

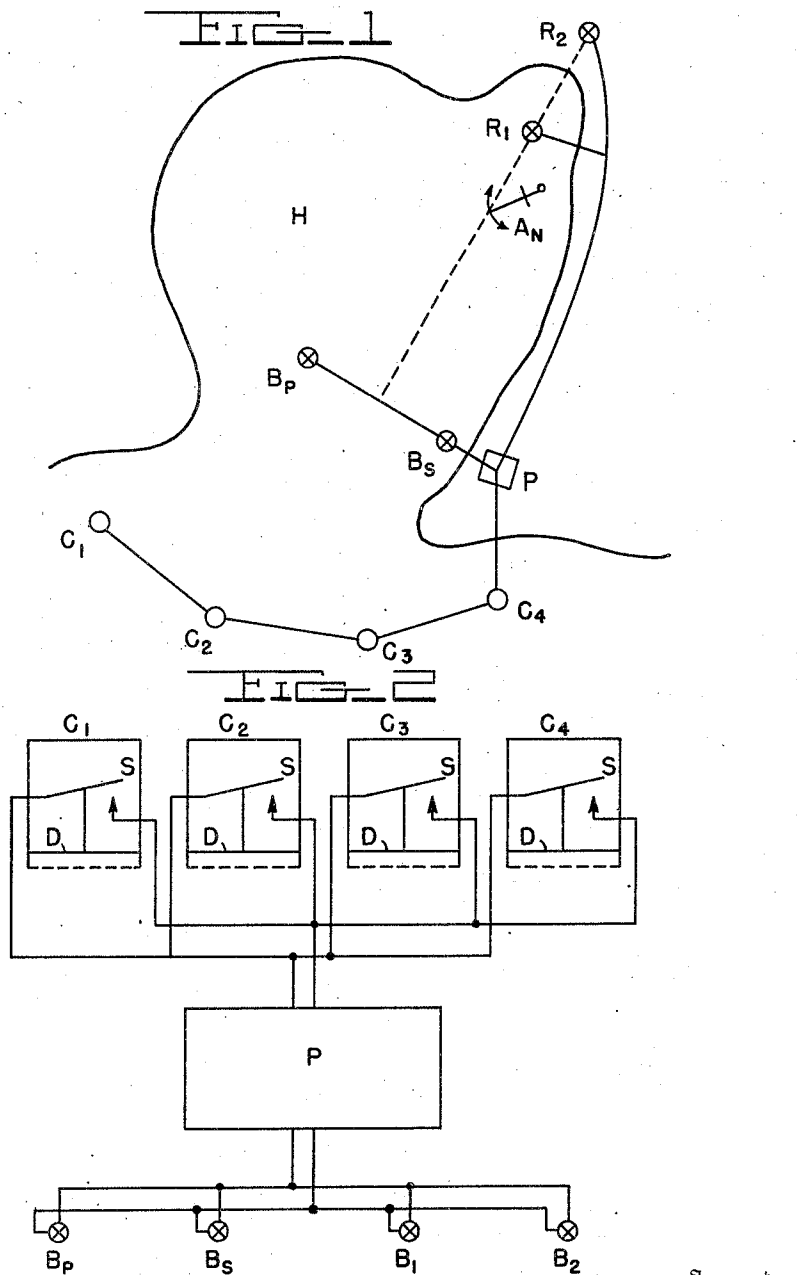
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H. M. TRENT
TIME-DELAY RELAY SYSTEM

