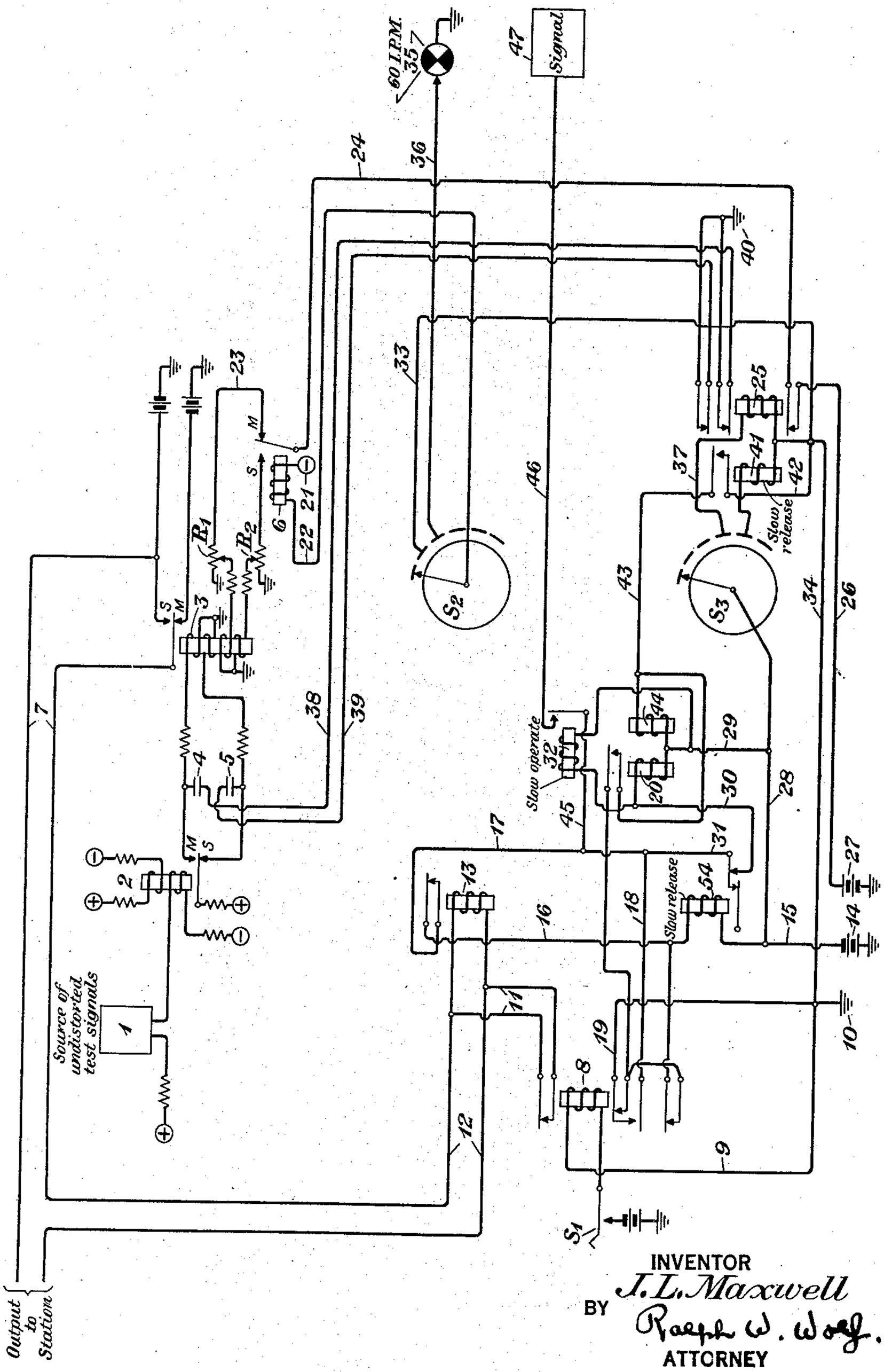
June 5, 1945. J. L. MAXWELL 2,377,438

TESTING APPARATUS

Filed May 13, 1943



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Patented June 5, 1945 2,377,438

UNITED STATES PATENT OFFICE

2,377,438

TESTING APPARATUS

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Application May 13, 1943, Serial No. 486,835

4 Claims. (Cl. 178—69)

This invention relates to apparatus for testing transmission systems, such for example, as telegraph systems, and more particularly to means for controlling the operation of the testing apparatus from the station being tested rather than from the test room.

