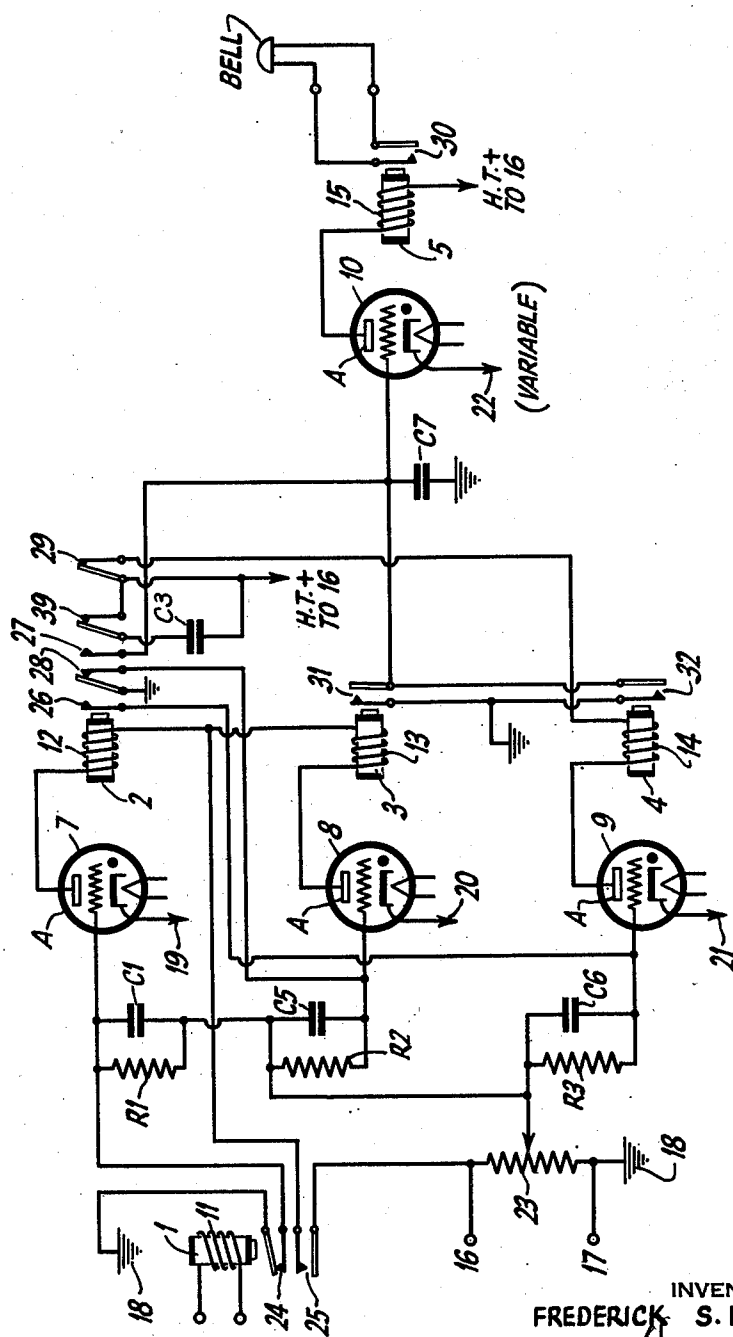


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AUTOMATIC ALARM SELECTOR

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AUTOMATIC ALARM SELECTOR

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This invention relates to an improved automatic alarm selector arrangement for giving an alarm on the receipt of a predetermined wireless signal (such as is used for requesting aid by ships at sea) composed of a regular series of dashes of definite length and spacing.

It is conventional practice in radio marine signaling systems to send out a series of dash signals separated by spaces for the purpose of transmitting a distress call. Certain automatic alarm devices are now standardized, which will answer to a distress call consisting of at least three dash signals of four seconds duration separated by spacing intervals of one second duration.

Since a call signal for assistance is frequently sent by hand, and the timing done by the aid of a watch, it is essential for the effective operation of an automatic alarm system that some tolerance be permitted in the length of the dashes and spaces, so as to allow for errors in sending. The embodiment of the invention to be described is, therefore, designed to respond to signals consisting of dashes of from between three and one-half to four and one-half seconds duration, separated by spaces of less than one and one-half seconds. This latitude allows for an error of plus or minus one-half second in the length of each dash, a tolerance which, it has been found in practice, is sufficient for hand operating.

Various known automatic signal operated alarm systems have been based on the use of mechanically driven cams with clutch mechanism arranged to be driven at constant speed by motors, though other systems utilizing dashpot relays consisting of small pistons working in suitable cylinders for securing timing have been used. Such known mechanical arrangements, however, suffer from the disadvantages of being difficult and expensive to build, and when constructed difficult to maintain in adjustment.

