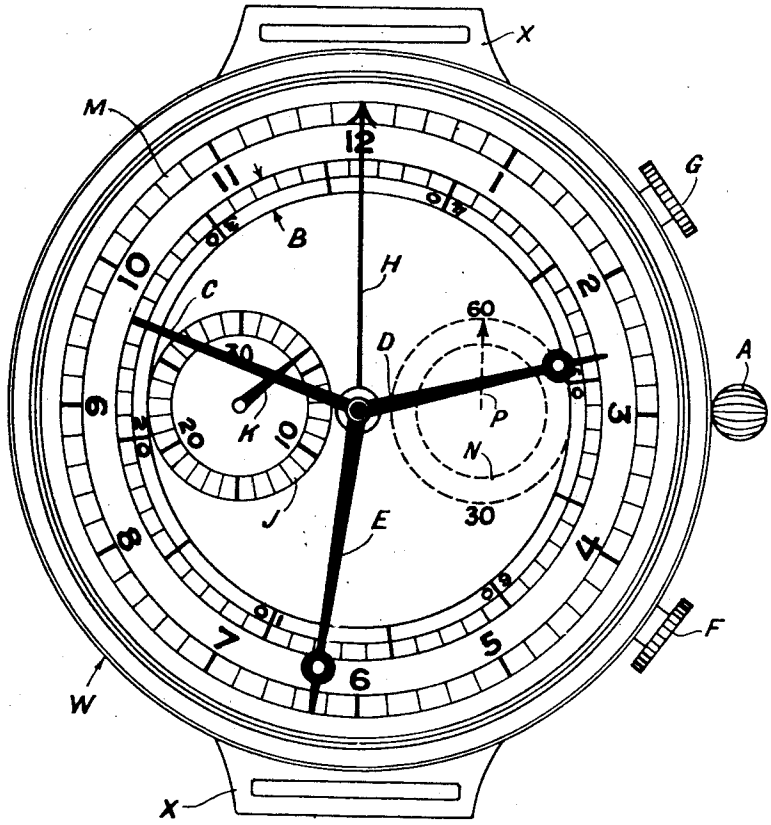
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WATCH DIAL AND HANDS

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INVENTOR:
DRURY ALBERT McMILLEN
By Richardson, David and Nordon
Attys

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WATCH DIAL AND HANDS

Drury Albert McMillen, Sao Paulo, Brazil

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This invention relates to watches and more particularly to watches intended to fix accurately the moment of an occurrence or observation.

There are in existence several types of watches which permit of adjustment to set the time recorded on the dial accurate as regards the hour, minute and second. Other kinds of watches are also known, usually termed stop-watches, which permit the determination of the time which has passed from the occurrence of a certain event or between two events.

The object of this invention is to provide a watch having hour, minute and seconds hands which can be set to the exact hour, minute and second of time and which also allows an observer to fix the moment of any occurrence or of making an observation so that at any time thereafter the time of the occurrence can be determined, if necessary repeatedly.

The lack of a device having the above characteristics is felt particularly by navigators and aviators who have frequently to determine the position of a ship or a plane by the use of two data, (*a*) the altitude of one or more celestial bodies obtained by the use of a sextant and (*b*) the time, usually Greenwich mean time, at which the observation was made, that is to say the exact hour, minute and second at which the sextant was used to determine the angle of altitude.

In practice, particularly at night, there is always an inevitable lapse of time or lag between the exact second that the celestial body was observed and the observation of the time indicated by a watch for the reason that the use of a sextant at night would normally be carried out without a light or at least in a very dim light and before the observer can determine the exact time he has to take several actions of indeterminable duration, such as for example, to place his sextant in a safe place, turn on some kind of light, take up pencil and paper and make a careful observation of the time indicated on his watch.

It will be clear that although the setting on the sextant remains or may remain at the same position for an indefinite period so that the altitude of a celestial body marked thereon in degrees, minutes and tenths of minutes can be read several times to ensure the correct reading, thus avoiding the almost certain error which would arise with one rapid reading, the same observation cannot be carried out when it is a case of reading a common type of watch, the hands of which are continuously moving and are never stationary. As a result, there is not only the certain error in seconds of time between the actual

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observation of the celestial body and the moment of the watch reading due to the necessity of taking the actions above-mentioned, but there is often a much larger error, frequently of a whole minute of time, due to actual misreading of the watch caused by the necessity of speed in observation and due to the fact that the hands are continuously in a different position since they must always be read while moving.

