Aug. 7, 1934. E. FELDMANN 1,968,933

MEANS FOR PRODUCING TIN OXIDE

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Fig. 1.

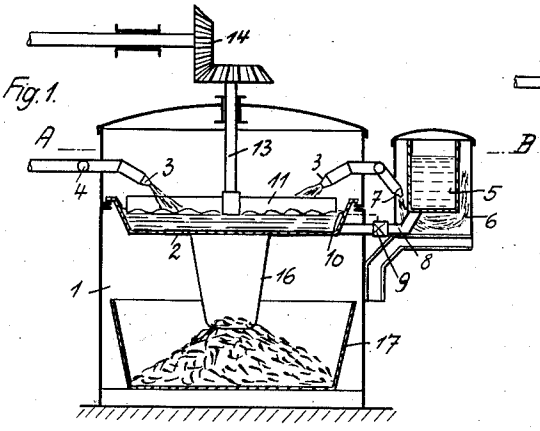


Fig. 4

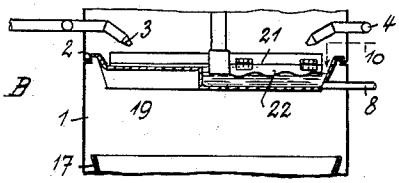


Fig. 5

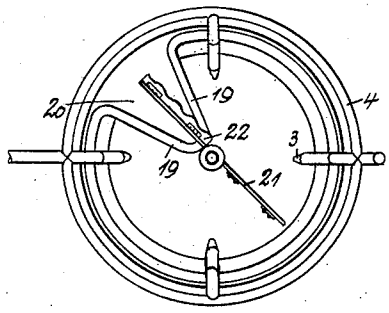


Fig. 2.

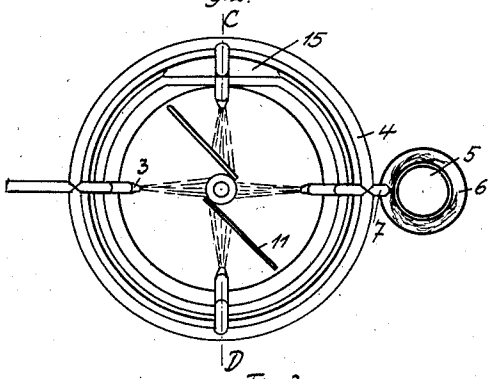


Fig. 6

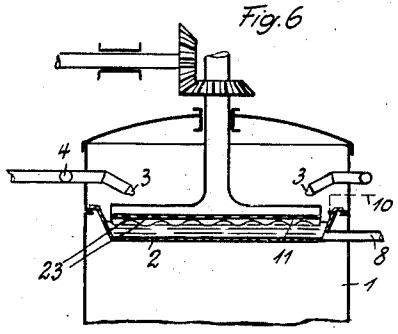


Fig. 3.

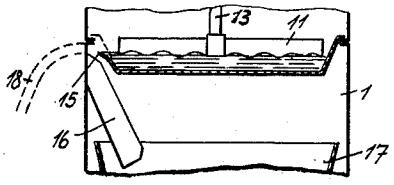


Fig. 7

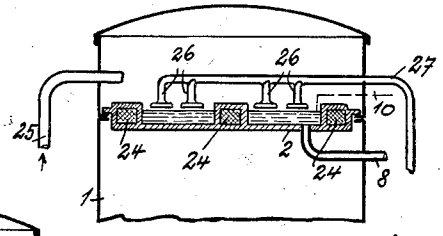
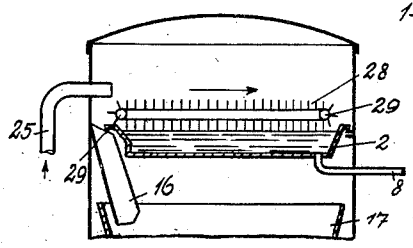


Fig. 8.



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Fig. 9.

