July 24, 1962 H. B. HEUER 3,045,418

TIME METER

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FIG.1

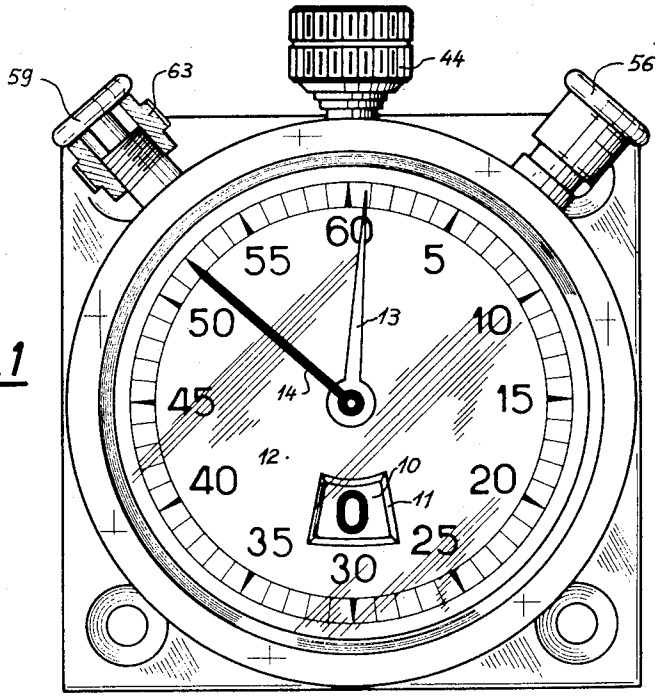
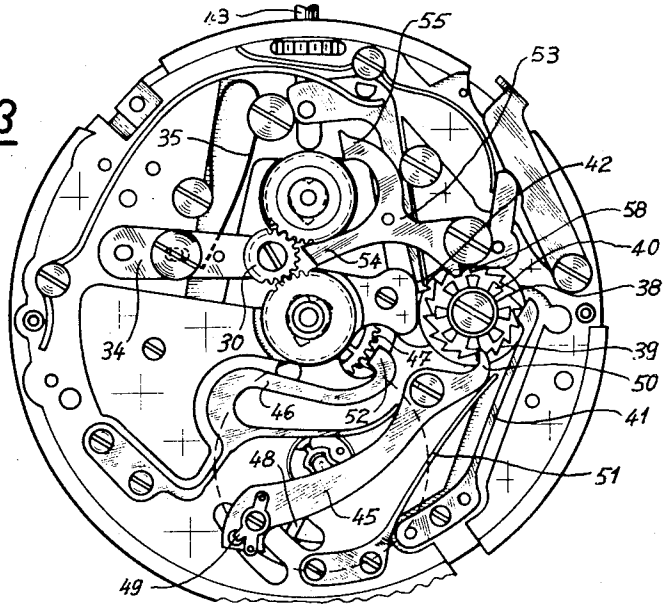