At the time of installation of a telegraph set, such as a teletypewriter, or during routine maintenance visits thereto it is the practice to have connected to the set apparatus located at a test room which will transmit to the set various types of signals such, for example, as undistorted signals, signals with a certain percent of marking or spacing bias, or switched bias signals. Heretofore the control of the apparatus for transmitting these signals to the teletypewriter set was under control of the test room attendant. The test man at the teletypewrier would telephone in and ask that the test set be connected to the station to be tested and be adjusted to send a certain type of signal. After this type of signal was received the test man would again call the test room and ask to have the apparatus adjusted to send a different type of signal. In other words, the test man would have to call the test room each time he desired a change in the type of signals sent to the teletypewriter set. This would involve not only numerous telephone calls between the set and test room, but continual attendance of the apparatus at the test room. The arrangements of the invention provide means whereby practically all control of the test room apparatus is in the hands of the test man at the set to be tested. Only one call is required, to start the test room apparatus in operation, and after that the changing from one type of signal to the other is under the control of the test man at the set being tested. Other objects and features of the invention will appear more fully from the detailed description of the invention hereinafter given.

This invention may be more fully understood from the following description together with the accompanying drawing in which is shown a circuit diagram embodying a preferred form of the invention.

The testing apparatus utilized in the invention would comprise a source 1 of undistorted test signals which would be connected to a relay 2. In response to these undistorted signals relay 2 would move its armature between its marking and spacing contacts and connect battery to either one of the upper set of windings of relay 3. Condensers 4 and 5, which in the arrangement shown may or may not be grounded, are connected to these windings for the purpose of producing in these windings a current having a rounded wave shape. A second set of biasing windings is provided for relay 3. Circuits for these biasing windings may be completed to battery over either variable resistance R_1 and the marking contact of relay 6, or over variable resistance R_2 and the spacing contact of relay 6. When a circuit is completed through the upper biasing winding of relay 3 and over the marking contact of relay 6, marking bias may be introduced in the signals repeated by relay 3 to the subscriber's line 7. When a circuit is completed through the lower biasing winding of relay 3 and over the spacing contact of relay 6, spacing bias may be introduced in the signals repeated by relay 3 to the subscriber's line 7. By operating by hand switching mechanism (not shown) the relay 6 could be made to operate and release sixty times per minute, and thus furnish for testing purposes what are termed switched bias signals. By causing the circuits of the biasing windings of relay 3 to remain open, undistorted signals could be repeated by relay 3 to the subscriber's line 7. The foregoing arrangements are well known in the art and the control thereof, as heretofore pointed out, was normally in the hands of the operator at the test room.

In the arrangements of the invention the operation of the foregoing arrangements for producing different types of test signals is under the control of the test man at the set to be tested. The test man will communicate with the test room and ask that the apparatus be connected to the line, and that it be conditioned for operation. After the set is connected, the attendant at the test room will operate switch S_1 and from then on the apparatus is under control of the test man at the station. The operation of switch S_1 will close a circuit from battery, contact of switch S_1, winding of relay 8, conductor 9 to ground 10 and thus operate relay 8. The operation of relay 8 will open a short circuit 11 across circuit 12 leading to the subscriber's set being tested and will allow relay 13, which is in series with conductors 7, to follow the signals sent over the circuit to or from the set being tested. Relay 13 controls the following circuit for relay 54: from battery 14, conductor 15, winding of relay 54, conductor 16, contact and armature of relay 13, conductors 17 and 18, armature and make contact of relay 8, conductor 19 to ground 10. Relay 54, however, is a slow-release relay and will not release unless the spacing signals actuating relay 13 are longer than normal, as for ex-

ample a "break" signal. Relay 54 when operated holds open a circuit to be traced hereinafter for the stepping magnet 20 which controls the step-by-step movement of the contact arms of switches S_2 and S_3. As the stepping magnet is not operated at this time these contact arms will each remain on their No. 1 contacts.

