Nov. 8, 1960 K. TRICK 2,958,996

SETTING GEAR FOR AN ALARM WATCH

Filed Sept. 12, 1956 2 Sheets-Sheet 1

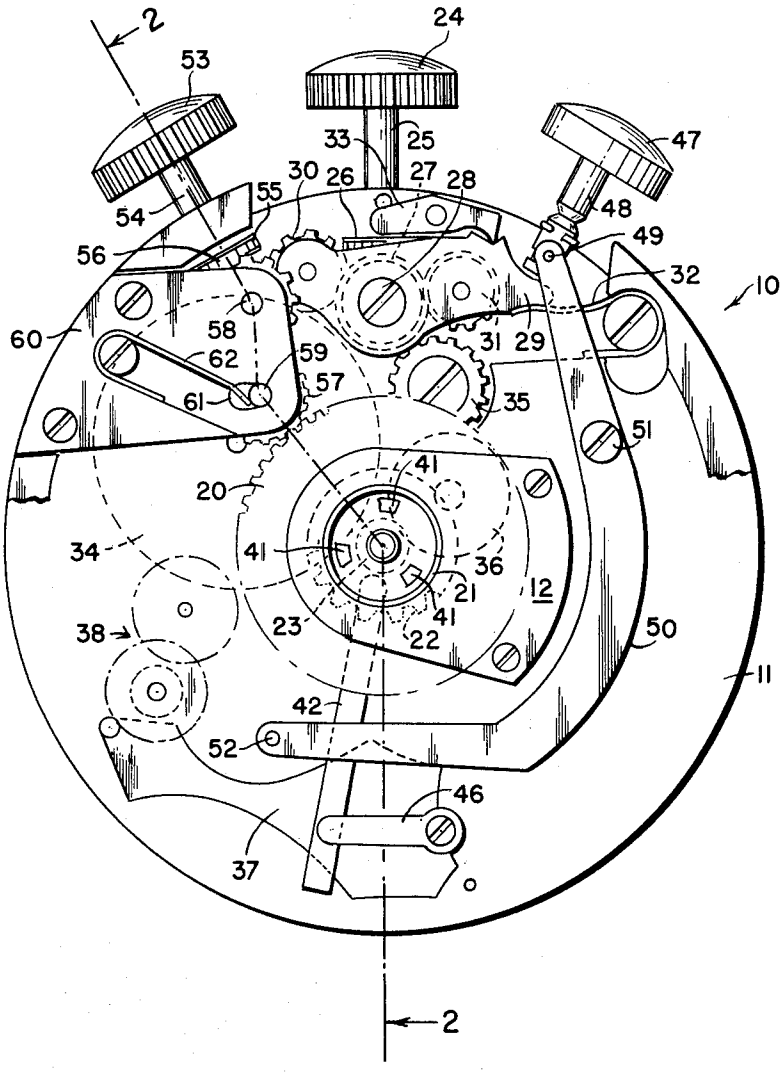

FIG. 1

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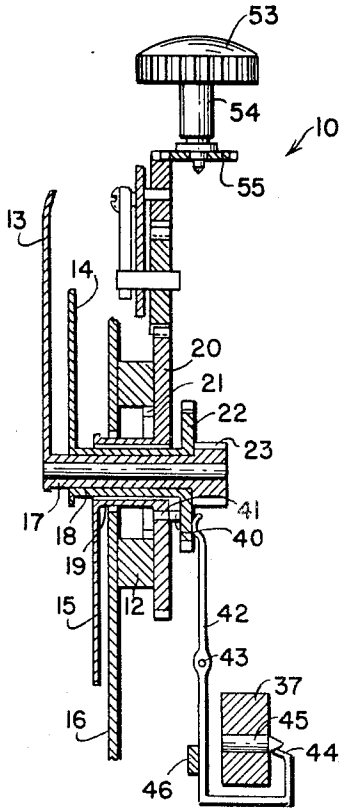

FIG. 2

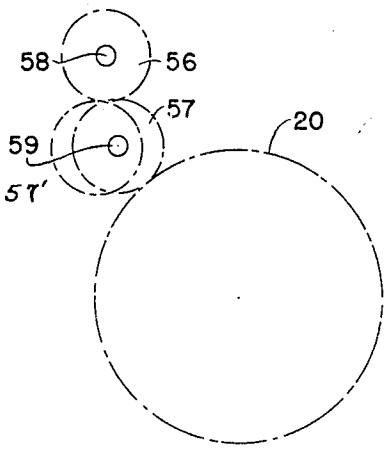

FIG. 3

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SETTING GEAR FOR AN ALARM WATCH

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The present invention relates generally to alarm wrist watches, and more particularly is directed to improvements in the mechanism provided for setting the alarm in such watches, this application being a continuation-in-part of my prior, copending application for United States Letters Patent, identified as Serial No. 281,594, filed April 10, 1952, and now abandoned.

