

Feb. 26, 1952

E. H. BEISER

2,587,026

TIME SWITCH

Filed Nov. 14, 1947

4 Sheets-Sheet 1

Fig. 1

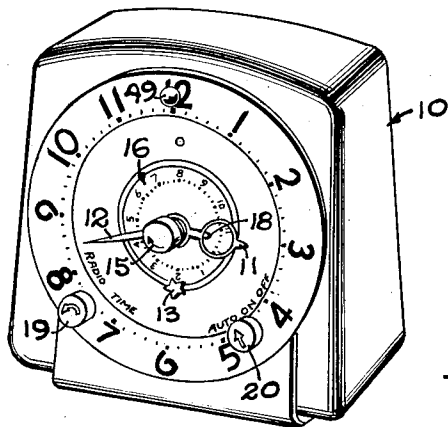


Fig. 2

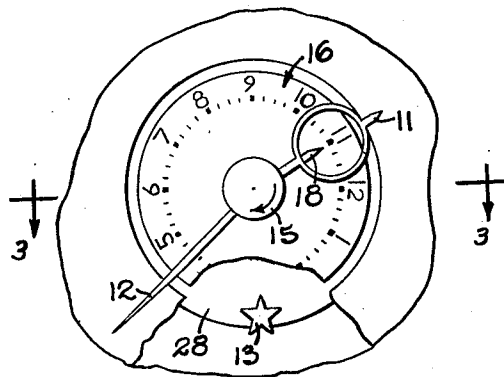
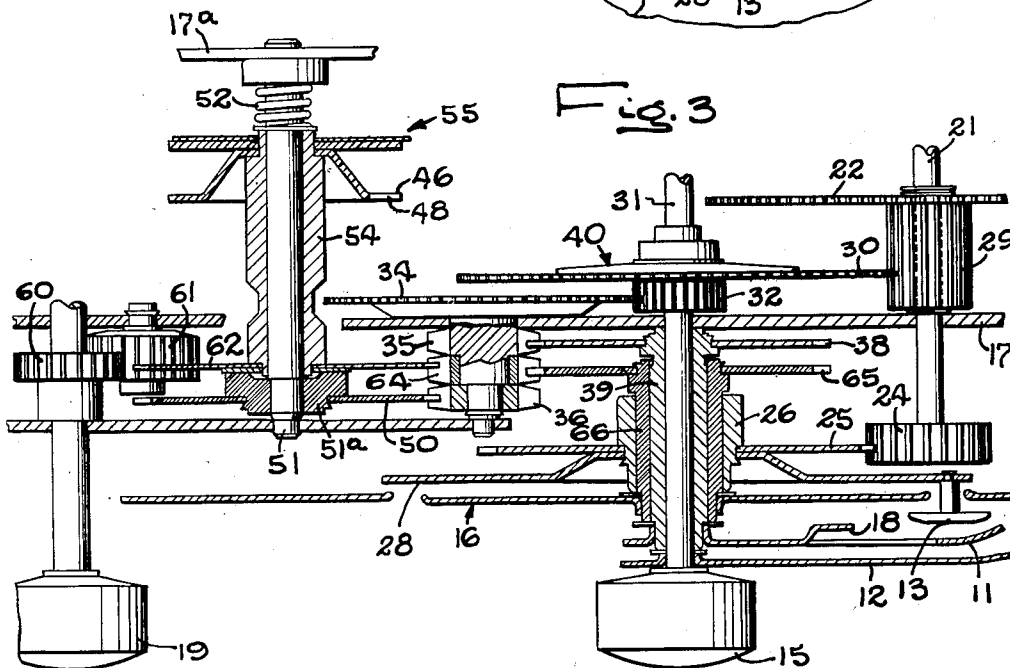


