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TIME BASE MECHANISM

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Fig. 3.

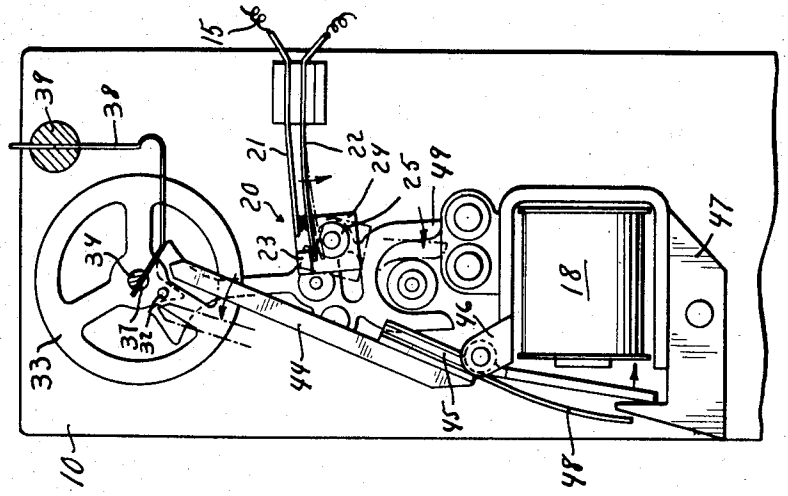


Fig. 2.

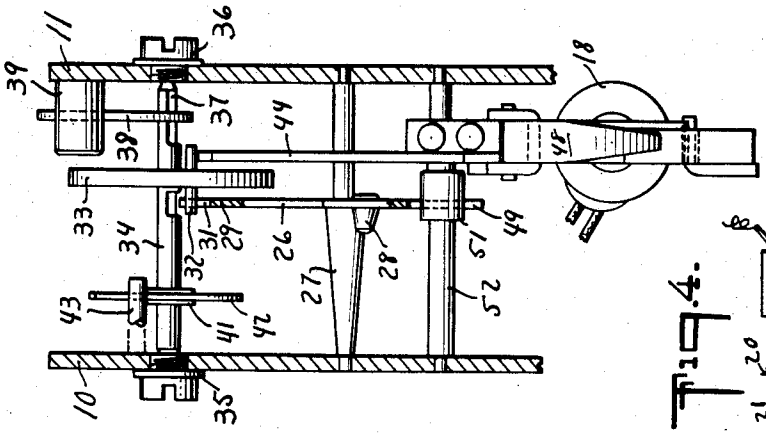


Fig. 4.

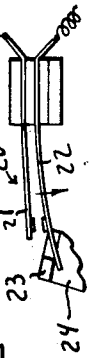
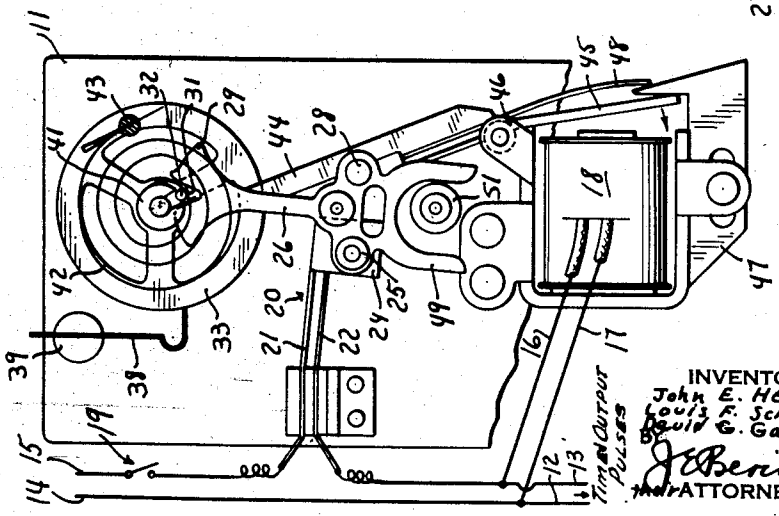


Fig. 1.



