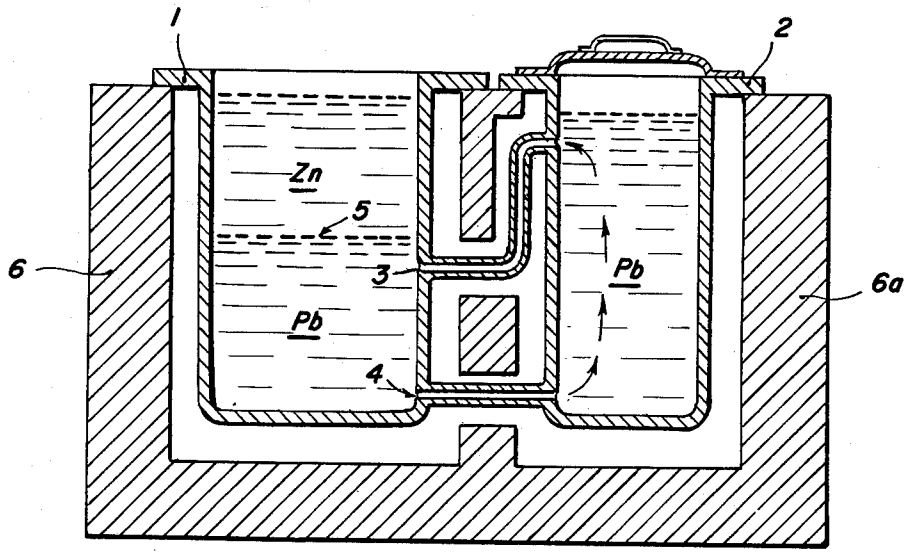
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GALVANIZING METHOD INCLUDING A REMOVAL OF METALLIC IRON FROM ZINC-CONTAINING MATERIALS SUCH AS METALLIC ZINC AND IRON-ZINC COMPOUNDS

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GALVANIZING METHOD, INCLUDING A REMOVAL OF METALLIC IRON FROM ZINC-CONTAINING MATERIALS SUCH AS METALLIC ZINC AND IRON-ZINC COMPOUNDS

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As is known, for instance in the hot galvanization of iron articles, fairly great zinc losses occur for the reason that metallic iron reacts with metallic zinc to form iron-zinc. This compound, the theoretical composition of which is about 6% iron and 94% zinc, is consequently capable of binding considerable amounts of zinc. As the melting point of the iron-zinc is higher, namely 530° C., than the temperature commonly used in a galvanization bath, i. e. 430° C. to 460° C., said compound will separate from the melt and, due to its higher specific gravity, sink to the bottom of the galvanization container. From here the compound is removed from time to time by any suitable means. The incidental removal, in this connection, of great amounts of zinc is unavoidable, and this represents a considerable loss.

Iron-zinc compounds are also formed in certain metallurgical processes for the production of zinc from iron-bearing zinc ores or if the reducing material is iron-bearing ash. The separation of zinc from compounds thus obtained likewise represents an unsolved problem.

The present invention relates to a method and to an apparatus for the removal of iron from zinc compounds of the kind described.

This method may be summarized as follows:

Into a lead bath maintained at a temperature of 700° C., an iron-zinc compound is introduced. The zinc of the compound thereupon dissolves in the lead melt until the latter is saturated with respect to zinc. At a temperature of the melt of 700° C., the saturation occurs when the lead contains from 8 to 9 per cent by weight of zinc in solution. If the amount of lead is sufficiently great relatively to the added iron-zinc compound, all the zinc from the iron-zinc compound will dissolve while the iron which does not go into solution floats up to the surface of the lead melt where it can be skimmed off by any suitable means. If the lead bath temperature is decreased after the removal of supernatant iron, a liquid phase which is rich in zinc separates during the cooling process and ascends to the surface of the lead bath. This phase becomes richer in zinc the lower the temperature sinks, until at 420° C. it separates eutectically into an upper pure zinc layer and a lower lead-rich layer containing only about 2% by weight of zinc.

The pure zinc floats to the surface and can now be removed in solid form at this temperature. Thereupon the lead bath may be reheated to 700° C. for treating new amounts of iron-zinc. The zinc remaining in the lead bath is not lost but remains continuously therein. This method makes possible the production of zinc of maximum purity from an iron-zinc compound.

