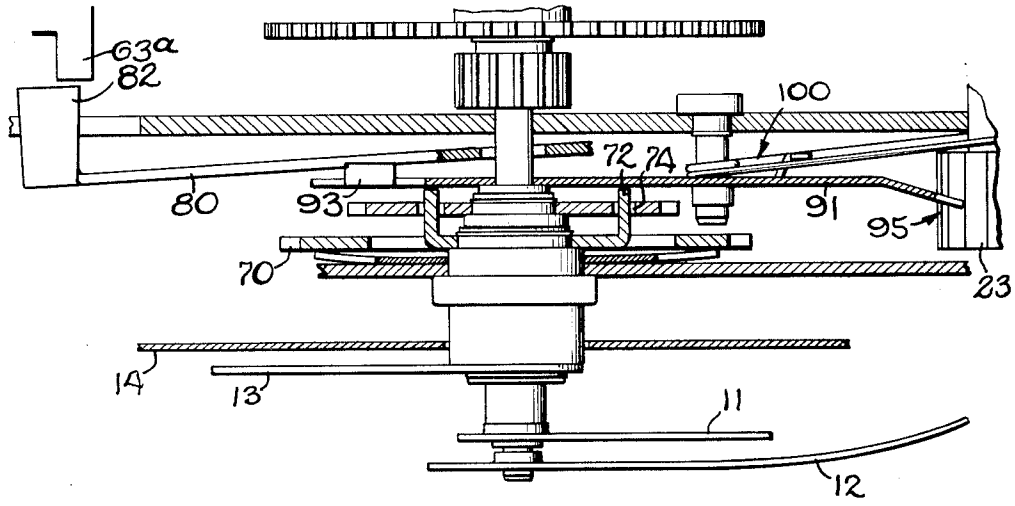
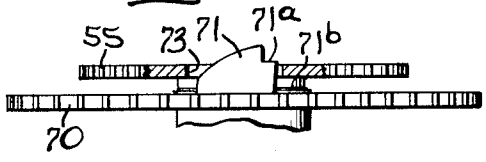


Fig. 5C



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3,213,603

ALARM DELAY MECHANISM FOR ALARM CLOCK

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Filed Mar. 4, 1964, Ser. No. 349,236
8 Claims. (Cl. 58—18)

The present invention relates to alarm clocks and more particularly to means for providing a programmed alarm cycle.

A popular feature of alarm clocks permits the user to sleep five or ten minutes after the alarm initially sounds. This may be accomplished by pressing a control on the clock shutting off the alarm and setting up a delay cycle or the alarm cycle itself may be programmed within the clock to provide a few seconds of initial ringing followed by about ten minutes of silence before a sustained alarm is sounded. It is to programmed alarm mechanisms of this type that the present invention is directed.

Thus it is an object of the invention to provide an alarm clock having an improved mechanism for programming a short initial ringing of the alarm which is automatically terminated and which is followed, after a delay time interval, by the main or sustained ringing of the alarm. It is another object of the present invention to provide an alarm program mechanism which is accurate and reliable and in which the initial ringing interval and delay interval may be predetermined with a higher order of accuracy than is usually possible in an inexpensive alarm clock. In one of the aspects of the invention it is an object to provide a timing device embodied in an alarm of the vibrated clapper type in which the vibrated clapper serves as the escapement for the accurate timing of the interval and in which the length of the interval may be readily changed simply by changing the length of a drive segment.

It is another object of the present invention to provide an alarm program mechanism which is extremely simple, is long wearing and proof against misuse, and which may be added with only nominal expense to existing designs of spring wound alarm clock mechanisms.

Other objects and advantages of the invention will become apparent upon reading the attached detailed description and upon reference to the drawings in which:

FIGURE 1 is a perspective view of a clock mechanism employing the invention, partly distorted and with portions broken away to reveal the internal construction.

FIG. 1A is a fragmentary perspective showing the clapper and trip spring.

FIG. 2A is a fragmentary face view showing the trip member and associated shift segment following winding and prior to ringing of the alarm.

FIG. 2B is a transverse section taken along the line 2B—2B in FIG. 2A.

FIG. 2C is a fragmentary side view of a dropoff cam.

FIGS. 3A and 3B correspond to FIGS. 2A and 2B, showing the effect of dropoff at the first step of the dropoff cam, with the trip member released and with the alarm initially ringing.