INVENTOR
John E. Hewitt
Louis F. Schmidt
David G. Gardner
By J. C. Beringer
their ATTORNEY

United States Patent Office

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TIME BASE MECHANISM

John E. Hewitt, Louis F. Schmidt, and David G. Gardner, Lansing, Mich., assignors to Abrams Instrument Corporation, Lansing, Mich., a corporation of Michigan

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3 Claims. (Cl. 200—90)

This invention relates to electro-mechanical devices initiating electrical pulses at an accurately controlled rate. It has particular reference to a self-contained unit utilizing its own natural period to control an impulsing mechanism, the purpose of the unit being that of a time base providing timed electrical impulses for use in an intervalometer or like device characterized by operation at repetitious timed intervals.

An object of the invention is to present a time base as described of simple compact construction and of general utility.

Another object of the invention is to provide for the production of accurately timed electrical impulses through electro-mechanical means constituting a unitary time base.

A further object of the invention is to present a generally new construction and arrangement of parts, in a device of the kind described, for initiating the operation of, and continuing in operation, a constant period device in the form of a balance wheel and hair spring assembly.

Still another object of the invention is to provide a spring detent means for the constant period device positioning it at periods of rest for operation by mechanical impulse generating means.

Other objects and structural details of the invention will appear from the following description when read in connection with the accompanying drawings, wherein:

Fig. 1 is a view in side elevation, and in part diagrammatic, of a time base unit in accordance with the illustrated embodiment of the invention, the left hand mounting plate being removed;

Fig. 2 is a view of the time base unit of Fig. 1 in longitudinal section, some parts being omitted;

Fig. 3 is a view similar to Fig. 1, taken from the opposite side of the unit with the right hand mounting plate removed; and

Fig. 4 is a detail view showing the normally closed contacts in the unit as they appear when open.

Referring to the drawing, a time base unit in accordance with the illustrated form of the invention comprises parallel spaced apart mounting plates **10** and **11**. Supported between the plates **10** and **11** are the elements of the impulsing mechanism which operate to send timed electrical output pulses to an external place of use through out-going conductors **12** and **13**. The latter are in effect continuations of in-coming power conductors **14** and **15** leading from a source of electrical current. Connected across the power conductors by means of leads **16** and **17** is an electro-magnetic device or solenoid **18**. In the power conductor **15** is an on-off control switch **19** as well as a switch **20** comprising make and break contact arms **21** and **22**, the latter switch being interposed in the line **15** between the switch **19** and the electro-magnetic device **18**. In the operation of the mechanism, the switch **19** is closed so that the energizing and deenergizing of the device **18** becomes a function of the closing and opening movements of the contact arms **21** and **22**.

The arms **21** and **22** have the form of spring blades, and, as indicated in Fig. 3, such blades are tensioned in a manner normally to engage respective contact points thereon with one another. The lower blade arm **22** extends beyond the outer end of the upper blade arm **21** and underlies a cam portion **23** on a piece **24** of a non-

conductive material secured as by an eyelet **25** to the mid area of a fork member **26**. The latter is pivotally mounted on the outer end of a shaft **27** supported between the mounting plates **10** and **11**. The pivot point for the fork member **26** is in the central longitudinal plane thereof, with the cam piece **24** mounted on one side thereof. To balance or compensate for the weight of the latter, there is mounted on the fork member on the other side of the central pivot point thereof a lead slug **28**.

Extending upward from its pivot point **27**, the fork member **26** is formed at its upper end with an expanded portion **29** through the upper edge of which opens a V-shaped cut-out **31**. Adapted to enter the cut-out portion **31** is a pin **32** installed in and extending laterally from the hub of a balance wheel **33**. A shaft **34** mounts the balance wheel **33** which is secured to the shaft in a concentric relation thereto. The opposite ends of the shaft **34** are received in respective bearings **35** and **36** installed in the mounting plates **10** and **11**. The shaft is freely rotatable in the bearings. Near its one end, the shaft **34** is formed with a flat **37** adapted to be engaged by one end of a leaf spring **38**, the opposite end of which is anchored to a stud **39** fixed in the mounting plate **11**. The leaf spring **38**, in conjunction with the flat **37**, acts as a spring detent and when it is engaged with the surface **37** yieldingly holds the shaft **34** from rotation.