FIG.3

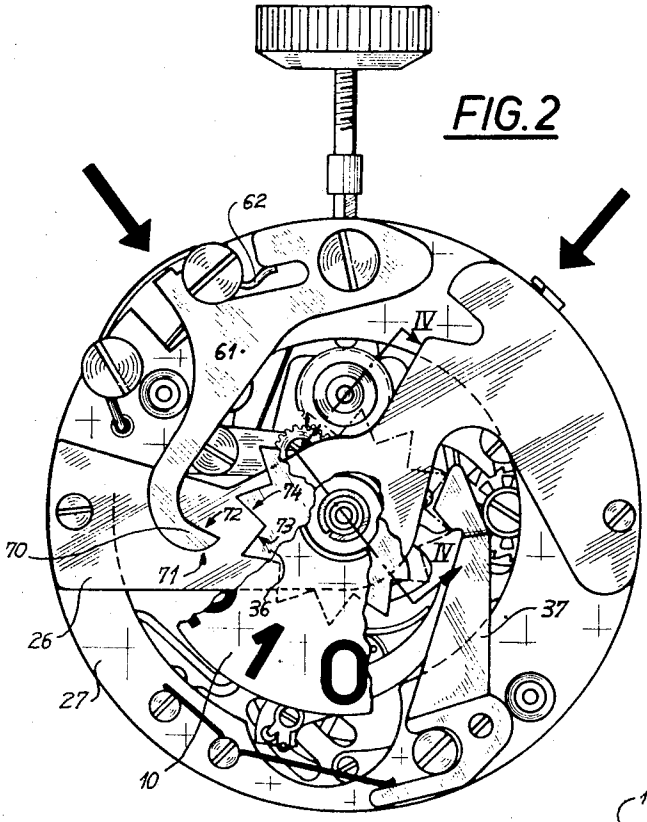


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FIG. 2



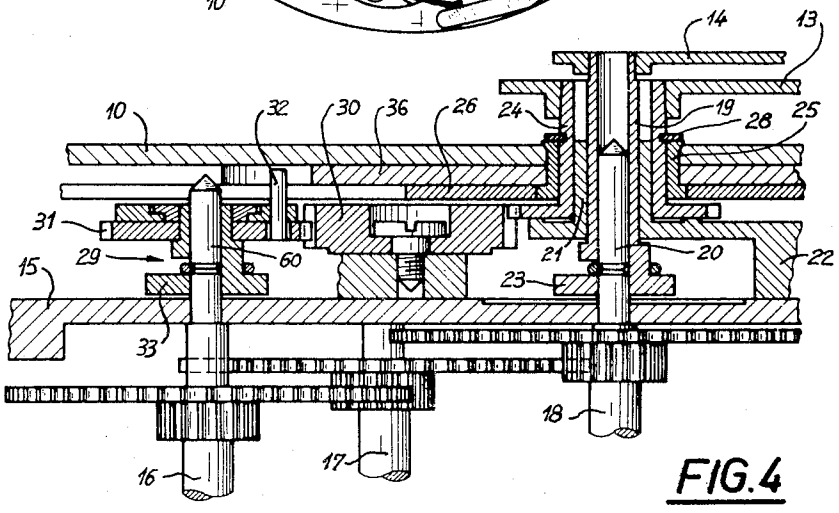


FIG. 4

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TIME METER

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My invention has for its object a time-meter including an hour indicating disc rotating intermittently so as to make successive digits appear behind a gate formed in a dial; means for driving the hour indicating disc, consisting of a star wheel fixed below the disc and a pinion mounted on an eccentric centre wheel; a spring detent engaging into the star wheel so as to hold the hour indicating disc at a given angular position; a push-button arrangement for zero re-set of the hour indicating disc independently from zero re-set of the minute and second indicating members, said arrangement comprising a push button, a rocking member providing for the progression of the star wheel by one interval at every pressure on the push-button, and means preventing the star wheel from rotating by an angle greater than an interval owing to its inertia and against setting lever action whenever an exaggerated pressure is exerted on the push-button.

The accompanying drawings illustrate, by way of example, a preferred embodiment of the time-meter forming the object of my invention. In said drawings:

FIG. 1 is a front view of the time-meter.

FIG. 2 is a view, from the dial side, of the time-metering mechanism.

FIG. 3 is a view similar to FIG. 2, wherein several members carried by the plate near the dial have been removed.

FIG. 4 is a sectional view through line IV—IV of FIG. 2.

The time-indicating members of the meter illustrated are constituted, as shown in FIG. 1, by an hour-indicating disc **10**, the digits on which appear through the gate **11** formed in the dial **12**, while a central minute-hand **13** and a sweep seconds hand **14** turn over said dial.

The mechanism controlling the time-indicating members is carried by the pillar plate **15** and includes (FIG. 4) an eccentric centre wheel and pinion **16**, a third wheel and pinion **17** and a fourth wheel and pinion arranged centrally at **18**.

The sweep seconds hand **14** is driven, as shown in FIG. 4, over a sleeve **19** fitted with slight friction over the end of the spindle **20** rigid with the fourth wheel and pinion **18**. Said sleeve **19**, revolving inside a bearing sleeve **21** formed in a bridge plate **22** secured to the pillar plate **15** on the side facing the dial, is provided at its lower end with a heart-shaped return to zero cam **23**.

The minute hand **13** is keyed to a cannon pinion **24** adapted to revolve round the bearing **21**. Over the pipe of cannon pinion **24** is freely fitted the hub **25** of an arrangement formed by the hour indicating disc **10** and by the twelve-pointed star wheel **36**; said hub is provided at its lower end with a carrier section revolving inside a circular bearing formed by an opening in a small bar **26**. The latter is fitted on the pillar plate **15** through the agency of an annular bridge plate **27** (FIG. 2).

