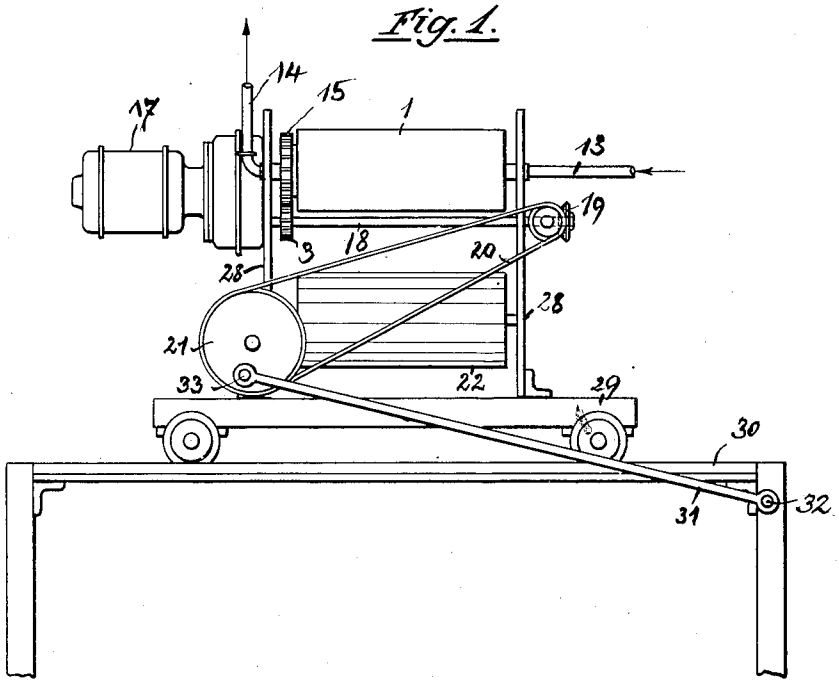
Aug. 16, 1938. W. HEIMBERGER 2,127,116

MANUFACTURE OF ENAMEL

Filed Oct. 4, 1935

Fig. 1.



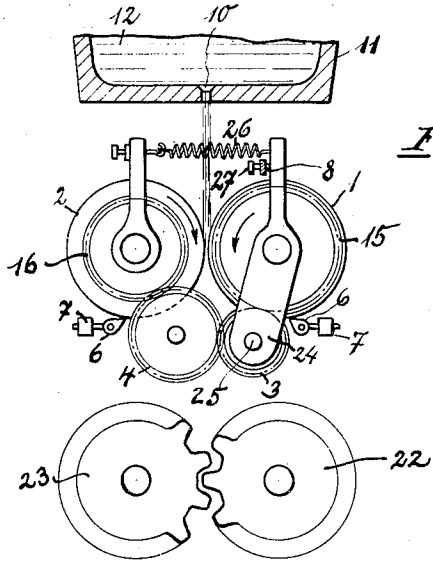


Fig. 2.

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Patented Aug. 16, 1938 2,127,116

UNITED STATES PATENT OFFICE

2,127,116

MANUFACTURE OF ENAMEL

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Application October 4, 1935, Serial No. 43,478
In Germany October 10, 1934

3 Claims. (Cl. 83—91)

My invention relates to the manufacture of enamel and more especially to the treatment of fused enamel, whereby the fused mass is rapidly cooled and at the same time disintegrated in a particularly favorable and efficient manner.

The invention includes apparatus adapted for use in the carrying out of such treatment.

As is well known to those skilled in the art, the cooling of the fused enamel has hitherto been carried out as a rule by slowly introducing the hot fluid enamel into water, whereby the enamel is rapidly cooled and broken up into small fragments. In view of its simplicity this method has found extended use although tests have shown that enamel, which is not so granulated, possesses more favorable physical and chemical properties.

It has also been tried to reduce the fused enamel to thin threads by extruding it from the melting oven by means of compressed air. This process, however, involves the drawback that the cooled threads of enamel have a great volume and require large rooms for storage.

I have succeeded in cooling fused enamel without bringing it in direct contact with water and without the cooled product taking up more room than the fragments or granules obtained when proceeding according to the old wet method. My invention further involves the advantage, as compared with the granulated enamel, of requiring only very little cooling water. Moreover the costs of subsequently grinding the enamel are lower than those required when grinding the granules obtained according to the wet method, while any drying of the cooled enamel can be dispensed with altogether.

According to the present invention the thin jet of liquid enamel emerging from the melting oven is caught between two cooled rolls, which cause the enamel to be rolled out to form a thin ribbon. In passing through between the rolls the enamel transfers onto the rolls and the cooling water only the comparatively small quantity of heat energy required to render the rolled-out enamel semi-solid and to prevent it from caking together. The enamel after having been precooled in contact with the rolls collects in the storage tank in the form of thin ribbons or plates in order to slowly give off the heat still accumulated therein. In view of the large quantity of precooled enamel the access of air to the interior of the heap of material is greatly hindered.

