

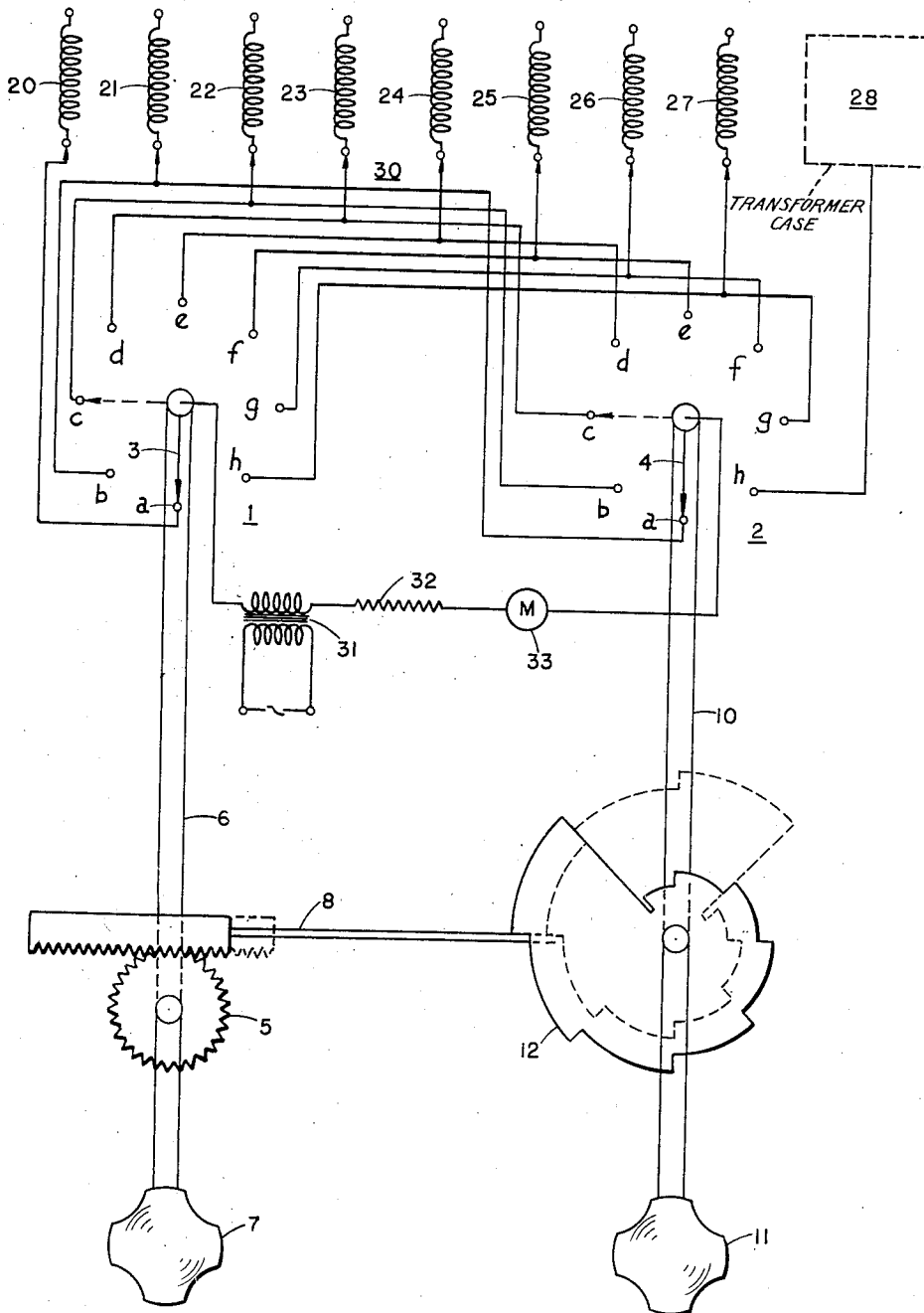
Feb. 8, 1949.

S. G. LUTZ

2,460,835

ELECTRICAL INSULATION TESTING APPARATUS

Filed Nov. 21, 1945



Inventor

SAMUEL G. LUTZ

334

McHayes

Attorney

UNITED STATES PATENT OFFICE

2,460,835

ELECTRICAL INSULATION TESTING
APPARATUS

Samuel G. Lutz, Washington, D. C.

Application November 21, 1945, Serial No. 630,114

2 Claims. (Cl. 175-183)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

1

This invention relates in general to electrical testing apparatus, and in particular to a permutation switching device for electrical testing apparatus.

In checking the electrical resistance between a multiplicity of points in a circuit, or in checking the insulation, for example, between a plurality of windings in a transformer, the probability of accidentally failing to secure a measurement between all possible combinations of such points, increases with the number of points involved. It is therefore an object of this invention to provide a quick and reliable switching system for checking the electrical resistance between any and all possible combinations of points in a circuit.

It is another object of this invention to provide a simple and reliable permutation switching device for electrical testing apparatus.

Other objects and features of the present invention will become apparent upon a careful consideration of the following detailed description, when taken together with the accompanying drawing; the single figure of which, shows a schematic diagram of a preferred embodiment of the invention.

