Feb. 8, 1955 H. JUNGHANS ET AL 2,701,439

CLOCK ALARM DEVICE SETTABLE TO THE MINUTE

Filed Feb. 16, 1951

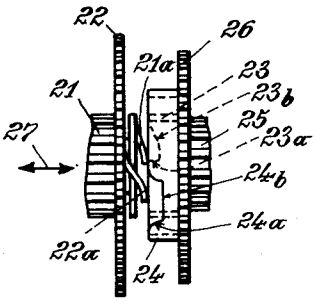

Fig. 2

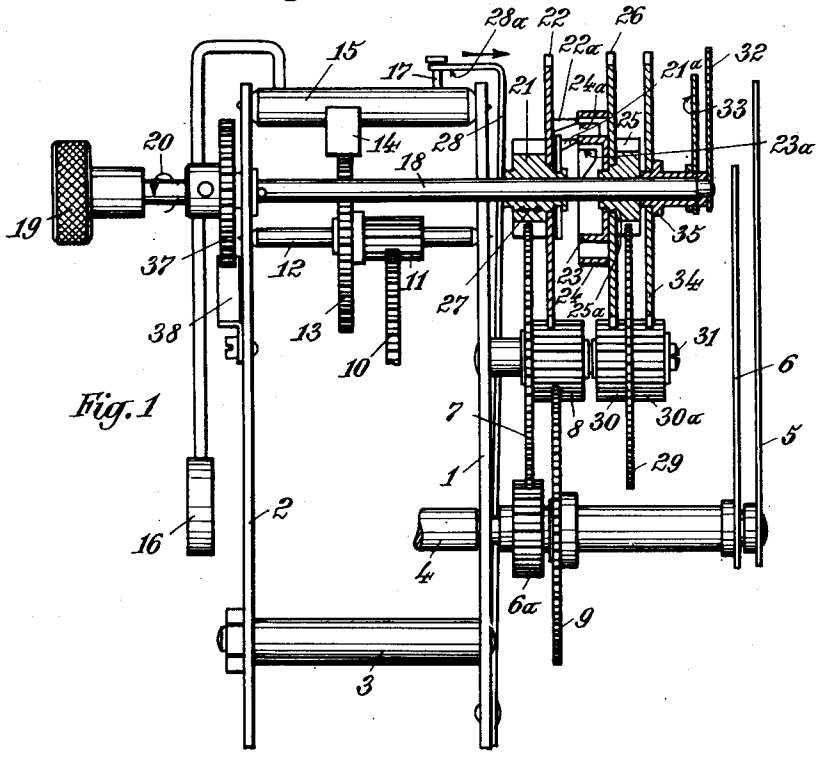

Fig. 1

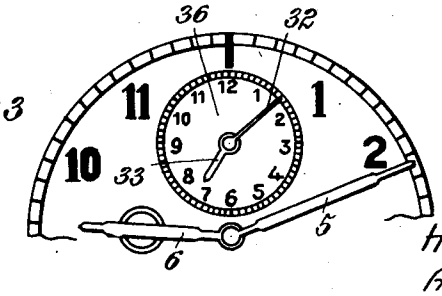

Fig. 3

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2,701,439

Patented Feb. 8, 1955

2,701,439

CLOCK ALARM DEVICE SETTABLE TO THE MINUTE

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Application February 16, 1951, Serial No. 211,306

6 Claims. (Cl. 58—22)

The present invention relates to chronometers with a release device, in particular alarm clocks. In alarm clocks of known design the time of waking can only be set with an accuracy of approximately 5 minutes. Moreover, with the usual 12-hour alarms the range of adjustment cannot be fully utilized, but only about 10½ to 11 hours thereof; i. e. an alarm set for 7 o'clock, for example, cannot, directly after running down, be set again immediately for the same time, but only for times which are at least about 1 to 1½ hours earlier, thus for 5:30 or 6 o'clock at the latest. The reason for the imprecise and limited possibility of adjustment is the so-called alarm serving customarily to control the release member (alarm tension spring), and which rotates once in 12 hours and owing to its diameter which is limited for constructional reasons does not, in practice, permit of ensuring that the trip finger co-operating with the usual cam is tripped exactly to the minute and which, in addition, must be provided, for the purpose of returning the trip finger to the starting position, with a setting cam whose time equivalent, in accordance with experience, is 1 to 1½ hours.