It has been determined by experiment that contrary to the opinion of many navigators and most laymen, the correct observation of time recorded on a watch is a quite difficult operation if correct results are to be constantly obtained. A recent experiment carried out by the applicant using eighteen different observers showed an average error in reading the time from a navigation watch of normal type of six minutes twenty-seven seconds. From further experiments it has been determined that the majority of the mistakes in reading occurred in determining the exact minute of time and there were less errors in determining the particular hour and second. This error occurs particularly when the minute hand is located at a more or less central position between two five-minute intervals, for example when the watch indicates thirty-two or thirty-three minutes or seventeen or eighteen minutes. In such a case it is quite easy to misread a full minute when observing the time.

It is to be understood that the usual type of chronometer used on board ship cannot be used in an aeroplane due to vibration and instability of the moving platform and while a navigator or observer can normally adjust his watch one or more times daily to the exact hour and minute of time obtained from radio signals the normal watch, generally speaking, cannot be adjusted to indicate the exact second of time.

Further objects and novel features of this invention will become apparent from the following description and accompanying drawing showing by way of example a watch face or dial constructed according to the invention. The drawing also shows in dotted lines a possible modification of the watch dial.

The watch illustrated, designated generally by W, is of the type normally worn on the wrist, for which purpose it is provided with two apertured lugs X for the attachment of a wrist strap. The dial is provided in the normal manner with a scale M indicating hours and minutes and with an hour hand D and minute hand E. Additionally, a seconds hand C is mounted on the same

spindle in order that the time may be read off in hours, minutes and seconds.

Arranged for example within the scale M is a further annular scale B marked off in seconds showing in the normal manner sixty seconds in the complete circle. The watch is provided, as is usual, with a winding head A which in this case is capable of limited radial displacement and when pulled out the winding head A releases the seconds scale B so that rotation of the winding head in its pulled-out position causes rotation of the scale B in a clockwise or counter-clockwise direction as desired. This provides means for adjusting the time shown on the watch to a setting correct to one second. When the head A is pushed inwardly the scale B is locked in its adjusted position.

The adjustment of the hour hand D and minute hand E is effected by the depression or radially inward movement of a head F and rotation of the winding head A when in its inward position in the normal manner.

The watch is additionally provided with an auxiliary seconds hand H mounted on the main watch spindle, which hand H is linked to a further hand K moving over a subsidiary dial J. The connection between the seconds hand H and the hand K is such that the hand K moves in a clockwise direction through one scale division of the dial J for each complete revolution of the hand H.

The movement of the hands H and K conforms to that of a stop-watch and is regulated by inward depression of a head G. Normally the hands H and K are stationary and are set at zero with the hand H opposite the designation 12 on the scale M and the hand K at zero on the dial J. On depression of the head G the mechanism is released so that the hands H and K move in the normal manner to indicate minutes and seconds of time which have elapsed since depression of the head G.

The accuracy of the time keeping of the watch is checked periodically, such as once every twelve or twenty-four hours by a time signal received from an observatory or radio station or the like. The watch is set by pulling out the winding head A and moving the seconds scale B so as to maintain the designation 60 beneath the seconds hand C. The operator is thus enabled to provide coincidence of the sixty-second mark on scale B and the seconds hand C at the exact instant that the radio or signal or the like indicates the correct time. When the radio signal is heard the head A is depressed so as to lock the ring B in its proper position to register the exact second of time.

Following the setting of the scale B to provide the exact second of time, the hour hand D and the minute hand E are immediately set by depressing the head F and turning the winding head A to set the hands D and E for the correct hour and minute. By the preceding adjustments the watch is now set to read accurately during the next twelve or twenty-four hours providing that the watch is maintained in good condition and is correctly regulated to exhibit relatively accurate time-keeping characteristics.

When using the watch to indicate the exact moment of observation of a celestial body the observer at the moment of observing the celestial body by means of a sextant or the like depresses the head G which releases the stop-watch mechanism so that the minute and seconds from depression of the head G are accumulated on the dial J and hand H. In the position shown in the drawing the hands H and K show that from the moment the head G was depressed exactly four minutes have passed, since the hand K is in the position marking four accumulated minutes and the seconds hand H is just passing the twelve hour or zero mark on the scale M.

Thus when observing the celestial body and obtaining the altitude thereof by means of a sextant the observer would depress head G in order to set in operation the stop-watch mechanism giving the accumulated time from the instant of depression of the head G. In this way as long as the hands H and K continue moving the observer has succeeded in fixing the exact time of observation and he can thus put the watch aside and determine the time of observation at any suitable time thereafter within the period of time indicated on the accumulator dial J.

