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EXTRUDING AND IMPROVING OF LEAD ALLOYS.

No Drawing. Application filed February 5, 1924. Serial No. 690,718.

An object of this invention is to provide a process for extruding lead alloys so that the extruded article may be afterwards improved.

A further object of this invention is to provide a process for improving extruded lead articles after extrusion has taken place.

This process is described as applying to lead-antimony cable sheath, but it is to be understood that the same process may be applied in extruding and improving articles made of other lead alloys such as lead-tin alloys, etc.

According to this process the proper proportions of lead and antimony are cast into the form of a slug or ingot. This ingot is then heated for a period of time, depending upon the percentage of antimony present and the temperature at which the heating apparatus is maintained. When this period of time has elapsed the ingot is placed in an extruding press and extruded in the form of cable sheath, substantially as outlined in the co-pending application of R. S. Dean and W. E. Hudson, Serial No. 690,717 filed February 5, 1924. Immediately upon emanation from the die, the hot sheath is quenched. The sheath is then coiled onto the reels in the ordinary manner and allowed to age at room temperature.

As an alternative the ingot may be cast in the extruding press and heated while in the press, the extrusion and quenching then being carried on as above. This method is not so desirable, on account of the time required for heating, as during the heating the extruding press would have to remain idle.

In order to get the maximum amount of hardness, as the improved quality, according to this method, an alloy of slightly less than 2½% antimony is used with pure lead. The time of heating is 72 hours, and temperature 240° C. The quenching bath may be ordinary running water at approximately or slightly below room temperature. The time required for testing out the cable, sealing the ends, etc. in practice is found to give sufficient aging to obtain substantially the hardness required. (For a full description of this hardening method reference is made to our co-pending application, Serial No. 690,716 filed February 5, 1924.)

As described in the copending application just cited, the method of improving the lead alloys consist generally in heating an alloy composed of lead-antimony, lead-tin or other materials until the material alloyed with the lead is in solid solution therein, quenching the heated alloy to a temperature below the temperature of recrystallization of the alloy, and aging the quenched alloy at room temperature.

When employing underground cable, especially underground cable of the larger sizes, it is impossible to conveniently handle a cable with an extremely hard sheath; the difficulty principally encountered is in drawing the cable sheath into the conduit and in shaping it around the sides of the manhole. When such is the case it will sometimes be found necessary to sacrifice some hardness in order to obtain greater flexibility. The sheath employed in such cases may be thinner than the sheath which has heretofore been used, but on account of the necessity of preserving its flexible character it cannot be made as thin as the required tensile strength would seem to indicate.

The hardness of the cable sheath may be reduced in various ways, such as decreasing the percentage of antimony, decreasing the time or temperature of heating, or by allowing the alloy to partly cool before quenching. A specific manner in which the process may be varied as indicated is more fully explained in our co-pending application referred to above.

By using hardened lead antimony alloy for the making of cable sheath, the thickness of the sheath may be materially reduced, resulting in a saving in material and still have much greater tensile strength, hardness, and resistance to abrasion than has been obtainable by the use of an untreated alloy.

When cable is to be employed of the type usually termed "aerial and block cables" the maximum hardness of the sheath may be employed for the purpose of making the cable self-supporting, and in this way doing away with the messenger wire and rings

which are now commonly employed to support this type of cable.

If it is desired to keep the cable sheath or other article soft for a period of time, after quenching, said article may be put into cold storage, i. e., stored in temperatures of 0° C. or lower. This lower temperature appreciably retards the age-hardening. This may be of considerable advantage in working with large objects, for example, the larger sizes of cable sheath.

What is claimed is:

1. A process for producing an improved lead cable sheath, which consists in alloying antimony with lead, reducing the resulting alloy to a solid solution to facilitate its extrusion, extruding said alloy into cable sheath, quenching said extruded alloy while in the solid state to produce a supersaturated solid solution, and causing said alloy to assume a more stable state.