FIGS. 4A and 4B are views corresponding to FIGS. 3A, 3B, but showing the position of the shift segment at the end of its motion and with the trip member cammed to its silencing position to begin the delay interval.

FIGS. 5A and 5B correspond to FIGS. 4A, 4B but show the positions of the members upon dropoff at the second step of the dropoff cam and with the trip member finally released for sustained ringing of the alarm.

FIG. 5C is a fragmentary view of the dropoff cam similar to FIG. 2C but showing final dropoff.

While the invention has been described in connection with a preferred embodiment, it will be understood that

I do not intend to be limited to the embodiment shown but intend to cover various alternative and equivalent constructions included within the spirit and scope of the appended claims.

Turning now to FIG. 1 there is shown an alarm clock **10** incorporating the present invention having an hour hand **11**, a minute hand **12** and a settable indicator hand **13** arranged in front of the usual dial or bezel **14**, only a portion of which is shown. For the purpose of winding the clock a winding key **15** is provided. A setting knob **16**, as will be seen, serves to set the timekeping hands **11**, **12**, as well as a settable indicator **13**. An adjacent alarm disabling button **17** performs the function of turning the alarm off after it has served its purpose, it being understood that the button **17** remains in its pulled-out position during the normal operation of the clock and during the alarm cycle to be described.

Certain portions of the clock mechanism shown in FIG. 1 will be recognized by one skilled in the art as conventional and it will thus suffice to describe such portions briefly. In the preferred embodiment a single spring **20** is employed for driving the clock train and for powering the alarm mechanism, the spring having its inner end connected to a driving train output gear **21** and its outer end connected to an alarm output gear **22** which is preferably of shallow cup shape to contain the spring. The alarm output gear **22** is rigidly connected to an alarm output pinion **23** by a shaft **24**, the shaft also serving as a winding stem supporting the key **15**. To provide a ratchet for the spring **20**, the alarm output gear **22** engages an alarm drive pinion **25** which is floatingly mounted and spring pressed into meshing position by a ratchet biasing spring **26**. Thus when the key **15** is rotated in the direction shown, the alarm output gear **22** rotates, coiling the spring **20**, the inner end of which is held stationary by the drive train output gear **21** and with retrograde motion being prevented by the ratcheting pinion **25**. The special function of the alarm output pinion **23** during winding will be discussed in detail at a later point.

A drive train, generally indicated at **30**, serves to couple the output gear **21**, associated with the spring, to the escapement mechanism. Thus the output gear meshes with a pinion **31** coupled to a minute wheel **32**. Meshing with the wheel **32** is a first intermediate pinion **33** secured to a first intermediate gear **34**. The latter in turn meshes with a second intermediate pinion **35** secured to a second intermediate gear **36**. Meshing with the latter is an escapement pinion **37** on an escapement wheel **38**. The latter has an associated pin lever **39** under the control of a balance wheel **40** having the usual hair spring **41**. It will be apparent, then, that with the spring balance properly adjusted the minute wheel **32** will turn at a timed rate, with the energy for the system being furnished by the spring **20**. For the purpose of connecting the minute wheel **32** to the minute hand **12** there is provided, at the rear end of the minute shaft **46**, a slip clutch **45** of the coil spring type.

For driving the hour hand, a stepdown connection is provided including a pinion **51** on the minute shaft meshing with a motion gear **52**. The motion gear has a pinion **53** which meshes with an hour wheel **55** and which is connected by a hollow shaft **56** to the hour hand **11**. The stepdown gearing is of the usual 12:1 reduction ratio.

As stated, the alarm mechanism is powered by the same spring which drives the timing train. Thus, as shown in FIG. 1, the ratcheting pinion **25**, which meshes with the alarm output gear **22**, drives a star wheel **61** cooperating with an escapement **62** secured at one end of a clapper arm being pivoted at **64** on the stem of the alarm disabling button **17**. The clapper **65** at the end of the arm cooperates with a bell **66** which may be of the usual cup-shape partially enclosing the mechanism.

For the purpose of triggering the alarm at preset time, an indicator wheel 70 is used which is coaxial with the hour wheel 55 and which is provided with a pair of diametrically arranged dropoff cams 71, 72 registering with dropoff openings 73, 74 formed in the hour wheel. The indicator wheel 70 is coupled by means of a short collar to the alarm indicator 13 in order to indicate the point of dropoff. The indicator wheel 70 is set by a setting pinion 75 on a setting stem 76, the pinion being biased toward the wheel by a spring 77. By pulling the setting knob 16 outwardly, the pinion 75 may be engaged with the motion gear 52 for setting the clock hands, the setting movement being accommodated by the slip clutch 45.

