

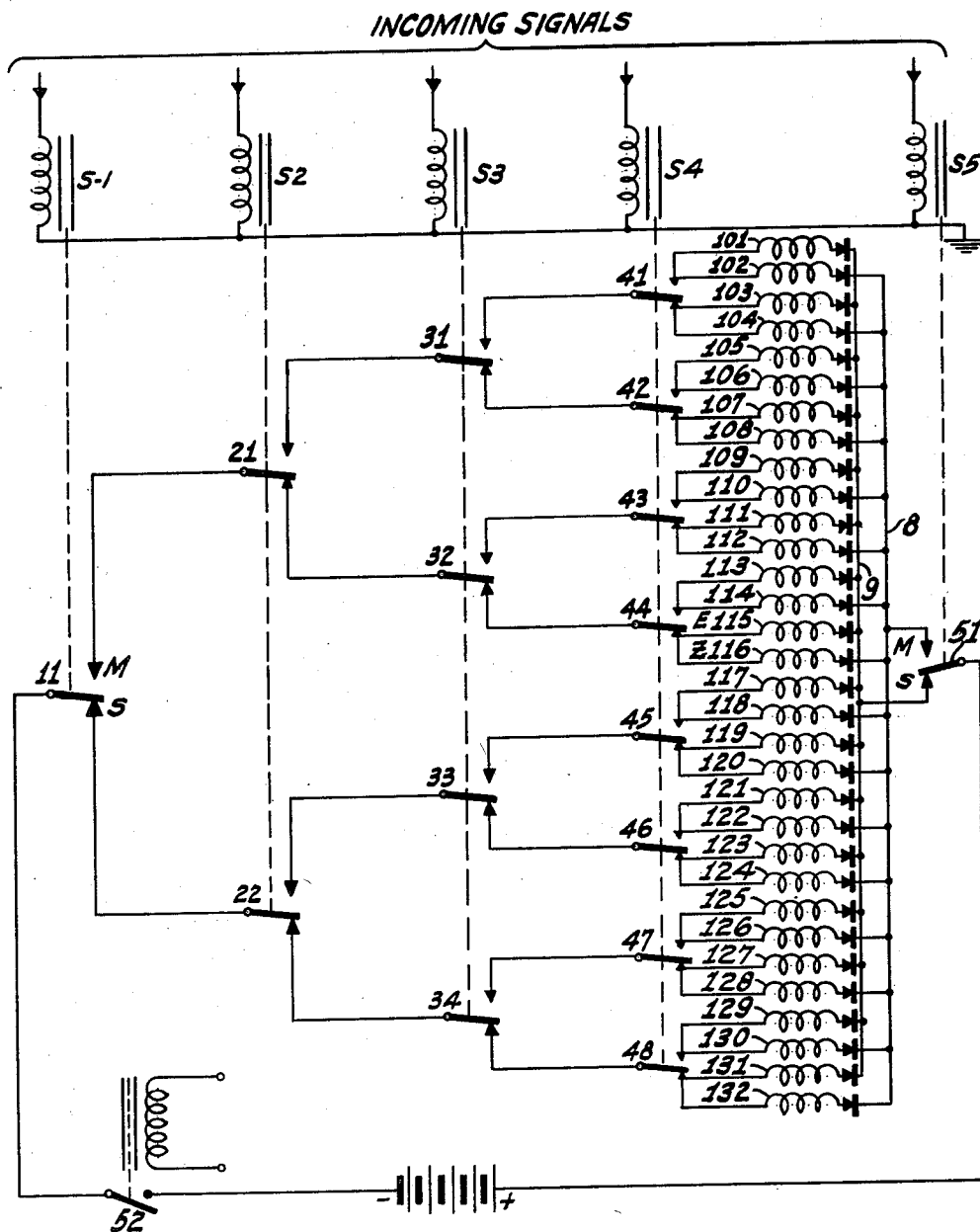
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RELAY TYPE SELECTING CIRCUIT ARRANGEMENT

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RELAY TYPE SELECTING CIRCUIT
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The invention relates to selecting circuit arrangements, and particularly pertains to telegraphic code translators used in connection with code converters and like circuit arrangements.

Binary selecting circuits such as relay translator circuits are known in the prior art, a typical example of which is found in U. S. Patent No. 2,471,126, issued May 24, 1949, to the present inventor.

In prior art arrangements at least one of the selecting relays, the fifth such relay in a 5-unit code translator for example, is necessarily provided with a large number of contacts, frequently 32, each of which is used to complete a circuit through the winding of an electromagnet or relay as is required by the particular system in which the device is employed. In actual practice, the number of contacts required practically necessitates the paralleling of several relays the use of which imposes severe maintenance problems with a concomitant increase in the cost of maintenance, and also raises the initial cost and space requirements.

It is an object of the invention therefore to provide a simplified selecting circuit arrangement and more specifically a simplified relay translator circuit.

It is another object of the invention to materially reduce the number of contacts required for a switching mechanism of the relay type translating system, to reduce installation and operating costs.

