

Jan. 25, 1949.

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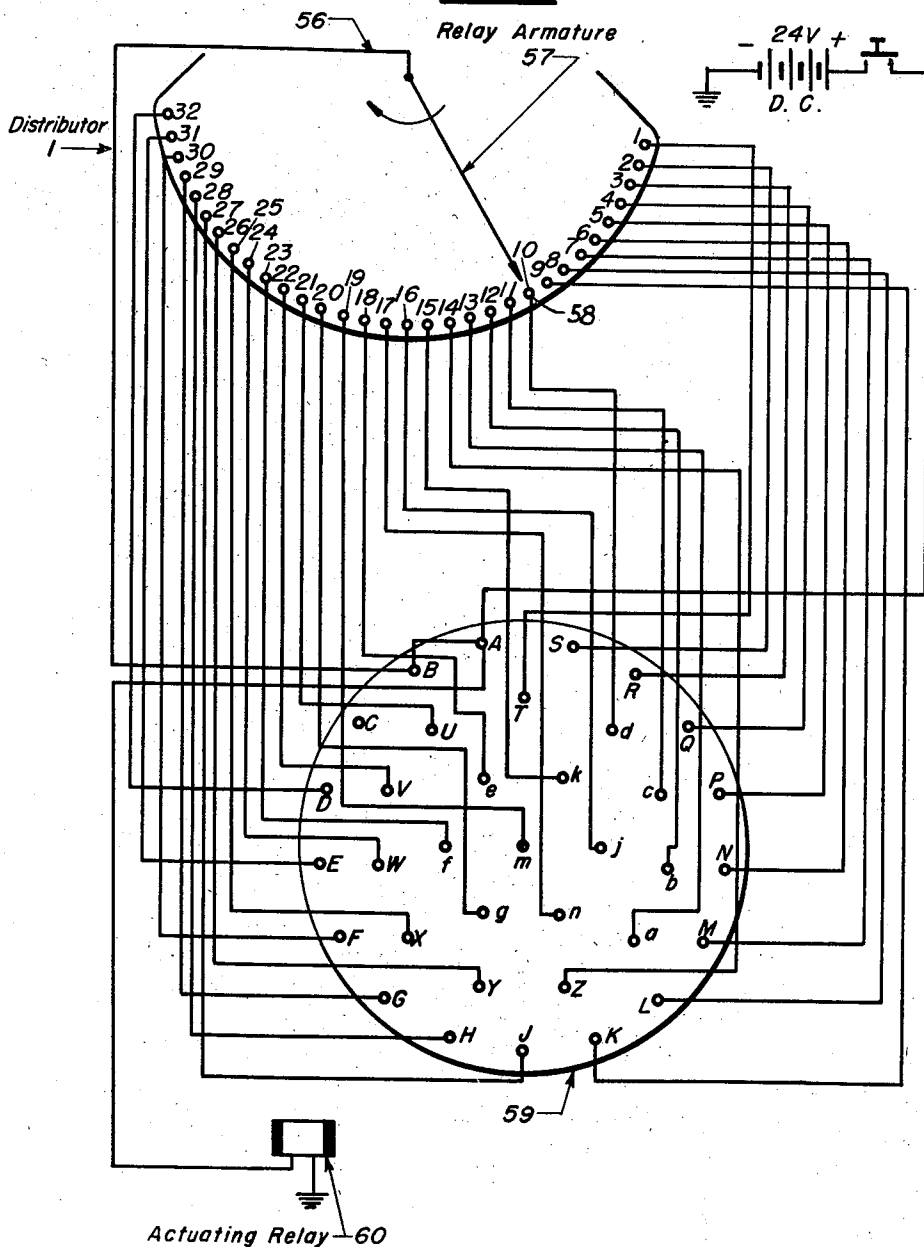
2,459,801