Fig. 3



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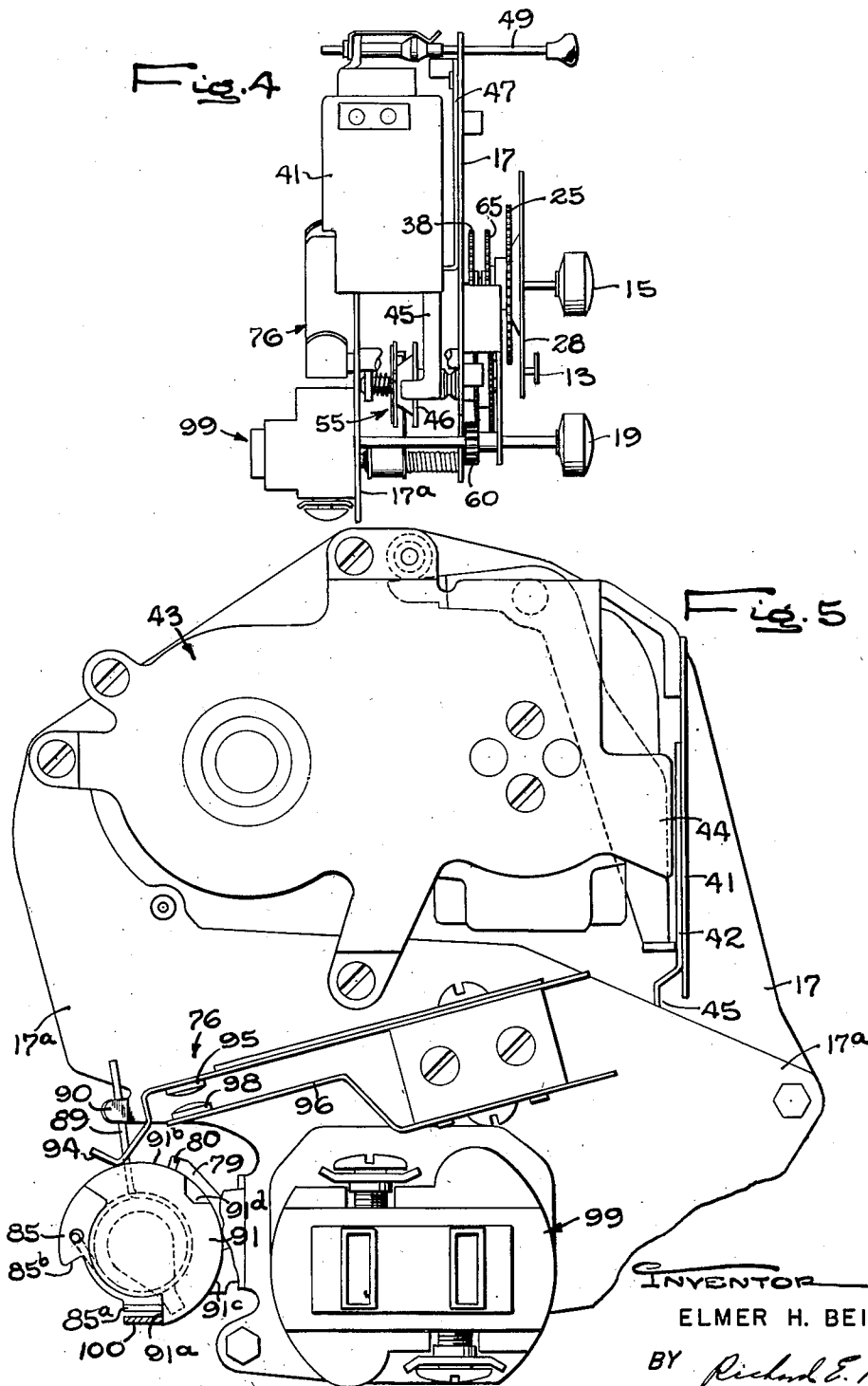
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4 Sheets-Sheet 2



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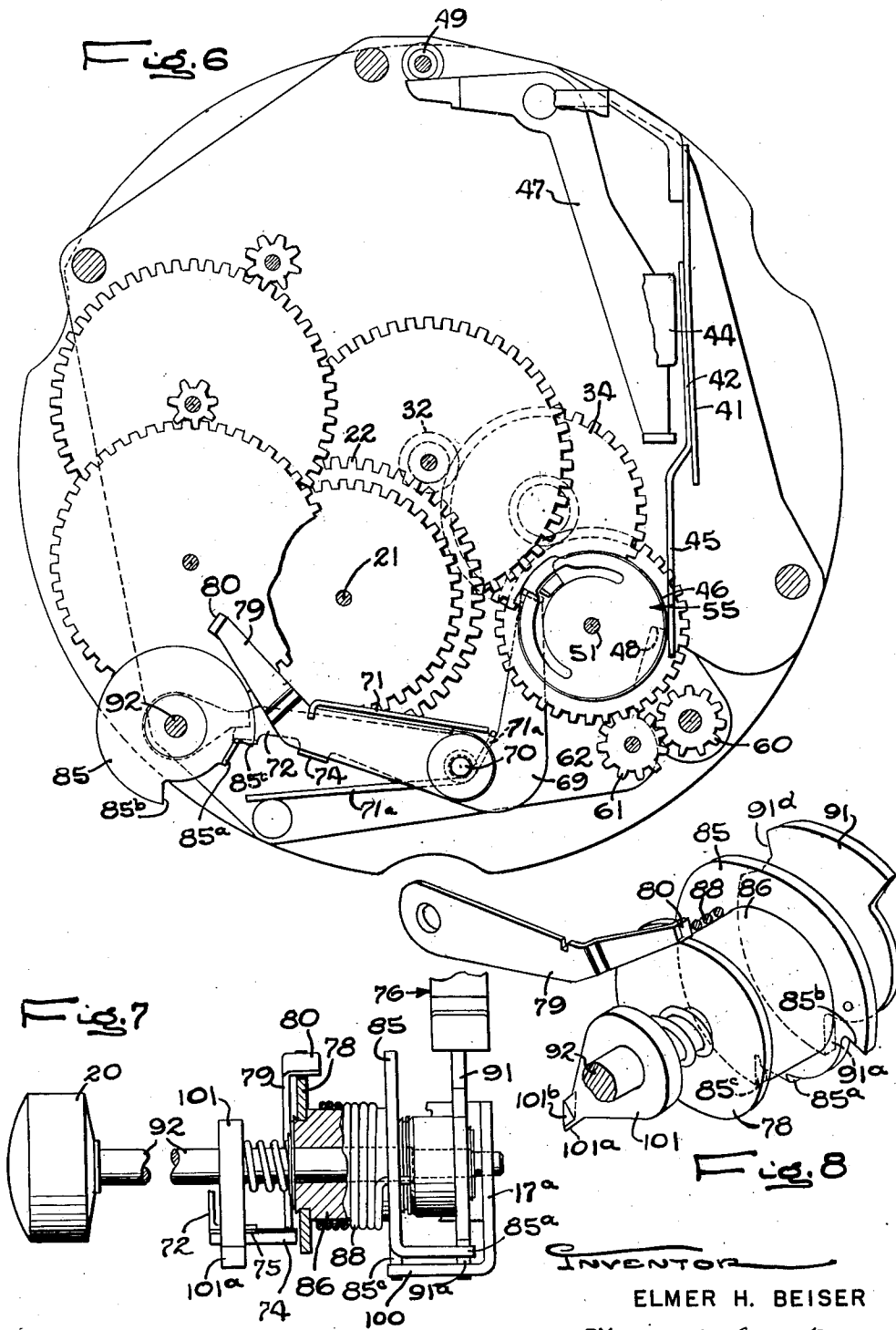
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4 Sheets-Sheet 3



