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AUTOMATIC RADIOELECTRIC STANDBY DEVICE

Filed Sept. 17, 1931

3 Sheets-Sheet 1

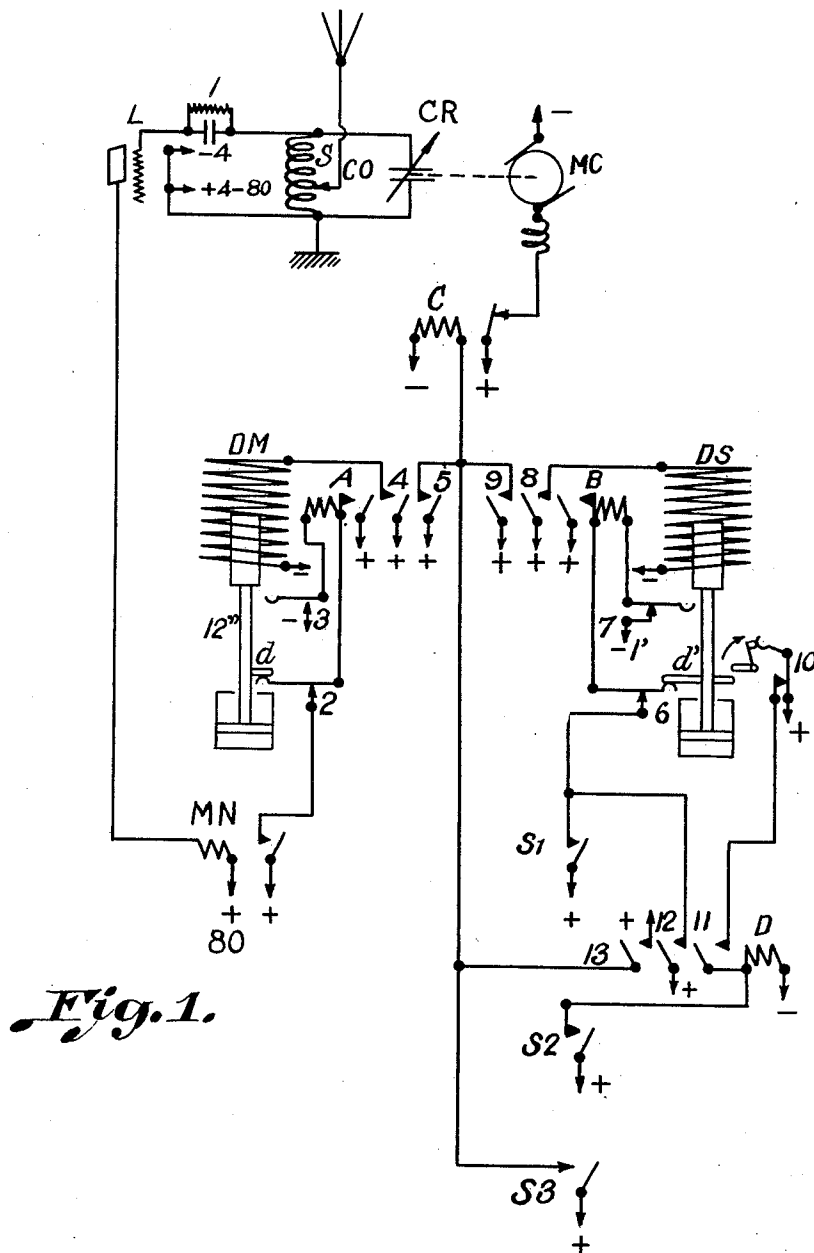


Fig. 1.

