

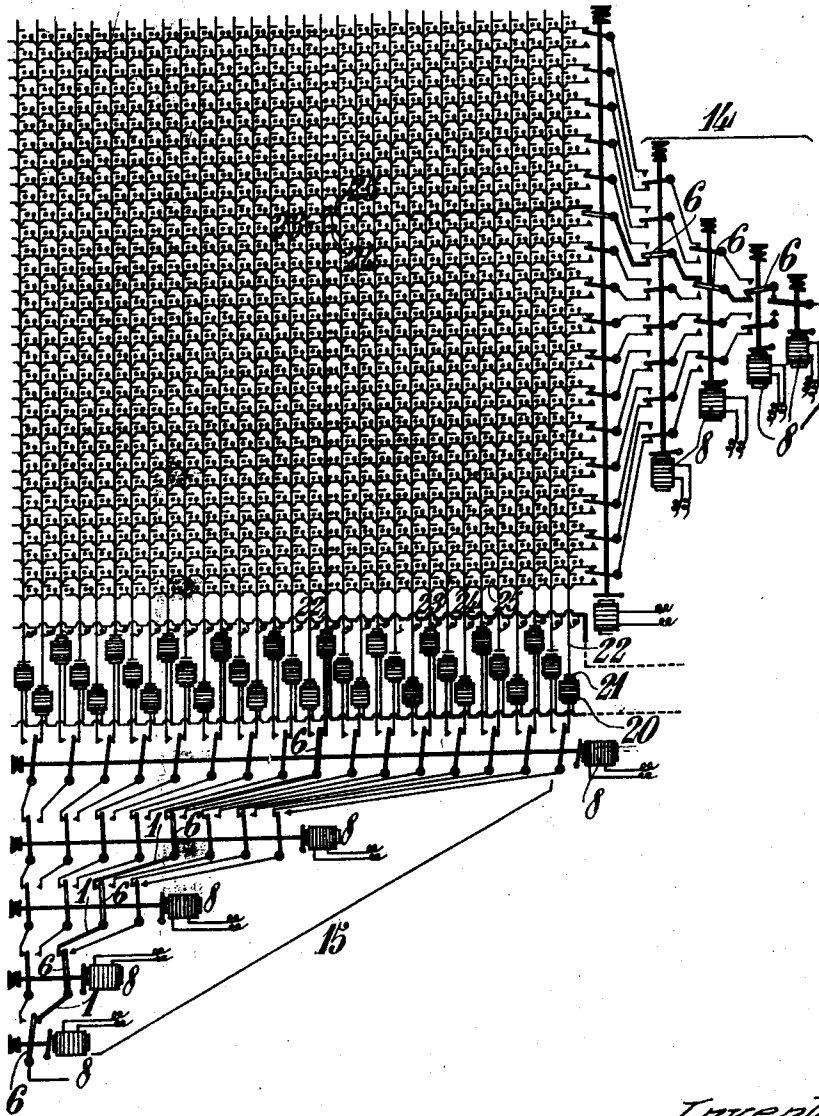
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TELEGRAPHY

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To all whom it may concern:

Be it known that I, JEAN LAURENT SÉMAT, a citizen of the French Republic, residing at 9 Rue du Pont Louis Philippe, Paris, France, have invented certain new and useful Improvements in Telegraphy, of which the following is a specification.

Electric connection systems are known which make it possible to effect at will the selection and the closing of a given circuit out of a large number of circuits. In such arrangements, jointly with electric control lines which are controlled by distinct manipulators or keys, are utilized electromagnets which are operated simultaneously by switches or groups of switches. Each of these switches forms a commutation lever and, by being moved angularly, can be brought into contact with contacts which are connected to two switches of the next group; the number of switches for the successive groups being 1, 2, 4, . . . n . In these conditions 2^n indicates the number of circuits controlled by the last switching element comprising n switches.

Electric connection systems are also known, in which the closing of a given circuit out of a large number of circuits is effected either, by means of groups or switches comprising an increasing number of switches in successive groups, or by means of groups each containing a like number of switches. But the control electromagnets of the latter groups are either connected direct to the control lines, or controlled by means of groups of switches which are not built in accordance with the progression 2^n , which greatly reduces the number of circuits which is controlled by the system of connection.

It has further been proposed either to control mechanical elements by moving bars operated by electromagnets, the circuits of the said electromagnets being controlled by two groups of switching elements comprising 1, 2, 4, . . . switches, or to control the circuits of electromagnets one of the terminals of which is connected to one of the lines controlled by a switch group comprising 1, 2, 4, . . . switches, another similar switch group controlling the common terminal of groups of electromagnets connected in parallel and the number of which is

equal in each group to that of the lines controlled by the first switch group.

This invention relates to a system in which two groups of switching elements are used to bring about the connection of electric circuits, each group consisting respectively of 1, 2, 4 . . . $\frac{2^p}{2}$ switches and 1, 2, 4 . . . $\frac{2^q}{2}$ switches (p and q being equal

to or different from each other) for controlling $2^p \times 2^q = 2^n$ circuits. In these conditions, one of the switch groups controls, for example 2^p circuits to which is connected one of the terminals of 2^p circuits to be controlled, the other terminals of the said circuits cooperating with 2^p switches which belong respectively to 2^q rods which are moved by energizing 2^q electromagnets, the circuits of the said electromagnets being controlled by the second switch group.