By this it is to be understood that it is more convenient than in present procedure for the observer to make his observation and simultaneously depress head G, then to turn on a light, place his sextant in a convenient place, take up pencil, paper and if necessary a magnifying glass and at his leisure take the desired number of readings of the altitude indicated on his sextant in order to determine the correct reading. During all this procedure the hands H and K of the watch continue to run and when the sextant observations are completed the observer takes up the watch to determine the exact moment of observation. For example, referring to the figure, the observer might conveniently wait until the seconds hand H is passing the 0 or 12 indication on the scale M and at that moment observe the time by means of the hands D, E and C. In the case under consideration the watch indicates 2 h. 31 m. 25 s. This time is recorded but from the moment that the observation of the celestial body was made and the head G depressed, the accumulator dial J had marked up four minutes. The exact moment of observations was, therefore, 2 h. 31 m. 25 s. less four minutes, or 2 h. 27 m. 25 s. Preferably, the observer should wait another full minute and check his reading, which would then be 2 h. 32 m. 25 s. whereas the accumulator dial would show five minutes accumulated time, so that the subtraction of this amount from the latter time will again provide the time of observation of 2 h. 27 m. 25 s.

The watch thus enables an observer or navigator to fix the exact moment of an observation, this time being able to be checked as often as desired or convenient for the observer in view of other operations being undertaken. It is to be noted that the observer may if desired subtract the accumulated time shown by minute hand K on dial J and by the seconds hand H at any instant irrespective of whether or not the seconds hand H is passing the zero or twelve-hour mark on the dial M, from the time indicated by the hands C, D and E but the experience of the applicant has shown that it is easier, more convenient and more accurate to wait until the hand H is either at mark 6 or the mark 12 of the scale M.

To return the hands K and H to zero setting and to lock them in this position, the head G is again depressed after the time of observation has been accurately recorded.

If due to manufacturing difficulties it is inconvenient to mount the seconds hand H on the same spindle as the watch hands D, E and C, an auxiliary dial N having a seconds hand P, as shown in the drawing in dotted lines, may be pro-

vided moving in synchronism with the seconds hand C. In such a case the hand P would be linked with the minute hand K and would form a substitute for the seconds hand H.

It is to be understood that the mechanism by which the movements above described are effected is well known in the art and the mechanisms per se form no part of the present invention.

I claim:

1. A watch dial intended particularly for navigational purposes having a main scale indicating hours and minutes, a main spindle associated therewith, an hour hand and a minute hand each mounted to rotate about the axis of said spindle, said hands being adjustable in position, which includes a main seconds hand mounted to rotate about the axis of said spindle, an adjustable dial element marked with a sixty-second scale and rotatable freely about the axis of said spindle through 360°, said movable dial element being lockable in an adjusted position, an auxiliary seconds hand mounted to rotate about the axis of said spindle, a subsidiary scale marked in minutes, and an auxiliary minute hand associated with said subsidiary scale and linked to said auxiliary seconds hand whereby said auxiliary minute hand moves over said subsidiary scale through one minute graduation for each 360° revolution of said auxiliary seconds hand, said auxiliary minute and seconds hands being controlled by stop-watch mechanism of conventional type.

2. A watch dial intended particularly for navigational purposes having a main scale indicating hours and minutes, a main spindle associated therewith, an hour hand and a minute hand, each

mounted to rotate about the axis of said spindle, said hands being adjustable in position, which includes a main seconds hand mounted to rotate about the axis of said spindle, an adjustable dial element marked with a sixty-second scale and rotatable freely about the axis of said spindle through 360°, said movable dial element being lockable in an adjusted position, an auxiliary seconds hand mounted on a second spindle and rotatable in synchronism with the main seconds hand, a subsidiary scale marked in minutes, an auxiliary minute hand linked to said auxiliary seconds hand whereby said auxiliary minute hand moves over said subsidiary scale from one minute graduation to the next for each 360° revolution of said auxiliary seconds hand, and a second subsidiary scale graduated in seconds associated with said auxiliary seconds hand, said auxiliary seconds and minute hands being controlled by stop-watch mechanism of conventional type.

DRURY ALBERT McMILLEN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
396,914	Bovet et al.	Jan. 29, 1889

FOREIGN PATENTS

Number	Country	Date
216,203	Switzerland	Nov. 17, 1941