It is an object of the present invention to provide a simplified alarm setting mechanism for alarm wrist watches employing a rotatable, manually actuable crown for setting the alarm mechanism which is separate from, and in addition to, the usual rotatable and axially movable crown provided for both winding the main spring of the watch and setting the time indicating hands thereof.

A specific object is to provide an alarm setting mechanism which is arranged and constructed so that the crown thereof may be rotated in opposed directions, that is, either forward or backward, without damage to the associated wrist watch structure, while the time indicating hands of the watch may also be set in either the forward or backward directions without encountering any destructive or damaging resistance from the alarm setting mechanism.

In accordance with an aspect of this invention, an alarm wrist watch is provided with an hour wheel associated with the time indicating hands, an arrangement for setting the time indicating hands by effecting either forward or backward rotation of the hour wheel, an alarm dial wheel associated with the alarm setting hand and having a series of notches therein engageable by projections on the hour wheel when the time indicating hands occupy positions corresponding to the setting of the alarm setting hand to then permit relative axial movement of the alarm dial wheel and hour wheel for causing operation of an associated alarm, the projections and notches being formed so that the hour wheel and alarm dial wheel and the associated time indicating hands and alarm setting hand are free to be set, without causing corresponding movement of each other, only in the clockwise and counterclockwise directions, respectively, and mechanism for setting the alarm setting hand including an alarm setting crown rotatable either forward or backward, a gear train driven by rotation of the alarm setting crown and engageable with the alarm dial wheel, and free-wheel means interposed in the gear train to prevent application of a clockwise or forward torque to the alarm dial wheel by operation of the alarm setting crown, so that the time indicating hands cannot be disturbed by rotation of the alarm setting crown in the direction for producing such clockwise torque, and to prevent rotation of the gear train and crown of the alarm setting mechanism as a result of counter-clockwise or backward rotation of the alarm dial wheel with the hour wheel during backwards setting of the time indicating hands, whereby the crowns for setting the alarm setting hand and the time indicating hands, respectively, can both be

rotated forward and backward without damage to the structure of the alarm wrist watch.

In accordance with a further aspect of the invention, the free-wheel means of the alarm setting mechanism includes a spindle rotatably supporting a gear of the gear train adapted to mesh with the alarm dial wheel and mounted in a slotted bearing arranged so that, with the spindle at one end of the slotted bearing, the related gear meshes with the alarm dial wheel, and, with the spindle at the opposite end of the slotted bearing, the related gear is disengaged from the alarm dial wheel, and spring means urging the spindle to said one end of the slotted bearing but being adapted to be overcome by counter-clockwise driving rotation of either the related gear or the alarm dial wheel.

The above, and other objects, features and advantages of the invention will be apparent in the following detailed description of an illustrative embodiment thereof which is to be read in connection with the accompanying drawings forming a part hereof, and wherein:

Fig. 1 is a diagrammatic front elevational view of certain mechanisms included in an alarm wrist watch embodying the present invention;

Fig. 2 is a sectional view taken along the line **2—2** of Fig. 1; and

Fig. 3 is a diagrammatic view illustrating the free-wheeling operation of an alarm setting mechanism included in the alarm wrist watch of Figs. 1 and 2.

The drawings illustrate only those mechanisms of an alarm wrist watch **10** embodying the present invention which relate to the setting of the time indicating hands and the alarm setting hand and to the operation of the alarm, other parts of the watch movement being conventional and eliminated from the drawings in order to permit a clear understanding of the characteristic features and advantages provided in accordance with the invention.

The alarm wrist watch **10** includes the usual main plate **11** (Fig. 1) and a front plate **12** (Figs. 1 and 2) for supporting the various components of the watch movement. A minute hand **13**, an hour hand **14** and an alarm setting hand **15** are disposed in front of the usual dial **16** (Fig. 2) to cooperate with the latter so that the hands **13** and **14** indicate the time, while the hand **15** serves to show the time at which the alarm is set to be released or to sound. The hands **13**, **14** and **15** are mounted on the front ends of concentric, successively telescoped hollow shafts or cannons **17**, **18** and **19**, respectively (Fig. 2).