Near the opposite end of the shaft **34** there is attached thereto, as by a press fit, a collet **41** to which is attached one end of a hair spring **42**. The opposite end of the hair spring **42** is anchored to a stud **43** set in the mounting plate **10**. The aforementioned pin **32**, in the balance wheel **33**, extends through and beyond the wheel on its opposite sides. The one extending end of the pin is presented for cooperation with the fork member **26** while the other extending end is presented for cooperation with an impulse arm **44** or more particularly with an upwardly extending end of such arm. The opposite end of the arm **44** is attached to an armature member **45** pivotally connected to an ear **46** on a frame **47** forming a part of the electro-magnetic device **18**. The assembly comprising the arm **44** and armature **45** is urged by a spring **48** in a clockwise direction about the ear **46** but will rock in the opposite direction upon energizing of the device **18**, the armature **45** extending into cooperative relation with the coil of such device in a conventional manner.

In the operation of the unit, the parts normally assume the position shown in Figs. 1 to 3 under the influence of detent spring **38**, spring **48** and the natural resilience of blade members **21** and **22** which maintain the contacts thereon closed. The fork member **26** is at this time rocked in a leftward direction (as viewed in Fig. 3), causing the cam **23** to assume a position permitting the contact blade arms **21** and **22** to close. Accordingly, should the on-off switch **19** now be closed current will be supplied the out-put conductors **12** and **13**, and also be supplied to the electro-magnetic device **18**. The latter being thus energized, draws the armature **45** to it and so rocks the impulse arm **44** in a leftward or counterclockwise direction as viewed in Fig. 3. In the course of such movement, the upper or outer end of the arm engages the pin **32**, which may be termed the impulse pin, and, as such motion is continued, rocks the balance wheel **33** a short distance in a clockwise direction. The arm **44** moves on and beyond the path of motion of the pin **32**, as it completes its rocking motion in response to the energizing of the device **18**, the arm assuming at the end of such travel substantially the position shown in dotted lines in Fig. 3. The rotary impulse given the balance wheel **33** is effective through the shaft **34** to wind the hair spring **42** or to store energy therein. As the impulse arm **44** passes out of cooperative relation with the pin

32, the stored energy is released to effect an opposite or counterclockwise motion of the balance wheel. In the course of this latter motion, the impulse pin 32 enters the cut-out portion 31 of the fork member 26 and engages the right hand edge thereof (Fig. 3) in a manner to rock the fork member in a clockwise direction about its pivot 27. This motion is effective through the cam 23 to depress the lower switch contact arm 22 out of engagement with the upper switch contact arm 21, as indicated in Fig. 4, whereupon the supply of current to the out-put conductors 12 and 13 and to electro-magnetic device 18 is interrupted. Upon the deenergizing of the device 18, the impulse arm 44 is allowed to return to its initial position by the action of spring 48.

Referring again to the balance wheel 33, which continues its counterclockwise movement (Fig. 3) under the urging of the hair spring 42, the wheel gradually reaches a condition of equilibrium and the hair spring will start to wind up and cause the balance wheel to move in an opposite or clockwise direction. In the course of this movement, the fork member 26 is re-engaged by the impulse pin 32 and rocked in the opposite direction back toward its starting position. The cam 23, in response thereto, rises to permit the re-engagement of spring contact arm 22 with arm 21 and a consequent reclosing of the electrical circuit from in-put conductors 14 and 15 to out-put conductors 12 and 13 to the electro-magnetic device 18. The latter again actuates the armature 45 and impulse arm 44, which latter moves to re-engage the pin 32 and to impart another kick or impulse thereto in a counterclockwise direction for repeated, continued operation of the balance wheel and hair spring assembly. At the time of actuation of the arm 44, the balance wheel will still be moving. It is accordingly necessary to time the contact assembly so that the impulse arm will be able to overtake the impulse pin before the hair spring has caused the impulse pin to move beyond the reach of the impulse arm. Such timing permits the impulse arm to impart energy to the hair spring on each clockwise rotation of the balance wheel. In this connection, it will be understood that the leaf spring 38 and the flat surface 37 on the shaft 34 cooperate to define for the balance wheel a normal position in which the impulse pin 32 is always presented for actuation by the impulse arm at the start of a series of operations. As long as power is applied to the unit the oscillatory motion of the balance wheel, which together with its associated parts may be considered a constant period device, will continue. The repeated opening and closing of the contact arms 21 and 22 thus also occurs at regular accurately determined intervals with a consequent supply of electrical impulses to the out-put conductors of constant frequency and duration.