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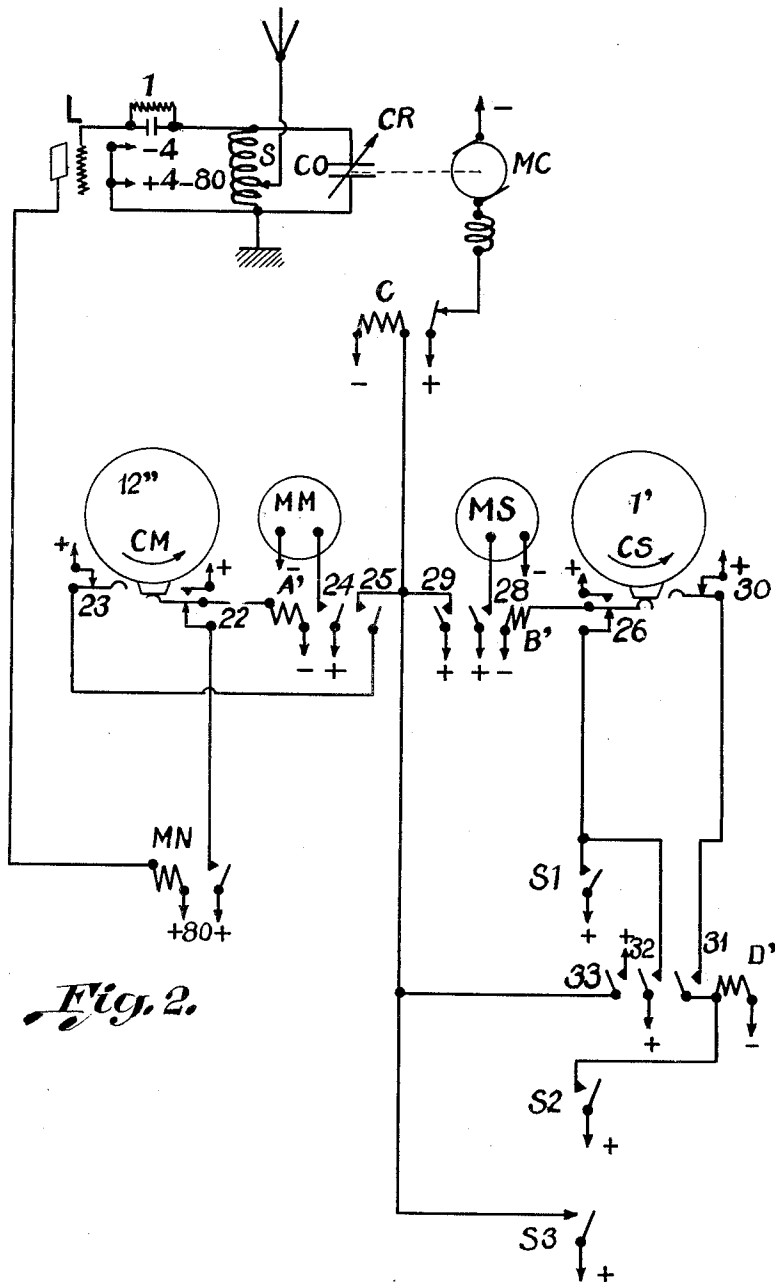


Fig. 2.