2. A method for producing an improved lead cable sheath, which consists in alloying matter with lead, reducing the alloy to a substantially homogeneous solid solution to facilitate its extrusion, forming the resulting alloy into cable sheath, quenching said formed alloy to produce a supersaturated solid solution, and causing said alloy to assume a more stable state.

3. A method for producing an improved lead cable sheath, which consists in alloying matter with lead, reducing the alloy to a solid solution to facilitate its extrusion, forming said alloy into cable sheath by extrusion, quenching said extruded alloy while in the solid state to produce a supersaturated solid solution, and causing said supersaturated solid solution to gradually assume a substantially stable state.

4. A process for extruding and improving lead alloys, which consists in casting the alloy into the form of an ingot, heating said alloy ingot until a substantially homogeneous solid solution is formed, placing said ingot in an extruding press, extruding said ingot, quenching the extruded article to a temperature below 100° C., and aging.

5. A process for improved lead-antimony cable sheath, which consists in casting the alloy in requisite proportions in the form of an ingot, heating said ingot for 72 hours at a temperature below the fusing temperature to produce a solid solution which contains substantially all of the antimony present in the alloy, placing said ingot in an extruding press, extruding said ingot into cable sheath, quenching said sheath, and aging.

6. A process for improved lead-antimony cable sheath, which consists in casting the alloy in requisite proportions in the form of an ingot, heating said ingot for 72 hours at a temperature of 240° C., to produce a solid solution which contains substantially all of the antimony present in the alloy, placing said ingot in an extruding press, extruding said ingot into cable sheath, quenching said sheath, and aging.

7. A process for producing improved lead-antimony cable sheath, which consists in casting the alloy in requisite proportions in the form of an ingot, heating said ingot for 72 hours at a temperature of 240° C. to produce a solid solution which contains substantially all of the antimony present in the alloy, placing said ingot in an extruding press, extruding said ingot into cable sheath, quenching to room temperature, and aging.

8. A process for producing improved lead-antimony cable sheath, which consists in casting the alloy in requisite proportions in the form of an ingot, heating said ingot for 72 hours at a temperature of 240° C. to produce a solid solution which contains substantially all of the antimony present in the alloy, placing said ingot in an extruding press, extruding said ingot into cable sheath, quenching to room temperature, and aging at room temperature.

9. A process for producing improved lead cable sheath, which consists in alloying with lead not less than 1% and not more than 2.5% antimony, casting the resulting alloy into the form of an ingot, heating said ingot at a temperature below the fusing temperature to reduce the alloy to a substantially homogeneous solid solution, extruding said ingot into cable sheath, quenching, and aging.

10. A process for producing improved lead cable sheath, which consists in alloying with lead not more than 2.5% antimony, but more antimony than is soluble in solid lead at room temperature, casting the resulting alloy into the form of an ingot, heating said ingot at a temperature slightly below the fusion temperature to produce a substantially homogeneous solid solution, extruding said ingot into cable sheath, quenching, and aging.

11. A process for improving lead alloy articles, which consists in casting the alloy in the form of an ingot, heating said ingot at a temperature below the fusion temperature until a solid solution is formed, said solid solution containing substantially all of the material alloyed with the lead, extruding said ingot into the form desired, quenching said extruded article, and aging.

12. A process for improving lead-antimony cable sheath, which consists in heating a cast ingot at a temperature below the fusion temperature until a solid solution is formed, said solid solution containing substantially all of the antimony present in the alloy, extruding said ingot in the form of a cable sheath, quenching said sheath, and aging.

13. A process for improving lead-antimony cable sheath, which consists in casting

an ingot, heating said ingot at a temperature below the fusion temperature until a solid solution is formed, said solid solution containing substantially all of the antimony present in the alloy, placing said ingot into an extrusion press, extruding said ingot into a cable sheath, quenching said cable sheath, and aging said cable sheath at room temperature.

In witness whereof, we hereunto subscribe our names this 22nd day of January A. D., 1924.

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