It has been found that the wear and tear on mechanical alarm systems reduces the life of the parts to a considerable extent.

Other automatic signal operated alarm systems employ thermionic valves in circuit arrangements designed to overcome the disadvantages associated with the known mechanical systems. Arrangements of this type provide a selector system which has its timing based on electrostatic control rather than on a mechanical circuit scheme. Time constant resistance-reactance circuits function to time the operation of various sensitive relay devices through the medium of thermionic valves.

Although the known thermionic valve types of selector overcome to a large extent the disadvantages associated with the mechanical schemes,

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they are not entirely satisfactory as they depend for their successful operation on the stability of a number of factors which are not economically controllable. For example, variation in the tension of the relay springs, fluctuation of the operating potentials applied to electrodes of the valves, or aging of the valves themselves, will cause unreliable operation of the system.

In the past therefore it has been the practice in thermionic systems of the foregoing nature to employ wherever possible suitable control devices in order to stabilize the variable factors. Such control devices, apart from the fact that they are expensive to construct, introduce undesirable complications into the circuit arrangement and construction of the apparatus.

The object of the present invention is to provide an improved automatic alarm selector in which the disadvantages associated with known mechanical or thermionic valve systems are avoided.

A further object of this invention is to provide an improved automatic alarm selector which employs no moving parts other than electric relays, which is independent within wide limits of potential supply variation, and which utilizes inexpensive relays.

A still further object of this invention is to provide an improved automatic alarm selector which is reliable in operation as well as being simple and economical to construct.

The above objects are achieved in accordance with the present invention by providing, in automatic selectors of the electronic type, means whereby the energizing current of individual selector relays in the system is caused to vary substantially instantaneously from zero to the required operating value when the particular energizing circuit is completed.

More specifically an improved automatic alarm selector in accordance with the present invention comprises in combination a signal relay responsive to incoming signals, a first selector relay the operating winding of which is energized by the discharge current of a grid controlled gas discharge device, circuit means including a time constant network for applying control potentials to the grid of said device a predetermined time after the operation of said signal relay, a storage circuit for accumulating potential increasing with successive operations of said first selector relay, an alarm or indicating device, means responsive to potentials of a predetermined value in said storage circuit for actuating said alarm or indicating device; a second selector relay which

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functions to discharge said storage circuit when the operating winding of said second selector relay is energized by the discharge current of a second grid controlled gas discharge device, circuit means including a time constant network for applying control potentials to the grid of said second discharge device when said first selector relay has been operated for a predetermined time; and a third selector relay the operating winding of which is energized by the discharge current of a third grid controlled gas discharge device to discharge said storage circuit a predetermined time after the opening of said first selector relay.

For a more complete understanding of the invention and the manner in which it is to be carried out, attention is now directed to the following description in connection with the accompanying drawing which illustrates one method of carrying out the invention.

In order to simplify the description, only that portion of an automatic alarm system which is necessary for an understanding of the invention is indicated in the drawing.

The automatic alarm selector diagrammatically illustrated comprises essentially a signal relay 1, the operating winding 11 of which is energized in any convenient manner from the output circuit of conventional radio receiving apparatus (not shown).

Associated with the signal relay 1 are a plurality of relays 2, 3 and 4 which are individually associated with operating gas discharge devices 7, 8 and 9, respectively. Any convenient type of grid controlled gas discharge device, such as a triode or tetrode, may be used without affecting the operation of the invention.

Relays 2, 3 and 4 are adapted to control potentials built up in the storage device C1, which potentials serve to actuate an alarm or indicating device (not shown) through the gas discharge device 10 and the relay 5 in the manner herein-after to be described.

Operating potentials are applied to the anodes of the devices 7, 8, 9 and 10 through the operating windings 12, 13, 14 and 15 of the associated relays 2, 3, 4 and 5, respectively, from the positive terminal 16 of any convenient potential supply source (not shown). The negative terminal 17 of the potential supply source is connected to a point of zero potential, such as the earth 18.

The control potential at which the devices 7, 8, 9 and 10 are rendered conductive is controlled in the present example by the application of suitable positive biasing potentials to the respective cathodes 19, 20, 21, 22 of the devices 7, 8, 9, 10.

The desired biasing potentials for the cathodes 19, 20, 21 and 22 of the devices 7, 8, 9 and 10 may be derived from any convenient source such as, e. g., the potential divider network 23 connected across the terminals 16 and 18 of the potential supply source (not shown).

In the operation of the system, signals detected and amplified in the usual radio receiver (not shown) cause the relay 1 to be operated immediately upon receipt of a signal.

When relay 1 operates, it removes the connection between the control grid of device 7 and ground (contacts 24) and allows condenser C1 to discharge through R1 raising the potential on said control grid, previously negative with respect to cathode. It also closes the contacts 25 which complete a circuit for the application of

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operating potentials to the anodes A of the devices 7, 8.

