

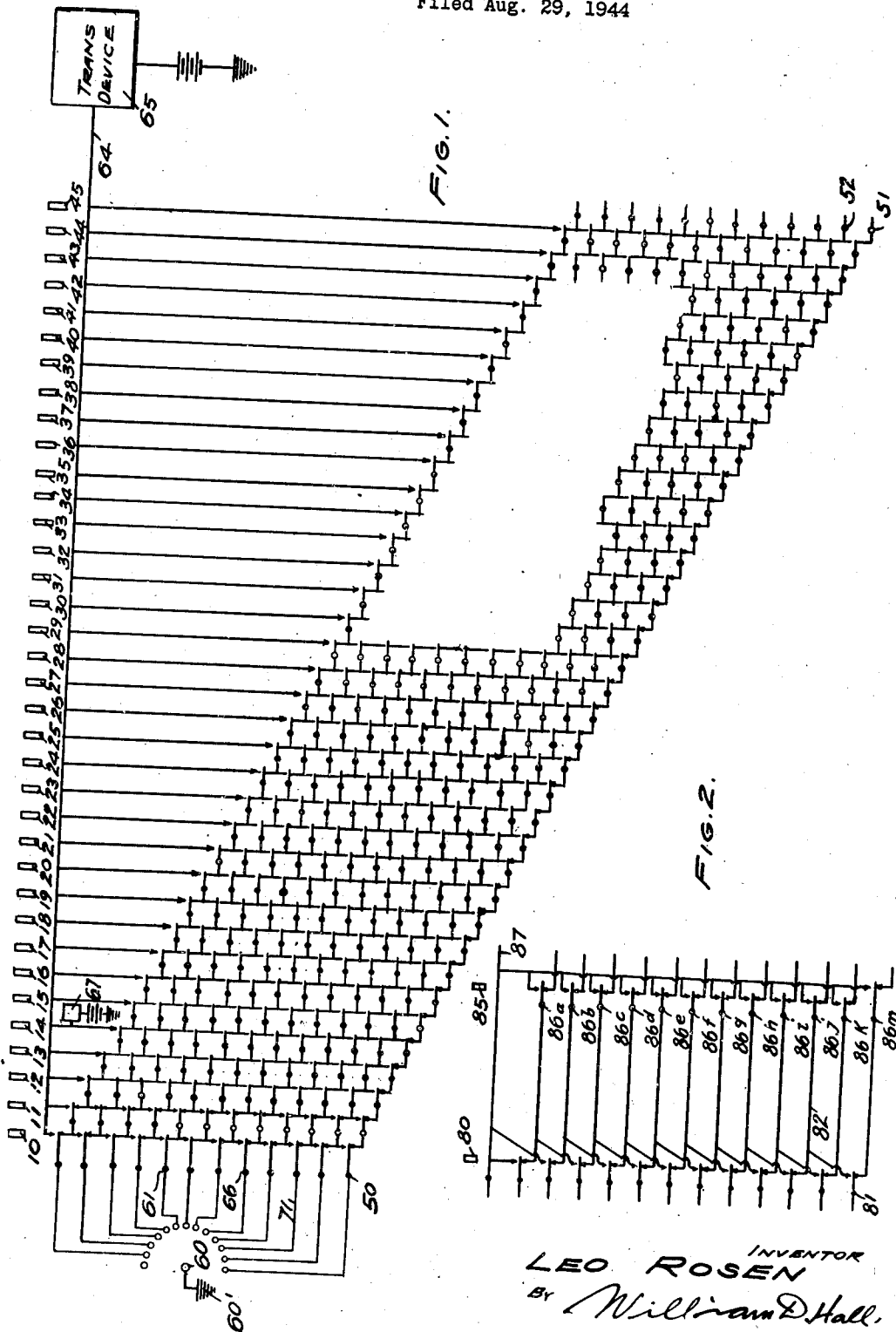
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COUNTING APPARATUS

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COUNTING APPARATUS

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment of any royalty thereon.

This invention is in electrical counting circuits or the like and, particularly, is an apparatus for indicating when a predetermined number out of a larger possible number of events to be studied have occurred.

By way of illustration, there may be thirty-six telephone circuits between two points. It is important for the telephone company to know if nearly all of the circuits are in use at the same time so that auxiliary circuits can be prepared and telephone service thus maintained between the two points. Through the use of this invention, a warning can be given when, for instance, twenty-five or thirty circuits are simultaneously in use.

Another application for the invention may be found in theaters where it is important that the volume of any sound apparatus be varied in accordance with the number of persons in the theater.

Additional uses for the apparatus will readily suggest themselves. Suffice it to say at this point that the invention is intended primarily to indicate the number of changes in conditions that have taken place; it may, however, indicate which conditions have changed, or when a certain sequence of conditions have occurred.

One object of the invention is, therefore, to provide an electrical means for indicating when a certain number of unrelated events have occurred. Another object is to provide electrical means for indicating when a predetermined number of mutually dependent events have occurred.

An additional object is to provide a statistical study of a number of events, some of which are of greater importance than others, and to provide result weighted in accordance with the importance of the events.

Other objects will be apparent from the reading of the following description and claims.

In the drawings, Figure 1 illustrates a chain of relays which is the fundamental feature of the invention.

Figure 2 illustrates a means by which a particular event is caused to carry more weight than another event.

Referring to the drawings and, particularly, to Figure 1, a series of thirty-six multiple-contact relays may be seen. These are numbered 10 to 45 inclusive, and are thus intended to provide study of thirty-six different variable conditions.

