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H. W. WINKLER
FLAME STERILIZATION

2,963,389

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2 Sheets-Sheet 1

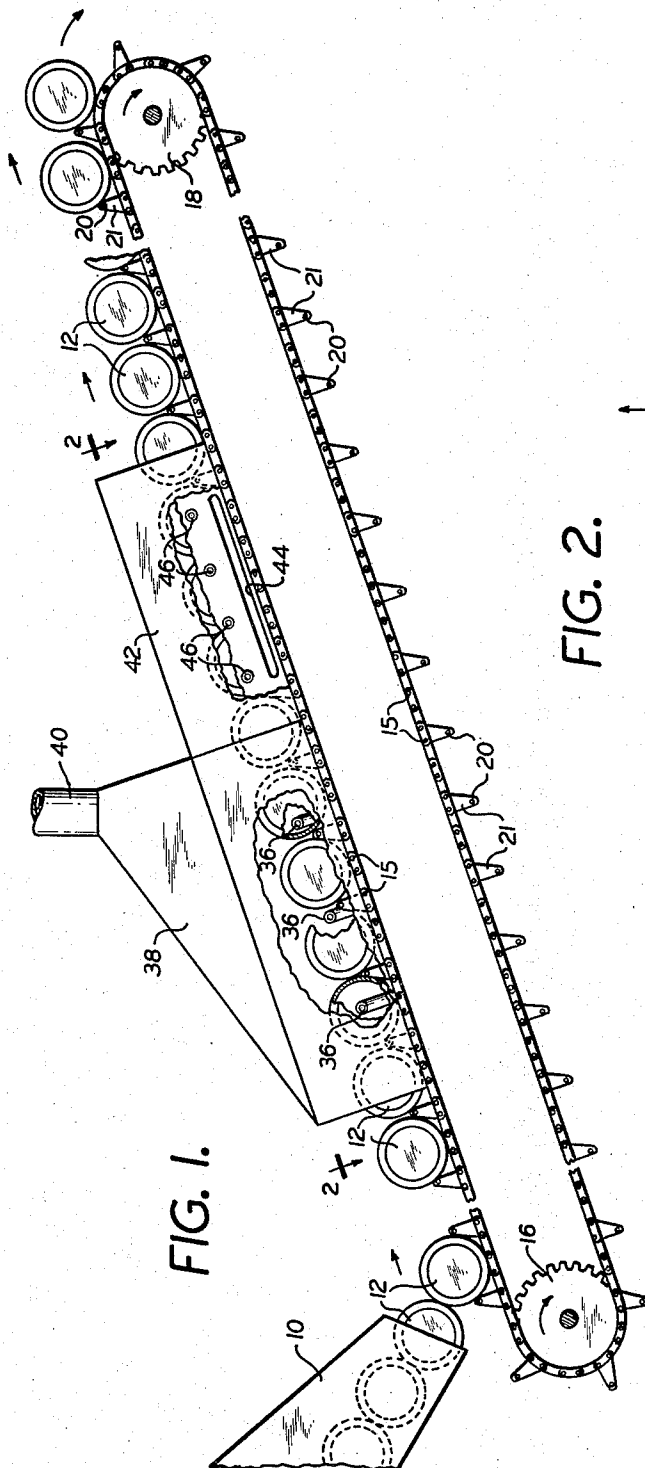
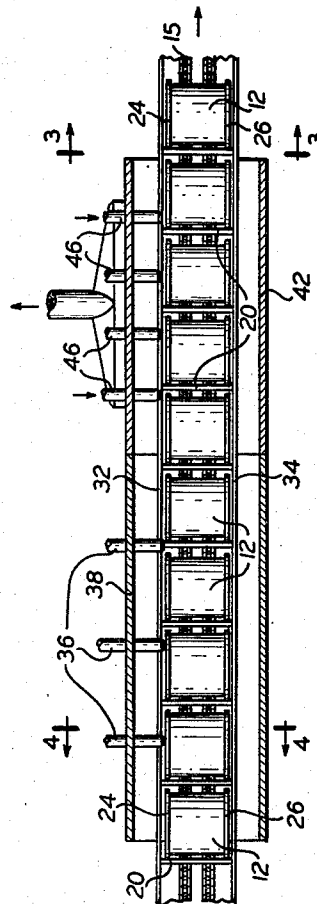


FIG. 2.



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2 Sheets-Sheet 2

FIG. 3.

