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METHOD OF TESTING PROTECTIVE COATINGS

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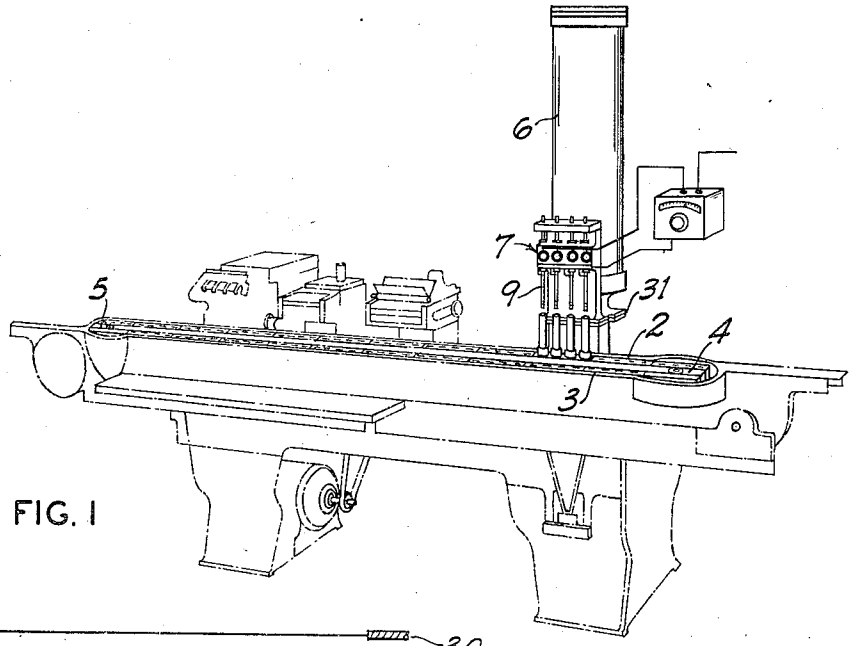

FIG. 1

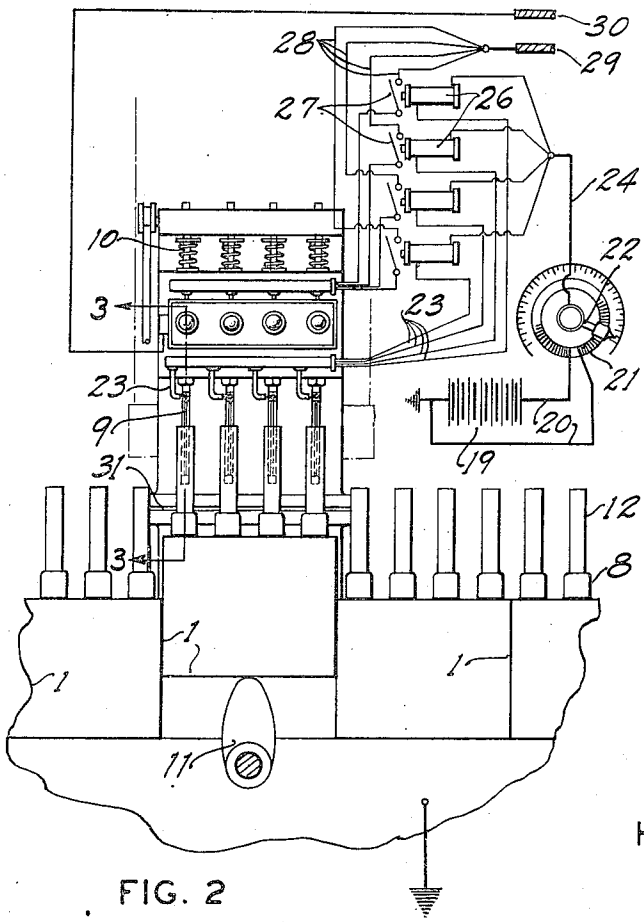

FIG. 2

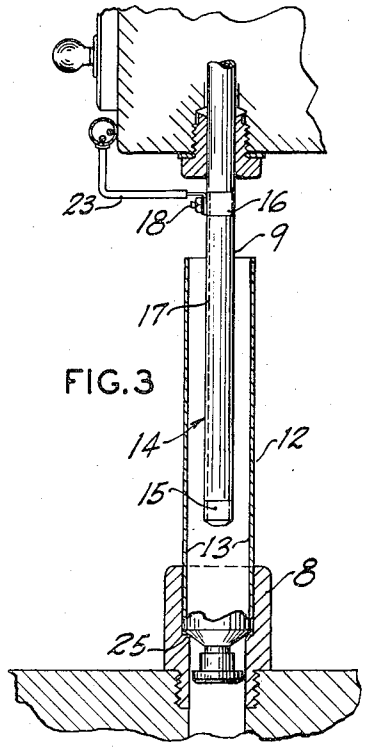

FIG. 3

HERBERT C. DE STAEBLER
INVENTOR

BY George R. Ericson
ATTORNEY

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METHOD OF TESTING PROTECTIVE COATINGS

Herbert C. De Staebler, Kirkwood, Mo.