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TIME SWITCH

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4 Sheets-Sheet 4

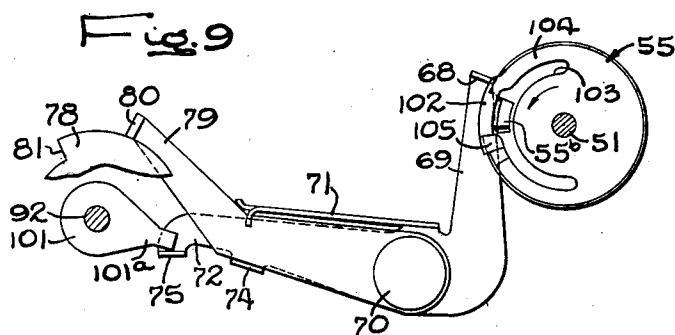
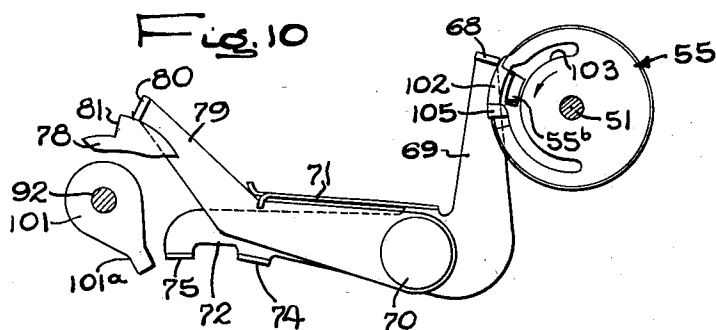


Fig. 11

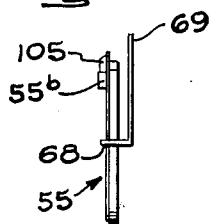


Fig. 12

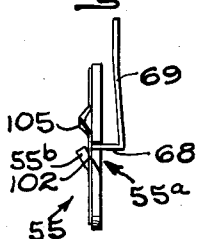


Fig. 13

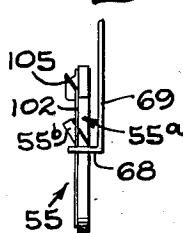
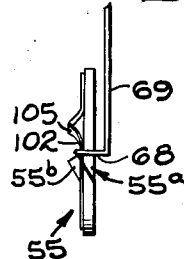
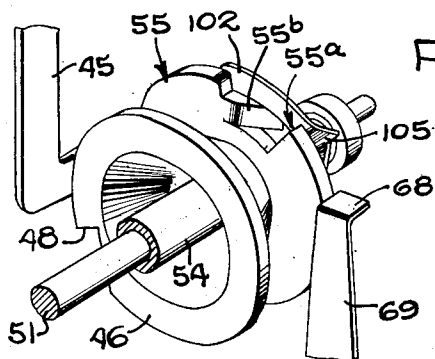


Fig. 14



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UNITED STATES PATENT OFFICE

2,587,026

TIME SWITCH

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Application November 14, 1947, Serial No. 786,065

8 Claims. (Cl. 200—38)

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The present invention relates to time controlled switches and more particularly to clock actuated mechanism for controlling both an electrical alarm circuit and an audible alarm.

Clocks having switch mechanism for controlling an electrical circuit to energize a radio receiver, lamp or the like for alarm purposes, have been known for a number of years but have not been widely used for several reasons, primarily of which are the high cost and complexity of construction and operation. Another drawback is the inability of switch mechanisms conventionally used to clearly and positively make and break the circuit of electrical appliances having a heavy current drain such as ovens and miscellaneous types of heaters. Then too, it has been considered impracticable to mount adequate switch control mechanism in a clock housing which is of substantially the same size and external appearance as an ordinary electric alarm clock.

One of the factors in the complexity of operation of prior art alarm switches has to do with the manual setting of the control element. In a number of such switches a control knob or the like is provided for selecting an "on," "off," or "auto" position, the "auto" position being the one normally used and which causes the switch to be operated after a predetermined time interval. Upon expiration of the time interval, however, the switch will be thrown "on" but the control knob will not indicate that such condition exists.

It is, accordingly, one of the objects of the present invention to provide an improved alarm clock switching mechanism in which the control knob or the like at all times indicates whether or not current is actually flowing through the device. It is a related object to provide an improved switch of the above type in which the control knob is automatically moved from the "auto" position in unison with switch operation and in which the return movement to set up a successive switching cycle serves to reset or recock the switch operating mechanism without intentional care on the part of the operator.