The cannon pinion **24**, of which the axial shifting is limited by the bar **26**, is driven by the centre wheel and pinion **16** through the agency of a rotary system **29**, fitted with slight friction over the end of the spindle **60** of said centre wheel and pinion and passing through the plate **15**, and of a transmission pinion **30**.

The rotary system **29** includes a toothed wheel **31** carrying a projection **32** and a heart-shaped return to zero cam **33**. The transmission pinion **30** is fitted in an arm

34 (FIG. 3) and is urged against the teeth on the cannon pinion **24** and on the toothed wheel **31** by a spring **35**.

The angular position of the arrangement **10—36** resting in the small bar **26** and held in position by a clip **28**, is defined by a spring detent **37**, FIG. 2. At each rotation of the centre wheel and pinion **16**, the projection **32** provides for the progression of the star wheel **36** by one interval, i.e. by one twelfth of a revolution of the disc **10** rigid with the star wheel.

The means controlling the starting and the stopping of the driving mechanism include, as shown in FIG. 3, a stop-carrying wheel **38** rigid with a ratchet **39** provided with sixteen teeth. Said wheel **38** carrying eight stops **40** is subjected to the action of a spring detent **41** and is actuated by a catch **42** connected with the rod **43** of a central pusher member **44** (FIG. 1). A pressure exerted on the latter provides for a progression by one tooth interval of the ratchet wheel **39**, which produces the starting and stopping of the driving mechanism according to the angular position assumed by the stops **40**.

The stoppage of the mechanism is obtained through the agency of two brakes **46** and **45** acting simultaneously, respectively on the wheel **47** of the fourth wheel and pinion **18** and on the balance wheel **48**. The brake **45** is constituted by a lever, of which one arm carries a shoe **49**, while its other arm is provided with a nose **50**. Said braking lever is subjected to the action of a spring **51** which urges the shoe **49** against the cooperating part of the balance wheel **48**. If the wheel **38** is in the angular position illustrated in the drawing, the nose **50** is raised by one of the stops **40** and the shoe **49** is held away from the balance wheel. If the wheel **38** is, in contradistinction, in an angular position spaced by one sixteenth of a revolution with reference to the position illustrated, the nose **49** drops into the space separating two successive stops **40** and the shoe **49** locks the balance wheel **48** against movement. The brake **46**, which is constituted by a spring blade, is controlled by the brake **45** and acts through the agency of a shoe **52** on the teeth of the wheel **47**.

The return to zero of the hands **13** and **14** is obtained through the agency of an arrangement including a forked rocking member **53**, the arms **54** and **55** of which form two hammers adapted to act on the corresponding heart-shaped return to zero cams **23** and **33**.

The rocking member **53** is controlled by a lateral pusher knob **56** (FIGS. 1 and 2) subjected to the action of a return spring, not shown. Said arrangement is locked whenever a stop **40** is located in registry with the tail-piece **58** of the rocking member **53**, as occurs each time the brakes **45** and **46** are not actuated and it is released at the moment at which a stop **40** raises the nose **50** and produces a locking of the driving mechanism.

The indicating mechanism is arranged for zero re-setting the hour indicating disc **10** independently from the zero re-setting of the other indicating members.

This arrangement includes a lateral push-button **59** controlling a rocking member **61** subject to the action of a return spring **62**. Said rocking member, when pivoting because a pressure is exerted on the push-button, touches a tooth of the star wheel **36** and provides for its progression by an angle greater than half an interval, thus enabling the setting lever **37** to complete the action of the rocking lever conveniently while the latter returns to its first position.

The star wheel **36** is prevented from moving through an angle larger than one interval under the action of its inertia whenever the action of the spring detent **37** is overcome by an exaggerated pressure exerted on the push-button **59**. This is obtained by the shape of the end of the rocking member **61**, which end forms a projection

70 bounded by an inner impulse surface 71 adapted to impinge against the rear side 73 of the successive teeth of the star wheel and to thus make the star wheel turn intermittently while the outer surface 72 of the projection 70 forms an abutment stopping the successive star wheel teeth through their front side 74 just after the impulse has been given to the preceding star wheel tooth.

The impulse surface 71 is rounded so as to engage only a very small area on the rear side 73 of the successive teeth during the successive impulses. In contradistinction the abutment surface 74 is rectilinear and engages a line on the front side 74 of the successive teeth so as to stop the star wheel.