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6 Claims. (Cl. 177—311)

This invention relates to automatic inspecting devices for use with automatic packing machines and more particularly relates to means for inspecting protective coatings for metal tubes such as are used to package tooth paste, shaving cream or the like.

Commercial tooth pastes and shaving creams generally contain ingredients which re-act chemically with some of the less expensive available metals which are otherwise suitable for the construction of thin walled collapsible tube containers to cause objectionable discoloration and contamination of the paste. It has been found, however, that an unbroken protective coating such as lacquer applied to the interior of the tube containers provides a satisfactory means of preventing contact between the paste and the metal and permits the use of such metals as lead or aluminum which would otherwise cause contamination of the paste. It is highly essential, however, that this coating be continuous and unbroken as a relatively small break in the coating, not obvious upon visible inspection, would cause considerable contamination.

The present invention has for its primary object the provision of an inexpensive and reliable device for testing the continuity of such coatings and which includes a signaling device automatically operative upon detection of a break in the coating.

It is a further object of the present invention to so arrange, in combination, a device of the above character and an automatic tube filling and closing machine that full automatic operation of the testing device is attained.

Other objects and advantages will appear upon reference to the following description and accompanying drawing in which

Fig. 1 is a perspective view of an automatic tube filling and closing machine having attached thereto a testing device constructed in accordance with the present invention.

Fig. 2 is an enlarged view of a portion of the machine shown in Fig. 1 having a somewhat diagrammatic arrangement of the testing device circuits shown therewith.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

The tube filling and closing machine illustrated in Fig. 1 is of modern construction and of the type which employs a conveyor system comprising a train of separate block-like carriers 1, which are slidable vertically independently of each other and are moved horizontally in guideways 2 and 3. The carriers move from right to left in the guideway 2 and their direction is reversed at the ends of the guideways by means of the turntables 4 and 5. A hopper 6 for storing the paste to be packed is provided and a multiple tube filling head is indicated at 7. Socket-like holders 8, attached to the upper surface of the carriers 1, to receive the tubes to be filled are provided.

In the machine illustrated the filler head carries four nozzles 9. The paste is discharged under pressure from these nozzles and the discharge is controlled by valves therein not shown, which are operated by push rods 10. Means for applying pressure for the ejection of the paste from the nozzles 9 is not shown, but it will be understood that such means is incorporated in modern tube filling machines of the type indicated in Fig. 1. The carriers are moved vertically by cam means 11 as they move into line with the filler head and the nozzles 9 enter the container tube 12 so that filling may start from the lower end. It is immaterial as far as the present invention is concerned whether the container tubes are moved upward to admit the nozzles or whether, as in other machines, the filler head is movable vertically and wherein the nozzles are moved downward into the container tubes.

The container tubes 12 are constructed of metal, such as lead or aluminum having relatively high conductivity and are provided, on their inner surfaces 13, with a continuous and unbroken protective coating such as lacquer or the like, and are impervious to the paste they are to contain and having relatively high dielectric strength. As it is obviously a difficult matter to visibly inspect such coatings for breaks, I propose to inspect them electrically by means of the following arrangement:

The filler tubes 9 are constructed of a non-conductive material, preferably one of the commercial thermo-plastics, and carry attached thereto electrodes 14 which comprise a pair of conductive bands 15 and 16 and a conductive connector strip 17. The upper bands 16 are provided with studs 18 for the connection of leads. A source of electrical energy is indicated in the form of a storage battery at 19. A closed battery circuit 20 including a resistor 21 and a slidable take-off arm 22 provides a means for applying a variable potential at the electrodes 14. The electrodes 14 are connected to slidable arm 22 by individual leads 23 and the common lead 24. It is desired to point out at this time that commercial tooth pastes and shaving creams have been found to be fairly good conductors of electricity.

The container tubes 12 contact, at their lower ends, the shoulders 25 formed in the sockets 8 and it will be understood that the tubes are grounded through these sockets and the machine. It is of particular advantage in the present arrangement to attach the electrodes to the filler nozzles so that the coatings may be subjected to electrical pressure at a time when the paste is being discharged, as at this time the lower end of the tube is reacting with considerable pressure against shoulder 25 to form a good contact for grounding the tubes. Connected in the in-

dividual leads 23 are highly sensitive relays 26 which operate on extremely low currents to close switches 27 which control the signal light circuit 28. The signal light circuit may be connected to any suitable available source of electrical energy at 29 and 30. It will be understood that while a storage battery is indicated as a source of electrical energy for testing the coatings any suitable source may be utilized. However, an advantage is gained in the use of direct current, in that the relays 26 may be made highly sensitive, which is obviously essential, without danger of their vibrating as would be the case when operated on alternating current.