It is a further object of the present invention to provide an improved electric alarm clock having a controlled switch mechanism in which heavy duty electrical contacts may be operated rapidly and positively while imposing only slight mechanical load on the clock. It is another object to provide a durable switch operating mechanism in an alarm clock which may be completely included in a housing no larger than that ordinar-

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ily employed in the audible type alarm clock. A further object is to provide a time switch mechanism employing clock type components in a simple and straightforward manner, the entire device costing very little more than competitive clocks not having the electrical control feature. Also, it is an object of the invention to provide a switch type alarm clock in which the audible alarm portion is coordinated with the switch portion in an improved manner and without interfering with separate manual control of either of them.

Other objects and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings, in which:

Fig. 1 is a perspective view showing the general external appearance of my improved alarm clock.

Fig. 2 is a fragmentary view of the central portion of the face of the alarm clock shown in Fig. 1.

Fig. 3 is a transverse sectional view of the clock mechanism taken along the line 3—3 of Fig. 2 and bisecting the central axis of the clock.

Fig. 4 is a side elevation of the clock mechanism as the mechanism appears when viewed from the left.

Fig. 5 is an enlarged rear view of the clock mechanism showing the electrical contacts and operating cam therefor.

Fig. 6 is a view similar to Fig. 5 but in vertical section with the rear plate removed to show the internal gear wheels and release mechanism in greater detail.

Fig. 7 is a fragmentary detailed view showing the control knob, control shaft and associated parts.

Fig. 8 is a perspective view of the portion of the mechanism shown in Fig. 7.

Fig. 9 is a fragmentary stop motion view showing the switch controlling parts prior to the resetting operation.

Fig. 10 is similar to Fig. 9, showing the parts as they appear during resetting.

Figs. 11-14 are fragmentary stop motion views showing the switch controlling cam and cam follower in the untripped position, tripped position, after normal resetting, and after immediate resetting respectively.

Fig. 15 is a fragmentary perspective view enlarged to show in detail the structure of the switch controlling cam for enabling immediate resetting.

While the invention is susceptible of various modifications and alternative constructions and uses, I have shown in the drawings and will here-

in describe in detail one embodiment of the invention. It is to be understood, however, that I do not intend to limit the invention by such disclosure, but aim to cover all modifications of alternative constructions and uses falling within the spirit and scope of the invention as expressed in the appended claims.

Referring now to Figs. 1 and 2 it will be noted that the clock indicated generally at 10 has an hour hand 11, a minute hand 12 and a revolving star 13 as a seconds indicator. The time may be set just as in a conventional clock by a knob 15 on the minute hand. Also shown is an auxiliary or alarm dial 16 which cooperates with an auxiliary pointer 18 on the hour hand. As will later be seen in greater detail, the auxiliary dial 16 is rotatably adjustable with respect to the hour hand by means of a setting knob 19 located at the left-hand side of the clock. Another knob, which may be conveniently called a control knob and indicated at 20, determines whether an internally contained time switch is controlled automatically or is set in the "on" or "off" condition. When the control knob 20 is set in the "auto" position, provision is made within the clock mechanism to operate an electric circuit at the time designated by the pointer 18 on the dial 16.

The clockwork, the initial portion of which is conventional, can be clearly understood from inspection of Fig. 3. The mechanism, mounted on front and back plates 17, 17a, is driven by a clock motor and gear train (not shown), the driving power being applied at the right-hand portion of the figure. A shaft 21 is timely rotated by the driving train, while a gear 22 coaxial with such shaft is rotated in unison but at a reduced speed. Fast on the forward end of the shaft 21 is a pinion 24 which drives a gear 25. Mounted flatly adjacent the gear 25 and on a common sleeve 26 is a disk 28 which carries at its periphery the seconds indicator which, as previously noted, is a star 13. The latter projects through an annular slot defined by the clock face and the auxiliary face 16 contained within it.

Drawing attention now to the driving gear 22, it will be noted that it carries a pinion 29 which in turn drives a gear 30 of relatively large diameter and mounted on a main spindle 31. Normally rotatable with the gear 30 is a central pinion 32 which is fastened to the central spindle 31 and thus serves to rotate the minute hand 12 (and knob 15) pressed on the forward end thereof.

In order to rotate the hour hand at a reduced speed, the pinion 32 is in mesh with an intermediate gear 34 having a pair of pinions 35, 36 thereon. The first of these, 35, is in mesh with an hour reduction gear 38 which is fast to a central sleeve 39 on the spindle 31. At its forward end the sleeve 39 carries the hour hand 11 in driving engagement. Thus far described, the clock mechanism will provide an indication of time just as any conventional clock, provided that the input elements 21, 22 are rotated at the proper rate. If desired, the hands of the clock may be adjusted manually by rotation of the knob 15 at the outer end of the shaft 31, slippage taking place in a friction clutch 40 to make it impossible to jam the gear train.

Having observed the main gear train, attention may now be given to the means for controlling the audible alarm which may be of the conventional type, employing a buzzer energized by the leakage flux from the clock driving motor. The buzzer armature will be observed at 41 in Fig. 6. It includes a magnetic portion 42 in close prox-

imity to poles 44 of the driving motor 43. Such armature is preferably disabled prior to alarm by applying outward pressure to a downwardly extending tongue 45, the latter being accomplished by an alarm controlling cam 46. As will be observed, the latter, upon passage of time, is caused to rotate, a notch 48 formed therein being gradually advanced until the tongue 45 drops free, enabling vibration of the armature 41 to take place. The construction of both the notch and the tongue will become apparent by reference to Fig. 15 in the drawings. Manual shut-off of the buzzer is effected by shut-off lever 47 operated by manual plunger 49.