These disadvantages of usual alarm clocks are known and already in themselves limit the possibilities of use thereof. In addition, however, there is also a need in the household for a chronometer capable of measuring short periods exactly to the minute, e. g. in baking, cooking, photographic work, listening to the radio, etc., and for these purposes the ordinary alarm clock cannot be used at all for the reasons stated. The present invention has as its object to produce an alarm clock which is exact to the minute and can be set, in practice, throughout the entire range of adjustment, by adding a small number of simple structural parts, while retaining to a considerable extent the proved forms of construction.

The basis of the solution of the problem of the invention is the idea of associating a fine release device with a pre-release device of a coarse nature in respect of time. According to the invention, it is intended to provide at least two control members connected behind one another in their action with reference to the release member, of which the one connected behind revolves at any given time at a considerably greater speed than the one in front. In the preferred embodiment of the invention for an alarm clock, the control member which rotates once in the time adjustment range (e. g. of 12 hours), has arranged after it a second control member which rotates at many times (e. g. 12 times) the angular velocity of the first control member, thus, in the case of the example, once an hour. Accordingly, when the first, slowly-running control member comes into operation, only a pre-release takes place and only when the more quickly-running second control member has also arrived in the release position does the main release take place; in other words, the hour hand and the minute hand are provided with corresponding release members. In principle, there would be nothing in the way, for example, of connecting another similar control member behind the minute control member for seconds control and, if required, similar ones for controlling fractions of a second. In addition, without departing from the idea of the invention, the range of adjustment could be extended from 12 to 24 hours.

The constructional embodiment of the idea of the invention preferably displays the following characteristics: The two control members may be arranged on a common axis, the slowly rotating control member being mounted on the more quickly-running one. Said more quickly-

running (minute) control member can be connected securely to a pinion, which engages with a gear of the usual dial train which rotates once an hour, while the (hour) control member which is mounted loosely on said pinion engages with a gear of the dial train which rotates once in 12 hours. Preferably, the common axis of the two control members is the alarm set spindle, upon which the setting members associated with the control members are arranged, the minute setting member being securely and the hour setting member loosely mounted, a gear ratio of 12:1 being adjusted between the two. For the purpose of setting the alarm, a pinion, which simultaneously carries the setting member, is fixedly mounted on the alarm set spindle and drives through a 12:1 reduction gear a toothed wheel which simultaneously carries the hour setting member, the setting members being constructed as so-called alarm cams of different diameter and arranged inside one another and the hour cam being mounted on the setting pinion of the minute cam together with its toothed setting wheel. For indicating the alarm adjustment, there can be provided on the change speed gear co-operating with the two alarm cams a double-sided pinion, the outer half of which engages with a toothed wheel similar to the toothed setting wheel for the hour cam which is loosely mounted on the alarm set spindle and the hub of which carries the hour hand for the alarm setting dial, while the minute hand is fixedly mounted on the set spindle. For the purpose of facilitating adjustment exactly to the minute, a retaining disc graduated in minutes may be provided on the alarm set spindle and a retaining spring on the nearest plate of the mechanism, the retaining disc being conveniently constructed as a ratchet wheel in order to render it impossible to turn the alarm set spindle in the reverse direction.

Further characteristics and advantages of the invention may be seen from the following description of one example of embodiment, reference being made to the accompanying drawings wherein:

Figure 1 shows part of an alarm clock mechanism seen from the side, partly in section, the parts of the works not necessary for understanding the invention being omitted;

Figure 2 shows details of the control members; and Figure 3 shows a front view of the arrangement of the dial plate.