BOMB STATION DISTRIBUTOR CHECKER

Filed Oct. 25, 1945

2 Sheets-Sheet 1

Fig. 1



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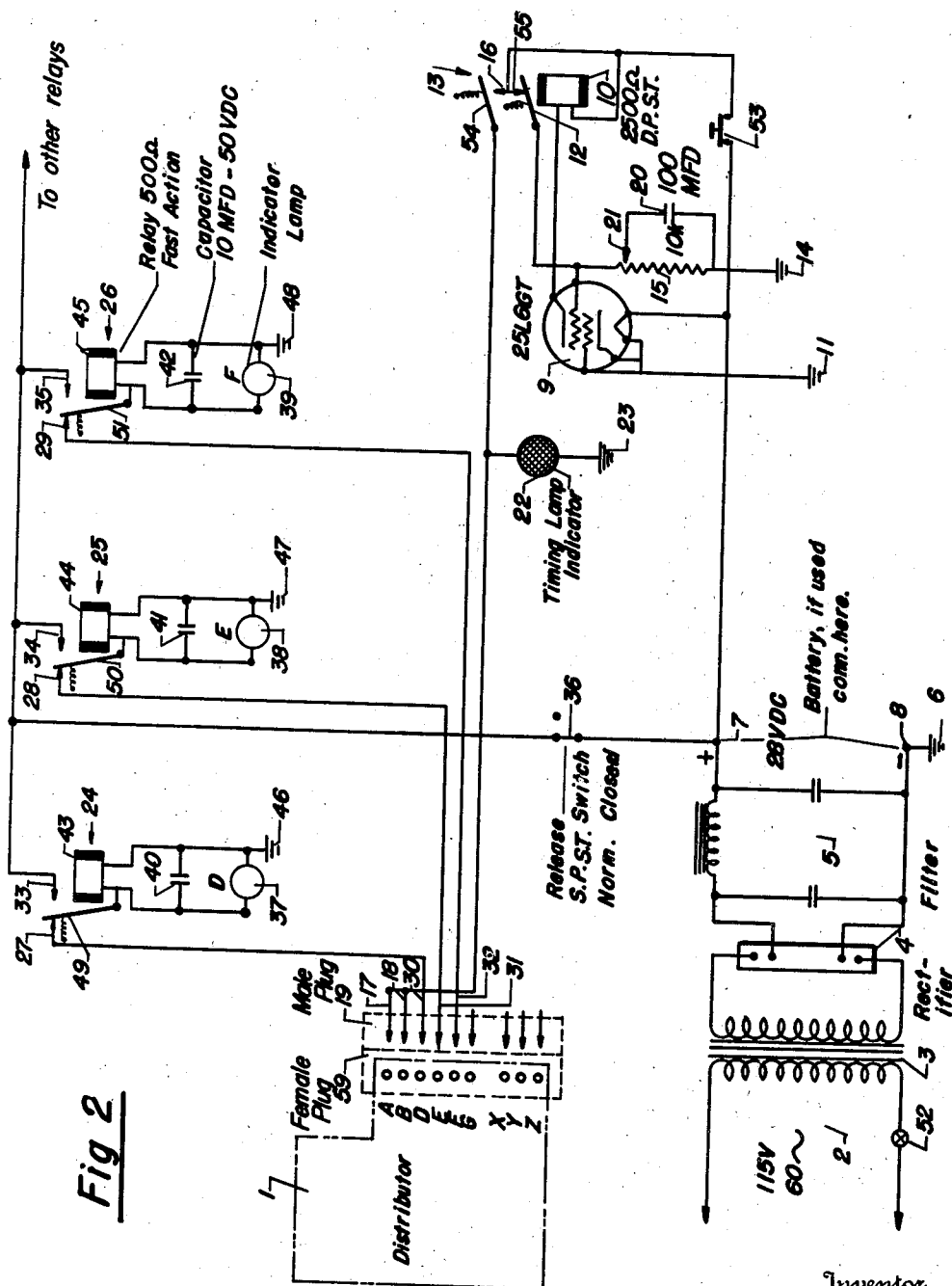
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2,459,801

BOMB STATION DISTRIBUTOR CHECKER

Filed Oct. 25, 1945

2 Sheets-Sheet 2



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2,459,801

BOMB STATION DISTRIBUTOR CHECKER

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Application October 25, 1945, Serial No. 624,625

3 Claims. (Cl. 175-183)

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

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This invention relates to electric testing apparatus, and more particularly to an apparatus for checking a conventional distributor used in controlling the various bomb stations in a bomb release system on aircraft.

A modern bomber with its many electrical circuits and devices presents a difficult problem in continuity testing. This invention facilitates the testing of one of said electrical devices, the bomb station distributor, by providing means for expeditiously testing correct connections and continuity of leads. This invention eliminates the slow procedure of testing each lead individually for correct assembly and continuity. This is done by plugging the connecting cable of my invention into the main connector receptacle of said distributor. This connects the distributor conductors in series with a source of electricity and lamps. If any distributor circuit under investigation is broken, the corresponding indicating lamp in my invention does not illuminate. The operations of checking the multiplicity of circuits in a bomb release distributor is accomplished automatically.