2,549,865

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2 Sheets-Sheet 1



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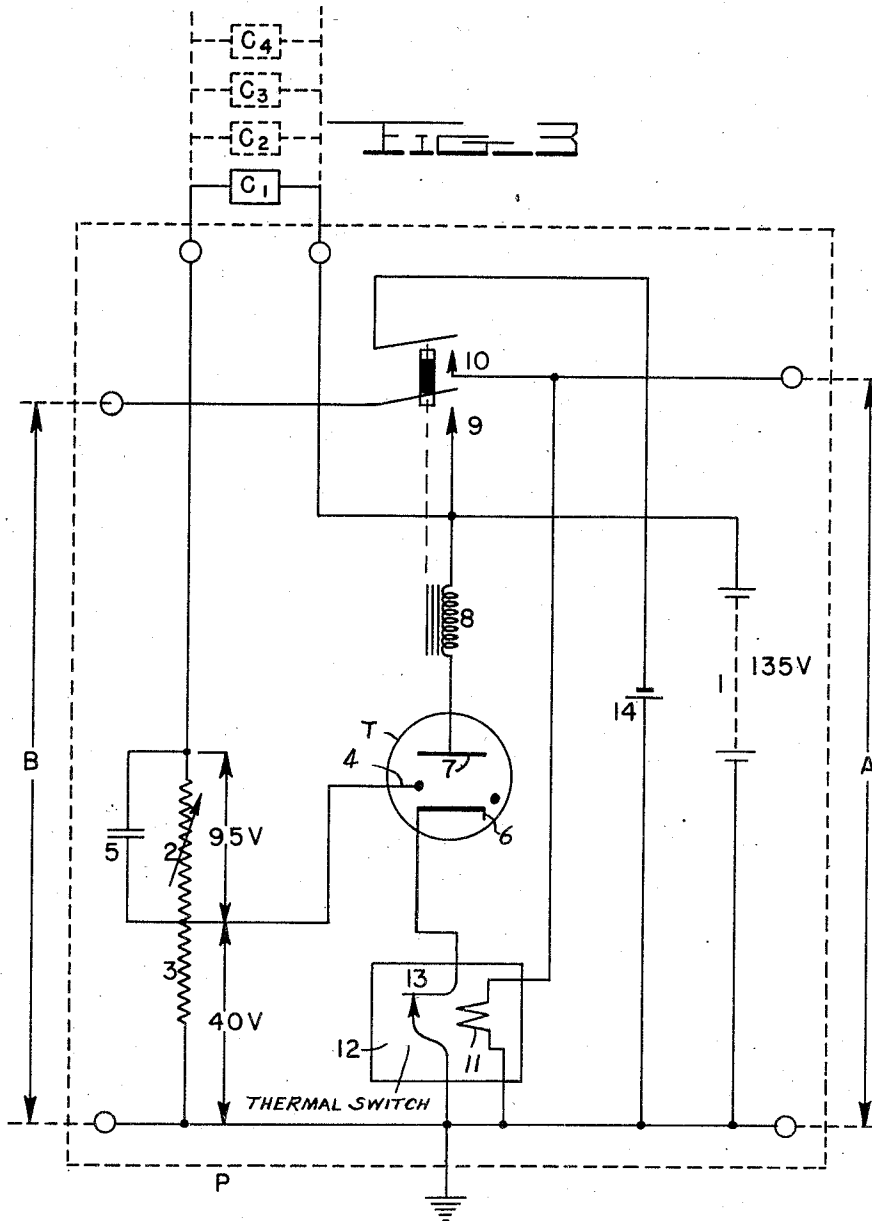
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TIME-DELAY RELAY SYSTEM

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4 Claims. (Cl. 175—320)

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This invention relates to electro-mechanical devices and more particularly to devices of this character, which are operated by a limited battery supply, in which it is desirable to extend as long as possible the life of the batteries.

In remote harbors, lighted beacons, buoys or range lights may often be provided, lit when needed by batteries. These lights may be lit by the wave action produced by a vessel passing distant control points but it has been impossible heretofore to distinguish between a pulse created by a passing boat and those produced by wave action generated by rough weather. However since small boats will not frequently desire to pass into or out of small harbors at night in stormy weather, it would be satisfactory to suspend operation of the lights during rough weather to avoid wasting batteries on such occasions.

It is therefore the object of this invention to provide a method of and means for overcoming the objection that automatically controlled devices of the type covered in this specification are of short life due to early battery exhaustion.

It is also the object of this invention to provide a method of and means for commencing the operation of a device upon the occurrence of a specified impulse but not continuing the operation of said device if the impulse is frequently repeated.

It is another object of this invention to provide a method of and means for turning on the power supply of a circuit when an impulse occurs and not again turning on the power supply if the impulse occurs at a frequency of greater than a certain specified frequency.

More specifically it is the object of this invention to provide a system whereby an automatically operated electro-mechanical light buoy which is lit by the passing of a vessel is not again lit if the pressure pulses occur frequently, as for instance, if occasioned by wave action.

In a broader sense it is the object of the present invention to provide a means for causing operation of a device upon each closing of a pair of contacts if they are spaced far enough apart in time, but only on the first closing if they are spaced less than a definite amount.

It is a further object of the invention to provide means to operate a device upon the closing of a pair of contacts but to omit operation of said device upon the rapid closing of said contacts, with a very small power consumption.