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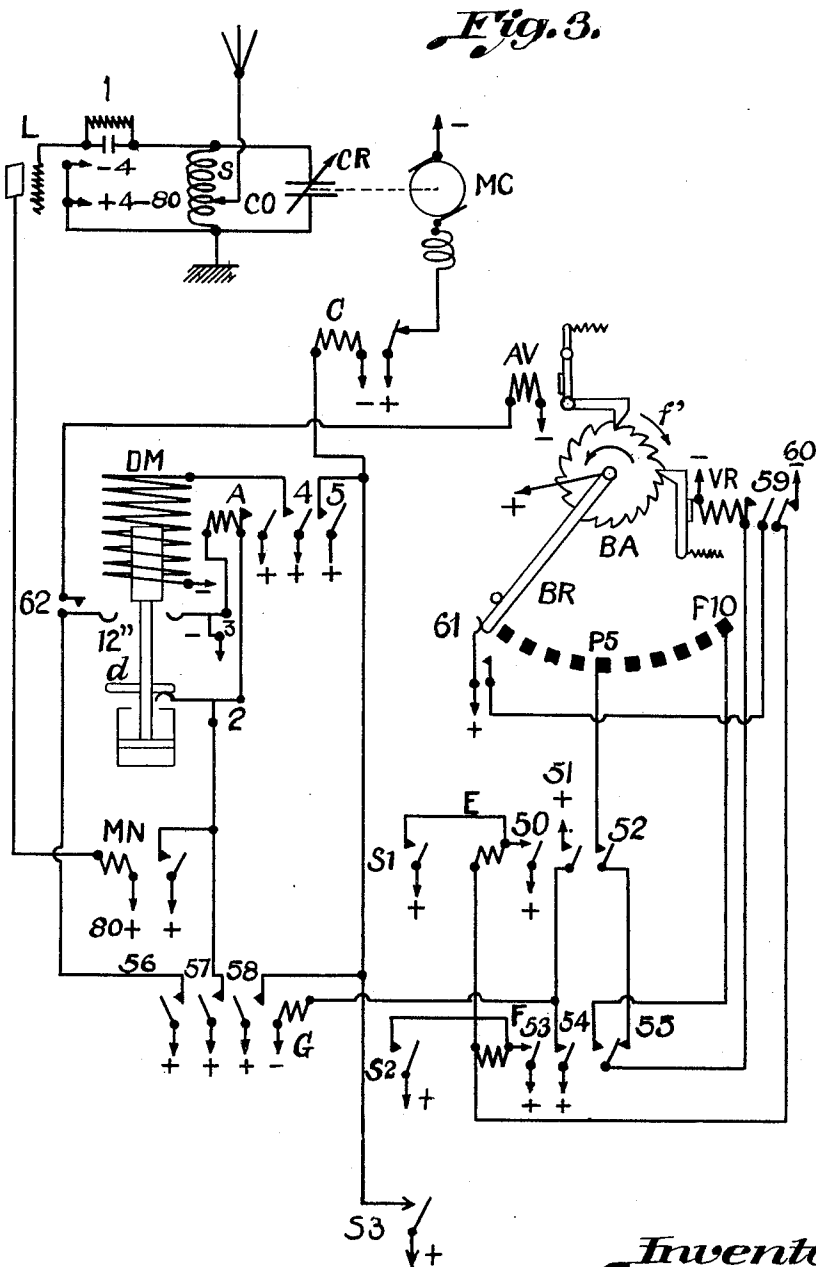
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UNITED STATES PATENT OFFICE

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AUTOMATIC RADIOELECTRIC STANDBY
DEVICE

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4 Claims. (Cl. 250—40)

It is necessary in radioelectric receivers, in order to receive a particular transmission, to vary one or more elements of the receiving oscillatory circuit until the circuit is tuned to the length of wave of the desired transmitting station.

The present invention has for its object to provide an automatic radioelectric standby device producing a continuous variation of the elements of the receiving oscillatory circuit, the variation being effected uninterruptedly so long as a signal of sufficient force to actuate an electric relay is not received but the variation being suspended for a predetermined period of time when a signal of sufficient strength is received.

The automatic standby device may be combined with a calling or alarm selector in such a manner that the period during which the variation of the variable element or elements of the receiving circuit is suspended is controlled by the form of the signal received.

In general, a calling or alarm selector apparatus is arranged to close the circuit of the calling instrument when the characteristic signal to which they have been arranged to respond has been repeated several times consecutively. For example, the alarm selector acting under a series of signals constituted by "dashes" of four seconds duration, is constructed to actuate the alarm instrument after the receipt of three such dashes.

The automatic radioelectric standby device combined with an alarm selector is constituted in such a manner that the variation of the elements of the standby oscillatory circuit is suspended for a predetermined period of time upon the receipt of any signal, this period being substantially increased if the signal received comprises a "dash" of four seconds duration. The period during which the said variations are suspended will be doubled if the signal received comprises two dashes of four seconds duration and finally the variations will be completely suspended if the signal received comprises three dashes of four seconds duration.