The rounded shape of the impulse surface allows thus a sliding movement thereof over the rear side of the cooperating teeth when the rocking member is caused to pivot under the action of the push-button 59; this ensures an even distribution of wear.

These impulse and abutment surfaces are designed so as to limit to a minimum the time elapsed between the actual beginning of the impulse and the stop produced by the abutment surface. This cuts out any undesired shocks.

The spring detent 37, the rocking member 61 and the return spring acting thereon are fitted on the annular bridge member 27. A ring 63 screwed over the sleeve inside which the stem of the pusher member 59 slides, allows axially locking the latter against inward movement.

What I claim is:

1. A time meter comprising an hour disc carrying an annular scale of hours, a gated dial under which said disc is adapted to revolve to show the figures of its scale in succession through the gate in the dial, an annular minute scale on the dial, a minute hand and a sweep seconds hand cooperating with the minute scale, an eccentric centre gear including a spindle, a toothed wheel fitted with slight friction over said spindle and controlling the minute hand, two return to zero cams rigid with said sweep seconds hand and with said toothed wheel respectively, a projection carried eccentrically by the toothed wheel, a star-shaped wheel coaxially rigid with the hour disc and driven by said projection engaging in intervals between its teeth, a train of gears operatively connecting the sweep seconds hand with the centre gear, a first knob, a balance wheel operatively connected with said train of gears, means engaging the train of gears and the balance wheel and controlled by said first knob to produce alternatively upon successive actuations of the first knob, the starting and the stopping of the operation of the time meter, a second knob controlling the return to zero of the two return to zero cams; a third knob and a mechanism through which actuation of said third knob shifts the star-shaped wheel and hour disc stepwise to zero.

2. A time meter comprising an hour disc carrying an annular scale of hours, a gated dial under which said disc is adapted to revolve to show the figures of its scale in succession through the gate in the dial, an annular minute scale on the dial, a minute hand and a sweep seconds hand cooperating with the minute scale, an eccentric centre gear, including a spindle, a toothed wheel

fitted with slight friction over said spindle and controlling the minute hand, a return to zero mechanism, including cams, for the seconds hand and the minute hand, a projection carried eccentrically by the toothed wheel, a star-shaped wheel coaxially rigid with the hour disc and driven by said projection engaging the intervals between its teeth, a train of gears operatively connecting the sweep seconds hand with the centre gear, a first knob, means engaging the train of gears and controlled by said first knob to produce alternatively upon successive actuations of the first knob the starting and the stopping of the operation of the time meter, a second knob controlling the return to zero of the two return to zero cams, a third knob, a rocking member controlled by said third knob and one end of which faces the star-shaped wheel, to engage upon actuation of said third knob the interval between two successive teeth to thereby shift the star-shaped wheel by one tooth interval, a spring detent holding the star-shaped wheel elastically in its successive angular positions corresponding to an accurate positioning of an hour scale figure under the dial gate.

3. A time meter comprising an hour disc carrying an annular scale of hours, a gated dial under which said disc is adapted to revolve to show the figures of its scale in succession through the gate in the dial, an annular minute scale on the dial, a minute hand and a sweep seconds hand cooperating with the minute scale, an eccentric centre gear, including a spindle, a toothed wheel fitted with slight friction over said spindle and controlling the minute hand, a return to zero mechanism for the seconds hand and the minute hand, a projection carried eccentrically by the toothed wheel, a star-shaped wheel coaxially rigid with the hour disc and driven by said projection engaging the intervals between its teeth, a train of gears operatively connecting the sweep seconds hand with the centre gear, a first knob, means engaging the train of gears and controlled by said first knob to produce alternatively upon successive actuations of the first knob the starting and the stopping of the operation of the time meter, a second knob controlling the return to zero of the zero mechanism, a third knob, a rocking member controlled by said third knob and one end of which forms a projection extending towards said star-shaped wheel and defined between a forward rounded impulse surface adapted to engage the rear surfaces of the successive teeth of the star-shaped wheel to urge the latter through one tooth interval and a substantially flat rear abutment surface stopping the progression of the star-shaped wheel by engagement with the front surface of the following tooth a very short moment after the impulse has been given by the impulse surface, a spring detent holding the star-shaped wheel elastically in its successive angular positions corresponding to an accurate positioning of an hour scale figure under the dial gate.

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