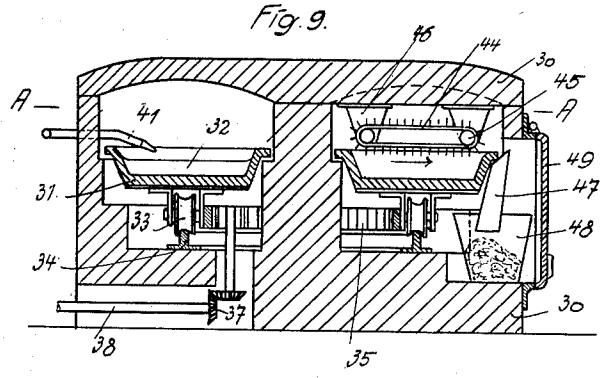
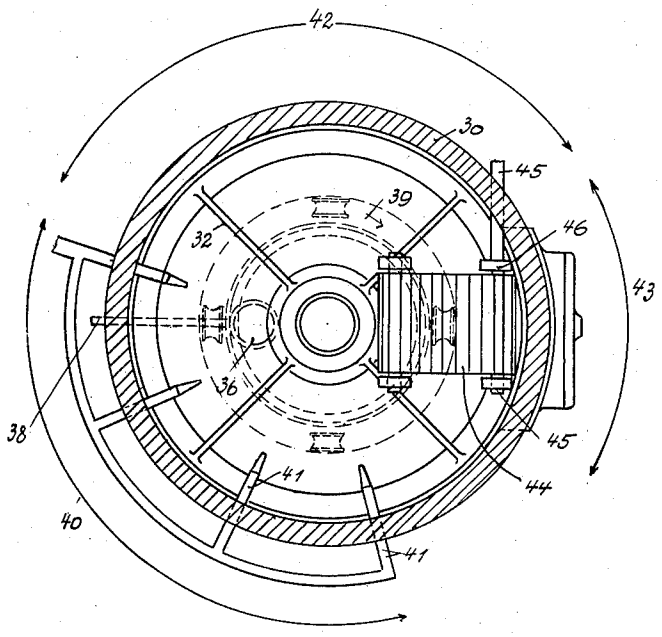


Fig. 10.



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UNITED STATES PATENT OFFICE

1,968,933

MEANS FOR PRODUCING TIN OXIDE

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Application March 21, 1931, Serial No. 524,307
In Germany March 29, 1930

7 Claims. (Cl. 23—277)

I have filed applications in Germany on March 29, 1930 and June 16, 1930.

This invention relates to means for producing tin oxide, which is used in the industry for the manufacture of enamel and other purposes.

In prior art tin oxide was manufactured in furnaces provided with a fireproof tank, where it was heated to a high temperature by means of a heating device and where it was brought into contact with oxidizing air. Tin oxide was formed at the surface and was scooped off by a workman, who had to use a scooper inserted through an opening provided in the tank. The success of this process depended upon the skill of the workman, who had to be constantly present. The quality of the tin oxide recovered by this manual process is quite irregular. A further disadvantage of this process is a considerable loss of dust caused by the fact that the outlet of the furnace must be always open, by the smoke gases and by the fact that the process is a manual one.

Another process known in prior art, comprises heating tin in a closed tank. Then the heating process is interrupted and air is led over a tin bath. The vapors formed above the tin bath are condensed and tin oxide is obtained. This process cannot be carried out continuously, but must be interrupted at periodical intervals. In carrying out this process, the constant presence of the workman is also necessary.

An object of the present invention is the provision of a method and means for recovering tin oxide, which will be devoid of the above-mentioned drawbacks.

In accordance with the present invention tin oxide is removed continuously and automatically from the tin bath and is led to a collecting tank, without bringing the tin oxide in contact with atmospheric air and without the necessity of employing a skilled worker.

Furthermore, the present invention contemplates the provision of means for continuously removing the oxide which rises to the surface of the molten tin, said means being arranged over the oxidizing tank and close to the surface of the bath, the tin being maintained at the oxidizing temperature. A delivery pipe is also provided in order that the tin may be maintained at the same level within the tank.