An alarm dial wheel **20** is fixed on the back end of the hollow shaft or cannon **19** and has a circular rib **21** on its front face that extends rotatably into a suitable opening in the front plate **12**. An hour wheel **22** is secured on the cannon **18** of the hour hand **14** and is disposed in back of the alarm dial wheel **20**, the hour wheel **22** being free to move axially toward and away from the alarm dial wheel. A pinion **23** is provided at the back end of the cannon **17** of the minute hand and is disposed in back of the hour wheel **22**.

The mechanism for setting the time indicating hands **13** and **14** of the alarm wrist watch **10** includes a crown **24** (Fig. 1) mounted on a winding stem **25** which is both rotatable and axially displaceable between a depressed winding position and an extended time setting position. A pinion **26** is mounted on the stem **25** for rotation with the latter, but the stem **25** is axially slidable relative to the pinion **26** and the latter is held against axial displacement so that the pinion **26** can continuously mesh with an intermediate pinion or gear **27** rotatably mounted on a pivot **28**. A rocking bar **29** is also mounted on the pivot **28** and carries rotatable gears **30** and **31** which mesh with the gear **27** and are disposed at opposite sides

of the rocking axis of bar **29**. A spring **32** acts against the bar **29** to urge the latter to rock about its pivot in the counterclockwise direction, as viewed in Fig. 1. Rocking of the bar **29** is controlled by a lever **33** which is suitably connected, at one end, to the stem **25** to be rocked in response to axial displacement of the latter, and which acts, at its other end, against the bar **29** so that, when the stem is extended, bar **29** is rocked in the clockwise direction in opposition to the action of the spring **32** and, when the stem **25** is depressed, the spring **32** can return bar **29** in the counter-clockwise direction to engage the gear **30** with the usual winding ratchet wheel **34** for the main or driving spring. On the other hand, when stem **25** is extended, bar **29** is rocked, in the manner indicated above, to free or disengage gear **30** from the winding ratchet wheel **34** and to engage gear **31** with an intermediate gear **35** which, in turn, meshes with a gear **36** engaging the pinion **23** of the minute hand cannon **17**. A conventional gear transmission (not shown) is provided between the pinion **23** and the hour wheel **22** so that the latter will be rotated at a suitable rate in response to rotation of the pinion **23**.

Thus, when the crown **24** is rotated in its depressed position, as illustrated in Fig. 1, the main or driving spring of the watch is wound and, when the crown **24** is rotated with the stem **25** in its axially extended position, the time indicating hands **13** and **14** are turned, either backwards or forwards, that is, either counter-clockwise or clockwise depending upon the direction of rotation of the crown, to effect setting of the time indicating hands.

It is to be understood that the watch **10** includes a conventional movement (not shown) powered by the main spring for normally driving the minute pinion **23** and the hour wheel **22** so that the minute hand **13** and the hour hand **14** will effect complete revolutions in one hour and in twelve hours, respectively.

The alarm wrist watch **10** includes an alarm mechanism having a hammer **37** which is driven, in a conventional manner, from the main spring through a gear transmission **38** (Fig. 1).

As previously mentioned, the hour wheel **22** is axially movable toward and away from the alarm dial wheel **20**, and the hour wheel is provided with one or more, preferably three, as illustrated, projections **40** extending from its forward face and adapted to engage in corresponding apertures **41** in the alarm dial wheel **20** when the hour wheel is in a predetermined rotational position relative to the alarm dial wheel. When the projections **40** are out of registry with the related apertures **41**, the projections **40** space the hour wheel **22** rearwardly from the alarm dial wheel, and three angularly spaced apart projections and related apertures are preferred to avoid any tilting of the hour wheel when the latter is spaced rearwardly from the alarm dial wheel by the projections. Further, in order to permit entry of the projections **40** into the apertures **41** only in one rotational position of the hour wheel relative to the alarm dial wheel, the several projections and the related apertures are spaced different radial distances from the axis of relative rotation.