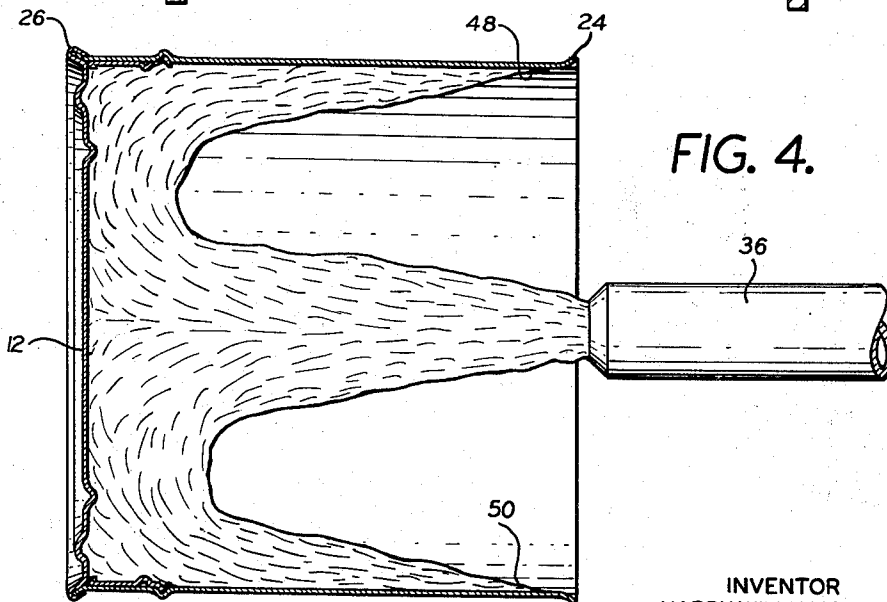
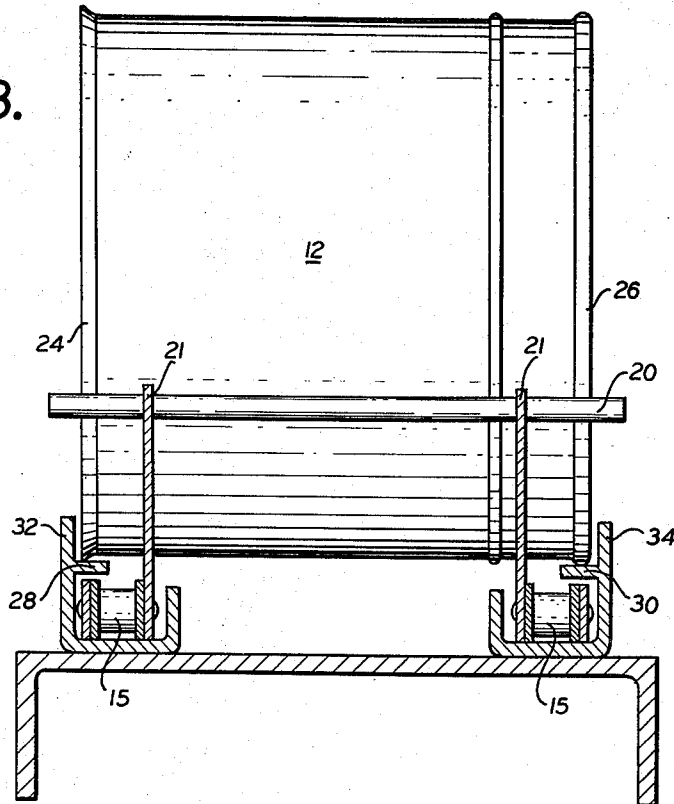


FIG. 4.

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1

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FLAME STERILIZATION

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This invention relates to a process for sterilizing and cleaning cans. The invention is particularly useful in preparing cans to receive a dry powdered material that must be sterile as packed and that is susceptible to deterioration in contact with water.

Complete and quick sterilization and removal of contaminating foreign material that may occasionally be adhered to the inside of a can is difficult with either air or live steam. In the case of the latter there is also the difficulty of drying so thoroughly as to ensure the absence of occasional retained drops of water from condensed steam.

When it has been attempted to substitute direct flame for hot air or steam sterilization, there has arisen the complication of overheating of any heat destructible material on a surface of the can, such as the lithographing that is commonly applied to the outside of cans for many uses. A further difficulty is the softening of such organic lithographing material so that it is marred by contact with a conveyor or other firm surface during the heating operation.

The present invention provides a process in which direct flame is used without adverse effect upon such lithographing material or the like.