A series of different methods are described below as examples of carrying the automatic radioelectric standby device into effect, reference being directed to the accompanying drawings in which:—

Figure 1 illustrates diagrammatically a radioelectric standby device employing a dash pot or clock-work slow-acting relay.

Figure 2 illustrates a similar device to that il-

lustrated in Figure 1 but employing rotary relays (motors or clutches) and

Figure 3 illustrates a similar device employing a telephonic finder.

Referring to Figure 1, an oscillatory receiving circuit is indicated at CO and comprises a self inductance S shunted by a variable condenser CR and a detector valve L connected in the oscillatory circuit in the usual manner. A relay M N connected in the plate circuit of the valve is arranged to operate when sufficiently strong signals are received in the circuit.

The relay M N may be arranged to control on the one hand the automatic standby device in the manner hereinafter explained, and on the other hand, a calling or alarm selector not shown in Figure 1.

Presuming that the selector controlled is an alarm selector, it must comprise, in addition to its ordinary equipment, the following—

1st—A contact S1, which will be closed when a first signal comprising a "dash" of four seconds duration is received.

2nd—A contact S2 which will be closed when a second signal comprising a "dash" of four seconds is received.

3rd—A contact S3, which will be closed upon the receipt of a signal constituting a third dash of four seconds duration. In general, the addition of the actuation of these three contacts offers no difficulty with selectors of known type; it may even be possible to utilize existing contacts.

The variable condenser CR is operatively connected to the spindle of a small motor MC with the interposition of a suitable reducing gear to produce a slow variation of the wave length of the oscillatory circuit CO during the rotation of the motor; the condenser CR will be preferably constituted by substantially semi-circular blades which may be continuously rotated, thus permitting a continuous variation of the wave length, whilst maintaining the same direction of rotation of the motor; the values of the self inductance S and of the condenser CR are calculated to cover the wave length range which it is desired to explore.

A cutting out relay C is arranged to control the motor circuit MC in such manner that the motor is stopped when the relay C is energized.

A relay DM of the slow acting type, either by means of a dashpot or by clockwork mechanism or any other slow acting device, is so regulated as to complete its operative stroke in 12 seconds

and controls a contact 2 when normally at rest, and a contact 3 at the end of its stroke.

An auxiliary relay A is combined with the slow acting relay DM in such a manner that when a signal is received, that is to say, when the relay MN operates, the relay A is energized and remains energized during the period of the stroke of the slow acting relay DM. The relay A is arranged to control the relay DM, and also the relay C, the result being that upon the reception of a signal, the relays MN, A, DM and C come into operation; the latter relay remains energized for the whole period of operation of the slow acting relay DM, and during this period the rotation of the motor MC, and therefore, the variation of the condenser CR, is suspended.

An auxiliary relay B is combined with a slow acting relay DS in a similar manner to the relays A and DM and the slow acting relay DS is regulated so as to complete its stroke in one minute, this system being controlled by the contact S1 of the selector with the result that if a first correct signal causes the contact S1 to operate, the motor MC will be stopped for one minute.

A relay D is arranged to be controlled by the contact S2 and is associated with a contact 10 actuated by the slow acting relay DS. The relay D is provided for the purpose of effecting a second operation of the unit B and DS with the result that if the contact S2 is closed, the slow acting relay DS operates twice and the motor MC is stopped for 2 minutes.

The contact S3 is arranged to control directly the relay C and is closed when the correct signal is received for the third time in succession and then remains closed until the intervention of the operator. The motor MC is thus permanently stopped. In general, with alarm or calling selectors, the final element which controls S3 is arranged to remain locked pending the intervention of the operator.

The action of the automatic standby device as shown by Figure 1 is as follows:

The relay C being at rest, the motor MC is working and the condenser CR moves slowly causing the wave length of the oscillatory circuit CC to vary over a predetermined range.