An additional object of this invention is to provide means for operating a device upon the closing of a pair of contacts but to omit operation

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of said device upon the rapid closing of said contacts, and also means for adjusting the duration of the operating period.

An ancillary object of this invention is to provide a device of the type described which will occupy a small volume and be of light weight.

These and other objects will become clear from the following specification taken in connection with the accompanying claims.

In accomplishing the objects of this invention there is provided a pressure-actuated switch-controlled circuit so arranged that upon the occurrence of a predetermined impulse, such as is caused by a passing vessel, the circuit will cause closure of a relay, which will in turn actuate the desired mechanisms as required for instance to light certain range or buoy lights. After the lapse of a desired interval of time, the relay will open causing the operation to be discontinued. After the lapse of a different interval from the initial actuating pulse, the apparatus will be in condition to be reactivated, but if the pressure pulses occur sooner the apparatus will not be actuated and the second occurrence of the pressure pulse will merely re-set the time interval from the second occurrence. Thus wave action will render and continue the apparatus inoperative after the first actuation.

Having thus briefly described this invention, attention is invited to the drawings, in which Fig. 1 is a simple map of a harbor having lights adapted to be actuated in accordance with the invention; Fig. 2 is a schematic wiring diagram of the lights and impulse stations of Fig. 1; and Fig. 3 is a detailed wiring diagram of the controlling circuits for the accomplishment of the objects of this invention.

Referring now more particularly to Fig. 1, H is a harbor near the entrance of which are two entrance buoys, B_p and B_s and near the head of which is the anchorage A_n. To sail from the entrance to the anchorage there are provided range lights R₁ and R₂. The lights B_p, B_s, R₁ and R₂ are all adapted to be lit electrically, but since the harbor is remote and is but infrequently used, it is desired to provide a system for turning on the lights only if a vessel approaches and desires to enter. To accomplish this a series of control points C₁, C₂, C₃ etc. are laid around the harbor's entrance connected to a power and control pack P. B_p, B_s, R₁ and R₂ etc. are connected to P as shown.

In Fig. 2, to which attention is now directed, the control points C₁, C₂, etc., are shown as hydrostatically controlled switch elements S operated

upon lowered pressure by means of diaphragms D. Connections from C₁ and C₂, etc., to P and from thence to R₁, R₂, B_p and B_s are as shown.

Referring now to Fig. 3 there is shown the arrangement of the power and control pack P. Upon the closure of either of the pressure actuated switches C₁, C₂, etc., the potential of the B-battery 1 is impressed across the series resistors 2 and 3. However because of the large capacity of condenser 5, in shunt across resistor 2, substantially the entire B-battery potential will be impressed across resistor 3 and on the electrode 4 of the cold cathode glow type tube T. Electrode 4 is thereby given an instantaneous voltage of about 135 volts relative to electrode 6. The tube T has a "trigger" action and once the anode current is started it will continue until the circuit is interrupted. The voltage on 4 causes it to act as a grid and starts current flowing through the anode circuit of the tube comprising anode 7, relay inductance coil 8, battery 1, switch 13 and electrode 6. This causes the relay to close contacts 9 and 10 causing the A voltage of battery 14 to be impressed across output terminals A, and the B voltage of battery 1 to be impressed across output terminals B.

Either a high voltage B or a low voltage A may be supplied to the buoys and range lights and this voltage may be used as desired either to light the lights directly or to actuate relays which may be provided to control the flow of a local source to the lights. Closure of contact 10 also supplies current to the heater coil 11 of the time delay switch 12 and after a desired interval of time the heating of the coil causes the normally closed switch 13 to open and interrupt the plate-cathode current flow causing opening of contacts 9 and 10.

When coil 11 cools and contact 13 again closes, the tube T will no longer pass current until the potential of 4 is again raised to about 75 volts or more relative to electrode 6.

Once the condenser 5 is fully charged, the B voltage is impressed through 2 and 3 in series and the IR drop across 3 will not be great enough to cause 4 to start the tube plate current. The period of discharge of 5 through resistor 2 may be adjusted as desired by changing the value of the resistor. The relay will not be activated until the condenser is substantially discharged. Thus if the switches are being closed by the action of waves in rough weather, the relay will be operated the first time only and after that subsequent closures merely serve to recharge condenser 5 to full capacity, replacing the charge which has leaked off through 2 since the last closure of a contact C.

