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UNITED STATES PATENT OFFICE

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PROCESS OF CLEANING WIRE

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My invention relates to a process of cleaning wire especially the red or copper clad wire employed as lead-ins of mercury switches.

In the manufacture of mercury switches the lead-in wires which are sealed through the glass envelope or casing of the switch and which are welded to the electrodes that cooperate with the mercury switch are, of course, subjected to high temperatures during the manufacture of the switch. The portions of the lead-in wires which project exteriorly of the switch become coated or covered with oxides and other impurities during the manufacturing operations and after the switch has been completely manufactured it is necessary to clean these wires thoroughly before tinning the same. The usual method that has been resorted to for cleaning the exterior portions of the leading-in wires has been to mechanically scrape the same. This operation is slow, laborious, and unless carefully carried out will set up cracking strains in the glass that is sealed around the inner portions of the lead-in wires.

One of the principal objects of the present invention is to provide a process of cleaning the exterior portion of copper clad or red lead-in wires of mercury switches chemically and in such manner that the operation may be speeded up, the amount of labor required greatly reduced, and liability of the seal-ins around the wires being strained or cracked avoided.

In carrying out the present invention the mercury switches, after being completely manufactured, are carefully placed in a perforated hard rubber basket so that a large number of switches may be processed at the same time. The loaded basket is then successively dipped in tanks containing baths or solutions of hydrochloric acid, nitric acid, and sodium ammonium borate, the switches being washed and rinsed in running water following each dipping operation.

In the first dipping, the hydrochloric acid digests and removes practically all of the oxides which occur as a scale or coating on the wire. Preferably the hydrochloric acid utilized in the first dipping has a specific gravity of 1.18 and the switches and their wires are immersed therein for approximately forty seconds. After such immersion the loaded basket is lifted out of the hydrochloric acid solution, drained and then dipped in running water to remove all traces of the hydrochloric acid.

The second dipping operation in nitric acid dissolves the chlorides that may be formed on the surfaces of the wires and also has the property of digesting any remaining oxides so that when the switches and their wires are removed from the nitric acid the wires are thoroughly cleaned and their surfaces are clear of oxides and are bright and shiny. The nitric acid utilized preferably has a specific gravity of 1.42 and the switches and their wires are immersed therein for a period of about ten seconds.

It is preferable to preserve this sequence of acid dipping, that is, first in hydrochloric acid and then in nitric acid, for the reason that the hydrochloric acid has a more uniform action on the entire surface of the oxide covered wire. If the nitric acid were used first it would tend to eat in certain parts more than others and thereby leave a pitted or non-uniform surface.

After being lifted out of the nitric acid and drained, the mercury switches may be washed or may be immediately placed in a 20% solution of sodium ammonium borate for approximately five seconds, the latter operation being preferable. Sodium ammonium borate neutralizes any acid traces that may occur in the pores of the metal, small cracks in the glass, or the like, and also prepares tne copper surface so that it is not readily oxidized when brought out into the air. The ammonium in the sodium ammonium borate solution has the characteristic of dissolving any copper oxide that may be formed by the action of the sodium borate. The sodium borate forms a microscopic film of copper oxide on the wires but this film is converted into ammonium sodium cuprate which is soluble in water and is taken off in the final rinse or washing, leaving a bright or seemingly highly polished surface which is well adapted for the tinning operation. It is to be understood that following the immersion

in the sodium ammonium borate, the basket containing the mercury switches is lifted out of the solution, drained, and then rinsed under running water for at least ten seconds. The tubes are then dried preferably in a drier although atmospheric drying may be sufficient.

The projecting portions of the lead-in wires after being subjected to this process have a surface which might be termed a non-acid skin which is not readily oxidized in the air and which maintains the surfaces of the lead-in wires in proper condition for the tinning operation which immediately follows the process.

The tinning operation consists in dipping the lead-in wire in a molten bath of tin or solder.

The sodium ammonium borate solution is prepared by dissolving 10 parts (by weight) of ammonia and 10 parts (by weight) of sodium borate in 80 parts (by weight) of water.

I claim:

1. The hereindescribed process of cleaning the lead-in wires of mercury switches which consists in dipping the switches and the wires successively in hydrochloric acid, nitric acid, and sodium ammonium borate.

2. The hereindescribed process of preparing the lead-in wires of mercury switches for tinning which consists in first dipping the switches and their lead-in wires in a solution of hydrochloric acid, then removing the switches and rinsing them in water, then dipping the switches in a solution of nitric acid, next removing the switches from the nitric acid and rinsing them in water, then dipping the switches in a solution of sodium ammonium borate, and finally removing the switches and their lead-in wires from the sodium ammonium borate and rinsing them in water.

3. The hereindescribed process of preparing the lead-in wires of mercury switches for tinning which consists in first dipping the wires in a solution of hydrochloric acid having a specific gravity of approximately 1.18 for approximately forty seconds, then rinsing the wires with water, then dipping the wires in a solution of nitric acid having a specific gravity of 1.42 for approximately ten seconds, then dipping the wires in a 20% solution of sodium ammonium borate for approximately five seconds and then rinsing the lead-in wires in water for approximately ten seconds and then drying the lead-in wires.

In witness whereof, I hereto affix my signature.

CARL JOHN WARNKE.