Any signals received are detected by the valve L and when the signals are sufficiently powerful to cause the relay MN to act, the relay A is energized, as on the one hand, it is connected to the negative pole of source of electric current by the contact 3 and on the other hand to the positive pole of the said source by the contact 2 and the contact of the relay MN, the relay A by its own action then becomes directly connected to the positive pole by one of its contacts (holding contact).

The relay A through the contact 5 effects the operation of the relay C and thus stops the motor MC. The relay A also actuates the contact 4 to supply the slow acting relay DM with current and the latter comes into operation for 12 seconds, during which period the finger *d* is slowly raised, finally moving the contact 3; at this moment, the relay A comes to rest.

When the relay A has completed its operation, the relays DM and C are no longer energized, the finger *d* falls and the motor MC is caused to run for the duration of the downward movement of the said finger. This period is regulated to be, for example, about 2 seconds, so as to permit a small displacement of the condenser CR.

It should be noted that as long as the finger

d is not in its normal position of rest, the contact 2 is open, and the relay A cannot be freshly energized.

When the finger *d* arrives at its normal position of rest, it again closes the contact 2 and re-establishes the circuit and its members in the original or normal state. If at this moment a further signal is received, the unit MN, A, DM and C operates and the condenser is stopped at its new position for 12 seconds. If, on the contrary, no further signal is received the relay MN is not energized, the motor MC rotates and varies the capacity of the condenser CR until a sufficiently strong signal is intercepted.

It will thus be seen that any signal of sufficient strength in the prescribed range, whatever it may be, effects the stoppage of the variation of the circuit CO for 12 seconds and the condenser is then varied until the receipt of a fresh signal.

Supposing now that the automatic standby device is combined with an auto-alarm selector responding to three consecutive signals of dashes of 4 seconds duration, the first of these dashes will effect the closing of the contact S1, the second that of the contact S2, and the third that of the contact S3.

From the commencement of reception of the signal, the unit MN, A, DM, C will operate as has been previously stated, but if during this period of 12 seconds a first dash is registered by the selector, the contact S1 is closed.

The contact S1 controls the unit B and DS in the same way as the contact of MN controls the unit A and DM, but the slow acting relay DS is regulated for the raising of the finger *d* to last a minute. The relay B thus remains energized for one minute, and controls by its contact 9 the relay C. The motor MC and the condenser CR are thus stopped for one minute.

After this minute, if another dash of 4 seconds has not been registered, the motor starts running again. If, on the contrary, a second dash of 4 seconds has been received, the contact S2 is closed and the relay D energized and is maintained energized by the contact 11 and the contact 10 of the slow acting relay DS. The relay D by virtue of its contact 13 maintains the relay C energized, and the motor MC remains stopped.

After the first minute, when the finger *d'* of the relay DS closes the contact 6, the relay B receives a fresh excitation by virtue of the contacts 6 and 12 and the relay DS operates afresh but immediately after the initial movement of the finger *d'*, the contact 10 is open and the relay D de-energized.

It will thus be seen that, if in the course of receiving signals, two dashes each of 4 seconds duration, are received, the contacts S1 and S2 are closed and the motor MC is stopped for 2 minutes.

Finally, if the correct signal (3 dashes, each of 4 seconds duration) is received, the contact S3 is closed and remains closed until the operator intervenes. In this case, the relay C is energized, and the motor MC and the condenser CR are stopped finally.

The automatic standby device shown by Figure 2 is similar to that shown in Figure 1, but the slow acting relays DM and DS are replaced by cams CM and CS.

The cam CM is actuated by the motor MM, so as to make one revolution in 12 seconds. The cam CS is actuated by the motor MS in such manner as to make one revolution per minute.

The operation of this device is as follows:—

When the signals received cause the relay MN to operate, the relay A' is energized, and, through its contact 24 starts the motor MM and moves the cam CM. The relay C is excited by means of the contact 25 and stops the motor MC and condenser CR. Upon the movement of the cam CM, the contact 22 controlled thereby rises and connects the positive pole of a source of electric current to the relay A' which remains excited for the whole revolution, that is to say, for 12 seconds.