The discharging rate for the condenser C1 is adjusted by suitable choice of the resistance R1, the value of the latter being such that at the end of three and one-half seconds of continuous discharging the positive potential on the condenser C1 causes the gas discharge device 7 to fire, and the relay 2, which is energized by the discharge current, is operated.

As the discharge current through the device 7 increases from zero to its maximum value practically instantaneously, full operating current flows through the energizing winding 12 of the relay 2 causing it to operate immediately the device 7 is caused to fire.

Relay 2, when operated, closes contacts 26, 27 and opens contacts 28, 29. The closure of contacts 27 completes a circuit whereby the storage condenser C7 is charged through the condenser C3 to a certain predetermined value. Each successive operation of the relay 2 will increase the potential stored in C7 by approximately equal amounts, to a value such as will cause the device 10 to ignite.

As the discharge current of device 10 is caused to flow through the energizing winding 15 of the relay 5, the ignition of the device 10 will cause operation of the relay 5 thereby completing the energizing circuit of an alarm bell or bells or other indicating device through closure of the contacts 30.

The variable bias potential applied to the cathode 22 of the device 10 facilitates a selection of the control potentials required to cause ignition. By suitable adjustment of the cathode biasing potential the device 10 may be caused to fire at a control potential equal to that built up on the storage condenser C7 by the requisite number of operations of the relay 2.

The operation of the relay 2 disconnects the control grid of device 8 from ground, and allows condenser C5 to discharge through resistor R2 raising the potential on said control grid. The values of the condenser C5 and the resistor R2 are such that after a period of one second the potential applied to the grid from the condenser C5 will cause the device 8 to ignite. The relay 3 which is energized by the discharge current of the device 8 is immediately operated to close the contacts 31, thus providing a short circuit path to remove any charge accumulated on the storage condenser C7.

From the foregoing it will be seen that if an incoming signal lasts for more than 4.5 seconds (3.5+1) after the operation of relay 1, relay 3 will be operated to reject such signal by discharging the storage condenser C7. Only signals whose length is between 3.5 and 4.5 will be accepted and allowed to build up potential on the storage condenser C7.

In order to ensure that only signals which are separated by the correct spacing intervals are accepted by the apparatus, a further selector relay 4 and associated gas discharge device 9 is provided.

If at any time the incoming signal ceases, relay 1 will be de-energized and return to its normal condition, thereby opening the contacts 25, and closing contacts 24.

The closing of contacts 24 restores the initial negative bias on device 7, while the opening of the contacts 25 open-circuits the anode potential supply circuit of the devices 7 and 8. The removal of anode potential from the devices 7 and 8

extinguishes the discharge in the device 7, thereby allowing the relay 2 to return to its normal condition and also prevents ignition of the device 8 and consequent operation of the relay 3.

In the normal (no signal) condition of relay 2 the contacts 26, 27 are opened and the contacts 28, 29 and 39 are closed.

In this condition of the relay 2, operating potentials are applied to the anode of the device 9 through the contacts 29, while opening of contacts 26 removes earth connection from grid of device 9 and allows said grid to charge positively due to discharge of C6 via R3.

The discharging rate of the condenser C6 is governed by the value of the network components. The value selected for these components in the present example is such that at the end of five seconds the positive potential applied to the grid from the condenser C6 is sufficient to cause ignition of the device 9. The relay 4 is immediately operated by the discharge current of the device 9 flowing through its energizing winding 14. Resultant closure of the contacts 32 functions to discharge the storage condenser C7, thereby restoring the apparatus to the waiting condition.

Thus, if a space of more than 1.5 seconds exists between two successive operations of the relay 2, the total interval (for a 3.5 second dash) between two openings of the relay 2 is more than five seconds and is not acceptable to the apparatus.

To put it another way, if the time interval which elapses between two successive operations of the relay 1 is in excess of five seconds, made up of 3.5 seconds for the signal and 1.5 for the space, the apparatus is restored to the waiting condition. The contacts 39 function to completely discharge the condenser C3 after each operation.

The operation described in detail above may be summarized briefly as follows:

On receipt of a signal, relay 1 operates. After 3.5 seconds the device 7 ignites and operates relay 2 whereby a potential charge of fixed value is applied to the storage condenser C7. Further signals of the correct length and spacing will result in a repetition of the above operation and raise the potential on the storage condenser C7 in steps to a value which will cause the device 10 to ignite with a consequent actuation of the alarm bell or bells or other indicating device through the operation of the relay 5.

The number of successive operations of the relay 2 which are required to set off the alarm is determined by the positive biasing potential applied to the cathode 22 of the device 10.

