Jan. 15, 1952 R. M. M. OBERMAN 2,582,349

SELECTING SYSTEM

Filed April 21, 1948 2 SHEETS—SHEET 1

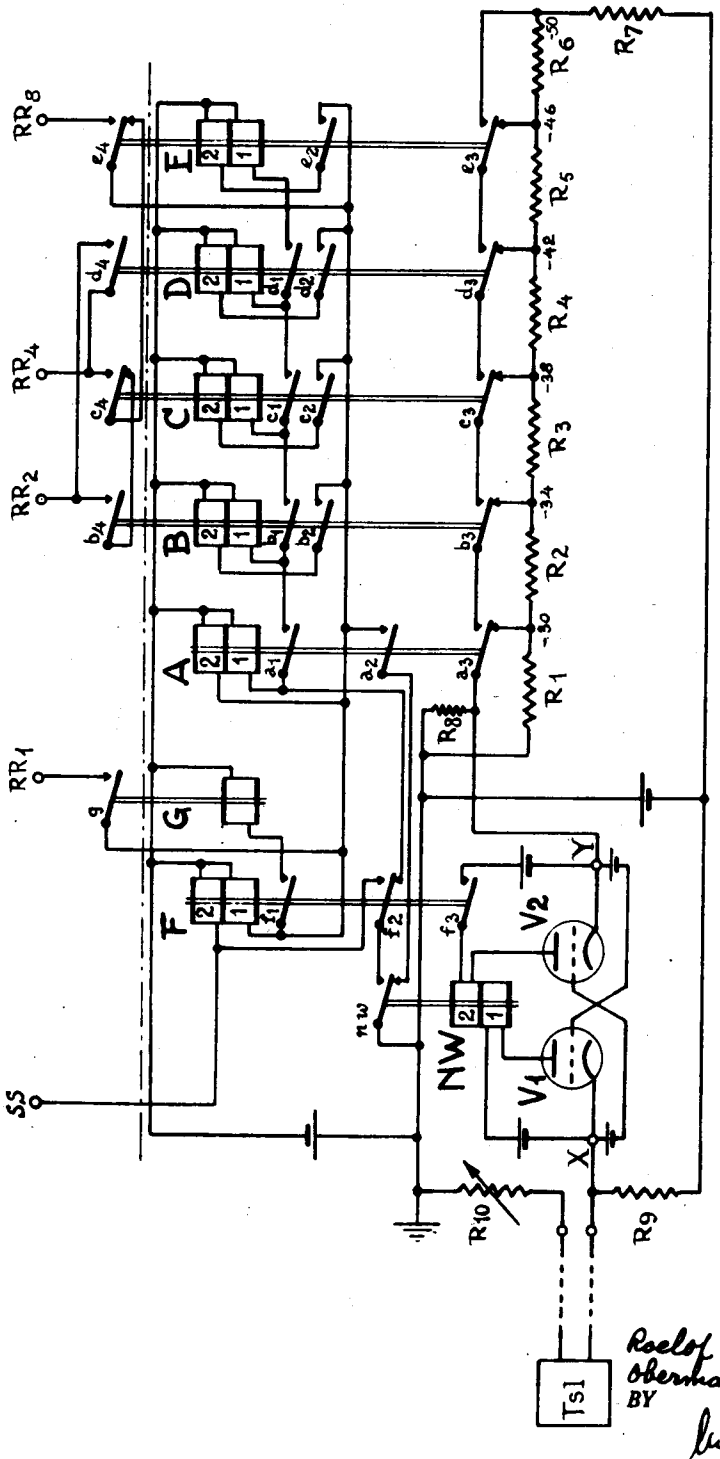

FIG. 1.

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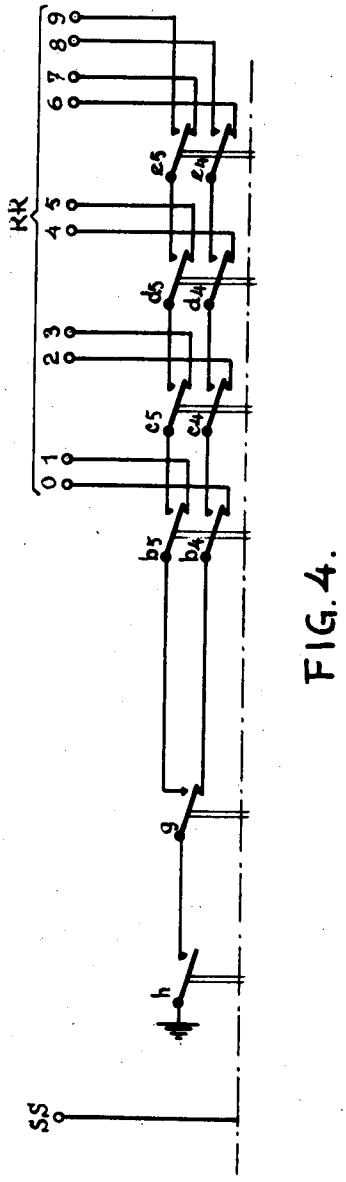