These and other objects of the invention which will appear as the specification progresses are attained by arranging the circuits of a relay operated selective switching system so that at least one of the relays requires but one single-pole double-throw switch instead of sixteen or more switches. The output signaling relays are connected to the next preceding relay switching circuit in such a manner that switching requirements for that relay are unchanged.

Every character code combination within the framework of an equal length code is comprised of a like number of elemental units. The several character code formations are recognized from one another by the nature (marking or spacing) of the individual units. Because of this characteristic, one-half of the total number of code combinations terminate in marking and the other half in spacing units. Likewise, random length codes can be divided into combinations terminating in elements of one nature and combinations terminating in elements of another nature, such as those Morse code characters ending in dots

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and those ending in dashes. It will be obvious that in handling such codes it is preferable to interpose the circuits according to the invention at a point in the relay train other than the terminal stages since the maximum number of switches is seldom if ever required at the latter stages. It is suggested that the circuit according to the invention be inserted at the fourth element discriminating circuit of Morse code translators. For convenience, however, the description of a circuit according to the invention will be limited to the five-unit code translator.

Since the last selecting relay, the fifth relay in a five unit code translator, is needed only for indicating the nature of the fifth element, the number of switches on that relay may be reduced from sixteen single-pole double-throw to one single-pole double-throw assembly by relocating the recording magnets or repeating relays, thus saving a total of forty-five switch springs in a five unit translator.

The invention will be described with reference to the accompanying drawing forming a part of the specification and in which the sole figure is a schematic circuit diagram of a relay translator according to the invention.

Referring to the drawing, there is shown a diagram of a five-unit relay type code translating circuit having four input selecting relays S1, S2, S3, and S4 provided with the usual number of switch springs connected in a binary base selection arrangement familiarly known as a "Christmas tree." The connections to these switch springs up to and including the arms of switches 41—48 of relay S4 are unchanged from that shown in the above mentioned U. S. patent. Relay S4 is shown provided with eight single-pole double-throw switch springs, although in actual practice it may be found desirable that several relays having a proportionate number of switch springs be connected in parallel or in cascade, an example of the latter connection being given in the above-mentioned U. S. patent.

The devices shown at 101—132 may be any unilateral impedance devices which are to be selected according to the problem confronting the artisan. Unilateral impedance devices are necessary to prevent interaction between devices connected to a common output lead as will be seen from an inspection of the drawings. As a practical matter the usual utility devices, which in general practice are rotary solenoids mechanically coupled to the key levers of a recording machine or repeating relays provided with contact assemblies arranged to set up new code com-

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binations, are adapted for the purpose simply by connecting a rectifier element in series with each conventional device. Almost any form of rectifier will be suitable, for example, germanium crystals, copper-oxide rectifiers, or both of the diode and multi-element types vacuum tubes. It has been found that some vacuum tube-relay combinations are less satisfactory than others, hence some experimenting may be necessary if such combinations are desired. Relay-rectifier combinations 101—132 are divided into pairs and the input connections to each pair are connected together, thence to one of the stationary switch members of selecting relay S4. There should be one pair of polarized magnets or relay-rectifier combinations for each stationary switch member.

The output terminal of one magnet or combination in each pair is connected to a common conductor 8 and its mate to a common conductor 9. Conductor 8 connects to the marking contact M on the last selecting relay S5 and conductor 9 to its spacing contact S. The arm of switch 51 may be connected to ground potential if desired.

Relays S1 to S5 inclusive operate in response to received signals, so that for example if the letter "E," represented as MSSSS in a 5-unit code, is received, relay S1 only operates and (assuming for the present that switch 52 is closed) a circuit is then completed from the negative pole of battery through contact M of switch 11, switches 21, 32 and 44, as shown, to the input of coil-and-rectifier combinations 115 and 116 corresponding to the letters E and Z. Since switch 51 is in spacing condition, the circuit through coil-and-rectifier combination 116 corresponding to the letter "Z" and conductor 8 is open at switch 51. Coil and rectifier combination 115 corresponding to the letter "E" is connected to conductor 9, therefore, its circuit is completed to plus battery through switch 51. If the letter "Z," represented by MSSSM, is received, the circuit from negative through switches 11, 21, 32 and 44 remains unchanged, but conductor 9 is open and conductor 8 is closed at switch 51. Since coil 116 is connected to conductor 8, it is energized and operates according to its required function. All other code combinations are similarly established.

If the received signal elements arrive simultaneously, the device selected is then energized to perform its prearranged duty without further ado. In such case, however, combination 132 must either be omitted or disabling means provided to prevent its activation except when specifically called upon. If the received signal elements arrive sequentially, as is the usual case in Morse to 5-unit code translators, means must be provided to energize the selected device only after selection has been completed. In such cases, a print pulse is usually provided in the associated apparatus and may be used to actuate a relay S-6 to close normally open switch 52 after selection has been made, although it should be obvious that many other arrangements can be substituted therefor. As a suggested alternate arrangement, the rectifier element of each combination may be in the form of a grid controlled electron discharge device or a transistor which is normally biased to cut off and adapted to have a pulse of proper potential applied to the control electrode thereof after the selection has been completed. In this manner the unilateral impedance element and the energizing switch element are combined to effect considerable saving of apparatus and at the same time afford considerable flexibility of application, since different actuat-

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ing pulses may be applied to different utility devices as the situation may require.