Means are provided for causing the cams 71, 72 to drop into the openings 73, 74 arranged to receive them when the preset time is reached to effect release of the alarm clapper for sounding the alarm. For this purpose the hour wheel 55 is mounted for endwise movement and a trip spring 80 is provided which not only biases the hour wheel 55 but also provides followup movement for release of the clapper. Thus the member 80, which is in the form of an elongated leaf spring, is anchored at its base end 81 to the clock frame, the tip of the member being transversely bent to form a clapper engaging portion 82 which cooperates with a laterally bent lug 63*a* on the clapper arm. At the middle of the trip spring 80 a central clearance hole 83 is provided for clearing the shaft 46.

Briefly stated, when the trip spring 80 is in its rearwardly pressed position, as it is when the cams 71, 72 are riding "high" on the surface of the hour wheel 55, the portion 82 of the spring obstructs the lug 63*a* on the clapper arm maintaining the alarm silent. However, when the hour wheel 55 is gradually rotated around in a clockwise direction upon passage of time, the point of dropoff is reached so that the cams 71, 72 drop into the openings 73, 74 accompanied by forward movement of the hour wheel 55 and forward movement of the trip spring 80 thereby retracting the tip 82 of the spring away from the clapper arm to the position shown in FIG. 3B and allowing the clapper to strike the bell 66.

In a conventional alarm clock construction, the clapper once triggered, continues to ring the alarm until the shutoff plunger is pressed inwardly by the user of the clock or until the spring, which powers the alarm mechanism fully unwinds. However, in accordance with the present invention means are provided, responsive to the rotation of the spring output pinion which accompanies the ringing of the alarm, for shutting off the alarm after ringing for only a few seconds. Means are further provided for again turning on the alarm after a delay time interval of suitable duration, which may be on the order of 8–10 minutes, in order to give the user of the clock this much additional "sleep." More specifically in accordance with the invention, a dropoff cam is employed having a first relatively shallow step which, upon dropoff, moves the trip spring sufficiently to release the alarm, with the resuting rotation of the spring output pinion being utilized to move a shift sector for restoring the trip spring to its initial, disabling position. Moreover, the dropoff cam has a second, relatively deep, step which drops off several minutes later and which results in sustained ringing of the alarm. Thus referring to the drawings and particularly to FIGS. 2A and 2B, I have provided a program mechanism 90 which includes a shift segment 91 in the form of a flat plate of metal which is pivoted on a stud 92 and having a cam 93 which is normally clear of the trip spring 80 but which, upon rocking of the shift segment about its pivot is brought into camming engagement with the trip spring to restore the same to its alarm-disabling position. An arcuate slot 94 in the member 91 serves to "clear" the minute shaft 46. For the purpose of rotating the shift segment upon initial triggering of the alarm, the shift segment has a toothed segment or rack 95 which meshes with the spring output pinion 23. The toothed segment is sufficiently short so that its entire width is traversed by the pinion 23 in only a few seconds' time.

Means are provided for enabling the output pinion, which engages the segment, to rotate far beyond the range of the segment incident to winding the clock and incident to the sustained ringing out of the alarm, with the excess movement of the pinion being idle as far as the shift segment is concerned. Thus in accordance with one of the aspects of the invention, a centering spring is provided which urges the toothed segment into a centered position with respect to the spring output pinion so that when the latter rotates beyond the range of the segment in either direction the additional rotation simply produces idle "clicking" of the segment and the segment is not driven beyond its intended range. In the present instance, the centering action is brought about by use of a hairpin spring 100 which has its apex coiled about the stud 92 and which has legs 101, 102 which are biased inwardly against the shaft 24 of the spring output pinion 23. The legs of the spring are prevented from springing inwardly by means of a stop member 103 formed on the shift segment 91. It will be apparent, then, that the shift segment tends to remain in its alined position so that when the spring output pinion 23 is rotated in either direction beyond the range of the segment, the final tooth of the segment will, nevertheless, remain in engagement with the pinion, clicking idly as the pinion rotates but in readiness for meshed engagement with the pinion when the pinion rotates in the opposite direction.