In order to normally hold the hammer **37** against actuation and to release the alarm for operation only when the time indicated by the hands **13** and **14** corresponds to the time set with the hand **15**, a generally radially extending double-armed lever **42** is rockably pivoted intermediate its ends, as at **43** (Fig. 2), and bears forwardly, at its inner end, against the hour wheel **22**, while the outer end portion of the lever **42** is bent around the hammer **37** and has an end abutment **44** movable into the path of movement of a pin **45** projecting from the hammer **37**. A leaf spring **46** acts against lever **42** in the direction for moving the abutment **44** out of the path of the pin **45** and for urging the inner end of lever **42** forwardly against the hour wheel **22**. Further, the lever **42** is arranged so that, when the hour wheel **22** is spaced rearwardly from the alarm dial wheel

20 by the projections **40**, as in Fig. 2, the abutment **44** holds the pin **45** and the associated hammer **37** against movement, and, when the projections **40** register with the apertures **41**, spring **46** acting through lever **42** causes forward movement of the hour wheel against the alarm dial wheel and the corresponding rocking of lever **42** frees the abutment **44** from the pin **45** to release the alarm hammer **37** for operation in the usual manner.

In order to stop the alarm, the alarm wrist watch **10** is provided with an alarm stopping crown **47** mounted on the outer end of an axially movable stem **48** which has a circumferential groove therein receiving a coupling pin **49** at one end of an alarm stopping lever **50**. The lever **50** is pivoted intermediate its ends, as at **51**, and, at the end thereof remote from the coupling pin **49**, carries an abutment pin **52** which is movable into, and out, of range of the rocking movement of hammer **37**. In the illustrated arrangement, outward axial movement of the stem **48** moves the pin **52** out of the range of rocking movement of hammer **37** to permit such rocking of the latter when the set time occurs, while inward axial movement of the stem **48** moves the pin **52** against the hammer to halt the operation of the alarm.

In an alarm wrist watch embodying this invention, the projections **40** of the hour wheel **22** are formed with inclined or cam-like surfaces so that the hour wheel **22** can be rotated in the clockwise direction, during clockwise setting of the time indicating hands, without entraining, or carrying along, the alarm dial wheel **20**, and so that the alarm dial wheel will be entrained and rotatably carried along after the projections **40** engage in the apertures **41** during counter-clockwise setting of the time indicating hands. Conversely, the alarm dial wheel **20** can be rotated in the counter-clockwise direction relative to the hour wheel **22**, during setting of the alarm, without entraining the hour wheel, whereas clockwise setting of the alarm dial wheel **20** could result in entrainment of the hour wheel upon engagement of projections **40** in apertures **41** and, thereafter, further clockwise rotation of the alarm dial wheel would disturb the setting of the time indicating hands and, possibly, even cause damage to the mechanisms by reason of the strong frictional resistance to driving of the hour wheel by the alarm dial wheel.

In order to provide for setting of the alarm dial wheel **20** and its associated alarm setting hand **15**, the alarm wrist watch **10** embodying this invention includes a third crown **53** mounted on a stem **54** which has a pinion **55** secured thereto. Interposed between the pinion **55** and the alarm dial wheel **20** are two intermediate gears **56** and **57** which are rotatably mounted on spindles **58** and **59**, respectively. The spindle **58** is mounted in a support plate **60** to define a fixed axis for the related gear **56** so that the latter continuously meshes with the pinion **55**, while the spindle **59** is slidable along an elongated slot **61** which is substantially equi-distant from the axis of gear **56** along the length of the slot and which extends generally in the direction toward and away from the toothed periphery of the alarm dial or setting wheel **20** so that, while the gear **57** continuously meshes with the gear **56**, the gear **57** is moved into and out of meshing engagement with the alarm dial wheel **20** by movement of its spindle **59** along the slot **61**. Further, a spring **62** acts, with a relatively small force, against the spindle **59** to yieldably urge the latter along the slot **61** to the end where meshing engagement is effected between the gear **57** and alarm dial wheel **20**.

It is apparent that, when crown **53** is rotated in the direction causing counter-clockwise rotation of gear **57**, the thrust of the teeth of gear **56** against the teeth of gear **57** will be in the direction opposed to the action of the spring **62**, and the latter is sufficiently weak so that the spindle **59** will then move along the slot **61**, toward the left, as viewed in Fig. 1, to remove the gear **57** to the position represented at **57'** on Fig. 3, where

the gear **57** is out of engagement with the alarm dial wheel **20**. Thus, the alarm dial or setting wheel **20** cannot be driven in the clockwise direction by rotation of the intermediate gear. On the other hand, when the crown **53** is rotated in the opposite direction to cause clockwise rotation of gear **57**, the thrust of the teeth of gear **56** upon the teeth of gear **57**, and the reaction of the thrust of the teeth of gear **57** against the teeth of wheel **20** cooperate with the spring **62** to maintain the spindle **59** at the end of slot **61** where the gear **57** and wheel **20** are in meshing engagement.