Referring again to Fig. 3 the means here employed for driving the alarm controlling cam 46 may be seen. The pinion 36 as stated above, rotates in unison with the hour hand 11. In driving engagement with pinion 36 is an alarm gear 50 which is fastened on the forward end of an alarm spindle 51 by means of a flanged collar 51a. An alarm sleeve 54 which carries the alarm controlling cam is telescoped over the spindle 51 and seated on the flanged collar 51a. Upon passage of time, the alarm controlling cam 46 on the sleeve 54 is timely advanced until drop-off of the alarm control tongue 45 occurs. Advanced simultaneously with the alarm controlling cam 46 is a switch controlling cam, indicated generally at 55, lying flatly adjacent thereto. Since the latter cam and its associated mechanism constitute a primary feature of the present invention, they will later be covered in detail.

Provision is made in the device disclosed for varying the relative angular position of the cams 46, 55 with respect to the remainder of the clock driving train to set the alarm. As shown in Fig. 3, such positioning is made possible by the construction of the members 51a, 54 which form a friction clutch. Such clutch members are pressed together axially by a spring 52, the friction being sufficiently great so that sleeve 54 is normally driven in unison with the hour hand 11. The force required to cause slippage may be regulated merely by controlling the degree of compression of the spring 52. Rotative adjusting movement of the sleeve 54 with respect to the clock train is accomplished by means of the alarm setting knob 19. This knob serves to rotate a pair of pinions 60, 61 which in turn rotate an alarm setting gear 62, pressed or otherwise fastened on the forward end of the sleeve 54. It will be apparent, therefore, that rotation of the alarm setting knob 19 will cause joint rotative adjustment of the cams 46, 55 with slippage taking place at the clutch surfaces.

In order that indication of the alarm setting may be made on the face of the clock, means are provided for coupling the cams 46, 55 with the auxiliary dial 16. To accomplish this, an auxiliary pinion 64 is used which rotates a gear 65 on a forwardly projecting sleeve 66. The dial 16, mounted at the forward end of the sleeve 66, rotates coaxially with the hands of the clock, and the relative position of the cams with respect to the driving train is at all times indicated by a cooperating pointer 18 on the hour hand 11. The indication on the dial 16 thus designates the time at which the alarm cams 46, 55 will be transported around to the alarm position.

In the practice of the invention, improved means are provided for actuating an electrical switch upon advancement of switch controlling cam 55 into the alarm position. As disclosed

in Fig. 6 and in the fragmentary views of Figs. 9-15, the switch controlling cam 55 has a cam follower 68, the latter being carried by a cam follower lever 69 pivoted at a stationary pivot point 70. The cam follower 68 is biased into engagement with the periphery of the cam 55 by means of a biasing spring 71a that is wound around pivot 70 (Fig. 6). The lower arm 72 of lever 69 has a flexible lateral extension 71 that bears on the upper surface of a switch release arm 79. Arm 72 also has a rigid lug 74 that bears on the bottom of arm 79. A reset lug 75 is formed on arm 72.

Upon passage of time, the switch controlling cam 55 is driven slowly in a clockwise direction as viewed in Fig. 15, and in a counterclockwise direction as viewed in Figs. 6, 9, and 10. Eventually, by reason of a notch 55a cut into the periphery of the switch controlling cam 55, the cam follower 68 drops radially inward. This movement is accompanied by rotational movement of the cam follower lever 69 under the biasing influence of the spring 71a.

In accordance with one of the aspects of the invention, rotational movement of the cam follower lever 69 is caused to release or "trigger" a cocked electrical switch, such switch being indicated generally at 76 in Figs. 5 and 7. To accomplish this a switch release plate 78 is used which is normally retained in cocked position by the switch release arm 79. The latter has an offset tip portion 80 which rides on the periphery of the switch release plate 78 to engage an abutment 81 formed thereon. As shown in Figs. 9 and 10, the switch release arm 79 is pivoted freely at pivot 70 and is engaged by the flexible extension 71 of lever 69 to press the tip portion 80 against the periphery of plate 78. The lug 74 engages the bottom of the switch release arm 79 so that rotational movement of the cam follower lever 69 in a clockwise direction (as viewed in Figs. 9 and 10) is positively transmitted to the switch release arm. Rotational movement of the lever 69 in a counterclockwise direction is transmitted by flexure of the extension 71. In this way, dropping of the cam follower 68 into the notch 55a of the switch controlling cam causes the switch release arm 79 to be rotated clockwise as viewed in Figs. 9 and 10. This disengages the offset tip 80 of the arm 79 from the cooperating abutment 81 on the switch release plate. The manner in which the latter results in operation of the switch contacts will be apparent upon reference to Figs. 5, 7, and 8.

In addition to the switch release plate 78 referred to, it will be observed that the switch mechanism includes a switch advancing plate 85 joined rigidly with the release plate by means of a spring barrel 86. Wound about the barrel 86 is a coil spring 88, one end of which is received in the plate 85 while the other end, 89, is caught on a projection 90 formed integral with the back plate 17a of the clock. The spring, thus anchored, serves to store energy which is released for switch advancing purposes upon movement of the release arm 79. Mounted adjacent the switch advancing plate 85 is an insulated switch cam 91. The latter is fixed to a rotatable control shaft 92 which extends forwardly within the housing of the clock to the knob 20. A lost motion connection is provided between the cam 91 and the advancing plate 85. At the limit of lost movement, however, the plate 85 is effective to advance the insulated switch cam 91 by reason of the engagement of cooperating abutments

thereon. In the present instance such abutments include an axially extending projection 85a on the switch advancing plate and a radially extending shoulder 91a on the switch cam 91. Triggering of the release plate is thus effective to rotate the switch cam 91 in a counterclockwise direction as viewed in Fig. 5.