I prefer carrying out this cooling process with the aid of a device such as illustrated diagrammatically by way of example in the drawing affixed to this specification and forming part thereof. In the drawing

Fig. 1 is a side elevation, while

Fig. 2 is a diagrammatic front elevation of the rolls and driving gear with the melting pot containing the fused enamel shown in vertical section, cylindrical breakers being arranged below the rolls.

Referring to the drawing, 1 and 2 is the pair of rolls mounted in close parallel juxtaposition below the tap 10 of the melting pot 11 containing the body 12 of fused enamel. The rolls 1 and 2 are hollow, and cooling water is passed through them with the aid of supply and exhaust pipes 13 and 14, respectively. Annular gears 15, 16 are mounted on the rolls 1 and 2, respectively, a driving gear 3 meshing with the annular gear 15 of roll 1 and with an intermediate gear 4 meshing with the annular gear 16 of roll 2. The driving gear 3 is driven by an electromotor 17. Power is transmitted through spindle 18 and bevel gear 19 and belt 20 and sheave 21 to a pair of breakers 22, 23 arranged below the rolls. The roll 1 is supported in a bearing 24 mounted for rocking motion on the hub 25 of the driving wheel 3 and is pulled towards roll 2 by a spring 26, a set screw 27 acting as a check to nicely adjust the width of the gap between the two rolls.

The rolls, breakers and driving gear are mounted on standards 28 supported by a carriage 29 which can be displaced in the axial direction on a track 30 extending below the melting pot or oven.

In the modification here illustrated the gear wheel 4 is larger than the driving wheel 3, and the rolls 1 and 2 therefore revolve at different speeds.

The spring 26 might as well be replaced by an eccentrically located weight.

The cooling water is preferably passed through the hollow shafts of the rolls.

In order to prevent the rolled-out enamel from sticking to the rolls, scrapers 6 may be provided, which are pressed against the roll surfaces by counter-weights 7.

Obviously the toothed wheel gearing may be replaced by any other driving and connecting means.

By driving the rolls at different speeds, as illustrated in the drawing, I provide that the ribbons or plates of enamel, besides being rolled, are also torn, whereby they are formed with transversely extending sections, which are thinner than corresponds to the distance between the rolls, and these thinner sections are apt to cool

down more quickly than the thicker ones, so that they have already lost their plasticity when passing through between the breakers arranged below the rolls.

The rocking arrangement of roll 1 shown in the drawing is provided for in view of the possibility that part of the enamel flowing from the melting pot might cool down on its way from the tap to the rolls to extent of getting hard and requiring considerable force to be rolled out to a thin ribbon or disk. In such a case the roll 1 may yield and allow such a piece to pass through, and this might become necessary also in the case where part of the oven lining has passed through the tap hole together with the enamel.

In order to enable larger quantities of enamel to be cooled or quenched by means of this device, I provide for a reciprocatory movement of the device as a whole below the tap hole in axial direction, in order to distribute the enamel over a larger section of the rolls and to roll it out to a wider ribbon than would be formed, if the jet of enamel always met the same point of the rolls. This reciprocatory movement may be brought about by a rod 31 pivoted to the supporting structure at 32 and to the sheave 21 at 33. Obviously on rotation of the sheave, since the rod 31 cannot be stretched, the carriage 29, on which the device is mounted, will be forced to travel to and fro on the track 30.

This reciprocatory movement of the device acts towards increasing the cooling capacity of the device to such an extent that even the quantity of enamel fused in a large oven can be cooled in a comparatively short time. If a plurality of tap holes is provided in a large furnace, a separate device should be mounted below each hole, or the length of the rolls should be so dimensioned that a plurality of tap holes can discharge fused enamel into a single pair of rolls.

The breakers 22, 23 mounted below the rolls serve to further cool and simultaneously break the thin bands or ribbons. The small fragments thus formed take up less room for storage than the bands as a whole.

With the aid of the device above described the enamel issuing from the smelting oven can be cooled down quickly to near the transformation point. On the other hand a cooling beyond this point, at which the enamel undergoes a shrinkage, will take place slowly and at the small laminae of enamel are not subjected to the internal stresses, which they would be subjected to when rapidly cooled beyond the transformation point. Possibly the improved physical properties of the enamel cooled down in accordance with the present invention may be caused by the circumstance that the cooling velocity after passing the transformation point is reduced thereby.

Various changes may be made in the details disclosed in the foregoing specification without departing from the invention or sacrificing the advantages thereof.

I claim:—

1. The method of dry-cooling fused enamel comprising rolling-out the hot fused enamel between artificially cooled surfaces rotating at different speeds.

2. The method of dry-cooling fused enamel which comprises rolling-out the hot fused enamel between artificially cooled rotating surfaces, which rotate at different speeds, and collecting the rolled-out enamel in the form of a heap which is caused to slowly give off the heat accumulated therein.

3. The method of dry-cooling fused enamel which comprises rolling-out the hot fused enamel into thin ribbons between artificially cooled surfaces, which rotate at different speeds, and breaking down the thin ribbons thus obtained.

WALTER HEIMBERGER.