While the invention has been described with reference to a circuit specifically for the 5-unit code translator, it is understood of course that the system is applicable to many forms of selecting circuits of which code translators form only a part and that obvious modifications will be suggested by one skilled in the art without departing from the spirit and scope of the invention.

The invention claimed is:

1. A selecting circuit arrangement for completing a single electric circuit through a single one of a number of electric devices in response to coded information of at least three elements of at least two conditions each, including a pair of poly-position switching elements each having a single arm member connected to one end of said single electric circuit and at least two contact members associated with said arm member, a number of pairs of complementary terminals to which said electric devices are to be connected individually, means to connect the pairs of complementary terminals in groups with respect to one terminal of each pair and means to connect the other terminal of one of each pair of complementary terminals of said groups to one of a common plurality of common busses, unilateral impedance devices individually interposed in said group connections to be in series with each of said electric devices, means including at least one multiple-arm switching element to connect each of said groups to one of said contact members of one of said poly-position switching elements and to connect each of said common busses individually to said contact members of the other poly-position switching element, each of said switching elements being operated in response to the conditions of a different one of said coded information elements.

2. A selecting circuit arrangement for completing a single electric circuit through a single one of a number of electric devices in response to binary coded information of a number of elements, including a pair of two-position switching elements each having an arm member connected to one end of said single electric circuit and two contact members associated with said arm member, a number of unilateral impedance devices, means individually to connect one of said electric devices in series circuit with each of said unilateral impedance devices, means to connect given terminals of the series circuit connected devices in a number of groups of a predetermined count of devices in each group, and means to interconnect the other terminals of said series circuit devices in said count of circuits, there being one device of each of said group connected to each count of circuits, means including a plurality of multiple-arm switching elements having contact structures connected in binary geometrical progression cascade to connect each of said groups of series circuit devices to one of said contact members of one of said two-position switching elements and to connect each of said count of circuits to one of said contact members of the other two-position switching element, each of said switching elements being operated in response to a different one of said binary coded information elements.

3. A selecting circuit arrangement for completing a single direct current electric circuit through a single one of a number of electric devices in response to coded information of five elements of two conditions each, including a pair

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of two-position switching elements each having a single arm member connected to one end of said single electric circuit and two contact members associated with said arm member, a number of rectifier devices, means to connect one of said electric devices in series circuit with each of said rectifier devices, means to connect the series circuit connected devices in groups with respect to one terminal of each and means to connect the other terminal of one of each member of said groups to one of two common busses, means including three multiple-arm switching elements having cascaded contact structures to connect each of said groups to one of said contact members of one of said two-position switching elements and to connect each of said common busses individually to said two contact members of the other two-position switching element, each of said switching elements being operated in response to the condition of a different one of said coded information elements.

4. A selecting circuit arrangement for completing a single direct current electric circuit through a single one of a number of electric devices, including a pair of two-position switching elements each having an arm member connected to one end of said single electric circuit and two contact members associated with said arm member, a number of semi-conductor devices, means to connect one of said electric devices in series circuit with each of said semi-conductor devices, means to connect the series circuit connected devices in groups with respect to one terminal of each and means to connect the other terminal of one of each member of said groups to one of two common busses, first, second, and third multiple-arm switching elements having two, four and eight arms respectively and two contact members associated with each arm, the arms of said first multiple arm switching elements being connected to said contact members of one of said two-position switching elements, the contact members of said first multiple arm switching element being individually connected to the arms of said second multiple arm switching element and the contact members of said second multiple arm switching element being individually connected to the arms of said third multiple arm switching element, the contact members of said third multiple arm switching element being individually connected to said

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groups of series circuit connected devices at said one terminal of each, and said common busses being connected individually to said contact members of the other two-position switching element, each of said switching elements being operated in response to the condition of a different one of said coded information elements.

5. A code translator circuit arrangement including a single direct current energizing circuit, a plurality of signal relays having cascaded contact assemblies comprising a first signal input relay having a contact assembly comprising an armature connected to one end of said single energizing circuit and front and back contacts associated with said armature, an intermediate signal input relay having a contact assembly comprising armatures connected to the front and back contacts of the preceding signal input relay and having front and back contacts associated therewith, a plurality of output signal relays having terminals of the windings thereof connected in pairs, said pairs of input terminals being connected individually to the front and back contacts of said intermediate signal input relay contact assemblies, rectifier elements individually connected in series circuit with the windings of each of said output signal relays, a conductor connecting the rectifiers connected to an output signal relay of each pair of output signal relays, a bus connecting the rectifiers connected to the other output signal relays of each pair and a final signal input relay having a contact assembly comprising an armature connected to the other end of said single energizing circuit and having front and back contacts associated therewith, said front and back contacts being connected to said conductor and said bus to energize one only of said plurality of output signal relays in response to actuation of said signal input relays.

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REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,547,964	Semat	July 28, 1925

FOREIGN PATENTS

Number	Country	Date
687,419	Germany	Jan. 29, 1940