A little before the end of the revolution, the cam of CM opens the contact 23 so that the relay C is no longer excited, and the condenser CR is again moved. At the end of the revolution, the contact 22 is restored to its lower position and, if, at this moment, there is no signal received, the relay A' is no longer excited, and the motor MC continues to rotate until the receipt of a further signal.

When a signal comprising a dash of 4 seconds duration is received, the contact S1 is closed, the relay B' is excited and the motor MS is energized by the closing of the contact 28. The cam CS is thus rotated for one revolution which occupies a period of one minute. During this period the relay B' remains energized by virtue of the contact 26 being located at its upper position and the relay causes the excitation of the relay C by actuation of the contact 29. At the end of the revolution of the cam CS the contact 26 is moved to its lower position and the relay B is de-energized so that the motor MC is again energized.

The operation of the relay D' shown in Figure 2 is exactly the same as that of the relay D shown in Figure 1, the contact 30 being opened a little after the commencement of the second rotation of the cam CS.

The automatic standby device represented by Figure 3 is similar to those above described but it comprises a slow acting relay combined with a finder of the type used in automatic telephony. The relays MN, A, DM and C are arranged to function in the same way as those employed in the apparatus illustrated in Figure 1 and the action of this unit is not altered. Nevertheless, the slow acting relay DM is provided with a supplementary contact 62 which controls a driving electro-magnet AV of the telephonic finder.

The telephonic finder is constructed by a barrel BA containing a spring (not shown) which tends to keep the arm BR in the position of rest shown on the drawings.

The barrel BA is provided with teeth and the actuating electro-magnet AV acts on the teeth by means of a pawl and causes the barrel to rotate in the direction of the arrow *f*, each impulse received by the electro-magnet AV causing the forward movement of the barrel by one tooth so that the selector switch arm BR secured to the barrel moves a distance of one contact. The barrel is maintained at the position to which it is moved by means of a counter pawl which may be disengaged by the electro-magnet VR.

The arm BR moves over a series of 10 terminal-contacts.

A relay G controls the unit A and DM in such manner as to cause it to work continuously. As the time of ascent of the finger *d* is 12 seconds, each 12 seconds the electro-magnet AV receives an impulse with the result that the arm BR is brought on to the terminal-contact P5 at the

end of one minute and on to the terminal-contact P10 at the end of two minutes.

These terminals may be arranged to control the electro-magnet VR, which causes the arm BR to be returned into its normal position.

A relay E, controlled by the contact S1 is arranged to bring the terminal P5 into circuit and a relay F controlled by the contact S2 is arranged to bring the terminal P10 into circuit.

The operation of this device is as follows:—

Upon the receipt of any signals whatever, the unit MN, A, DM and C operates as previously described.

Upon the receipt of a first signal of a dash of 4 seconds duration, the contact S1 is closed, the electro-magnet E magnetized and self-locked through the medium of the contact 50 and the relay G is then excited through the closing of the contact 51. The relay G through the medium of its contact 58 maintains the relay C energized and the motor MC stopped.

The relay G, through the medium of its contact 56 also connects the contact 62 with a source of current and through the medium of its contact 57 effects the supply of current to the control circuit of the relay A.

Under these conditions after the lapse of 12 seconds and the finger *d* of the relay DM reaches the top of its stroke, the contact 62 is closed so that the electro-magnet AV receives an impulse and causes the arm BR to move forward one step. The circuit of the relay A is broken by the opening of the contact 3 and the finger D again falls causing the contact 2 to be again closed, the relay A is again magnetized, and the armature of the relay DM makes a fresh stroke. Thus, the operation of the relays A and DM continues as long as the contact 57 is closed. At each ascent of the finger *d*, the contact 62 is closed and the arm BR moves forward one step so that finally, after five impulses, that is to say, at the end of 1 minute, the arm BR reaches the terminal P5 which, through the medium of the contact 52 when working, and contact 55 when at rest, causes the magnetization of the release magnet VR.