The bias is usually adjusted so that the device 10 will ignite and cause the alarm bell to ring or other device to function when the charge on the storage condenser C7 has been raised by either 3 or 4 successive steps (i. e., correctly timed dashes and spaces), according to the condition initially chosen.

The device 8 ignites and causes the storage condenser to be discharged if the length of the signal exceeds 4.5 seconds, and the device 9 ignites to perform a similar function if the space between successive signals exceeds 1.5 seconds.

From the foregoing description it will be appreciated that the selector system of the present invention constitutes a considerable improvement over the systems previously employed.

Unreliable mechanical devices are not required and the necessity for employing costly apparatus, such as a voltage regulator, sensitive relays and associated temperature control ovens, which in

the past have been essential in systems of the electronic type, is avoided.

The positive operation of the various selector relays by the discharge current of gas discharge devices results in virtual independence of normal plate supply variations and greatly improved relay action due to almost instantaneous change of relay current from zero to operating values, the latter being large enough to operate reliably the simplest types of relays.

In the present system the expensive stepping switch usually employed in prior art systems is eliminated, and replaced by a conventional capacitor type integrator which controls the ringing of alarm bells through a gas discharge device and its associated relay. This integrator may be adjusted very simply to ignite the gas discharge device on receipt of any predetermined number of signals.

What is claimed:

1. Improvements in automatic alarm selector arrangements, comprising, in combination, a signal relay responsive to incoming signals, a first selector relay the operating winding of which is energized by discharge current of a grid controlled gas discharge device, circuit means including a time constant network for applying control potentials to the grid of said device a predetermined time after the operation of said signal relay, a storage circuit for accumulating a potential increasing with successive operations of said first selector relay, an alarm or indicating device, means responsive to potentials of a predetermined value in said storage circuit for actuating said alarm or indicating device; a second selector relay which functions to discharge said storage circuit when the operating winding of said second selector relay is energized by the discharge current of a second grid controlled gas discharge device, circuit means including a time constant network for applying control potentials to the grid of said second discharge device when said first selector relay has been operated for a predetermined time; and a third selector relay the operating winding of which is energized by the discharge current of a third grid controlled gas discharge device to discharge said storage circuit a predetermined time after the opening of said first selector relay, the said selector arrangement including circuit means responsive to incoming signals to render the said gas discharge devices non-conductive.

2. Improvements in automatic alarm selector arrangements, comprising, in combination, a signal relay responsive to amplified received radio signals, a first selector relay arranged to be energized by the discharge current of a grid controlled gas discharge device, circuit means including a time constant network for applying control potentials to the grid of said gas discharge device a predetermined time after operation of said signal relay, a condenser for accumulating a potential increasing with successive operations of said first selector relay, an alarm bell or bells or other appropriate indicating device, means responsive to potentials of a predetermined value attained across said condenser for actuating said bell or bells or other indicating device; a second selector relay arranged to discharge said condenser when said second selector relay is energized by discharge of a second grid controlled discharge device, a time constant network through the medium of which control potentials are applied to the grid of said second

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discharge device when said first selector relay has been operated for a predetermined time; and a third selector relay arranged to be energized by the discharge current of a third grid controlled gas discharge device intended to discharge said condenser a predetermined time after opening of said first selector relay, the said selector arrangement including circuit means responsive to incoming signals to render the said gas discharge devices non-conductive.

3. Improvements in automatic alarm selector arrangements, comprising, in combination, a signal relay responsive to amplified received radio signals, a first gas discharge device with an associated relay arranged to be energized a predetermined time after operation of said signal relay to apply successive charges to a storage condenser, a gas discharge device operatively associated with an alarm actuating relay and arranged to be fired by said storage condenser when successive charges applied to the latter have reached a predetermined value, a further gas discharge device with operatively associated relay arranged to discharge said condenser if the length of a received signal exceeds a predetermined length of time and a still further gas discharge device with an operatively associated relay arranged to discharge said condenser if the space between successive received signals exceeds a predetermined length of time, the said selector arrangement including circuit means responsive to incoming signals to render the said gas discharge devices non-conductive.

4. Improvements in automatic alarm selector arrangements, comprising a combination in accordance with claim 1, in which said means re-

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sponsive to potentials of a predetermined value of said storage circuit for actuating said alarm or indicating device, consist in a gas discharge device which is so biased that it will be fired when successive charges applied to said storage circuit have attained a predetermined value.

5. Improvements in automatic alarm selector arrangements comprising a combination as claimed in claim 1, in which said means responsive to potentials of a predetermined value in said storage circuit for actuating said alarm or indicating device, consist of a gas discharge device which is variably biased so that it will be fired when a predetermined number of successive charges have been applied to said storage circuit.

6. Improvements in automatic alarm selector arrangements, comprising a combination in accordance with claim 1, in which positive biasing potentials are applied to the cathodes of said grid controlled gas discharge devices.

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