The operation of the program mechanism 90, and particularly the shift segment 91, will be apparent upon review of the stop motion diagrams set forth in FIGS. 2A–5A and the corresponding FIGS. 2B–5B respectively. Thus, referring first to FIGS. 2A, 2B, the condition there shown is that following the winding of the clock, for example, the evening before the alarm is to ring. The dropoff cam 71 on the indicator wheel 70 is out of register with the opening 73 in the hour wheel so that the hour wheel occupies a high riding position in which the trip spring 80 is pressed inwardly with the tip 82 blocking the movement of the clapper (FIG. 1A). Since the spring output pinion 23 is secured to the end of the winding stem, and since the winding stem is rotated counterclockwise, as viewed from the front of the clock, it is apparent that the winding will have the effect of depositing the shift segment in its lower or cocked position and with idle clicking occurring at the end tooth 95*a* of the segment until the spring 20 is fully wound. Under such conditions the cam 93 on the shift segment is in its retracted or "clear" position.

In carrying out the invention, the dropoff cams, as shown in FIG. 2C have first and second steps of dropoff, the cam 71 thus having a shallow step 71*a* and a deeper step 71*b*. Accordingly, when the set time is reached, initial dropoff occurs as shown in FIGS. 3B and 4B, resulting in limited endwise movement of the hour wheel 55 and with followup movement of the trip spring 80 in the releasing direction. This retracts the tip 82 of the trip spring from the clapper, allowing the clapper to vibrate against the bell 66 upon rotation of the star wheel 61. As the spring 20 unwinds, accompanied by rotation of the alarm output gear 22, the shaft 24 on which the output gear 22 is mounted rotates thereby rotating the alarm output pinion 23 clockwise. Since the end tooth 95*a* of the segment is in engagement with the pinion, the segment immediately meshes with the pinion and begins to rotate in the counterclockwise direction. As shown in FIG. 3A, the segment is at the mid position of the pinion and moving toward the end condition set forth in FIG. 4A. During the last portion of the counterclockwise movement of the shift segment, the cam surface 93 engages the trip spring, camming it rearwardly in the alarm disabling direction. This causes the tip 82 of the trip spring to be gradually moved from the position shown in FIG. 3B to the position in which the clapper is engaged and immobilized.

As the shift segment approaches the end of its range, the final tooth **95***b* of the segment remains in clicking engagement with the pinion **23** under the urging of the leg **102** of the centering spring **100**. With the clapper immobilized there is no further rotation of the pinion **23**. The alarm is thus disabled after ringing only a few seconds, and the shift segment, in the condition shown in FIGS. 4A, 4B, has thus performed its function. The alarm star wheel **61** and its escapement lever **62**, in addition to powering the clapper, perform the incidental function of measuring out, rather accurately, a short space of time on the order of a few seconds. Thus the period during which the alarm initially sounds may be accurately predetermined simply by varying the width, i.e., the number of teeth in segment **95** and the degree of overlap of the tip **82** with respect to the lug **63***a* of the clapper.

It may be noted that, unlike certain alarm delay mechanisms intended for the purpose of giving the user an additional period of sleep, the present mechanism is entirely automatic and does not require the user to touch any control member on the clock in order to initiate the delay interval.

Upon expiration of the delay interval, relative movement of the hour wheel **55** occurs permitting dropoff at the second step **71***b*. The delay interval, which is preferably on the order of 8–10 minutes, is determined by the distance *w* between the first step **71***a* and the second step **71***b* (see FIGS. 2C and 5C). When dropoff at the second step occurs, the parts occupy the position shown in FIGS. 5A, 5B. After dropoff at the final step **71***b*, the hour wheel **55** is in its fully advanced position and followup movement of the trip spring **80** results in retraction of the tip **82** of the trip member from the clapper, freeing the clapper for vibration against the bell **66**. It may be noted in FIG. 5B that this freeing action occurs notwithstanding the fact that the cam **93** on the shift segment **91** is still in its active camming position. Thus it is important that the second step **71***b* have a step which is greater than the throw of the cam **93** on the shift segment so that the action of the cam **93** is, in effect, overpowered or nullified to produce sustained ringing.