In operation: The empty container tubes are inserted in the sockets 8 by the operator. As they move into register with the filling head they are moved upward as indicated in Fig. 2 and paste is discharged under pressure from the nozzles 9. At this time a predetermined voltage is impressed upon the inner coating of the tube, the intensity of which has been predetermined by considerations involving the dielectric strength of such coating when of suitable thickness, the conductivity of the paste and the diameter of container tubes. The intensity of the impressed voltage being varied by adjusting the sliding take-off arm 22.

If the coating of any tube breaks down under this impressed voltage, due to a thin spot or break, sufficient current will flow through this particular tube circuit to cause its respective relay to close the circuit of a corresponding signal light. The signal light being arranged directly above and in line with the respective tubes, the operator's attention will be directed to the faulty tube which may then be removed from the conveyor.

If it is found that certain materials to be packed are substantially better conductors than those at present anticipated, further steps may be taken to prevent grounding of the testing circuit to the machine via the material within the filling tubes and hopper; such as insulating the filling head and hopper from the machine by insertion of an insulator at 31 and at any other points at which structural or operative connections between the hopper and filler head and the machine are necessary.

The foregoing description and accompanying drawing are intended to be illustrative, not limiting, and the exclusive use of all modifications within the scope of the appended claims is contemplated.

I claim:

1. In a machine for filling metal container tubes with a plastic material and simultaneously testing the continuity of protective coatings applied to the interior of the tube, a tube conveyor system including socket-like holders for receiving the tubes to be filled at their closed ends, a tube filling nozzle arranged to enter the tubes at their open ends and to discharge plastic material thereinto, an electrode attached to said nozzle and arranged to enter the tubes, said tube holding sockets being of metal and being connected to the machine so as to electrically ground the tube, a source of electrical energy, a lead connecting said source of energy with said electrode, an electrically operated signaling device, and a device interposed in said lead and responsive to a flow of current therethrough for controlling said signaling device.

2. In a tube filling machine, a filler head carrying a plurality of filler nozzles, a tube conveyor system for positioning the tubes to be filled in line with said nozzles, means for entering said nozzles into the open ends of the tubes, an electrical system for testing protective coatings applied to the interior of the tubes comprising electrodes arranged to be entered into the tubes simultaneously with the filler nozzles, a source of electrical energy, independent leads connecting said source of energy with said electrodes, a variable resistor arranged to vary the potential at said electrodes, means for grounding the tubes to be filled, electrically operated independent signaling device mounted on said filler head in line with respective nozzles, and independent relays in said leads for controlling said signals.

3. In a tube filling machine, a filling nozzle arranged to be entered into the open ends of the tubes to be filled and to discharge thereinto when so entered, an electrical system for testing protective coatings applied to the interior of the tube comprising a source of electrical energy, means including a lead from said source of energy for conducting electrical energy to a point within the tube during the discharge of said nozzle, means for grounding the tube, an electrically operated signaling device and a relay interposed in said lead for controlling said signaling device.

4. In a tube filling machine, means for filling tube containers with a semi-fluid material, an electrical system for testing thin non-conducting protective coatings applied to the interior of the tube containers comprising a source of electrical energy, an electrode arranged to be entered into the tube containers and spaced from the walls thereof and in contact with the material in the tube, a lead connecting said electrode with said source of energy, means for grounding the container tubes by contact with the exterior thereof, a signaling device, and a relay interposed in said lead for controlling said signaling device.

5. In a tube filling machine, means for filling tube containers with a semi-fluid material, an electrical system for testing the continuity of thin non-conducting protective coatings applied to the interior of the tube containers comprising a source of electrical energy, an electrode arranged to be entered into the tube containers and in contact with the material in the tube, a lead connecting said electrode with said source of energy, means for grounding the tube container by contact with the exterior thereof, and a control relay interposed in said lead and operable upon a flow of current therethrough occasioned by a fault in the coating.

6. In a container filling machine, means for filling the containers with the material to be packed, an electrical system for testing the continuity of thin, relatively non-conductive protective coatings applied to the interior of the containers comprising a source of electrical energy, an electrode arranged to be entered into the containers and in contact with the material therein, a lead connecting said electrode with said source of energy, means for grounding the containers by contact with the exterior thereof, and a control relay interposed in said lead and operable upon a flow of current therethrough occasioned by a fault in the coating.

HERBERT C. DE STAEBLER.