In Figure 1 the front plate of the mechanism is indicated by **1**; **2** is the rear plate of the mechanism, **3** one of the frame struts. The minute spindle **4** belongs to the clock movement (which is otherwise not shown in the drawing). **5** is the minute hand, **6** the hour hand, which is driven through the pinion **6***a*, change speed wheel **7**, change speed pinion **8** and wheel **9** constituting the usual dial train.

The central spring wheel of the alarm mechanism is indicated by **10**; it engages with the pinion **11** on the balance wheel spindle **12**. **13** is the alarm balance wheel, **14** the alarm anchor and **15** the alarm anchor spindle, to which the alarm hammer **16** and the silencing arm **17** are secured.

The following parts serve to set and release the alarm. On the alarm set spindle **18**, which can be turned by means of the knob **19** in the direction of the arrow **20**, is mounted in loosely rotatable manner the pinion **21**; it engages with the change speed wheel 7 and is hereinafter described as the minute control pinion **21**. On the part **21** is mounted in loosely rotatable manner the toothed wheel **22**, which engages with the change speed pinion 8 and is hereinafter described as the hour control wheel **22**. The minute control pinion **21** carries the minute control finger **21***a* and the hour control wheel **22** the hour control finger **22***a*.

Opposite the minute control finger **21***a* and the hour control finger **22***a* are located the minute alarm cam **23** and the hour alarm cam **24** respectively. The minute alarm cam **23** is fixedly connected to the pinion **25** and this in its turn is fixedly mounted on the alarm set spindle **18**; the pinion **25** is hereinafter described as the minute setting pinion.

On a projection **25***a* on the minute setting pinion **25** there is mounted in loosely rotatable manner the toothed

wheel **26**; this carries the hour alarm cam **24** and is hereinafter described as the toothed hour setting wheel.

The co-operation of the trip finger with the alarm snail may be predetermined as is known and it is therefore sufficient to remark briefly here that the minute control pinion **21** with the minute control finger **21***a* and the hour control wheel **22** with the finger **22***a* mounted on the part **21** can be moved in the direction of the double arrow **27** on the alarm set spindle **18** and, in fact (in Figures 1 and 2 of the drawing) is moved to the right, when the control fingers **21***a* and **22***a* are able to fall down on the sloping edges **23***a* and **24***a* of the two alarm cams. This movement takes place under the action of the alarm tension spring **28**, the locking nose **28***a* of which releases the silencing arm **17** on the alarm anchor spindle **15** at the same time and allows the alarm arrangement to come into operation.

The minute setting pinion **25** keyed on the alarm set spindle and the hour setting wheel **26** loosely running on the former are located above the change speed gear consisting of the wheel **29** and the pinion **30** in a working relationship which is such that one revolution of the hour setting wheel is equivalent to 12 revolutions of the minute setting pinion. The minute setting pinion **25** therefore has the same number of teeth as the minute control pinion **21** and the hour setting wheel **26** the same number of teeth as the hour control wheel **22**; in the same way, the change speed gear **29—30** has the same number of teeth as the change wheel gear **7—8**. Both change gears are mounted rotatably, independent of each other, on the common axis **31**.

The arrangement of the control members and the arrangement of the setting members has been described and the arrangement of the members indicating the setting of the alarm at any given time still remains to be described. As the alarm set spindle **18** is fixedly connected to the minute setting pinion, it is suitable as a member for the minute setting hand **32**. This is fixed at the front end of the spindle. The hour setting hand **33** must revolve in the ratio of 12:1 and is therefore again driven through a change speed gear. In fact, the change speed gear **29—30** is used for the purpose, the change speed gear pinion **30** being compound gear and having an outer portion **30***a*. The alarm hour hand wheel **34** now engages with outer portion **30***a* of the change speed gear pinion; on the tube **35** is mounted the hour setting hand **33**. The alarm hour hand wheel **34** has the same number of teeth as the hour setting wheel **26** and the hour control wheel **22**.

