May 5, 1959 A. L. HOUSE ET AL 2,885,076

HANDLING APPARATUS FOR ELECTRICAL ARTICLES

Filed Aug. 30, 1955 2 Sheets-Sheet 1

FIG 1

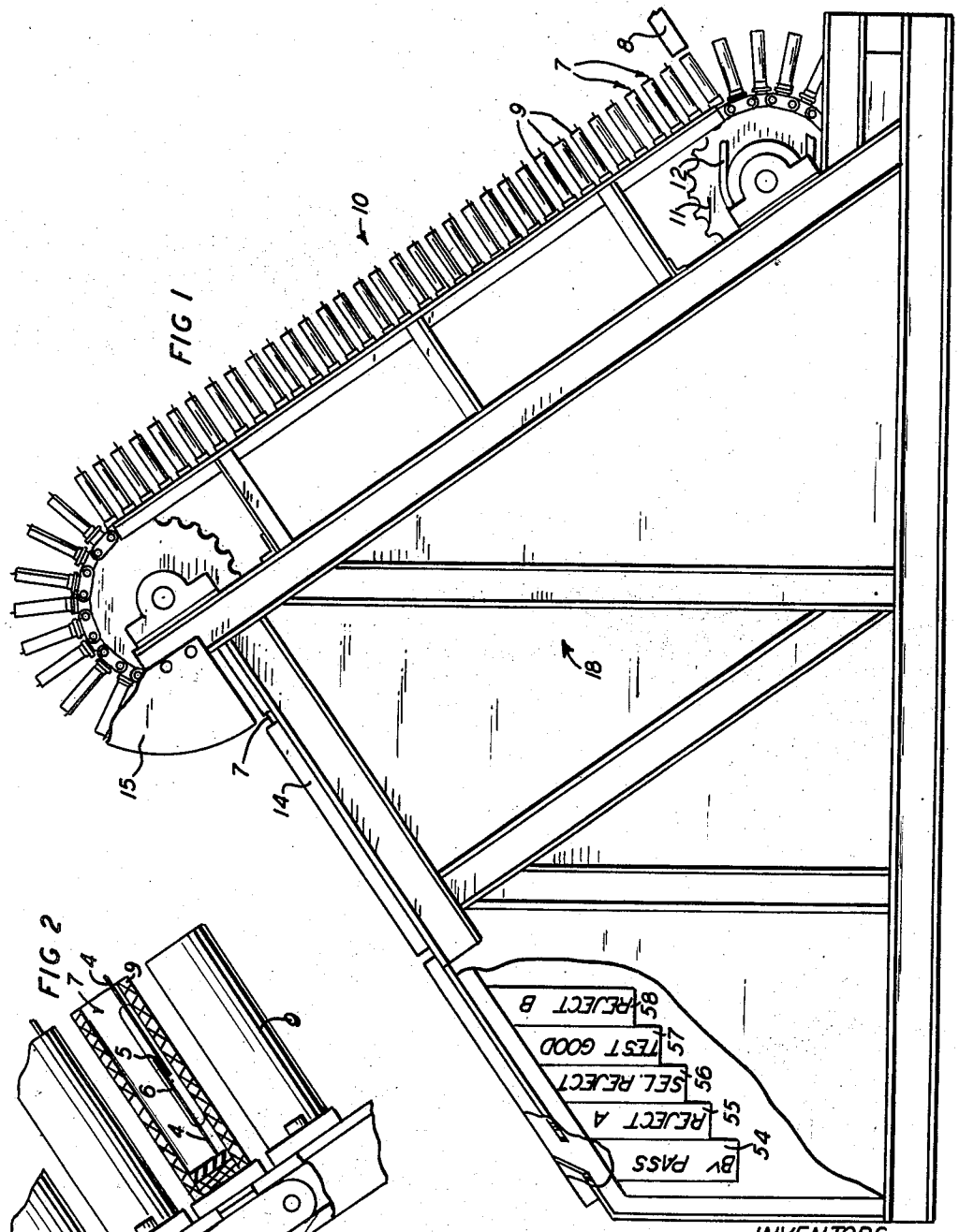


FIG 2

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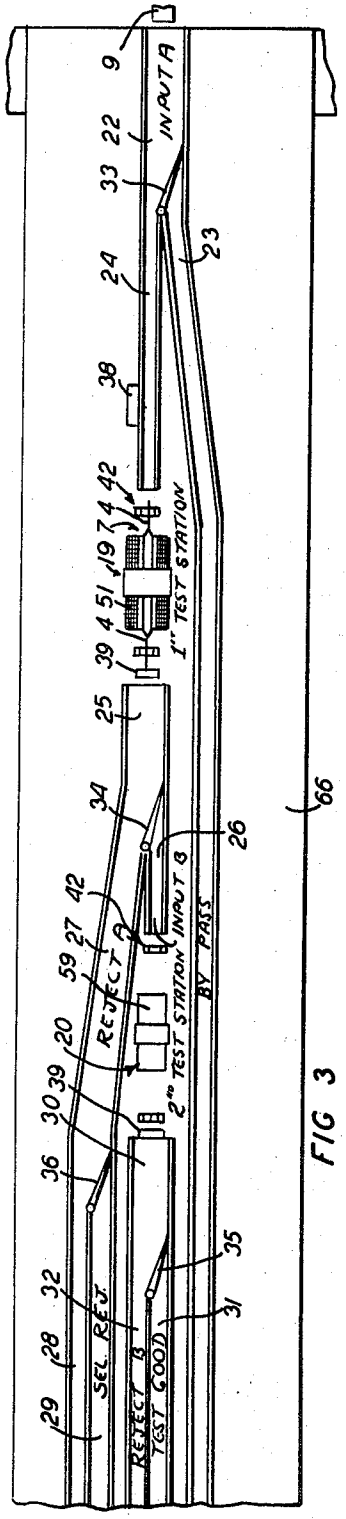


FIG 3

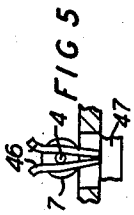


FIG 5

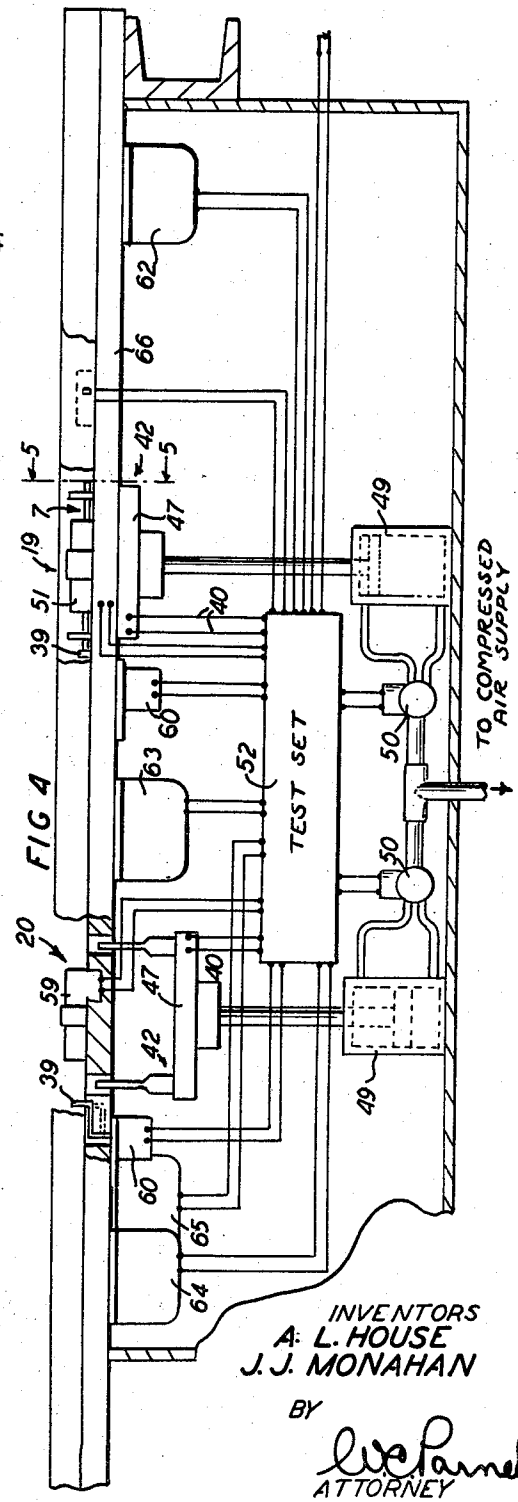


FIG 4

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HANDLING APPARATUS FOR ELECTRICAL ARTICLES

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Application August 30, 1955, Serial No. 531,547

1 Claim. (Cl. 209—75)

This invention relates to article handling apparatus and has for its object apparatus for receiving articles such as electrical switching devices, vacuum tubes, etc., as they are delivered singly from assembly machines, routing them to one or more test stations and then sorting them according to the results of the tests.