If it is admitted that the number of control lines of each switch group $p, q=5$, it will be seen therefore that the number of circuits that can be controlled by such a system, will be $2^5 \times 2^5 = 1024$ circuits.

The accompanying drawing shows diagrammatically, by way of example, a method of carrying out the present invention.

As indicated above, the chief characteristic of the invention consists in a system of electric connection by which it is possible to effect the closing of a given circuit and the passage of a current into one of a number of circuits. To that end, the terminals of the said given circuit can be connected from a distance and electromagnetically to the two terminals of the circuit in which is inserted the source of electric current; this double connection being effected by means of two switch groups built in the well known manner and comprising respectively switching elements comprising 1, 2, 4 . . . p switches and 1, 2, 4 . . . q switches, p and q being either equal or different.

The accompanying drawing illustrates a method of carrying out the invention in which p and q are equal. The two switch groups 14 and 15 each comprise therefore five switching elements constituted by 1, 2, 4, 8, 16 switches 6. Each switch of a switching element is electrically connected to one

of two contacts on which can be brought the switch of the preceding switching element when current is sent into the corresponding electromagnet 8 by a manipulator key (not shown).

The single switch constituting the first switching element of each of the groups 14, 15 is connected to one of the terminals of the circuit containing the source of electricity which is to be connected to the terminals of that one of the circuits which it is desired to close.

The last switching element comprises therefore 16 switches 6 controlling 32 lines. The 32 contacts controlled by the last switching element of the group 14 are connected to 32 lines, on which is branched one of the contacts of 1024 circuits that can be closed at will. The 32 contacts of the last switching element of the group 15 are connected to electromagnets 20, the circuits of which are closed by a common conductor. The armatures 21 of these 32 electromagnets 20 each carry, by means of rods 22, 32 contacts which can be brought against the 32 corresponding contacts of the 32 circuits which they control. The armatures of the electromagnets 20 are connected electrically by a common conductor to the line which terminates at the first switching element of the group 15, and at one of the terminals of the source of current.

It will be seen therefore that the utilization circuits will be closed when the group 14 has closed the circuit on one of its 32 leading-out lines and when the group 15 has brought about the operation of one of the armatures of the electromagnets 20.

By way of example and as shown in heavy lines in the accompanying diagrammatic drawing, it will be seen that:

(a) by sending current into the circuit of the 1st and 5th switching elements of the group 15, the circuit will be closed as indicated and one of the 32 electromagnets 20 will be energized. Consequently the armature of the said electromagnet moves and causes the contacts carried thereby to come into contact with 32 contacts belonging to 32 of the 1024 circuits controlled by the system; and

(b) by sending a current into the circuit of the 1st, 2nd and 4th switching elements of the group 14, the circuit will be closed as shown.

The one and only utilization circuit closed is therefore that corresponding to the contacts 24 and 25 which are connected together by the switch 23 carried by the armature 22 of the electromagnet energized by the passage of current in the group 15.

The electric current from the source flows through the circuit thus closed by the group 14 to which is connected one of the terminals of the said source and by the com-

mon conductor which connects together the armatures 22 of the electromagnets 20 of the group 15, which conductor is connected as shown to the other terminal of the said source of current.

It is obvious that the connections between the groups of switching elements may be of any length, direction and shape, and also that the movable elements of the switches 6 may be adapted to move angularly or in a direction parallel to themselves. In practice, as it is simply desired to establish or not contacts with contact pieces, it is possible to replace them by contact blades the displacements of which are of a few tenths of a millimeter.

It is also obvious that the simultaneous control of the switches 6 constituting each group can be effected by mechanical, electrical, or electromagnetic connections. Thus, for instance, the switches 6 of one and the same group can be actuated by the excitation of electromagnets connected in series or in parallel on the electric circuit corresponding to this group; these electromagnets acting respectively on each of the switches 6 corresponding thereto, or on the whole of the switches.

The arrangements hereinbefore described are also applicable in cases in which each switch can occupy, instead of two positions, three different positions relatively to the contacts with which they move. In such a case, the electromagnets 8 which operate the switches, will either receive no current, or positive or negative emissions of current, producing attraction or repulsion of the corresponding armatures.

In the case of the application of the invention to a typewriter recourse could be had to two sets of switches, one of which comprises 2 groups and controls $2^2=4$ lines, whilst the other comprises 4 groups and controls $2^4=16$ lines.

The combination of 2^2 and 2^4 allows of controlling 64 circuits by means of 64 different signals given by the progression $2^6=64$.