The method of operation of the arrangement is as follows:

Setting of alarm

By means of the knob **19**, the alarm set spindle **18** is turned in the direction of the arrow **20**, while observing the alarm setting dial plate **36** (Fig. 3), until the setting hands **32** and **33** (which run anti-clockwise) are at the desired time of waking. During this operation, setting pinion **25** which is fixedly connected to the alarm set spindle **18** and, moreover, carries the minute cam **23** has driven the hour setting wheel **26** with the hour cam **24** through the change speed gear **29—30**, so that at the end of the setting operation the sloping edges **23***a* and **24***a* are in the predetermined position with respect to the control fingers **21***a* and **22***a*. At the same time, the alarm set spindle **18** has carried with it the minute setting hand **32** which is fixedly connected to it and the hour setting hand **33** has been moved by the pinion **25** through the change speed gear **29—30***a* and the alarm hour hand wheel **34**.

Release of alarm

As the clockwork unwinds, the minute spindle **4** drives, through the pinion **6***a*, the change speed gear **7—8** and through the latter the minute control pinion **21** and the hour control wheel **22**; at the same time, the minute control finger **21***a* slides on the minute cam **23** and the hour control finger **22***a* on the hour cam **24**. As the minute cam **23** revolves twelve times faster than the hour cam **24**, the minute control finger **21***a* will, as a rule, run past the sloping edge **23***a* of the minute cam **23** several times without being able to fall, because the minute control pinion **21** is prevented, through the hour control wheel **22** by the hour control finger **22***a*, which cannot yet fall on to its control **24**, from being moved (Figs. 1 and 2 of the drawing) to the right. As the clock movement continues to unwind, the time will now arrive when the time of waking is reached. The hour control finger **22***a* will then reach the hour cam **24** by way of the sloping edge **24***a* and now be located over a notch **24***b*, whose time equivalent is at least one hour. Within this period a further revolution of the minute cam **23** may thus be carried out, i. e. only a part revolution, corresponding to the number of minutes set, will take place. When the minute control finger **21***a* now arrives at the sloping edge **23***a* of the minute cam, it can fall this time, because the hour control finger **22***a* is over the notch **24***b* on the hour cam **24** and is not prevented from being moved to the right.

The alarm tension spring **28** can therefore now move the minute control pinion **21** together with the wheel and both control fingers to the right and thereby release the alarm anchor spindle **15** through the nose **28***a* and the silencing arm **17**.

Some time after the fall has taken place, the minute control finger **21***a* strikes against the lifting curve **23***b* of the minute cam and is returned by the latter into the locked position while the minute control pinion **21** and the hour control wheel **22** with finger **22***a* mounted thereon are moved. This return movement takes place against the action of the alarm tension spring **28**, which, at the same time, comes within the range of the silencing arm **17** on the alarm hammer spindle **15** with its locking nose **28***a*. The time value of the lifting curve on the minute cam is approximately 10 minutes, i. e. only this amount is deducted from the range of adjustment of the alarm clock and immediately after release has taken place it can be set for a waking time which is 10 minutes before the position of the clock at the moment. Since the minute cam revolves at twelve times the angular velocity of the hour cam it is clear that the accuracy of release can be considerably increased, in spite of the fact that the minute cam encircles the hour cam. The subdivision of the control member according to the invention would naturally correspond to the extension of the effective edge of the hour cam to 12 times its length, a step which cannot, as a rule, be taken for constructional reasons.

In order to facilitate adjustment exactly to the minute, a ratchet wheel **37** with 60 teeth, which co-operates with the pawl **38**, is fixed on the alarm set spindle, the pawl simultaneously preventing the rotation of the alarm set spindle **18** in the reverse direction against the arrow **20**, because otherwise the minute control finger **21***a* when in the fallen position would strike against the sloping edge **23***a* and could be damaged.

The release device described is preferably intended for alarm clocks, but may also, without departing from the scope of the invention, be employed in other chronometers, in time switches and in clock movements for technical purposes.