According to the general features of the invention, articles to be tested are delivered singly to the upper end of a downwardly inclined test fixture and are gravity fed to a test station where a mechanism makes electrical connections thereto for testing. Tested articles are released from the test station and are guided to sorting receptacles at the lower end of the fixture.

A preferred embodiment of the invention particularly adapted to receive Western Electric Company type 224 dry reed switches as they are discharged singly from multiple position assembly machine (of the type disclosed in co-pending patent application No. 505,172 of Messrs. R. F. Brewer and J. A. Hosford filed May 2, 1955) and for subjecting the switches to the tests performed by the test set disclosed in co-pending application No. 531,518 of Messrs. F. Kulick, J. W. McGrath and A. H. Spence, filed August 30, 1955, includes a conveyor for receiving the switches as they are completed by the assembly machine and delivers them (after the newly fused glass envelopes of the switches have had time to cool) to the test fixture. The test fixture is downwardly inclined to permit the switches to be gravity fed to a first test station where they are stopped, connected in a test circuit and subjected to a number of operational tests after which the switches are released and guided to either a reject receptacle or a second test station. In the second test station, the switches are connected in another test circuit and subjected to a high potential breakdown test, and when released, are guided to either a high potential reject receptacle or a receptacle for good units.

These and other features of the invention will be more fully understood from the following detailed description taken in conjunction with the accompanying drawing, in which:

Fig. 1 is a side elevational view of apparatus incorporating the present invention;

Fig. 2 is an enlarged view of a portion of the conveyor showing one of the receptacles in cross-section;

Fig. 3 is an enlarged plan view of the test fixture portion of Fig. 1;

Fig. 4 is a side elevational view of the test fixture of Fig. 3 showing some of the parts diagrammatically, and

Fig. 5 is a view along the plane of line 5—5 of Fig. 4 showing one of the switch contacts contactor mechanisms.

Referring now to the drawing, attention is first directed to Fig. 1 wherein dry reed switches 7 are delivered singly from an assembly machine (not shown) through a tube 8 to receptacles 9 on an upwardly inclined conveyor 10. The dry reed switches 7 (Fig. 2), shown by way of illustrating the invention, have a glass envelope 6 and a pair of magnetically operable contacts 5 with spaced contacts 4 extending through the glass envelope. A sprocket 11 for driving the conveyor is driven by a belt 12 at a speed determined by the indexing of the assembly machine so that successive receptacles 9 will be in position to receive the switches 7 as they are successively delivered from tube 8. Alternately, the sprocket 11 could be driven by a conventional gearing arrangement directly by the driver for the assembly machine. In the present embodiment the conveyor, having ninety receptacles 9, is moved one position (with respect to tube 8) approximately every 10 seconds which allows a cooling interval of 7½ minutes for the newly fused switches from the time of discharge from the tube 8 to its delivery to the top of the test fixture 14. A retaining cover 15 on a stationary frame 18 for the conveyor and the test fixture prevents the switches 7 from falling out of the receptacles before they reach the test fixture.

Test fixture 14 is mounted at an angle of about 35° on frame 18 so that articles delivered to its upper end from the conveyor may be gravity fed down the fixture. In general, the test fixture includes an inclined main chamber 66 for supporting a first and second or an upper and a lower test station 19 and 20 respectively, a network of tracks 22 through 32 inclusively for receiving switches delivered to the top of the fixture and for guiding them through the test stations and a number of receptacles 54 through 58 inclusively at the lower end of the member 66 for receiving the tested articles. The first test station 19, in which the dry reed switches 7 are subjected to the operational tests, includes an actuating coil 51 for the switches, switch terminal contactor assembly 42 and a track blocking or stop member 39. The second test station 20 where the switches are subjected to a high potential test for testing the gas content of the switches includes a sleeve 59 for receiving the switches and a switch terminal contactor assembly 42 and a track stop member 39 similar to those of the first test station 19. The contactor assemblies 42 are supported on movable arms of double acting air cylinders 49 which are controlled by electromagnetically controlled or solenoid air valves 50. As seen in Fig. 5, the contactor assemblies 42 have a pair of opposed resilient conductive members 46 for making electrical connection with the spaced-apart contacts 4 of the switch, mounted on base members 47 at the ends of actuators of the air cylinders 49. The upper ends of members 46 are bent to form V-shaped receiving slots for engaging the contacts 4 of the switches when the air cylinders move the contactor assemblies 42 upwardly to connect a switch in the coil or the sleeve 59 into the test circuits. The stop members 39 are positioned below the test stations and normally block or stop switches in the test stations within either the coil 51 or the sleeve 59. Solenoids 60 are provided for retracting the stop members from the test stations for releasing the switches from the stations when the contactor assemblies 42 are retracted.