The above means can be operated mechanically or pneumatically. They can be constructed in a number of different ways, some of which are shown by way of example in the appended drawings.

In the drawings:

Figure 1 is a vertical section through an oven provided with mechanical means for removing tin oxide.

Figure 2 is a section along line A—B in Figure 1.

Figure 3 is a section along line C—D of Figure 2.

Figure 4 is similar to Figure 3, and shows a vertical section through a modification of the inventive idea.

Figure 5 is a section through the device shown in Figure 4.

Figure 6 is a vertical section through a device provided with pneumatic means for removing tin oxide.

Figure 7 is a vertical section through a device provided with electrical heating means and pneumatic means for removing tin oxide.

Figure 8 is a vertical section through a different device provided with mechanical means for removing tin oxide.

Figure 9 is a vertical section through a ring-shaped oven.

Figure 10 is a horizontal section along the line E—F of Figure 9.

The device shown in Figures 1, 2 and 3 of the drawings comprises a fire-proof oxidizing tank 2, which hangs in a cylindrical oven. The tin situated in this tank is heated to the temperature of oxidation by means of a gas burner 3, which at the same time is used to remove the oxidizing air. The gas is supplied to the gas burner 3 through an annular pipe 4. A storage tank 5 is provided outside of the oven and comprises a double jacket, the space 6 of which is heated by means of a gas burner 7. A pipe 8 is used for connecting the tank 5 with the tank 2. A valve or cock 9 is provided in the pipe 8, and is adjusted in such a way, that the amount of tin flowing into the tank corresponds to the amount of tin consumed within the tank. An electrical contact 10 is provided within the tank for the purpose of automatically adjusting the member 9. The contact 10 is operable to close the member 9 when the surface of the tin is rising and to open it when the surface is lowered. Scoopers or strippers 11 are situated above the surface of the tin within the tank and are connected with the shaft 12, which is slowly rotated by the shaft 13 through the medium of a conical gear 14. The strippers 11 are arranged on the shaft in such a way that the tin oxide formed on the surface of the tin is scooped toward the border of the tank. At one or several points 15, the border of the tank is low and flat. At these points the tin oxide will be scooped by the strippers over the inclined border of the tank, so that it falls downward and flows through the channel 16 into the collecting tank 17 situated in the bottom portion of the oven. It is also possible to provide at 15 pneumatic means for removing tin oxide by suction. Such means are indicated diagrammatically by reference character 18.

The device shown in Figures 4 and 5 comprises a tank 2, the open part 20 of which has been separated therefrom by means of intermediate walls 19. The strippers 11 shown in Figures 4 and 5

consist of an upper portion 21, which is attached to the shaft, and a lower portion 22, which is elastically connected with the portion 21. As soon as the strippers 11 begin to rotate, their lower portion 22 moves over the tin surface and comes in contact with the tin oxide. As soon as the strippers reach the intermediate walls 19, they push the tin oxide along the incline over the edge of the wall, so that it drops through the opening 20 into the collecting tank 17. Due to the fact that the members 21 and 22 are interconnected by elastic means, the strippers can easily pass over the intermediate walls 19.

In the modification shown in Figure 6 of the drawings, the strippers 11 are hollow and at the bottom are provided with suction holes 23. The tin oxide is removed by suction through the strippers and their shaft.

The device shown in Figure 7 of the drawings comprises no movable parts. Electrical heating coils 24 are used for heating the tin contained in the tank 2. Compressed air is injected into the hermetically closed oven through the pipe 25. A part of the injected air is consumed by oxidation and another part of it is removed and serves as a carrier for the rising tin oxide. Compressed air carrying the tin oxide is led through suitable pipes 26, which are connected with a common pipe 27 leading to the collecting tank 17, where the tin oxide is separated from the air. By regulating the amount of removed air, it is possible to obtain a higher pressure in the oven, which will favor the oxidation.