FIG. 4.

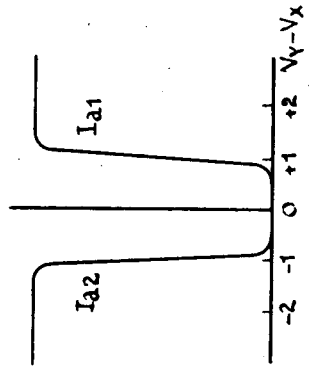

FIG. 3.

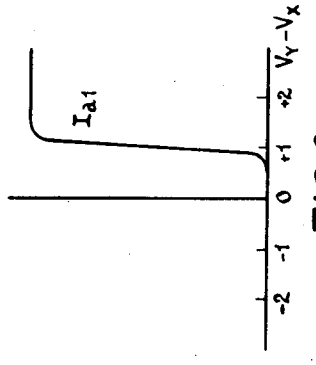

FIG. 2.

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Patented Jan. 15, 1952

2,582,349

UNITED STATES PATENT OFFICE

2,582,349

SELECTING SYSTEM

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Application April 21, 1948, Serial No. 22,426
In the Netherlands April 21, 1947

11 Claims. (Cl. 177—353)

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This invention relates to a receiving and selecting system responsive to different signalling criteria in an electrical signalling system, preferably a telegraph system or a telephone system in which certain signals are transmitted from the subscriber to the exchange or between the exchanges by means of the Wheatstone bridge equilibrium principle.

It is known to construct such devices with a controller or relay set, hunting step-by-step for bridge equilibrium, and being stopped when equilibrium is atttained; see U. S. Patent No. 2,410,050 to Deakin.

A device for quicker operation is disclosed in the co-pending U. S. patent application, Serial No. 767,536, filed August 6, 1947, now Patent No. 2,543,050, patented February 27, 1951, with four Wheatstone bridges each having an equilibrium discriminator, and capable to select a signal out of 15 possible signal criteria in the operation time of at most four successive relays.

The device according to the present invention combines a high positioning rapidity with the use of only one Wheatstone bridge, because in the first selection only test voltages corresponding to every second signal number are applied, the interjacent numbers being stepped over.

The discriminating device is of such a character that the selecting motion is stopped not only when a signal voltage is exactly equilibrated, but also when a signal voltage is passed.

In the second instance, after the selector's motion has come to an end, final discrimination between the odd and even number at stake is performed without changing the acquired selector position.

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be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Fig. 1 is a diagram of the relay selector; according to the invention;

Figs. 2 and 3 show curves characterizing the operation of the discriminating device shown in Fig. 1; and

Fig. 4 is a modification of the device shown in Fig. 1.

The diagram, Fig. 1, is drawn in non-operative ("normal") position. It will be assumed that in this situation both the points X and Y are biased to −30 volts.

Equality of these potentials is obtained by means of the adjustable resistor R_{16}.

For the following description of this example it will be assumed that ten different signal voltages can be imparted to the terminal X by introducing different resistances in the sending apparatus Ts_1.

The vacuum tube V_1 governs the selecting motion of the relay set A to E. During this selection the tube V_2 is inoperative, the contact f_3 in the output circuit of this tube being open. The operation of tube V_1 is characterized by the curve of Fig. 2, showing that this tube and the test relay (winding NW_1) remain inoperative, if terminal Y has a voltage equal to or more negative than the voltage of terminal X. If any signal is given, terminal X receives a more negative voltage according to the following table:

The other figures in this table will be explained in the following description.