According to another modification of the invention the hot lead bath is only cooled to a temperature of from 440° C. to 450° C. Hereby the separating zinc is still in liquid form and can, as such, be used directly for a galvanization bath.

When the invention is employed in connection with hot galvanization, the galvanization process is carried out in a bath consisting of an upper layer of liquid zinc and a lower layer of molten lead while the bath is maintained at a temperature suitable for hot galvanization, i. e. at 430°–460° C. The iron-zinc compound formed during the process sinks to the boundary surface between the zinc and the lead and can be removed therefrom to another bath containing only lead. This second bath is heated to a temperature of over 600° C., whereby the zinc goes into solution while the iron remains undissolved and can be removed. Hereafter the zinc-containing molten lead is introduced into the first-mentioned bath, and there cooled to a temperature of from 430° C. to 460° C. with consequent separation of zinc from lead, said zinc migrating to the upper bath layer of zinc.

The invention will be explained in further detail with reference to the accompanying drawing which diagrammatically shows a vertical section of an apparatus suitable for carrying out the invention in connection with hot galvanization.

Reference numeral **1** indicates a container for a galvanization bath which consists of a liquid zinc layer Zn floating on top of a molten lead layer Pb. The bath occupies the said container **1**, which in customary manner is arranged in a brick furnace **6** and heated from the latter either by warm combustion gases or electricity. The bath is maintained at normal galvanization temperature of from 430° C. to 460° C. Two tubes **3** and **4** serve to connect the container **1** with a second container **2**, the latter being filled with lead only. The tubes **3** and **4** are placed at different levels and extend, as shown, in such a way that they open into the lead layer of the container **1** and are not in contact with the zinc. The container **2** is also enclosed in a furnace **6***a* (which may be integral with furnace **6** and provided with suitable and conventional heating means) and is maintained at a temperature higher than that in container **1**.

The galvanization process is carried out in the container **1**.

The iron-zinc compound which is formed hereby sinks to the boundary layer **5** between the zinc and the lead in the bath **1** and from here it is removed in customary manner with suitable and per se conventional scooping means and transported to the container **2** which is maintained at a temperature of about 700° C. At this temperature the iron-zinc melts and the zinc is dissolved in the lead melt. Thanks to the increased zinc content of the lead in the container **2** and the somewhat higher temperature relative to the container **1**, the specific weight of the molten metal is lower in the container **2** than in the container **1**. In consequence of this difference and the difference in level between the tubes **3** and **4**, a natural circulation is created in the direction indicated by arrows with the result that the zinc-rich lead from the container **2** flows into the container **1** through the upper tube **3** while at the same time the zinc-poor lead flows from the container **1** to the container **2** through the tube **4**. Because of the lower temperature in the container **1**, zinc here separates anew from the lead and floats up to the zinc layer. When all zinc has separated from the iron-zinc in the container **2** the remaining iron floating on the surface is removed and new iron-zinc may be introduced into the container **1**.

Having thus disclosed the invention, what is claimed is:

1. A method of separating zinc contained in zinc-iron alloys, zinc dross and reduced zinc in iron-bearing zinc ores comprising introducing the zinc-iron material into a molten lead bath maintained at a temperature above about 600° C. whereby zinc is dissolved in the lead and iron, which is insoluble in said lead, floats on the surface of said bath, separating the insoluble iron from said bath, lowering the temperature of said bath to about 420°–460° C. whereby an upper layer of zinc separates which is

adapted to be removed from said bath at said lower temperature.

2. A method as claimed in claim 1 wherein the temperature of said bath is lowered to about 430° to about 460° C. after said iron has been separated from said bath, and hot galvanizing iron articles in said bath maintained within said last named temperature range.

3. A continuous method as claimed in claim 2 wherein the iron-zinc alloy formed during galvanizing iron articles in said bath at about 430°–460° C. is removed from the boundary between the zinc and lead layers in said bath, and transported into a second bath consisting of lead maintained at a temperature above 600° C. wherein zinc is dissolved and undissolved iron floats on the upper surface of said second bath, separating said undissolved iron and returning a part of the molten lead containing zinc from said second bath into the first named bath wherein the molten lead containing zinc is cooled to a temperature of about 430°–460° C. for further galvanizing.

4. A method as claimed in claim 3 wherein the molten lead containing zinc in said first named bath at a temperature above 600° C. is transferred to said second bath through a conduit connecting said baths and part of the lead purified in said second bath is transferred to said first named bath through another conduit connecting said baths.

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