Briefly stated the invention comprises the herein described process. The invention comprises, more specifically, the process of (1) passing a can with open end in proximity to and registration with a flame of such length that the flame extends completely to the bottom of the can and reverberates therefrom along the side wall of the can and (2) subjecting the thus heated can at once to a cooling operation. In the commercial embodiment, the invention includes rotating the cans at the time of contact with the flame so that improved distribution of the heat over the entire inner surface of the can is obtained and any carbonizable contaminating material present falls from the wall. In this embodiment also, the cooling is effected by a blast of cold air delivered into the rotating can.

To protect the heat softenable lithographing during the time when it is at an elevated temperature, the invention comprises means for supporting the can entirely on unlithographed portions of the exterior surface such as upstanding bead and open end flange at the two ends of the can, so that the lithographed can wall between these two ends is never in contact with any part of the conveyor but is in contact only with the air or other aeriform medium during the period when the can is subjected to the flaming operation.

The invention will be further illustrated by description in connection with the attached drawings.

Fig. 1 is a side elevational view partly broken away for clearness of illustration of the machine for conducting the sterilizing and cleaning operation.

Fig. 2 is a sectional view on line 2—2 of Fig. 1.

Fig. 3 is a sectional view on line 3—3 of Fig. 2.

Fig. 4 is a sectional view on line 4—4 of Fig. 2, all sectional views being in the direction of the arrows.

2

A chute 10 delivers a supply of cans 12 to the chain conveyor of usual kind, with the adjacent links jointed by pins 15. The chain is driven by the sprockets 16 and 18 at the two ends of the conveyor.

5 Rods 20 extend across the conveyor at distances apart to receive a can between two adjacent rods. They are supported by members 21 at a fixed level above the upper reach of the conveyor and near or somewhat below the middle of the horizontally lying cans, the said members being secured at their base to the chain by any conventional means such as rivets or bolts (not shown).

10 The conveyor, with the rods acting as pushers in contact only with the end beads or flanges 24 and 26 of the cans, move the cans to the right and uphill in the machine illustrated in Fig. 1 and thus cause rolling of the horizontally lying cans and their rotation. Also these end beads or ridges of the cans (Figs. 2 and 3) ride upon the rails 28 and 30 (Fig. 3) provided with upstanding flanges 32 and 34, respectively, which prevent the cans from slipping sidewise and bringing the beads or flanges out of registration with the upper surface of the rails.

20 Burners 36 for flaming gas or other elongated flames are mounted in the machine by means not shown and extend upward above the upper reach of the conveyor to a distance approximately equal to half the diameter of the cans so that, as the cans move by on the conveyor, the open ends of the cans move in close proximity and in registration with the outlets of the burners from which issue the flame or flames to be used in processing the cans. Hood 38 with stack 40 mantles the flaming area so that gases of combustion eventually pass upward through the said stack.

30 Immediately following the flaming chamber is another area, suitably with hood 42 with down draft created through slot 44 by suction means (not shown). Into this area extend outlet means 46 for delivering a blast or blasts of cold air in registration with the open ends of the cans and spaced therefrom by only such distance as to insure proper clearance at all times between the cans and the outlets as the cans move thereby.

40 The operation of the process and machine will be largely evident from the description that has been given.

45 The flames that are projected from the burners 36 are smaller at their base than the diameter of the open end of the cans and of such length as to extend completely from the open open end of the cans to the bottom or end thereof and to reverberate therefrom, back along the side walls as illustrated at positions 48 and 50 of Fig. 4. During this heating, the cans are in contact with no solid material except as the enlarged or ridged ends 24 and 26 of the cans ride upon the rails and rest against the pusher rods 20.

50 The time of contact of the cans with the flame is made short as, for instance, not more than 12 seconds and in ordinary commercial operations about 4—8 seconds. The rotation of the cans during the flaming operation and the length of the reverberating flame or flames increases the certainty of contact of all of the interior surface of the can with the flame during even this short period of time of the can in the flaming zone. Also the rotation during the air blasting operation under the hood 42 causes material that has been carbonized by the flame, such as organic contaminant that may have been adhered in the first place as foreign matter to the interior of the can, to fall through the air blast from the inlets 46 and be removed by the air, it being noted that the reverberating flames themselves remove some of the material loosened from the interior by the carbonizing action of the flame.

70 The flamed and then cooled cans are delivered, from the conveyor at the right end thereof (Fig. 1), to conventional can collecting equipment (not shown). The

cans so delivered are not only thoroughly sterilized but also freed from any moisture and most at least of the carbonizable foreign matter. They are suitable for use directly in being filled with powdered infant food, chocolate beverage powder or other material requiring the use of sterilized, clean, and dry containers. The lithographing remains in good condition.