We claim:

1. In an alarm clock having a movement including the usual 12:1 reduction dial train and an alarm mechanism, an alarm device settable to the minute comprising a setting spindle, a flanged pinion journalled for rotation on the setting spindle, a trip member fixed to the flanged pinion, a gear wheel rotatably mounted on the flanged pinion, a second trip member fixed to the gear wheel, the setting spindle being positionally related to an intermediate compound gear of the dial train to enable meshing therewith of the flanged pinion and the gear wheel to be rotated thereby in the ratio 12:1, and means engageable with the trip members in set positions to release the alarm mechanism.

2. In an alarm clock settable to the minute, a dial train comprising a centershaft carrying a centershaft-pinion and the minute hand, a cannon carrying the hour wheel and the hour hand, an intermediate compound gear composed of an intermediate gear pinion and an intermediate gear wheel interconnecting the centershaft pinion and the hour wheel, an alarm setting spindle, a rotary pinion journalled on the said setting spindle meshing with the intermediate gear wheel and having the same number of teeth as the centershaft pinion, a gear wheel rotatably mounted on the setting spindle with respect to the setting spindle and to the rotary pinion journalled by the setting spindle, said gear wheel meshing with the intermediate gear pinion and having the same number of teeth as the hour wheel, two alarm trip members rotatably mounted on the setting spindle, one of said members fixed to the rotary pinion and the other fixed to

the gear wheel mounted on the setting spindle, and means responsive to movement of said trip members for disengaging a spring-member provided for stopping the alarm.

3. In an alarm clock settable to the minute, a dial train comprising a centershaft carrying a centershaft-pinion and the minute hand, a cannon carrying the hour wheel and the hour hand, an intermediate compound gear composed of an intermediate gear pinion and intermediate gear wheel interconnecting the centershaft pinion and the hourwheel, an alarm setting spindle, a rotary and shiftable flanged pinion journalled on the said setting spindle, said flanged pinion meshing with the intermediate gear wheel and having the same number of teeth as the centershaft pinion, a gear wheel rotatably mounted on the flange of the said rotary and shiftable flanged pinion, said gear wheel meshing with the intermediate gear pinion and having the same number of teeth as the hour wheel, two alarm trip members mounted on the setting spindle, one of said members fixed to the rotary and slidable flanged pinion and the other to the rotary gear wheel carried by the flange thereof, a spring member for stopping the alarm, and means engageable with said trip members to cause shifting of the flanged rotary pinion, thereby to move said spring member into releasing position.

4. In an alarm clock as in claim 3, and including a 12:1 reduction gear having two end pinions and an intermediate gear wheel, a flange extending from the pinion fixed to the spindle, a pinion fixed to the setting spindle and carrying the means engageable with said trip member carried by the rotary pinion journalled on the setting spindle. a first rotary gear wheel journalled on the flange

of the pinion fixed to the setting spindle and carrying the means engageable with the trip member carried by the gear wheel meshing with the intermediate compound gear, the trip members and the means engageable therewith comprising respectively trip fingers and tripping cams, one of the two flanged pinions being mounted to slide towards the other on the spindle, a cannon carrying the hour hand of the alarm setting device and a second gear wheel rotatable with the cannon being rotatably mounted on the setting spindle, the pinion fixedly mounted on the setting spindle meshing with the intermediate gear wheel of the 12:1 reduction gear and the first and second gear wheels meshing each with one of the pinions associated on each side of the said intermediate gear wheel, and a minute hand fixed on the end of the setting spindle.

5. An alarm clock as in claim 3 wherein the trip members comprise radially spaced trip fingers and the means engageable therewith comprise coaxial tripping cams substantially arranged in a common plane.

6. An alarm clock as in claim 3 further comprising a ratchet wheel fixed on the spindle and a fixed spring pawl engaging the ratchet wheel and allowing the setting spindle to be turned in one direction only, the number of teeth of the ratchet wheel corresponding to an adjustment of the time setting spindle within 1 minute accuracy.

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