To summarize, then, the first step **71***a* on the dropoff cam initiates ringing of the alarm which initiates rotation of the spring output pinion **23** and which causes movement of the shift segment **91** resulting in the cam **93** of the latter restoring the trip spring **80** to its disabling position after a few seconds' ringing. Then, when dropoff occurs at the second step **71***b*, movement of the hour wheel, and the followup movement of the trip spring, produces final release of the clapper, notwithstanding the then position of the shift segment, until the alarm is manually shut off or until the spring which powers the alarm runs out. In the present clock, manual shutoff is achieved by pressing the shutoff plunger **17** which causes the whole clapper arm **63** to be moved inwardly so that the lug **63***a* thereon moves into disabling engagement with respect to the tip **82** of the trip spring.

Means are provided for limiting the sustained sounding of the alarm in the event that the disabling plunger is not operated, which is particularly desirable where the energy for driving the clock train and for driving the alarm are both obtained from a single spring. Thus a rotation limiting means **110** is provided including a pinion **111** coupled to the output pinion **23** and an idler **112** meshing therewith. Frictionally coupled to the idler **112** is a disabling disc **113** having a dog **114**. Briefly stated, when the idler rotates through a full revolution, the dog **114** on the disc **113** drops into blocking engagement with the teeth of the pinion **111** preventing any further rotation in that direction. This limits the final ringing of the alarm to an amount which depends upon the relative pitch diameters of the pinion **111** and idler **112** and which may be on the order of a half minute. For the purpose of causing the dog to be active in only one direction, i.e., the direction of unwinding movement of the pinion **111**, the disabling disc **113** is provided with a shielding lug **115** on one side of the dog and which is laterally bent to cooperate with a small diameter hold-off disc which forms a part of pinion **111**. Thus during winding of the clock the shielding lug **115** engages the hold-off disc **116** preventing the dog **114** from acting. Since there is no shielding lug on the opposite side of the dog, the dog is fully operable to produce limited rotation for the unwinding direction of rotation of the pinion **111**.

After the alarm has been either manually or automatically shut off, further rotation of the hour wheel **55** causes the dropoff cams **71**, **72** to ride out of their registering openings thus restoring the hour wheel and indicator wheel to the spread apart condition illustrated in FIG. 2B. This movement is, however, idle as far as shut off is concerned. When the clock is next wound, for example, the following evening, the rotation of the spring output pinion **23**, which accompanies the winding, causes the shift segment to be meshingly engaged with the pinion so that the first rotation or two of the pinion causes the shift segment to be deposited, again, in the armed position illustrated in FIG. 2A in readiness to respond to ringing of the alarm the following morning. Since alarm clocks of the present type require winding once a day, this insures that the shift segment will be moved to its armed position each time without care or thought on the part of the operator. Thus the operation, including the meaurement of the initial ring interval and measurement of the delay interval, is both reliable and precise.

It is one of the noteworthy features of the present construction that the present invention may be incorporated in clocks of known design simply by adding a few mechanical elements and without requiring any substantial modification of the existing structure. Thus in the present instance the shift segments **91** is rotatably mounted on a small auxiliary stud **92** and interposed between the hour wheel **55** and the trip spring **80**. The teeth on the shift segment are tailored to mesh with teeth of a simple pinion **23** pressed on the end of the shaft **24** which forms an extension of the winding stem. The centering spring may be conveniently built into the shift segment as shown in the drawings. This leaves, as the only further requirement, provision for successive endwise movement of the hour wheel **55** at successive, slightly spaced conditions of register with the indicator disc **70**, which is achieved in the present instance by forming steps of dropoff on the dropoff cam. Accordingly it will be seen by one skilled in the art that the alarm programming and delay feature has been brought about by addition of elements costing but a few cents for manufacture and installation, a cost which is greatly outweighed by the automatic delay feature.

While the means for providing an accurately predetermined interval upon initial triggering of the mechanism has been here usefully applied in the programming of an alarm mechanism, nevertheless it will be apparent to one skilled in the art that the shift segment and its associated parts, shown and described herein, may be used, if desired, for performing other functions as, for example, the operation of electrical contacts without departing from the invention. As stated, since the star wheel and clapper mechanism is an escapement capable of measuring short intervals of time, and since the rotation of the shift segment is precisely proportional to the rotation of the star wheel, being driven from the same shaft, the present invention enables automatic measurement of a time interval with an inherent accuracy of a fraction of a second which may be desirable for more precise applications.

Also it will be apparent to one skilled in the art that while a dropoff cam having two steps constitutes a significant part of the present invention, nevertheless equivalent mechanism may be substituted at this point capable of responding to two successive conditions of register be-

tween the hour wheel, or timing train, on the one hand, and the indicator wheel, or other settable member, on the other, again without departing from the present invention.