For purposes of illustration, the single embodiment of the invention, as shown in the drawing, is arranged to test insulation between the several windings of a transformer. In detail, the apparatus shown in the drawing, comprises a pair of multiple position selector switches 1 and 2, arranged so as to facilitate an insulation check between any and all possible combinations of the windings 20 through 27, and the transformer case 28, of transformer 30. Each switch 1 and 2 is of a type well known to the art, and comprises a plurality of fixed contacts *a* through *h*, and a single rotatable contact 3 and 4 respectively.

Rotatable contact 3 of switch 1 is operated by a rotatable shaft 6, which in turn is manually operated by knob 7. Associated with switch 1 is a suitable stop mechanism, which is arranged as hereinafter described in detail, to act jointly, and in such a manner, with a suitable stop engaging mechanism associated with switch 2 as to control the maximum counterclockwise setting of switch 2 according to the instantaneous setting of switch 1. In the specialized embodiment of the invention, the stop mechanism comprises, a suitable pinion member 5, and a rack and stop member 8. The stop engaging mechanism comprises a suitable cam member 12. Pinion 5 is so fixed to shaft 6 and rotatable therewith as to engage the rack and stop member 8, to thus provide lateral movement of the latter with rotation of knob 7. Rotatable

2

contact 4 of switch 2 is operated by a rotatable shaft 10, which in turn is manually operated by knob 11. Rigidly fixed to shaft 10, in the plane of pinion 5, is the stepwise spiral cam member 12. The action of rack and stop member 8, and cam member 12, is such as to provide switch 2 with a new reference, or zero, setting in the counterclockwise direction, for each new setting of switch 1; and to simultaneously permit clockwise rotation of switch 2 from such new reference setting. Specifically, as illustrated by the solid lines in the drawing, when switch 1 is set in its extreme counterclockwise position *a*, the rack and stop member 8 is fully retracted to the left, and switch 2 is free to be rotated to its extreme counterclockwise position *a* before the limit cam 12 engages the rack and stop member 8. When switch 1 is set in position *c*, as illustrated by the dotted lines, the rack and stop member 8 is advanced to the right, and the limit cam 12 engages the rack and stop member 8 two full steps earlier; to thus hold the maximum counterclockwise setting of switch 2 to position *c*.

In checking the insulation between transformer windings 20 through 27, a source of alternating current voltage, introduced by transformer 31, is serially connected with a current limiting resistance 32 and a suitable current indicating device 33, across the rotatable contacts 3 and 4 of the two selector switches. Each transformer winding is connected to a different fixed contact of the two switches 1 and 2. In switch 1, contact *a* is connected to winding 20; contact *b* to winding 21, and so forth. Similarly, in switch 2, contact *a* is connected to winding 21; contact *b* to winding 22, and so forth. Thus, by connecting each transformer winding to a different fixed contact of the two switches 1 and 2, and by the action of rack and stop member 8, and limit cam 12, shorting of the voltage source introduced by transformer 31, during an insulation test is prohibited. Moreover, this arrangement in connecting the transformer windings to the fixed contacts of the two switches 1 and 2, permits the final contact *h* of switch 2 to be connected to the transformer case 28, for providing an insulation check between it and any or all of the windings.

In actually performing an insulation check between the windings, switch 1 is first adjusted to position *a* and switch 2 is rotated through all possible positions. Thereafter, switch 1 is advanced to position *b*, and switch 2 is again rotated through all possible positions. This process continues until switch 1 has reached its extreme clockwise position. A fault in the insulation

between any combination of the windings thus tested, will be indicated by the current device 33.

Although I have shown and described only a certain and specific embodiment of the present invention, it is to be understood that I am fully aware of the many modifications possible thereof. Therefore, this invention is not to be limited except insofar as is necessitated by the spirit of the prior art and the scope of the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. In a device for testing the electrical insulation between a plurality of points; the combination of a pair of similar multi-position switches each having a single rotatable contactor and a plurality of fixed contacts, means electrically connecting each individual fixed contact of the first of said switches to a different one of said points, means also electrically joining each of said fixed contacts, except the first, of said first switch with the next preceding fixed contacts of the second switch, a stop mechanism associated with the rotatable contactor of the first switch and operable therewith, rotational limit means associated with the contactor of the second switch and operable therewith to engage said stop mechanism whereby the rotatable contactor of said second switch is prevented from coming into engagement with the fixed contact next preceding the fixed contact currently engaged by the contactor of said first switch, and means including a series combination of a voltage source and a current indicating device connected across said rotatable contacts of said switches.

2. In a device for testing the electrical insulation between a plurality of points; the combination of a pair of similar multi-position switches each having a single rotatable contactor and a plurality of fixed contacts, means electrically connecting each individual contact of the first of said switches to a different one of said points, means also electrically joining each of said fixed contacts, except the first, of said first switch with the next preceding fixed contacts of the second switch, a rack and pinion stop mechanism associated with the rotatable contactor of the first switch and operable therewith, a limit cam means associated with the rotatable contactor of the second switch and operable therewith to engage said stop mechanism whereby the contactor of said second switch is prevented from coming into engagement with the fixed contact next preceding the fixed contact currently engaged by the contactor of said first switch, and means including a series combination of a voltage source and a current indicating device connected across said rotatable contacts of said switches.

SAMUEL G. LUTZ.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,340,930	Catlin	May 25, 1920
2,007,992	Wenger	July 16, 1935
2,328,801	Hammell	Sept. 7, 1943

OTHER REFERENCES

Radiotronic Designer's Handbook, Smith; reproduced by R.C.A. Manufacturing Co., Inc.; Nov. 1941, pages 240-241.