Accordingly, although the crown **53** is free to be turned in either direction, setting of the alarm occurs only when the crown **53** is turned in the direction for producing counter-clockwise rotation of the alarm dial or setting wheel **20**. However, counter-clockwise rotation of the alarm dial wheel **20** cannot, by reason of the cam-like configuration of the projections **40**, cause entrainment of the hour wheel **22**. Thus, entrainment of the hour wheel **22** by the alarm dial wheel **20** is avoided during setting of the alarm.

Further, it will be seen that, when the alarm dial wheel **20** is rotated in the counter-clockwise direction as a result of entrainment by the hour wheel **22** during counter-clockwise setting of the time indicating hands, the thrust of the teeth of wheel **20** against the teeth of gear **57** shifts the latter bodily along the slot **61** in the direction away from the alarm dial wheel so that counter-clockwise rotation of the latter is not transmitted to the intermediate gears **56** and **57**, the pinion **55** and the alarm setting crown **53**. Since the alarm dial wheel **20** is not entrained by the hour wheel **22** during clockwise setting of the time indicating hands, it is apparent that the time indicating hands can be set in either direction without causing rotation of the gears **56** and **57**, the pinion **55** and the alarm setting crown **53**, and, therefore, without encountering the frictional resistance that would be associated with such rotation.

From the foregoing, it will be appreciated that the crown **24** can be rotated in either direction, when in the time setting extended position, and that the alarm setting crown **53** can also be rotated in either direction, without causing damage to the mechanisms of the alarm wrist watch **10**.

Although a particular embodiment of the invention has been described in detail herein and shown in the accompanying drawings, it is to be understood that the invention is not limited to that particular embodiment, and that various changes and modifications may be effected therein without departing from the scope or spirit of the invention, except as defined in the appended claims.

What is claimed is:

1. In an alarm wrist watch; the combination of time indicating hands and an alarm setting hand, an hour wheel associated with said time indicating hands, means for setting the time indicating hands by effecting rotation

of said hour wheel in opposed directions, means for setting said alarm setting hand including an alarm crown, a gear train rotated by said alarm crown and composed of a plurality of intermediate gears and an alarm dial wheel rotatably fixed with respect to said alarm setting hand, an alarm mechanism, said hour wheel being axially movable relative to said alarm dial wheel, said alarm dial wheel having at least one aperture therein and said hour wheel having at least one mating cam-like projection normally spacing said hour wheel from said alarm dial wheel and adapted to engage in the related aperture in one rotational position of the hour wheel relative to the alarm dial wheel and to then permit axial movement of said hour wheel toward said alarm dial wheel, alarm locking means normally preventing operation of said alarm mechanism and releasing the latter for operation in response to said axial movement of said hour wheel toward said alarm dial wheel, each cam-like projection being shaped to permit free rotation of said hour wheel and alarm dial wheel in clockwise and counter-clockwise directions, respectively, while preventing free rotation of said hour wheel and alarm dial wheel in counter-clockwise and clockwise directions, respectively, and a free-wheel mechanism interposed in said gear train to prevent application of a clockwise torque to said alarm dial wheel by operation of said alarm crown and to free said gear train from said alarm dial wheel during counter-clockwise rotation of the latter with said hour wheel.

2. In an alarm wrist watch, the combination according to claim 1; wherein said free-wheel mechanism includes a spindle rotatably supporting the last of said intermediate gears of the gear train adapted to mesh with said alarm dial wheel, a slotted bearing for said spindle to permit movement of the latter between positions wherein said last gear meshes with, and is free of, respectively, said alarm dial wheel, and spring means urging said spindle along said slotted bearing toward the position wherein said last gear meshes with said alarm dial wheel and adapted to be overcome by the thrust on said last gear parallel to said slotted bearing during counter-clockwise rotation of said alarm dial wheel with said hour wheel and during rotation of said last intermediate gear in the direction for applying a clockwise torque to said alarm dial wheel by said means for setting the alarm setting hand.

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