Beneath the pivot point 27, the fork member 26 is formed as a yoke 49 in embracing relation to a sleeve 51 on a shaft 52 extending between and supported by the mounting plates 10 and 11. The shaft 52 and collar 51 thereon may be termed a banking shaft assembly which limits and defines the alternate extremes of movement of the fork member.

What is claimed is:

1. A time base mechanism, including parallel spaced apart mounting plates, a shaft journaled between said plates, a balance wheel secured to said shaft, a hair spring anchored to one of said plates at its one end and connected to said shaft at its other end, an impulse pin on said balance wheel, an impulse arm movable to and fro between said plates and engageable with said pin to turn said wheel and store energy in said spring, said spring releasing its energy to effect an oscillating motion of said shaft and wheel, means for moving said arm in a timed relation to the movement of said balance wheel in such wise as to engage said arm with said pin at a predetermined point in the movement of said wheel in each cycle of oscillation thereof for the storing of additional energy in said spring, and spring detent means between said mounting plates and said balance wheel effective substantially at said point in the movement of said wheel, said spring detent means comprising a leaf spring anchored in one of said mounting plates and a flat on said shaft engageable by said leaf spring.

2. A time base mechanism, including parallel spaced apart mounting plates, a shaft journaled between said plates, a balance wheel secured to said shaft, a hair spring connected to said shaft and anchored to one of said plates, an impulse pin on said balance wheel, an impulse arm supported between said plates for pivotal movement, said arm being arranged to give an oscillatory impulse to said balance wheel through engagement with said pin, said hair spring absorbing the energy of said impulse and releasing such energy to said balance wheel for an oscillation thereof wherein said pin is repositioned to receive another impulse from said arm on a succeeding movement of said arm, electric-magnetic means supported between said plates and operative in response to the energizing and deenergizing thereof to effect a to and fro motion of said arm, and means for energizing and deenergizing said electro-magnetic means in a timed relation to the oscillation of said balance wheel, said last named means including a fork member supported between said plates for pivotal movement, an operative connection between said balance wheel and said fork member for rocking said fork member to and fro in response to the oscillations of said wheel, a pair of normally closed contacts in a timed out-put pulsing circuit further including said electro magnetic means, and a cam on said fork member opening said contacts and controlling the re-closing thereof in response to the rocking motion of said fork member.

3. A time base mechanism, including parallel spaced apart mounting plates, a shaft journaled between said plates, a balance wheel secured to said shaft, a hair spring connected to said shaft and anchored to one of said plates, an impulse pin on said balance wheel, an impulse arm supported between said plates for pivotal movement, said arm extending into parallel adjacent relation to said wheel on one side thereof and being arranged to give an oscillatory impulse to said balance wheel through engagement with said pin, said hair spring absorbing the energy of said impulse and releasing such energy to said balance wheel for an oscillation thereof wherein said pin is re-positioned to receive another impulse from said arm on a succeeding movement of said arm, electro magnetic means supported between said plates and operative in response to the energizing and de-energizing thereof to effect a to and fro motion of said arm, a fork member supported between said plates for pivotal movement and extending into parallel adjacent relation to said balance wheel on the other side thereof, pin means on said balance wheel engageable with said fork member to rock said member to and fro in response to the oscillations of said wheel, a pair of normally closed contacts in a timed out-put pulsing circuit further including said electro magnetic means, and a cam on said fork member opening said contacts and controlling the re-closing thereof in response to the rocking motion of said fork member.

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