It must be pointed out that:

(1) The switch group 14, instead of closing directly lines on which is branched one of the contacts of each utilization circuit, could be constructed like the switch group 15, that is to say that the 32 lines could be connected to electromagnets similar to the electromagnets 20. In such a case, the closing of each utilization circuit is brought about by bringing into contact with the two contacts of the circuit, metallic bridges belonging to the armatures of the electromagnets 20 which are moved by the operation of the groups 14 and 15;

(2) A single circuit having been closed in the connection system it is obvious that an electric current may be caused to circulate

therein by actuating a suitably arranged switch, which current may be applied to any desired purpose. If this switch is electromagnetically actuated, means may be provided whereby the said switch will be actuated as soon as the circuit through the connection system is closed.

In that case, the armatures of the electromagnets 8 and of the electromagnets 20 must, when the electromagnets are energized, be locked in position, so as to make possible the subsequent passage of the current which has to reach the utilization circuits, this locking continuing until the said electromagnets are de-energized by the return of their switches to their position of rest.

Having thus fully described the invention what is claimed as new and desired to be secured by Letters Patent is:—

1. Selective signalling apparatus comprising electromagnets receiving the control signals, armatures for said electromagnets respectively actuating 1, 2, 4 2ⁿ commutators controlling two different directions, the 2ⁿ terminal commutators respectively controlling two lines on which are connected one of the terminals of the different circuits for receiving the signals and a second switch to close said circuits.

2. Selective signalling apparatus comprising electromagnets receiving the control signals, armatures for said electromagnets respectively actuating 1, 2, 4 2ⁿ commutators controlling two different directions, the 2ⁿ terminal commutators respectively controlling two lines on which are connected one of the terminals of the different circuits for receiving the signals, an electric conductor connected to the first needle and to one of the terminals of a source of current, and a second switch to close one of the circuits to receive the signals.

3. Selective signalling apparatus comprising electromagnets receiving the control signals, armatures for said electromagnets respectively actuating 1, 2, 4 2ⁿ commutators controlling two different directions, the 2ⁿ terminal commutators respectively controlling two lines on which are connected one of the terminals of the different circuits for receiving the signals, an electric conductor connected to the first needle and to one of the terminals of a source of current, and a second switch whose discharge commutators respectively controls the excitation circuits of the two electromagnets.

4. Selective signalling apparatus comprising electromagnets receiving the control signals, armatures for said electromagnets respectively actuating 1, 2, 4 2ⁿ commutators controlling two different directions, the 2ⁿ terminal commutators respectively controlling two lines on which are connected one of the terminals of the different circuits

for receiving the signals, an electric conductor connected to the first needle and to one of the terminals of a source of current, and a second switch whose discharge commutators respectively controls the excitation circuits of the two electromagnets, the excitation current traversing the switch to pass out through a conductor common to said electromagnets.

5. Selective signalling apparatus comprising electromagnets receiving the control signals, armatures for said electromagnets respectively actuating 1, 2, 4 2ⁿ commutators controlling two different directions, the 2ⁿ terminal commutators respectively controlling two lines on which are connected one of the terminals of the different circuits for receiving the signals, an electric conductor connected to the first needle and to one of the terminals of a source of current, electromagnets belonging to the second switch group and also receiving control signals, armatures for said last mentioned electromagnets, respectively actuating 1, 2, 4 2ⁿ commutators controlling both directions, the 2ⁿ terminal commutators respectively controlling the excitation circuits of the two electromagnets, armatures for said electromagnets, conductor rods on said armatures carrying commutators the number of which corresponds to that of the lines controlled by the first switch.

6. Selective signalling apparatus comprising electromagnets receiving the control signals, armatures for said electromagnets respectively actuating 1, 2, 4 2ⁿ commutators controlling two different directions, the 2ⁿ terminal commutators respectively controlling two lines on which are connected one of the terminals of the different circuits for receiving the signals, an electric conductor connected to the first needle and to one of the terminals of a source of current, electromagnets belonging to the second switch group and also receiving control signals, armatures for said last mentioned electromagnets, respectively actuating 1, 2, 4 2ⁿ commutators controlling both directions, the 2ⁿ terminal commutators respectively controlling the excitation circuits of the two electromagnets, armatures for said electromagnets, conductor rods on said armatures carrying commutators the number of which corresponds to that of the lines controlled by the first switch to come into contact with the other terminals of the circuits to receive the signals.

7. Selective signalling apparatus comprising electromagnets receiving control signals, armatures for said electromagnets respectively actuating 1, 2, 4 2ⁿ commutators controlling both direction, the 2ⁿ terminal commutators respectively controlling two lines on which are connected one of the terminals of the different circuits to receive the

signals, an electric conductor connected to the first needle, and to one of the terminals of a current source, electromagnets belonging to the second switch group and likewise
5 receiving control signals, armatures for the electromagnets, respectively actuating 1, 2, 4 2ⁿ commutators controlling two directions, the 2ⁿ terminal commutators respectively controlling the excitation circuits of
10 two electromagnets, armatures for said electromagnets, conductive rods on said arma-

tures carrying commutators whose number corresponds with that of the lines controlled by the first switch, to come in contact with the other terminals of the circuits for receiving the signals, a conductor connecting said
15 metallic rods with the other terminal of the current source.

In testimony whereof I have signed my name to this specification.

JEAN LAURENT SÉMAT.