No.	Signal Voltage X	Test Voltage Y	Relays										
			NW_1 *nw*	G	A (1)	B (2)	C (4)	D (6)	E (8)	RR_1	RR_2	RR_4	RR_8
0	−32	−34	+	−	(+)	−	−	−	−	−	−	−	−
1	−34	−34	−	+	+	−	−	−	−	+	−	−	−
2	−36	−38	+	−	(+)	(+)	−	−	−	−	+	−	−
3	−38	−38	−	+	+	+	−	−	−	+	+	−	−
4	−40	−42	+	−	(+)	(+)	(+)	−	−	−	−	+	−
5	−42	−42	−	+	+	+	+	−	−	+	−	+	−
6	−44	−46	+	−	(+)	(+)	(+)	(+)	−	−	+	+	−
7	−46	−46	−	+	+	+	+	+	−	+	+	+	−
8	−48	−50	+	−	(+)	(+)	(+)	(+)	(+)	−	−	−	+
9	−50	−50	−	+	+	+	+	+	+	+	−	−	+

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will

The tubes V_1 and V_2 and the relay NW form a discriminating device having two terminals X, Y, which receive, respectively, the signal and comparison voltages. The result of the comparison or discrimination appears in the position of the armature *nw* of the relay NW.

The armature *nw* constitutes a means for controlling the selector means. If armature *nw* is on its front contact it starts the energization of the series of relays A to E. If armature *nw* is restored to normal so as to be in contact with its back contact the energization of the series comes to an end in the position which it had attained, the operative relays, for instance A, B, C being held in operative position by their second windings which are inserted in holding circuits. The remaining relays, for instance D and E remain idle.

The armatures a_3 to e_3 and the potentiometer R_1 to R_7 controlled by the same constitute a means for communicating information to the discriminator, namely the information how far the energization of the series of relays has proceeded. This information is communicated in form of a voltage for instance −42 volts to the discriminator over the terminal Y of the same.

The relay F forms a means for discriminating between odd and even criteria by completing with the armature f_3 thereof the circuit for the tube V_2 and the second winding of the relay NW. This enables a fine distinction to be made between neighboring signal voltages on terminal X, for instance if Y has a voltage of −42 and X has a voltage of −42 belonging to the "odd" signal "5" or −40 volts belonging to the "even" signal "4" as more fully pointed out in the table above.

The picking up of the testing voltages from the potentiometer R_1 to R_7 can be done by means of a rotating wiper the motor or ratchet of which is controlled by the armature *nw* or any equivalent therefor. In the discriminating device the terminals X and Y are essential elements whereas the other parts of the discriminating device could be replaced by equivalents.

Should, for instance, signal "5" be issued, then point X would be biased to −42 volts; tube V_1 operates and energizes winding NW_1, then closing a circuit for the relay A: ground, front contact *nw*, back contact f_2, winding A_1 to battery. Relay A operates and over contact a_1, the winding B_1 of the next relay is connected to ground.

The point Y is first tested with −34 volts, taken from the potentiometer R_1—R_7 by way of front contact a_3 and back contact b_3. As −34 volts is still positive with respect to −42 v., the tube V_1 and relay NW remain operative, enabling relay B_1 to operate with a delay of a few milliseconds causing the test voltage on point Y now to be changed to −38 v.

Similarly, relay C_1 is energized, but now point Y reaches the equilibrium voltage −42 volts over front contacts a_3, b_3, c_3 and back contact d_3. Tube V_1 now becomes inoperative and relay NW is reversed switching in its back contact so rapidly that relay D has no time to operate although its winding D_1 is energized for a short moment over control c_1.

The reversion to normal of relay NW de-energizes all relay windings A_1, B_1, C_1, but these relays are kept in operation by their second windings A_2, B_2, C_2 which are now connected to ground over back contact *nw* and contacts a_2, b_2, c_2, respectively.

Simultaneously a circuit is closed for winding F_1: ground, back contact *nw*, contact a_2, and with some delay relay G is also energized.

The operative relays are now: F, G, A, B and C and the register relays RR_1 and RR_4 are actuated: Viz: RR_1: back contact *nw*, contacts a_2, *g*; RR_4; back contact *nw*, contacts a_2, e_4, c_4;

Although contact b_4 is also closed, register relay RR_2 is not operated because its circuit is open at back contact c_4. By adding the indices of the register relays RR_1 and RR_4 the signal number "5" is recognized. By operation of relay F contact f_3 closes and the other vacuum tube V_2 is switched in, but tube V_2 and winding NW_2 do not operate because the signal voltage $X=-42$ v.) and the test voltage ($Y=-42$ v.) are found to be in equilibrium.