Turning now to the portion of the switch associated with cam 91 (Fig. 5), it will be noted that the cam has a notch 91d bounded by high portions 91b, 91c on the respective sides thereof. Riding on the periphery of the cam 91 and biased thereagainst is a switch arm 94 carrying a movable contact 95. Cooperating with the contact 95 and mounted on a stationary arm 96 is a second contact 98. By means of electrical wiring, which will be obvious to one skilled in the art, closure of the contacts 95, 98 is effective to apply voltage to an output socket 99 of a conventional type into which a radio or other appliance may be plugged.

Summarizing the operation of the device thus far disclosed, it will be apparent that the plate 78 may be cocked merely by turning the control knob 20 to the left as in Fig. 8. Subsequent advancement of the switch controlling cam 55 will cause movement of the levers 69, 79, release of the plate 78, and consequent rotation of the switch advancing plate 85 under the influence of the spring 88. Due to the meeting of the abutments 85a, 91a, the switch cam 91 will be advanced in a counterclockwise direction (as shown in Fig. 5), allowing the switch arm 94 to drop from 91b into the notch 91d in the periphery thereof.

This causes forcible closure of the contacts 95, 98. While such contacts are shown to be of moderate size they may, if desired, be considerably larger than illustrated and the arms upon which they are mounted may likewise be sufficiently stiff to cause high contact pressures. If this is done it is merely necessary to use a spring 88 having correspondingly increased stiffness. It is to be noted that the use of a more heavy duty contact arrangement does not increase the mechanical drag on the clock driving train. On the contrary, the pressure exerted by the cam follower 68 on the switch controlling cam 55 may be very light without affecting the positiveness of switch operation.

Movement of the cam disk 91 by the advancing plate 85 cannot, however, proceed any farther than necessary to drop the arm 94 into the notch 91d. The reason for this is that an abutment 85b on the plate 85 is located to strike a projection 100 which is rigid with the back plate 17a of the clock. The cam projection 100 serves to limit movement of the plate 85 in the opposite direction, as well, by reason of another abutment 85c. In short, cocking movement of the switch advancing plate 85 is limited by the abutment 85c while the advancement of the switch cam 91 is limited by the abutment 85b.

In accordance with one of the aspects of the invention, means are provided for simultaneously cocking the cam follower lever 69 upon cocking the switch release plate 78. As a result of such "resetting," the cam follower 68 will be in upraised position ready to drop into the notch 55a of the switch controlling cam upon expiration of a predetermined time interval and the switch mechanism will have sufficient energy stored in the spring 88 to cause positive operation of the switch arm 94 and the contacts controlled thereby. In the present device this dual function is performed by the control shaft 92 by

rotating the same in a clockwise direction as shown in Figs. 9 and 10. As viewed from the front of the clock and as shown in Fig. 8 such cocking rotation takes place in the counterclockwise direction, the control knob being moved to a position designated "auto." Taking up these functions one at a time, it will be apparent that counterclockwise rotation of the shaft 92 (Fig. 8) will cause interference to take place between the abutment 85a, 91a causing the plate 78 to rotate into a cocked position in which it is retained by the offset portion 80 of the switch release arm 79. Cocking of the cam follower 68, on the other hand, is accomplished by a cam follower reset lever 101 which is rigidly fastened on the shaft 92. The end portion 101a of the reset lever 101 (as shown in Fig. 9) engages the reset lug 75 on the cam follower lever 69. This serves to raise the cam follower 68 onto the periphery of the switch controlling cam 55. Under such conditions the clock is in readiness to close an electrical circuit at such time as the switch controlling cam 55 rotates the notch 55a into the receiving position.

As shown in detail in Fig. 15, the notch 55a is bounded on its trailing edge by an integral ear 55b which is angularly offset to serve as a lateral cam. Thus, after the cam follower 68 drops into the notch 55a, further rotation of the cam 55 will cause the cam follower to ride axially on the ear 55b and onto the lateral surface of the member 55. Under such conditions the cam follower 68 can be stated to be in an "inoperative" position, as contrasted with its "operative" position on the peripheral edge of the cam 55. It will be apparent that further automatic switch operation will require that the cam follower 68 be restored to its operative position by resetting the control knob back into the "auto" or left-hand setting.

Immediate reset

In accordance with one of the more detailed aspects of the invention, provision is included in the clock for immediate resetting of the switch mechanism. It will be apparent upon inspection of Fig. 15 that if no such provision were made, resetting would not be possible until the clock mechanism had advanced the switch controlling cam 55 past the cam follower 68 through an arc corresponding to the width of the notch 55a formed therein. The latter normally would take an hour or more. The latter would be disadvantageous since it not only requires the operator of the clock to remember to reset it upon the expiration of such disabled period, but it prevents the setting of an alarm time interval on the order of eleven to twelve hours.