For a more complete understanding of the invention and for other objects and advantages thereof, reference should now be had to the following descriptions in connection with the accompanying drawings, in which

Fig. 1 is a wiring diagram of a conventional bomb release distributor that can be conveniently tested by my invention; and

Fig. 2 is a wiring diagram of my invention.

Reference numeral 1 of Fig. 1 generally indicates the wiring diagram of a conventional thirty-two station distributor used on aircraft bombers for the release of bombs from the various bomb stations. Said bomb station distributor is a relay actuated timing or stepping switch designed to operate in conjunction with the release mechanisms which are at the bomb stations in an electrical bomb release system. The station distributor distributes electrical impulses to the various bomb release mechanisms in a bomb release system through any one of the thirty-two different circuits of the distributor. (Some airplane bomb release systems, due to the number of bomb stations in the airplane, do not require the use of all thirty-two circuits of the distributor.) An electrical impulse from my apparatus enters the distributor through pin receiving socket A of the female electrical connector receptacle 59, goes through pin B and through a pigtail wire connection 56 to the distributor arm

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57, out through the distributor points 58 to the female electrical connector receptacle 59, and back into the indicating circuits of my invention where a visual record is made. Part of the same incoming impulse to pin A travels through the relay 60 and the return is grounded. This energizes the relay 60 which attracts the relay armature inward. When the pulse ends, the relay becomes de-energized. This relay armature in conjunction with coacting springs and a ratchet provides an electrical impulse responsive motor means for positioning the distributor arm in readiness to receive a succeeding impulse from my invention for the next distributor circuit test.

Fig. 2 is a wiring diagram of my invention. Reference numeral 2 indicates an alternating current power supply, from which transformer 3 is actuated, the transformer being coupled to a dry disc rectifier 4 which, in turn, is connected in a bridge circuit with a suitable filter 5 having output terminals 7 and 8. The negative side of the filter output is grounded at 6. A substitute battery can be connected across the power line terminals 7 and 8 in lieu of the above alternating power source, if desired.

The plate of tetrode tube 9 herein identified as the electronic control, is connected to the positive power output terminal 7 through relay coil 10; the cathode return is connected to the negative side of said rectified power output through ground 11. The control grid is likewise grounded 11, through the cathode return. The screen grid of said tube has one lead connected to armature 12 of main relay switch 13, and has another lead connected to ground 14 through resistor 15. Capacitor 20 is connected across resistor 15 with one side of said capacitor connected to the grounded end of said resistor 15, and the other side of said capacitor in sliding engagement with said resistance through means of slider 21. The heater of said tube is connected across the power supply in any conventional manner.

Armature 54 of relay 13 is electrically connected to pins 17 and 18 of the male electrical plug 19. Timing lamp indicator 22 is connected to said line and grounded at 23.

Single-throw fast-acting auxiliary relay switches 24, 25 and 26 have their fixed contacts 27, 28 and 29 connected to male plug pins 30, 31 and 32, respectively. The remaining fixed contacts 33, 34 and 35 are connected together and electrically connected to the positive terminal 7 through single-pole single-throw release switch 36, normally closed. Indicator lamps 37, 38 and 39, and capacitors 40, 41 and 42 are connected in

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parallel across relay coils 43, 44 and 45, and grounded at 46, 47 and 48, respectively. Relay armatures 49, 50, and 51 are connected to the positive sides of their respective coils 43, 44 and 45.

Although Fig. 1 discloses a thirty-two station distributor, provisions for testing only three of the distributor circuits are shown in Fig. 2 as indicated by lamps 37, 38 and 39. The remaining distributor circuits can be tested with identical lamp arrangements connected in parallel with the above lamps.

Operation

The male electrical connector plug 19 is inserted in the female electrical connector receptacle 59 of Fig. 1, so that pins 17 and 18 associate with pin receiving sockets A and B, respectively. The test unit is energized through means of power switch 52. The timing switch or distributor 1 is turned on to either Slow or Fast depending on what speed it is desired to test the unit. It is recommended that all units be tested at both speeds. The test button 53 is depressed and held in that position until the distributor has been operated and tested through one complete cycle. A correctly operating distributor will light up all indicating lamps 37, 38 and 39. If none of the lamps light up and the timing lamp indicator 22 flashes on and off, it is an indication that the mechanical motor means for automatically positioning the relay armature 57 of the distributor 1 is open or defective. If none of the lamps 37, 38 and 39 light up, it is an indication that those particular lamp circuits through the distributor are defective.