Now it shall be considered what happens when signal "4" is given, biasing point X to −40 v.

The selecting operation develops exactly in the same way as with signal "5" up to the test voltage −42 v. on point Y, with relays A, B and C operating successively. But when contact f_3 closes the circuit for tube V_2 and winding NW_2, this tube, according to Fig. 3, now responds to the difference between the test voltage ($Y=-42$ v.) and the signal voltage ($X=-40$ v.), and relay NW operates for the second time. The second winding F_2 is now energized over front contacts *nw* and f_2. All the other relays A, B, C are de-energized; that is why the (+) marks in the table for signal "4" are placed in brackets.

The duration of stay of contact *nw* on the back contact between the de-energization of winding NW_1 and the energizing of winding NW_2 depends mainly on the delay of relay F controlling contact f_3. This stay ought to be long enough to actuate the register relays over back contact *nw*, and contact a_2, e_4, but relay G has no time to operate since its energization only starts with the closing of contact f_1, having the same delay as contact f_3, and from this moment relay NW is faster than relay G.

The result is that signal "4" is registered in relay RR_4 only: back contact *nw*, contact a_2, back contact e_4, front contact c_4. RR_2 is not operated for the same reason as in the preceding example.

During the second operative period relay NW restores all relays A to E to normal. This means that the test potential on point Y is restored to −30 v., and point X being still −40 v. because of the signal, tube V_2 becomes inoperative and tube V_1 operates winding NW_1. For the rest of the duration of the signal relay F is held in operation over front contact *nw*, front contact f_2, and winding F_2, while relay NW is held operative by tube V_1 and winding NW_1.

When the signal stops, tube V_1, winding NW_1 and winding F_2 are rendered inoperative and the entire arrangement is prepared to receive a new signal.

Returning to the first example (signal "5") it is remarked that during the presence of signal voltage on terminal X the relay NW is not rendered operative whereas relays A through C, and G remain operative. In order to restore these relays in preparation of the next signal, relay NW now performs a second operation of short duration after the signals stop, as the −30 v. bias on X opposite the −42 v. still present on Y causes windings B_1 and NW_1 to operate until by de-energizing A (B and C) the test voltage on Y is restored to −30 v.

The sequence switch SS (not shown) having the task to shift the selecting arrangement to e. g. another register, can be coupled to the front contact of f_2.

In the above example a four relay register is chosen to gather the intelligence given by the signal, but if a decimal register (e. g. a crossbar switch) is desired, the arrangement according to

Fig. 4 may be used. The number of contacts of relays G and A through E has to be increased in consequence of the greater number of output leads, and a relay H is added, giving register actuation after selection is completed. In Fig. 4 which corresponds to Fig. 1 along the line —.—.—, only the relay contacts concerned with registering are given.

The invention can also be carried out with a rotary selector instead of the relay set A to E, and several other modifications of the given example can be designed with preselection by twos and subsequent odd/even discrimination, among them the application of other signalling criteria such as different sender resistance, or any other phenomenon adaptable for definition of a series of signals.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of selecting systems differing from the types described above.

While I have illustrated and described the invention as embodied in selecting systems responsive to different electrical signals, I do not intend to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of my invention.

While I have illustrated and described what I regard to be the preferred embodiment of my invention, nevertheless it will be understood that such is merely exemplary and that numerous modifications and rearrangements may be made therein without departing from the essence of the invention.

I claim:

1. A selecting system responsive to different electrical signals forming pairs each comprising two contiguous signal criteria comprising in combination: a selecting means; a potential discriminating device; means connected to said discriminating device for controlling said selecting means; means operated by said selecting means for communicating information to said discriminating device, any such information being responsive to a pair of two contiguous signal criteria; and means for a final discrimination between odd and even signal criteria.

2. A selecting system responsive to different electrical signals forming pairs each comprising two contiguous signal criteria, comprising in combination: a series of selecting relays; a potential discriminating device; means connected to said discriminating device for successively operating said relays; means operated by said relays for communicating information to said discriminating device, any such information being responsive to a pair of two contiguous signal criteria; and means for a final discrimination between odd and even signal criteria.