As contact No. 1 of switch S_2 is not connected to anything, a circuit from the source of current 21 and through the winding of relay 6 and over conductor 22 will remain open, and the armature of relay 6 will remain unoperated, i. e., on its marking contact. A circuit will then be closed from ground through the upper biasing winding of relay 3, resistance R_1, conductor 23, marking contact and armature of relay 6, conductor 24, armature and contact of relay 25, over conductor 26 to battery 27 and ground. The closing of this circuit will introduce a certain amount of marking bias into the signals repeated by relay 3 of the line 7 and thence to the set being tested. After the test man at the set being tested has received sufficient signals with marking bias, he will then transmit to the apparatus at the test room a break signal. This break signal will consist of a spacing signal longer in duration than the normal signals, and will cause relay 13 to remain released a sufficient length of time to hold open the previously traced circuit for slow-release relay 54 sufficiently long so that relay 54 will release. This will close the following circuit from battery 14, conductor 15, conductor 28, conductor 29, winding of stepping magnet 20, conductor 30, contact of relay 54, conductor 31, conductor 18, armature and contact of relay 8, conductor 19 to ground 10. This will operate the stepping magnet 20 and cause the contact arms of switches S_2 and S_3 to move to their No. 2 positions. It is pointed out that relay 32 is connected in parallel with the stepping magnet 20. However, relay 32 is very slow to operate and will not operate at this time. With the contact arm of switch S_2 on its No. 2 position the following circuit will be closed: from source of current 21, winding of relay 6, conductor 22, contact arm and No. 2 contact of switch S_2, conductor 33, conductor 34 to ground 10. This will cause the armature of relay 6 to be operated, i. e., move to its spacing contact. A circuit will then be closed through the lower biasing winding of relay 3 as follows: from ground, lower biasing winding of relay 3, resistance R_2, spacing contact and armature of relay 6, conductor 24, armature and contact of relay 25, conductor 26 to battery 27. This will introduce a certain amount of spacing bias into the signals repeated by the relay 3 and over the circuit 7 to the set being tested. After the test man has received sufficient signals with spacing bias, he will then transmit another break signal. In a manner heretofore pointed out, this will release the slow-release relay 54 and close the circuit again for the stepping magnet 20, which will cause the contact arms of the switches S_2 and S_3 to move to their No. 3 positions. This will cause ground to be applied at the rate of sixty interruptions per minute by the interrupter 35 to conductor 36, and thence over the No. 3 contact and contact arm of switch S_2 to conductor 22 and the winding of relay 6 to the source of current 21. This will cause the relay 6 to operate in an intermittent manner and to cause the relay 3 to repeat switched bias signals over the circuit 7 to the set being tested. After the test man has received sufficient switched bias signals, he will again transmit a break signal. This in turn will cause the stepping magnet 20 to move the contact arms of switches S_2 and S_3 to their No. 4 positions. As contact No. 4 and contact arm of switch S_2 are not connected to anything, the circuit from the interrupter 35 through relay 6 will be broken and relay 6 will return to its marking contact. When the contact arm of switch S_3 reaches its No. 4 contact, the following circuit will be closed: from battery 14, conductors 15 and 28, contact arm and contact No. 4 of switch S_3, conductor 37, winding of relay 25, conductor 34 to ground 10. This will operate relay 25 and cause it to open all its contacts. When relay 25 is unoperated, a ground 40 is connected over the upper contacts of relay 25 and over conductors 38 and 39 to the condensers 4 and 5. When relay 25 operates, this ground 40 will be removed from the said condensers. When the lower contact of armature 25 is opened, a previously traced circuit from battery 27 and over conductors 26 and 24 to the armature of relay 6 will be opened. Hence when relay 25 operates, no battery will be connected to the biasing windings of relay 3. As these biasing windings will be ineffective and as ground is disconnected from condensers 4 and 5, the relay 3 will repeat undistorted signals, he will again send a break signal. This will move the contact arms of switches S_2 and S_3 to their No. 5 contacts. When the contact arm of switch S_3 moves to its No. 5 contact, the following circuit will be closed: battery 14, conductors 15 and 28, contact arm and No. 5 contact of switch S_3, winding of relay 41, conductor 34 to ground 10. This will operate relay 41. The operation of relay 41 will close the following circuit: from ground 10, conductor 34, conductor 42, contact and armature of relay 41, conductor 43, winding of release magnet 44, conductors 29, 28 and 15 to battery 14. This will operate the release magnet 44 and cause the contact arms of switches S_2 and S_3 to return to their original positions. It is pointed out that relay 41 should be sufficiently slow-release so that the contact arms may return to normal before the release magnet armature engages the rachet. If the test man at the set should at any time desire to signal the attendant at the testboard, he would send a spacing signal much longer than a break signal. The slow-operate relay 32, as heretofore pointed out, is connected in parallel with the stepping magnet 20. If the signal sent is of sufficiently long duration, the slow-operate relay 32 will operate. This will close a circuit from ground 10, conductor 19, contact and armature of relay 8, conductor 18, conductor 45, armature and contact of relay 32, conductor 46 to battery at the signaling apparatus shown schematically as 47.