Moreover, while the invention has been described in connection with obtaining an initial ringing on the order of a few seconds and an initial delay period on the order of a few minutes, it will be apparent to one skilled in the art that these times may be adjusted to the function to be performed and it is, as a matter of fact, one of the features of the present invention that the intervals may be predetermined over a wide range simply by adjusting the dimensions of the parts.

It will be further apparent to one skilled in the art that while the present construction includes a rockable shift member, it is not essential to the present invention that such member be rockable and, if desired, the toothed segment 95 could be in the form of a straight rack with the member 91 guided for straight line movement. However, rockable mounting for the shift segment 91 is preferred since this avoids necessity for guiding means and since it precludes the possiblity of binding and requires substantially no lubrication.

While the invention has been described in connection with a clock having a single spring for powering the driving train and alarm, it will be apparent that the invention is not limited thereto but is applicable to clocks in which separate springs are used and where the alarm spring has an output pinion for driving the shift segment.

In the following claims the reference to "indicating hands" is to the hands or other suitable time indicating means providing part of the clock. The terms "indicator wheel" and "hour wheel" are intended to refer to members which are stationary and driven respectively and which trigger the alarm upon achieving a position of register.

I claim as my invention:

1. In a clock, the combination comprising, a clock mechanism having an escapement and indicating hands together with an interposed drive train including an hour wheel, indicator wheel coaxial with the hour wheel, the hour wheel being relatively axially movable and biased with respect to the indicator wheel, a dropoff cam interposed between the indicator wheel and hour wheel and having a first dropoff step, an alarm mechanism including a spring having a spring output pinion and clapper, a trip member for the clapper normally occupying a clapper silencing position said trip member having means for moving the same from the silencing position in response to relative axial movement between the hour wheel and indicator wheel upon dropoff at the first step of the cam under the bias force existing between said wheels, means responsive to the resulting rotation of the spring output gear occurring incident to ringing of the alarm for a few seconds' duration for restoring the trip member to its silencing position for shutting off the alarm, said dropoff cam having a second step physically spaced from the first step by an amount corresponding to a delay time interval of a few minutes' duration for producing a second step of relative axial movement of the hour wheel for finally releasing the trip member and associated clapper for extending ringing of the alarm.

2. In a clock, the combination comprising, a clock mechanism having an escapement, indicating hands and an interposed driving train including an hour wheel, an indicator wheel settable with respect to the hour wheel, an alarm mechanism including a spring having a spring output pinion and clapper, trip means for maintaining the clapper normally silenced, means responsive to a first step of registration between the hour wheel and indicator wheel upon passage of time for releasing the trip means and associated clapper for initiating the ringing of the alarm, means responsive to the rotation of the spring output pinion accompanying a few seconds' ringing of the alarm for restoring the trip means to its silencing condition, means responsive to a second step of registration between the indicator wheel and the output wheel upon further passage of time and occurring a few minutes after said first step of registration for finally releasing the trip means for sustained ringing of the alarm.

3. In a clock, the combination comprising, a clock mechanism having an escapement and indicating hands together with an interposed drive train, a settable indicator wheel coaxial with the hour wheel, said hour wheel being relatively axially movable and biased with respect to the indicator wheel, a dropoff cam interposed between the indicator wheel and hour wheel having a first dropoff step, an alarm mechanism including a spring having a spring output pinion and clapper, a trip member associated with the clapper normally occupying a silencing position and responsive to the relative axial movement between the hour wheel and indicator wheel upon dropoff at said first step to release the clapper, a shift segment meshing with the spring output pinion, a cam interposed between the segment and trip member for restoring the trip member to silencing position upon predetermined limited rotation of the spring output pinion thereby limiting the initial ringing of the alarm to a few seconds' duration, said dropoff cam having a second dropoff step spaced from the first step by an amount corresponding to a delay time interval of a few minutes' duration for producing a second step of relative axial movement of the hour wheel for finally releasing the trip member for sustained ringing of the alarm.