In order to resolve the difficulty noted above, I provide a notch closing or bridging member 102 (Fig. 15). Such member, which may also be termed an immediate spring, is preferably in the form of an arcuate leaf spring which is fastened to the side of the switch controlling cam 55 in position to span the entire length of the notch 55a therein. As shown in Figs. 9 and 10, the spring member 102 is preferably disk-shaped having an annular slot 103 formed along one side and defining a resilient annular strip 104. While the outer radius of the portion 104 corresponds generally to the outer radius of the cam 55, the portion thereof which bridges the notch preferably has a somewhat greater radius. Furthermore, the resilient portion 104 is, in the preferred embodiment, shaped to have a deflecting surface 105.

As a result of the increased radius of portion 104 and the deflecting surface 105, it will be apparent that the bridging portion of the spring will tend to deflect outwardly as the cam 55 is rotatively advanced with respect to the cam follower 68. Also, the cam follower lever, which is preferably flexible in a lateral direction, will allow the cam follower to follow the deflecting surface 105. As a result of such construction the spring member 102 cannot in any way interfere with a sharp drop-off of the cam follower 68 into the notch 55a at the end of the pre-set time interval. However, upon a cocking or outward movement of the cam follower lever 69, the cam follower 68 will be raised clear of the bridging spring member 102 and the latter will be free to spring back into its normal position illustrated in Fig. 15. The member 102 therefore serves to support the cam follower 68 in its cocked or reset position on the cam 55 over the entire extent of the notch 55a. Thus it is seen that no time interval whatsoever need elapse after an alarm and before the switch mechanism can be reset. Since this removes one of the limitations of prior art switches, the desirability of such feature is obvious, and it is to be noted that it has been accomplished entirely without the use of finely machined or carefully dimensioned mechanical parts.

The series of Figures 11-14 show the relative positioning of the cam follower and the cam under the various conditions of operation previously alluded to. In Fig. 11 the cam follower 68 is shown as riding on the periphery of the switch controlling cam 55 corresponding to normal operation. In Fig. 12 the cam follower has dropped into the notch 55a. In Fig. 14 the relative positioning of the spring 102 and follower 68 is shown as they appear after an immediate resetting operation. Fig. 13 shows the position of the parts after they have been normally reset, that is, after the passage of a time interval of an hour or more since an alarm.

In accordance with a further aspect of the invention, provision is made for operating the electrical contacts completely independently of the automatic mechanism described above. This is accomplished by manual rotation of the control knob 20 one step in the clockwise direction so that it indicates "on." It might be expected that rotation of the knob 20 and the shaft 92 connected thereto would be impossible by reason of the interference between the cam follower reset lever 101 and the reset lug 75 on the cam follower lever 69. Provision is made, however, for allowing non-interfering return passage of the member 101 and the lug 75. This is effected by tapering the forwardly facing surface of the reset lever as shown at 101b in Fig. 8. Interference between the two members upon clockwise rotation of the shaft 92 thus causes the reset lug 75 to ride upwardly on the tapered surface 101b and therefore to clear the same without damage to any of the parts in the clock. Since the switch cam 91 is directly fastened to the rear end of the control shaft 92, the cam 91 is readily rotated so that the switch arm 94 falls into position in the notch 91d. Under such conditions the contacts 95, 98 come together causing the electrical load to be constantly energized from the receptacle 99. This mode of operation is completely independent of the movement of the time-controlled components utilized for automatic switching.

Similarly, the control knob 20 may be utilized

to place the switch contacts in a permanently "off" condition. To do this, it is merely necessary to turn the control knob 20 clockwise an additional step, causing the switch arm 94 to ride up on the raised portion 91c of the switch cam 91. The latter is effective to separate the contacts 95, 98 which are taken completely out of the control of the time-controlled part of the device. It is to be noted that in my improved construction control of the circuit is accomplished by a single pair of contacts regardless of whether the operation is automatic or manual. The break is positive, the contacts being pulled apart by direct manual effort. Thus all possibility of maloperation due to "sticky" contacts as a result of wear or current overloads is eliminated. It will, however, be appreciated that other specific contact structures and cam profiles could be used without departing from the more basic features of my invention.

Specific mention may next be made of a feature inherent in the device as described but which contributes markedly to the simple and foolproof operation. This is the simultaneous movement of the control knob from the "auto" to the "on" position which occurs incident to the automatic closure of the switch. The user of the clock is thus constantly apprised of the actual condition of the contacts. For example, the position of the knob 20 indicates at a glance whether the switch has just closed or whether it is about to close, it being impossible to determine this accurately by observing position of the dials relative to the hour hand of the clock when the pre-set time interval is about to expire. This is of particular value when the device being controlled does not give any observable indication of whether current is being supplied to it.

The fact that the control knob 20 and the contacts always keep "in step" in the improved clock also insures that the mechanism will be reset each time that automatic switching is utilized. If, for example, the device were constructed in the manner of conventional time switches in which the control knob remains set at the "auto" position in spite of closure of the contacts, the user might well assume that the device is ready for an automatic switching cycle when, in fact, the mechanism had not been reset. In the improved device resetting takes place automatically as an incident to moving the control knob to the "auto" position and it is not necessary for the user of the switch even to be aware that he is, by such movement, re-cocking the internal mechanism.

In the above discussion it has been assumed that the audible alarm and the electrical circuit are operated at the same time, in other words, that the alarm controlling cam 46 and the switch controlling cam 55 are in phase with one another. Normally however, the cams will be offset in phasing by a matter of a few minutes, the electrical circuit being completed prior to sounding the alarm. In this way a person using the clock to energize a radio may, upon being awakened by the latter, depress the plunger 49 and thereby prevent the audible alarm from sounding.