When the test button 53 is depressed, it closes the plate circuit and screen grid circuit of tube 9, thereby energizing said plate and said screen grid with a positive power line potential. The screen grid circuit is energized through armature 12 which is normally closed against contact 55, and capacitor 20 is instantly charged with a dissipable charge from the power line. Since the plate is energized simultaneously with said screen grid, the tube conducts and energizes relay coil 10. Current through the plate circuit and relay coil 10 subsequently displaces armature 12 from contact 55, and simultaneously closes armature 54 against contact 16. Thereupon, the discharge from capacitor 20 tends to maintain the screen grid energized and the tube in conducting condition, thereby holding armature 12 in the displaced or open position and 54 closed. At this instant, power supply current is allowed to flow to pins 17 and 18, to energize the distributor, through said relay armature 54. However, as the capacitor 20 continues to discharge, the bias on the screen grid becomes less and less positive, resulting in less and less plate current. When the plate current is reduced to a "drop-out" value, armature 54 is released to its former and open position and armature 12 is allowed to regain its normally closed position. At this instant, the power supply flow of current to pins 17 and 18 is stopped, due to the break in the circuit between armature 54 and fixed contact 16, and the pulse cycle is started over again.

During the interval of time between the closing and opening of armature 54, the relay 13 applies a timed power line pulse of current to the distributor arm, and to the motor means 60 of the distributor 1 which starts the distributor arm on its cycle of operation as heretofore explained. If the continuity of the particular distributor

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circuit is unimpaired, said pulse will light up the corresponding indicator lamp—for purposes of example, let us assume it to be lamp 37. At the same time the capacitor 40 begins to charge, and the relay armature 49 starts to close. As soon as the pulse is terminated, the capacitor 40 discharges into relay coil 43 causing the relay armature 49 to continue its travel until it makes contact with fixed contact 33. This connection allows power line current through switch 36 to lock the relay and cause the indicator lamp 37 to remain lighted.

While the above description discloses the operation of one circuit, the distributor arm 57 continues on its cycle as long as switch 53 is depressed, and the above operation repeats for every one of the thirty-two circuits through the distributor unless the mechanical motor means in the distributor is defective. Thus lamps 38, 39, etc., are successively and cumulatively lighted, if their circuits are continuous.

When a complete thirty-two point cycle has been made and it is necessary to extinguish all lamps, the release switch 36 is momentarily opened, which removes the voltage from the lamps and opens the relays in readiness for another complete cycle to be started or another distributor to be checked.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto, since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

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 an apparatus for testing a pulse actuated distributor, said testing apparatus comprising: a direct current power supply; an electronic tube having a heating filament, cathode, plate, control grid and screen grid, said heating filament being connected across said power supply, and said cathode and control grid being connected to the negative side of said power supply; a capacitor-resistance timing circuit connected across said screen grid and the negative side of said power supply; a plug connector; a double-pole single-throw relay switch having a relay coil, a pair of armatures and a pair of fixed contacts, said relay coil being connected across said plate and the positive side of said power source, said fixed contacts being connected to the positive side of said power supply, one armature being normally closed and connected to said screen grid, and the other armature being normally open and connected to a pin of said plug connector; an indicating lamp connected across said other armature and the negative side of said power source; single-pole double-throw relay switch means having a relay coil, an armature, and a pair of fixed contacts, one of said fixed contacts connected to the positive side of said power supply, the relay coil, the other of said fixed contacts and said armature which is normally closed against said other fixed contact connected in series across a pin of said plug connector and the negative side of said power supply; a capacitor connected across said last-named relay coil; indicating means connected across said last-named relay coil; a switch connected between said one

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fixed contact and the positive side of said power supply; and a switch connected between the double-pole single-throw relay switch and the positive side of the power supply.

2. An apparatus for testing a multi-circuit distributor comprising connecting means having input and output terminals connectible to the input and output terminals of said distributor, respectively, a power supply, an electronic tube having a screen grid and a plate circuit, a relay switch having a coil connected in said plate circuit, said switch having its input and output terminals connected to said supply and the input terminal of said connecting means, respectively, a timing circuit connected to said grid for periodically causing conduction of said tube whereby said switch is periodically energized, indicator means connected to each of the output terminals of said connecting means, and lock means for said indicator means connected across said indicator means.

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3. An apparatus according to claim 2 wherein said lock means comprises a relay switch having a coil across said indicating means, an armature connected to one end of said coil, and a pair of contacts connected to said supply and the output terminal of said connecting means, respectively.

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