Various modifications may be made in this invention. For instance the arrangement may be used in connection with the operation of call bells, gates or barriers or with the arming of various explosive devices. Therefore this invention is not to be considered as limited to the specific embodiment shown and described for the purpose of illustration but by the scope as defined by the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. In combination, an impulse actuated switch, a source of potential, a low pass filter circuit having input and output terminals, the input termi-

nals of said filter circuit being connected to said source of potential and switch in series thereby to receive an electrical impulse from said source of potential upon each closure of said switch, said filter circuit acting to pass freely impulses of low recurrence rate and to attenuate impulses of high recurrence rate, a control circuit coupled to the output terminals of said filter circuit and adapted to be energized by the impulses freely passed by said filter circuit, a relay connected to and actuated by said control circuit in response to the energization of said control circuit, and a load circuit including a time delay switch circuit connected to said relay to be rendered operative upon actuation of said relay, said time delay switch further being connected to said control circuit to disable same and thereby deactuate said relay after the elapse of a predetermined interval of time following the energization of said control circuit.

2. In combination, an impulse actuated switch, a source of potential, a low pass filter circuit having input and output terminals, the input terminals of said filter circuit being connected to said source of potential and switch in series thereby to receive an electrical impulse from said source of potential upon each closure of said switch, said filter circuit acting to pass freely impulses of low recurrence rate and to attenuate impulses of a high recurrence rate, a gaseous discharge device connected to the output terminals of said filter circuit and adapted to initiate a discharge in response to the pulses freely passed by said filter circuit, a relay connected to and actuated by the establishment of a discharge in said discharge device, a discharge quenching means coupled to said discharge device to terminate the discharge therein, and a load circuit including a time delay means connected to said relay and energized in response to the actuation of said relay to render said quenching means operative after the elapse of a predetermined interval of time following the actuation of said relay.

3. In combination, an impulse actuated switch, a source of potential, a resistance connected to said source of potential and switch in series to thereby receive an electrical impulse from said source of potential upon each closure of said switch, a condenser shunting a portion of said resistance and forming with said portion a long time constant whereby frequent closures of said switch produce small amplitude impulses across the unshunted portion of said resistance and infrequent closures of said switch produce large amplitude impulses across the unshunted portion of said resistance, a control circuit coupled across the unshunted portion of said resistance and adapted to be energized by only the large amplitude impulses appearing thereacross, a relay connected to and actuated by said control circuit in response to the energization of said control circuit, and a load circuit including a time delay switch circuit connected to said relay to be rendered operative upon actuation of said relay, said time delay switch further being connected to said control circuit to disable same and thereby deactuate said relay after the elapse of a predetermined interval of time following the energization of said control circuit.

4. In combination with a source of randomly recurrent electrical impulses, a low pass filter circuit having input and output terminals with the input terminals thereof arranged to receive the impulses from said source of impulses, said

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filter circuit acting to pass freely impulses of low recurrence rate and to attenuate impulses of high recurrence rate, a control circuit coupled to the output terminals of said filter circuit and adapted to be energized by the impulses freely passed by said filter circuit, a relay connected to and actuated by said control circuit in response to the energization of said control circuit, and a load circuit including a time delay switch circuit connected to said relay to be rendered operative upon actuation of said relay, said time delay switch further being connected to said control circuit to disable same and thereby deactuate said relay after the elapse of a predetermined interval of time following the energization of said control circuit.

HORACE M. TRENT.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
Re. 21,659	Adler	Dec. 17, 1940
1,242,756	Arnold et al.	Oct. 9, 1917

6

Name	Date
Dorsey	Sept. 13, 1921
Lea	Sept. 1, 1925
Thompson	Oct. 6, 1925
Almquist	June 5, 1928
Wensley	Feb. 19, 1929
Cockrell	July 12, 1932
Allen	Mar. 30, 1937
Rockwood	Jan. 23, 1940
Trogner	Feb. 11, 1941
Torcheux	Mar. 10, 1942
Richardson	Dec. 8, 1942
Hayes	Jan. 6, 1948
Murcek	Mar. 16, 1948
Giansante	June 8, 1948
Hartwig	Nov. 16, 1948

FOREIGN PATENTS

Country	Date
Great Britain	Oct. 6, 1927

Number
1,390,768
1,552,321
1,555,893
1,672,049
1,702,423
1,867,398
2,075,774
2,188,159
2,231,174
2,275,930
2,304,207
2,433,845
2,438,017
2,442,872
2,454,167