While the invention has been disclosed as embodied in certain specific arrangements which are deemed desirable, it is understood that it is capable of embodiment in many and other widely varied forms without departing from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A testing set comprising apparatus for producing different kinds of telegraph signals, switching mechanism adapted to be moved step-by-step to different positions, means operative when said switching mechanism is on one position for causing said apparatus to produce one kind of telegraph signal, means operative when said switching mechanism is on another position for causing said apparatus to produce another kind of telegraph signal, and means responsive to the reception by said set of a break signal sent

from the set being tested for moving said switching mechanism from one position to another.

2. A testing set comprising apparatus for producing different kinds of telegraph signals, switching mechanism adapted to be moved step-by-step to different positions, means operative when said switching mechanism is on one position for causing said apparatus to produce one kind of telegraph signal, means operative when said switching mechanism is on another position for causing said apparatus to produce another kind of telegraph signal, a relay operated when normal signals are being transmitted between said testing set and a set to be tested, said relay being sufficiently slow-release so that it will not be released by said normal signals but will be released when a break signal is sent from the set being tested, a stepping magnet and means controlled by each release of said relay for operating said stepping magnet whereby said switching mechanism may be moved from one position to another.

3. A testing set comprising apparatus for producing different kinds of telegraph signals, switching mechanism adapted to be moved step-by-step to different positions, means operative when said switching mechanism is on one position for causing said apparatus to produce one kind of telegraph signal, means operative when said switching mechanism is on another position for causing said apparatus to produce another kind of telegraph signal, a relay operated when normal signals are being transmitted between said testing set and a set to be tested, said relay being sufficiently slow-release so that it will not be released by said normal signals but will be released when a break signal is sent from the set being tested, a stepping magnet and a release magnet, and means controlled by subsequent releases of said relay for operating said stepping magnet whereby said switching mechanism may be moved from one position to another and for subsequently operating said release magnet whereby said switching mechanism will be restored to its original position.

4. A testing set comprising apparatus for producing different kinds of telegraph signals, switching mechanism adapted to be moved step-by-step to different positions, means operative when said switching mechanism is on one position for causing said apparatus to produce one kind of telegraph signal, means operative when said switching mechanism is on another position for causing said apparatus to produce another kind of telegraph signal, a relay operated when normal signals are being transmitted between said testing set and a set to be tested, said relay being sufficiently slow-release so that it will not be released by said normal signals but will be released when a break signal is sent from the set being tested, a stepping magnet, means controlled by each release of said relay for closing an operating circuit for said stepping magnet whereby said switching mechanism may be moved from one position to another, a second relay connected in parallel with the operating circuit of said stepping magnet, said second relay being sufficiently slow to operate so that it will only be operated when a signal longer than a break signal is transmitted from the set being tested and an alarm controlled by said second relay.

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