The oven shown in Figure 8 is rectangular in cross-section. The tin oxide is scooped from the surface by means of an endless band 28, which carries the strippers and which passes over the shafts 29, one of which is driven by means situated outside of the oven. The annular oven 30, shown in Figures 9 and 10, comprises an annular oxidizing tank 31, which is subdivided into several compartments by radial transverse walls 32. The tank is provided with rollers 33 and is movable along a circular rail 34, which is provided in the bottom of the oven. The tank is driven by a shaft 38, by means of a gear 35 and a pinion 36 over a conical gear 37. The direction of rotation of the tank is shown by the arrow 39 in the drawings. The oven is divided into three zones, namely the heating zone 40, in which the tin bath is heated to a high temperature by gas burners 41, the supplementary oxidizing zone 42, in which the tin bath is not heated any more, and the zone 43, where tin oxide is removed from the surface of the tin bath. The tin oxide is scooped by means of an endless band 44 provided with strippers and led over the shafts 45, one of which is driven by a motor not shown in the drawings. The shafts 45 are situated over blocks 36 at the cover of the oven. The scooping band pours the oxide scooped from the surface over the exterior border of the tank. The oxide passes through the channel 46 and drops into the collecting tank 47. At this point a flap-door 48 is provided in the masoned wall of the oven, so that the tank 47 may be removed through this door. The ribs subdividing the tanks are constructed in such a way that they will not interfere with the strippers. The upper layer of the tin bath is thus uninterrupted. These intermediate walls may be made higher, but in that case the scooping device must be movable in a vertical direction to enable it to be raised when passing over the ribs and to move downward again after it has passed over the ribs.

I claim:

1. An oven for producing tin oxide, comprising an oxidizing tank, means for supplying tin to said tank, means for heating the tin to an oxidizing temperature and for supplying air to the tin, means for maintaining the tin within said tank at a constant level, and means for removing the oxide formed on the surface of said tank.

2. An oven for producing tin oxide, comprising an oxidizing tank, a delivery pipe connected with said tank, a valve within said pipe, means for heating the tin within said tank to an oxidizing temperature and for supplying air to the tin, an electrical contact connected with said pipe and actuating said valve, and means for removing the oxide formed on the surface of said tank, the last-mentioned means comprising a stripping member movable with respect to the tin surface and coming in contact with said surface.

3. An oven for producing tin oxide, comprising an oxidizing tank, means for supplying tin to said tank, means for heating the tin to an oxidizing temperature and for supplying air to the tin, a container for the tin oxide, a shaft, a member rigidly connected with said shaft, and a second member elastically connected with the first-mentioned member, said members leading the tin oxide formed within said tank to said container.

4. An oven for producing tin oxide, comprising an oxidizing tank, means for supplying tin to said tank, means for heating the tin to an oxidizing temperature and for supplying air to the tin, a container for the tin oxide, an endless band, means for moving said band, a stripper connected with said band and coming in contact with the tin for leading the tin oxide formed within said tank to said container.

5. An oven for producing tin oxide, comprising an oxidizing tank, means for supplying tin to said tank, means for heating the tin to an oxidizing temperature and for supplying air to the tin, means for removing the oxide formed on the surface of said tank, the last-mentioned means comprising a stripping member movable with respect to the tin surface and coming in contact with said surface, and means for moving said tank.

6. An oven for producing tin oxide, comprising an annular oxidizing tank, a plurality of walls within said tank, means for supplying tin to said tank, means for heating the tin to an oxidizing temperature and for supplying air to the tin, means for removing the oxide formed on the surface of said tank, the last-mentioned means comprising a stripping member movable with respect to the tin surface and coming in contact with said surface and means for moving said tank.

7. An oven for producing tin oxide, comprising an oxidizing tank, means supplying tin to said tank, means for heating the tin to an oxidizing temperature and for supplying air to the tin, and means for removing the oxide formed on the surface of said tank, the last-mentioned means comprising a stripping member movable with respect to the tin surface and coming in contact with said surface, said stripping member displacing the tin oxide formed on said surface in a direction toward an opening formed in the tank above the tin surface.

ERNST FELDMANN.