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It will be apparent that, if a hundred conditions were to be studied, a hundred of these relays would have to be provided. The number of contacts governed by each relay will depend upon circumstances, it being necessary that there be as many output contacts for the chain as the highest number to be counted.

In the embodiment shown in Figure 1, neutral relays are used, and the movable contact members are normally held by their springs against the lower of their two cooperating fixed contacts.

Considering the apparatus now, as applied to a telephone system, and assuming that each of the relays 10 to 45, inclusive, is associated with one of the telephone circuits and is adapted to be energized when its circuit is in use, it will be apparent that, when all circuits are open, ground may be transferred from contact 50 through the lowermost set of contacts of the chain of Figure 1, and that it will emerge from the chain at contact 51. It will also be seen that the energization of any one of the relays 10 to 45, inclusive, will cause the input signal to emerge from the chain at contact 52. The energization of any additional relay with the closing of its associated contacts will "lift" the output one more step at the right-hand end of the chain.

At the left of Figure 1 may be seen multiple post switch 60, grounded at 60'. From this switch, ground can be introduced to any selected input contact. The switch is really intended to be used in the following manner:

If it is desired to know when five of the conditions to be observed have occurred, switch 60 would then be adjusted so as to introduce ground at input 61. Then, as soon as any five relays have been energized, the input signal will be carried to output line 64. This line is provided with a translating device 65 which may be a bell, a lamp or any other signalling means. Should it be desired to actuate the translating device 65 after the occurrence of eight events, the switch 61 would be adjusted so as to utilize input contact 66.

The apparatus can be used to provide a signal after a number of events have taken place in sequence. Assume that switch 60 is adjusted so as to introduce ground at input 61. It will be seen that, although translating device 65 will still be actuated after the counting of any five occurrences, auxiliary translating device 67, connected for energization to line 68, will also be actuated if the first five relays, 10 to 14 inclusive, close in order.

In addition, if desired, more than one of the input contacts at the left of Figure 1 can be used

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simultaneously. Thus, 61 and 71 could be utilized and would energize the translating device 65, once after operation in sequence of relays 10 to 14, inclusive, and a second time after the operation of relays 10 to 19, inclusive. Further modifications will suggest themselves, as for example the use at 65 of a multi-level indicating device.

The output contacts at the right-hand end of the contact chain of Figure 1, as 51 and 52, will ordinarily operate individual indicating devices, 10 as, for instance, numbered lights 51' and 52', but in special applications, perhaps every three or five contacts only will control an indicating signal.

In Figure 2 is shown schematically the means 15 by which the operation of a selected relay is caused to produce a result equivalent to the operation of a predetermined number of other relays. The arrangement of Figure 2 may be substituted for any two adjacent columns of switches shown in Figure 1. Relay 80, together with its contacts, 20 is, in fact, the only significant element of Figure 2. If relay 80 is energized and a signal is introduced at 81, that signal will be transferred to line 82, the effect being the same as if two relays in Figure 1 had been energized.

The effect of operation of relay 85 is to give a general alarm. Thus, a signal reaching any one of the contacts 86a to 86m would, if relay 85 were energized, be carried immediately to output line 30 87 and an indicating device of any desired sort. In fact, once relay 85 is energized, a signal reaching any of its contacts will cause an operation of said signalling device.

The above description is in specific terms. It should be understood that the invention is not limited to the exact structures shown and described, and for the true scope of the invention, reference should be had to the appended claims.

I claim:

1. In a counting system, a chain of switches each having a normal closed condition and a second closed condition, the switches being effectively arranged in coordinate rows and columns, each switch communicating with a switch in a succeeding column when in normal closed condition, and a different switch in a succeeding column when in its second closed condition, there being switches lengthwise of the chain equal in number to the items which may be counted and switches crosswise of the chain equal in number to the total number to be counted, means for actuating the switches by columns according to the occurrence of an event to be counted to cause them to assume their second closed conditions, a source of current, a plurality of input contacts for said chain, a plurality of outputs each connected to be energized when a switch of a column is in a predetermined one of its two closed conditions, and means for indicating the energized output.

2. In a counting apparatus, a chain of switches each having a normal closed condition and a second closed condition, the switches being effectively

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arranged in coordinate rows and columns, there being switches lengthwise of the chain equal in number to the items which may be counted and switches crosswise of the chain equal in number to the total number to be counted, substantially all of said switches communicating when in their normal closed conditions with predetermined switches in a succeeding column means for actuating the switches by columns according to the occurrence of an event to be counted to cause them to assume their second closed conditions, a source of current for said chain, a plurality of input contacts for said chain, a plurality of outputs therefor, and a second plurality of outputs each connected to be energized when a switch of a column is in a predetermined one of its two closed conditions.

3. In an electrical circuit, a chain of switches each having a normal closed condition and a second closed condition, the switches being arranged effectively in coordinate rows and columns, means for changing the conditions of said switches by columns, current supplying means, an input contact for each row of switches cooperating with said current supplying means, an output contact for each row of switches and a second output contact for each column of switches, there being normally a closed circuit between the input contact of a row and the output contact thereof, and after operation of said first mentioned means a closed circuit between the last mentioned input contact and another output contact through one of said columns of switches, and indicating means for the said rows of switches.

4. In an electrical circuit, a chain of switches each having a normal closed condition and a second closed condition arranged effectively in coordinate rows and columns, an input for each row, and a corresponding output for each row, current supplying means, means for closing a circuit through a preselected one of said inputs whereby, with the switches in their normal conditions, said circuit will include the output corresponding to said selected input, means for varying the conditions of the switches by columns and means connecting said rows through said columns to cause a circuit to be varied by providing therefor another output upon a variation of the conditions of the switches of a column.

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