The electro-magnet VR opens the contact 60, the electro-magnets E and G are de-energized, the electro-magnet VR withdraws the retaining pawl of the barrel BA and the arm BR is moved back into its normal position of rest.

A contact 61 maintains, as a measure of safety, the magnetization of the release magnet VR until the arm BR reaches its normal position of rest.

It will thus be appreciated that the relay G remains magnetized from the receipt of a signal comprising a dash of 4 seconds duration until the arm BR is located on the contact P5, that is to say, for a period of one minute; as the relay G controls the relay C, the motor MC and movements of the condenser CR is stopped during this period.

The relay F controlled by the contact S2 is similar to the relay E, but, through the medium of its contact 55 the relay F is arranged to connect the input of the electro-magnet VR to the terminal P10, so that under these conditions, if the contact S2 is closed, the relays G and C remain magnetized for 2 minutes.

It is to be understood that the automatic standby devices above described, are given as examples and are capable of being varied.

For example, the receiving radiotelegraphic circuits may be of any type, and may comprise

one or more variable elements, any desired number of amplifying elements being employed. The variation of the oscillatory circuit may be effected by controlling any one or more element such as a capacity, self, inductance reaction. The variable elements may be arranged to ensure a discontinuous variation of the range of wave lengths in connection with which the automatic standby is employed. The periods of stoppage corresponding to the different positions of the selector (12 seconds, 1 and 2 minutes) may be modified according to requirements. The automatic standby device may be affixed with a selector of any type, for example, a selector responding to three letters in signal form, the first letter signal acting on the contact S1, the second on S2, and the third on S3. The automatic standby device may be used without being combined with a selector and in this case, or, of course, only a time counting device will be employed. The slow acting relays may be of any type, for example, dashpot relays, clockwork relays or thermostatic relays. The cams CS and CM and the sets of contacts controlled thereby may be replaced by connecting or sector systems fulfilling the same functions.

In the device as shown by Figure 2 only one continuously working motor may be employed and in this case, the motors MC, MM and MS will be replaced by electrically controlled couplings effecting the coupling of the condenser CR or of the cams CM, CS to the motor spindle, a reducing gear suitably arranged for the desired speed being interposed between the couplings and the said spindle.

Claim:

1. In a radio-electric signal receiver, an oscillating circuit comprising at least one variable element, means to impress on said variable element a continuous motion, means to automatically stop said motion during a predetermined period of time in response to the receipt of a signal in the circuit, means to again set said element in motion when said signal is of other than a predetermined configuration, and means

for stopping the motion when the signal corresponds to said predetermined configuration.

2. In a radio-electric signal receiver, an oscillating circuit comprising at least one variable element, a motor controlling the continuous motion of said element, a relay responsive to the incoming signal and associated with the circuit of the said motor, a slow-acting device, means to operate the said slow-acting device and simultaneously to stop the motor, and means to again set the said motor in motion after a predetermined time period of the movement of the slow acting device when the received signal is other than a predetermined configuration.

3. In combination, a radio-electric signal receiver including a signal selector comprising several selecting stages actuated by an incoming signal in said receiver, an oscillating circuit comprising at least one variable element, means to impress on said variable element a continuous motion, means to automatically stop said motion during a predetermined period of time in response to the receipt of a signal in the circuit, and means to prolong the idle state of the said variable element, in the case where the effect of the signal during the first idle period is to operate one of said selector-stages.

4. In combination, a radio-electric signal receiver including a signal selector including several selecting stages actuated by an incoming signal in said receiver, an oscillating circuit including at least one variable element, means to impress on said variable element a continuous motion, means to automatically stop said motion during a predetermined period of time in response to the receipt of a signal in the circuit, means to repeatedly prolong the idle period of the said variable element in the case where the effect of the signal during the preceding idle period is to operate one of said selector stages, and means to finally stop the apparatus when the operation of the selector reaches a predetermined selecting stage.

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