4. In a clock, the combination comprising, a clock mechanism having an escapement and indicating hands together with an interposed drive train including an hour wheel, a settable indicator wheel coaxial with the hour wheel, the hour wheel being relatively axially movable and biased with respect to the indicator wheel, a dropoff cam interposed between the indicator wheel and hour wheel and having a first dropoff step, an alarm mechanism having a clapper, a spring having a drive train output gear coupled to the drive train and an alarm output pinion coupled to the alarm mechanism, a trip member normally occupying a clapper silencing position and responsive to relative axial movement between the hour wheel and the indicator wheel upon dropoff at the first step to release the clapper, a shift segment meshing with the alarm output pinion, a cam on the shift segment for camming the trip member back to silencing position, the shift segment having a limited number of teeth so that the initial ringing of the alarm is limited to a few seconds' duration, said dropoff cam having a second step spaced from the first step by an amount corresponding to a delay time interval of several minutes' duration for producing a second step of relative axial movement of the hour wheel for finally releasing the trip member for sustained ringing of the alarm.

5. In a clock, the combination comprising, a clock mechanism having an escapement and indicating hands together with an interposed drive train including an hour wheel, a settable indicator wheel coaxial with the hour wheel, said hour wheel being relatively axially movable and biased with respect to the indicator wheel, a dropoff cam interposed between the indicator wheel and hour wheel having a first dropoff step, an alarm mechanism including a spring having an output pinion and clapper, a trip member for the clapper normally occupying a clapper silencing position and responsive to the relative axial movement between the hour wheel and indicator wheel upon dropoff at the first step to release the clapper, a shift segment meshed with the spring output pinion for movement to a retracted position upon winding the spring and for movement to an advanced position upon unwinding of the spring incident to initial ringing of the alarm, a cam interposed between the segment and trip member for restoring the trip member to silencing position as the segment advances thereby limiting the initial ringing of the alarm to a few seconds' duration, said dropoff cam

having a second step spaced from the first step by an amount corresponding to a few minutes' delay interval for producing a second step of relative axial movement of the hour wheel for finally releasing the clapper for sustained ringing of the alarm, said segment having a biasing spring for biasing it into mesh with the spring output pinion and for producing idle clicking between the segment and the teeth of the output gear when the latter is rotated beyond the range of the segment.

6. In a clock, the combination comprising, a clock mechanism having an escapement and indicating hands together with an interposed drive train including an hour wheel, a settable indicator wheel coaxial with the hour wheel, said hour wheel being relatively axially movable and biased with respect to the indicator wheel, a dropoff cam interposed between the indicator wheel and hour wheel having a first dropoff step, an alarm mechanism including a spring having an output pinion and clapper, a trip member for the clapper normally occupying a clapper silencing position and responsive to the relative axial movement between the hour wheel and indicator wheel upon dropoff at the first step to release the clapper, a pivoted shift segment meshed with the spring output pinion for rocking movement to a retracted position upon winding the spring and for movement to an advanced position upon unwinding of the spring incident to initial ringing of the alarm, a cam interposed between the segment and trip member for restoring the trip member to silencing position as the segment advances thereby limiting the initial ringing of the alarm to a few seconds' duration, said dropoff cam having a second step spaced from the first step by an amount corresponding to a few minutes' delay interval for producing a second step of relative axial movement of the hour wheel for finally releasing the clapper for sustained ringing of the alarm.

7. In a clock, the combination comprising, a clock mechanism having indicating hands and a driving train, an alarm setting member, an alarm mechanism including a spring, output pinion, star wheel, and clapper, trip means for the clapper normally occupying a clapper silencing position and responsive to a condition of register between the setting member and an element in the driving train for releasing the trip means, a shift segment meshed with the spring output pinion for movement with the latter to a retracted position upon winding the spring and for movement to an advanced position upon unwinding of the spring incident to ringing of the alarm, restoring means on the segment for restoring the trip member to silencing position as the segment advances to stop rotation of the alarm output pinion thereby to define a time interval determined by the length of the segment and period of vibration of the clapper, said segment having a biasing spring tending to urge the segment into centered position with respect to the output gear to produce idle clicking of the segment when the output gear is rotated beyond the range of the segment when the spring is wound while insuring meshing of the segment and output gear when the spring unwinds.

8. In a clock, the combination comprising, a clock mechanism having indicating hands and a driving train, an alarm setting member, an alarm mechanism including a spring, spring output pinion, star wheel, and clapper, trip means for maintaining the clapper normally silenced, means responsive to a condition of register between the driving train for releasing the trip means and associated clapper for initiating the ringing of the alarm, means responsive to rotation of the spring output pinion accompanying a few seconds' ringing of the alarm for restoring the trip means to its silencing position and for stopping rotation of the output pinion thereby to define a short accurately predetermined time interval.

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