A gate 33 at the input end of track 24 which guides the switches to test station 19 may be rotated counter-clockwise as seen in Fig. 3 to block the track 24 and deflect switches from the "input A" track 22 into a "by-pass" track 23 whenever switches jam or pile up in the input track 24. A coin type switch 38 is located in the track 24 for triggering a test set 52 whenever a switch passes through. This test set which is not a part of the present invention may be of the type disclosed in the aforementioned application.

At the output or lower end of test station 19, switches enter track 25 and may be guided into either a "reject A" track 27 or the "input B" track 26 for test station 20, the routing of the switch being controlled by a gate 34 operated by a solenoid 63. Likewise, a gate 35 at the

lower end of track **30** below test station **20** deflects switches therefrom into either the "test good" track **31** or the "reject B" track **32**. Another gate **36**, in the lower portion of "reject A" track **27** and controlled by a solenoid **65**, is provided for deflecting rejected switches into a "selective reject" track **29**. The lower end of the "reject A" track below gate **36** is designated numeral **28**. "Reject A" track **28**, "selective reject" track **29**, "test good" track **31** and "reject B" track **32** are terminated with receptacles **55**, **56**, **57** and **58** respectively at the lower end of the fixture adjacent receptacle 54 for the by-pass track **23**.

In operation, switches are fed into the receptacles **9** of the conveyor **10** and then transported singly to the "input A" track **22** of the test fixture. A switch passing down the input track **24** triggers the test set **52** by closing the switch **38** and then is stopped in the first test station **19** by the stop or blocking member **39**. Solenoid air valve **50** is then operated to raise the contactor assembly **42** to engage contacts of the dry reed switch which is held within the coil **51**. The test set then subjects the switch to a succession of operational tests by controlling the strength of the field of coil **51**. In the event that the switch fails any of the operational tests, gate **34** will be operated by solenoid **63** to block "input B" track **26**, as shown, so that when solenoids **60** and **50** are operated to release the switch from the station by the retraction of stop **39** and contactor assembly **42**, the tested switch will be deflected into "reject A" track **27**. If the switch passes the tests, gate **34** is operated to block the "reject A" track **27** and the switches will be deflected into the "input B" track **26** for the second test station **20** where they will be similarly connected into a high potential breakdown test circuit of the test set **52**. In test station **20** an actuating coil such as **51** is not required consequently a mechanical retainer, sleeve **59**, is utilized to prevent members **46** from knocking the switches out of the test station when the contactor assembly **42** is moved to engage the contacts thereof.

When the switch is released from the first test station **19**, another switch is normally dropped from the conveyor into the input track **22** so that tests may be performed on switches in both test stations simultaneously. Tested switches from the lower test station **20** are released therefrom and deflected into either the "test good" track **31** or the "reject B" track **32** by operating solenoid **64**. Specific types of operational rejects from the "reject A" track **27** may be segregated by operating solenoid **65** which controls gate **36**. The switches then will

be routed through tracks **28**, **29**, **31** and **32** to their respective receptacles **55**, **56**, **57** and **58**.

It is to be understood that the above described arrangements are simply illustrative of the application of the principles of the invention. Numerous other arrangements may be readily devised by those skilled in the art which will embody the principles of the invention and fall within the spirit and scope thereof.

What is claimed is:

Apparatus for two stage testing and sorting of elongated electrical articles having spaced contacts extending longitudinally from opposite ends thereof, comprising an inclined main support member, an upper and a lower test station on the support member, each having movable means for stopping articles therein and a pair of bi-furcated contactors for engaging the spaced contacts of the articles and aligning them in the stations, a support for each pair of contactors, means for moving each of the supports between a normally retracted position and a test position wherein the contacts of articles in the test stations are jammed between the bi-furcated contactors to connect the articles in test circuits, means for holding the articles in the test stations when the contactors are moved into engagement therewith, a plurality of receiving means for the articles at the lower end of the support member, a conveyor for delivering articles singly and at regularly timed intervals to the upper end of the support member, guide means for receiving articles delivered to the upper end of the support member for gravity feeding them to the upper test station, a by-pass guide means on the support member for gravity feeding articles past the test stations directly to one of the receiving means at the lower end of the support member, means for selectively routing articles delivered to the upper end of the support member into the by-pass guide means in the event articles pile up thereon, means below the upper station for selectively routing articles from said upper station to the lower station or to another of the receiving means and means below the lower station for selectively routing articles from the lower station to still another of the receiving means.

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