I claim as my invention:

1. The combination with a clock having an alarm device thereon of an alarm controlling cam driven thereby, means including a cam follower movable between a cocked position in which it rides on the periphery of said cam and a released

position below said periphery for operating said alarm device, said cam having a notch in the periphery thereof adapted to receive said cam follower upon advancement of said cam into a predetermined position, a notch bridging member, said notch bridging member having means thereon for disabling it as an incident to the normal approach of said cam follower toward said notch to enable said cam follower to drop freely into its released position, and means for raising said cam follower out of said notch so that it rides on said notch bridging member in readiness for a subsequent alarm.

2. The combination with a clock having a switch thereon of a switch controlling cam driven thereby, means including a cam follower movable between a reset position in which it rides on the periphery of said cam and a released position below said periphery for operating said switch, said cam having a notch in the periphery thereof adapted to receive said cam follower upon advancement of said cam into a predetermined position, and a notch bridging member mounted on said cam for bodily rotation therewith, said notch bridging member having means thereon for deflecting it into relation to said cam follower as an incident to the normal approach of said cam follower toward said notch to enable said cam follower to drop freely into a released position, said notch bridging member including biasing means tending to restore it to a notch closing position, and manually operable means for raising said cam follower out of said notch so that it rides on said notch closing member for purposes of immediate reset.

3. In combination with a clock having a switch thereon, a switch controlling cam disk driven thereby, means including a cam follower movable between a cocked position in which it rides on the periphery of said cam disk and a released position below said periphery for operating said switch, said cam having a notch in the periphery thereof adapted to receive said cam follower upon advancement of said cam into a predetermined position, means including a leaf spring carried by said disk and lying flatly thereagainst in position to bridge said notch, said leaf spring having a deflecting surface thereon for deflecting it out of the way of said cam follower as an incident to the normal approach of said cam follower toward said notch thereby permitting said cam follower to drop freely into a released position in said notch, and manual means for lifting the cam follower out of said notch and into a cocked position on said bridging spring even though said notch is still in position to receive said cam follower.

4. In combination with a switch operating alarm clock, a switch controlling cam disk driven thereby, means including a cam follower movable between a cocked position in which it rides on the periphery of said disk and a released position below said periphery for the operation of said switch, said cam having a notch in the periphery thereof adapted to receive said cam follower upon advancement of said cam into a predetermined alarm position, an arcuate spring bodily carried by said disk and biased flatly thereagainst for normally bridging said notch, said spring being arranged to form a continuation of the outer periphery of the cam and having a deflecting surface thereon to enable said spring to be deflected out of its bridging position relative to said cam follower and upon the approach of the same to permit said cam follower to fall freely into said notch, and means for manually

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moving said cam follower out of said notch and onto said spring to permit resetting of said cam follower into its cocked position immediately after said cam follower has dropped into said notch and before said clock has had an opportunity to rotate the notch appreciably out of said predetermined position.

5. The combination with a clock of a switch release arm releasable by said clock at a predetermined time, a rotatably biased switch release plate having means thereon to restrain the same against movement except when released by said switch release arm, a rotatable switch cam having an active portion thereon and first and second inactive portions located on the respective sides of said active portion, said portions being presented with the cam in corresponding angular positions, switch means including a cam follower for riding on said cam and contacts operated upon said cam follower passing from an inactive to an active portion of said cam, a projection on said switch release plate for rotating said cam from the first inactive position to the active position upon the release of said release plate, and means including a manual operator for rotating said cam into its active position or into its second inactive position independently of the positioning of said switch release plate.

6. In combination with a clock, an alarm circuit including a switch, a rotatably biased switch release plate, a switch release arm actuated by said clock at a predetermined time for releasing said release plate, a rotatable switch cam having an active portion thereon and first and second inactive portions located on the respective sides thereof, a switch operating cam follower for riding on said cam and for operating said switch upon said cam follower passing between said active and inactive portions of said cam as the latter is moved between corresponding positions, an abutment on said switch release plate for shoving said switch cam from the first inactive position to the active position upon release of said plate, and means including a three position manual operator for (1) cocking said switch release plate and for moving said cam into the first inactive position, (2) for moving said cam into the active position and (3) for moving said cam into the second inactive position, movement into said second and third positions causing operation of said switch independently of said clock.

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7. The combination with a clock of a rotatable spring biased member releasable by said clock at a predetermined time, a manually rotatable shaft on which said spring biased member is rotatably mounted, a switch, a switch operating cam rotatable with said shaft, and a lost motion means connecting said spring biased member and said cam so that manual rotation of said shaft to a first position cocks said spring biased member for causing said cam to operate the switch when the spring biased member is released by said clock, and manual rotation of said shaft to a second position causes the cam to operate the switch independently of said spring biased member.

8. The combination with a clock of a cam having an operating position and driven by said clock, a pivoted cam follower lever having one end adapted for riding on said cam and means on the other end co-operating with a resetting means, a switch, means for operating said switch including a biased member, a switch release arm pivoted on said cam follower lever and having means for temporarily maintaining said biased member in a cocked position, said cam follower lever having means to positively transmit motion in one direction to said switch release arm to release said biased member upon movement of the cam follower lever into the cam operating position and having resilient means for transmitting motion from the cam follower lever to the switch release arm in the opposite direction for resetting; and manual resetting means for recocking said biased member and moving said cam follower lever out of said cam operating position.

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