Parts of the machine not illustrated and steps of the process not described are conventional.

The materials of construction are those that are usual in like parts in processes and apparatus of the present type. Thus the cans are made of any usual metal, tin plate, stainless steel, steel, or the like. The cans may be and suitably are provided on the inside with the usual high-temperature-resistant protecting lacquer, the lacquers being any kind that are commercial and adequate to withstand sterilization at the highest steam pressures ordinarily employed.

The heat destructible exterior coating of a can may be any one of the high temperature enamels employed in lithographing cans as a replacement for labels thereon. While the enamels are no part of the present invention, suitable enamels, are those commonly referred to as baking enamels. Thus the film forming material of the enamel may be an alkyd resin or an acryloid resin applied as a solution of the said resin in a volatile solvent therefor such as toluene, xylene, butyl acetate or the like, either alone or mixed. Pigmentary or other coloring material of any usual kind for such enamels is introduced, as for example titanium dioxide, carbon black, ultramarine blue or other pigment of the color desired. Printing on such an enamel base coat may be made with the same type of enamel but with a variation of the pigmentary material to give the contrast desired between the printed characters and the background.

The invention will be further illustrated by description in connection with the following specific examples of the practice of it.

Example 1

The cans to be sterilized and cleaned are made of tin plate with the tin exposed as a bright interior surface. The cans are lithographed over the exterior surface, the lithographing being heat destructible and heat softenable and not extending over the beads 24 and 26 that reach around the two ends of the cans.

The enamel is a pigmented alkyd resin heat-resisting enamel of the type disclosed above, the alkyd being a baking glycerine phthalate polyester. The cans are moved at a speed of four inches per second in the direction of the arrows pointing to the right and upwardly in Fig. 1. With cans of approximately 4.3 inches diameter four cans are wholly within the flame chamber under hood 38 at one time and there are three burners spaced approximately 6 inches apart within this chamber, with the gas outlets therefrom located about 2 inches above the upper surface of the rails on which the beads and flanges on the cans rest.

The speed of the conveyor 14 is made such that the cans pass through the flaming zone in the course of 4-6 seconds.

Then the cans go directly to the cooling chamber 42 in which blasts of air are introduced through the inlets 46 suitably at elevations just above the center of the open ends of the cans, and ash or carbon combustion residues are removed by suction slot 44. The cans re-

main in the cooling zone for a total period of 10-30 seconds and in this example for 20 seconds' total time. The cooling, after the 4-6 seconds stated, is in the open air on the conveyor to the right of chamber 42 in Fig. 1.

The gas delivered through burners 36 is to advantage natural, water, or coal gas at a pressure of 4-10 inches of water and ordinarily 5-6 inches. Atmospheric air is drawn into the burners through usual openings (not shown) or compressed air can be used when hotter flames is requested. Air is delivered through the inlets 46 in the zone at a positive pressure of which 10 p.s.i. gauge is an example.

With the machine and process described, all parts of the cans are heated to such temperature as to destroy bacteria or fungi therein and also to carbonize any carbonizable organic matter that may occur as dirt on the inside of the cans at the beginning of the sterilization and cleaning. Such carbonized matter, during the rotation of the cans and under the blast of the burners initially and of the cooling air subsequently, is blasted in large part at least from the cans so that they issue at the right end of Fig. 1 in sterile and cleaned condition.

This Example 1 is modified by changing the number of burners 36 to something less than or more than three but never less than one.

In a further modification of this example, the enamel or lacquer inside the can is omitted and the cans are used in bright condition with tin exposed inside the tin plate constituting the chief structural material of the can.

It will be understood that it is intended to cover all changes and modifications of the example of the invention herein chosen for the purpose of illustration which do not constitute departures from the spirit and scope of the invention.

I claim:

1. In sterilizing and cleaning an open end can including a heat softenable surface and removing any heat carbonizable contaminating material within the can, the process which comprises moving the can in close proximity to and in registration at its open end with a flame for a period of time not exceeding about 12 seconds and not less than the time required for the flame to sterilize the interior surface of the can and carbonize the said material, the flame being of width at the base thereof less than the diameter of said open end and of length greater than the depth of the can so that the flame extends through the open end to the bottom of the can and reverberates along the side walls towards the open end of the can, moving the can away from the flame, then at once introducing a blast of cooling air into the can so as to cool the heated can and blow therefrom any carbonized material, and rotating the said can during the entire period of registration thereof with the flame and during introduction of the blast of air.

2. The process of claim 1, the said moving and rotating being effected by rolling the can in a generally horizontal position.

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