3. A selecting system responsive to different signal voltages comprising in combination: selecting means; a potential discriminating device; means connected to said discriminating device for controlling said selecting means; means operated by said selecting means for successively biasing said discriminating device with a voltage having a predetermined relationship to a pair of two contiguous signal voltages; and means for a final discrimination between odd and even signal criteria.

4. A selecting system responsive to different signal voltages comprising in combination: a potential discriminating device; means for biasing same to be operative on different pairs of two contiguous signal voltage values; a selecting means operated by said discriminating device, said biasing means being controlled by said selecting means; and means for a final discrimination between odd and even signal criteria.

5. A selecting system responsive to different signal voltages comprising in combination a series of selecting relays; a potential discriminating device; means connected to said discriminating device for successively controlling said relays; means operated by said relays to bias said discrimination device with a voltage responsive to either of two contiguous signal voltages; and means for a final discrimination between odd and even signal criteria.

6. A selecting system responsive to different signal voltages comprising in combination a selecting device; a first vacuum tube; means connected to said first vacuum tube for operating said selecting device; means operated by said selecting device for biasing said first vacuum tube to be inoperative on either of two contiguous signal voltages; and a second vacuum tube, and means maintaining the bias of said second vacuum tube in a predetermined relationship to the bias of said first tube.

7. A selecting system responsive to different signal voltages comprising in combination a first vacuum tube; a plurality of selecting relays governed by said first vacuum tube; a second vacuum tube; means operated by said selecting relays for biasing one of said tubes to be inoperative on different pairs of two contiguous signal voltage values and for simultaneously biasing the other tube with a predetermined voltage difference with respect to said tube biased to be inoperative on different pairs of two contiguous signal voltage values.

8. A selecting system responsive to different signal voltages comprising in combination a first vacuum tube; a second vacuum tube; means to maintain a predetermined bias difference between said vacuum tubes; means for biasing one of said vacuum tubes to be inoperative on different pairs of two contiguous signal voltage values; and a series of selecting relays successively operated by one of said vacuum tubes, said biasing means being controlled by said selecting relays.

9. A selecting system responsive to different electrical signal criteria including odd and even signal criteria, comprising in combination, a selector means; a first vacuum tube; a second vacuum tube; a relay having a first winding connected in the anode circuit of said first vacuum tube and a second winding connected in the anode circuit of said second vacuum tube, said relay controlling said selector means; means operated by said selector means for biasing said two vacuum tubes, said biasing means of said vacuum tubes in correspondence with the different signal criteria being adapted to bias said first vacuum tube with the same potential for each pair of two contiguous signal criteria including an even signal criterion and the next higher odd signal criterion, the bias of said second vacuum tube being in a predetermined relationship to the bias of said first vacuum tube; and means being responsive to a final discrimination between odd and even signal criteria for switching on said second vacuum tube.

10. A selecting system responsive to different electrical signal criteria including odd and even signal criteria, comprising in combination, a series of selector relays; a first vacuum tube;

a second vacuum tube; a relay having a first winding connected in the anode circuit of said first vacuum tube and a second winding connected in the anode circuit of said second vacuum tube said relay successively operating said selector relays; means operated by said selector relays for biasing said two vacuum tubes in correspondence with the different signal criteria, said biasing means of said vacuum tubes being adapted to bias said first vacuum tube with the same potential for each pair of two contiguous signal criteria including an even signal criterion and the next higher odd signal criterion, the bias of said second vacuum tube being in a predetermined relationship to the bias of said first vacuum tube; and means being responsive to a final discrimination between odd and even signal criteria for switching on said second vacuum tube.

11. A selecting system responsive to different electrical signal criteria including odd and even signal criteria, comprising in combination, a selector device; a first vacuum tube; a second vacuum tube; a relay having a first winding connected in the anode circuit of said first vacuum tube and a second winding connected in

the anode circuit of said second vacuum tube, said relay controlling said selector device; means operated by said selector device for biasing said two vacuum tubes in correspondence with the different signal criteria so as to render said first vacuum tube inoperative on either of two contiguous signal criteria, the bias of said second vacuum tube being in a predetermined relationship to the bias of said first vacuum tube and means being responsive to a final discrimination between odd and even signal criteria for switching on said second vacuum tube.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
Re. 22,794	Deakin	Oct. 1, 1946
2,088,793	Judge	Aug. 3, 1937
2,295,534	Leathers	Sept. 15, 1942
2,407,286	Kinkead	Sept. 10, 1946
2,454,781	Deakin	Nov. 30, 1948