Feb. 6, 1945. D. D. PEEBLES 2,368,945

PROCESS FOR THE MANUFACTURE OF PRESERVED FOOD PRODUCTS

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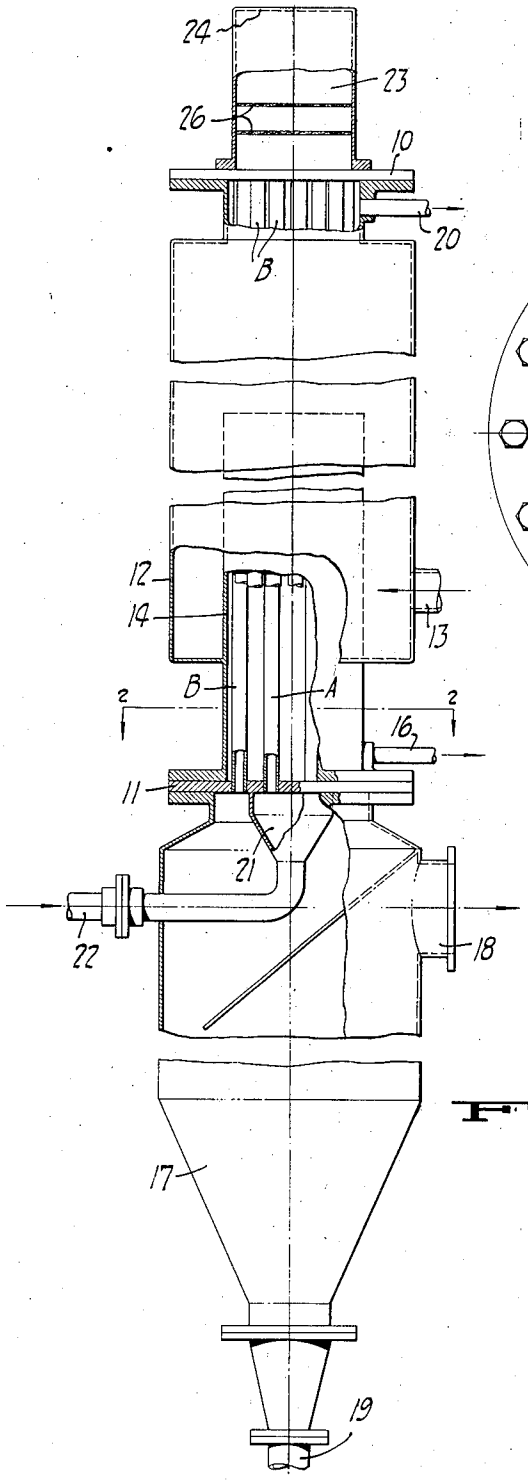


FIG_1_

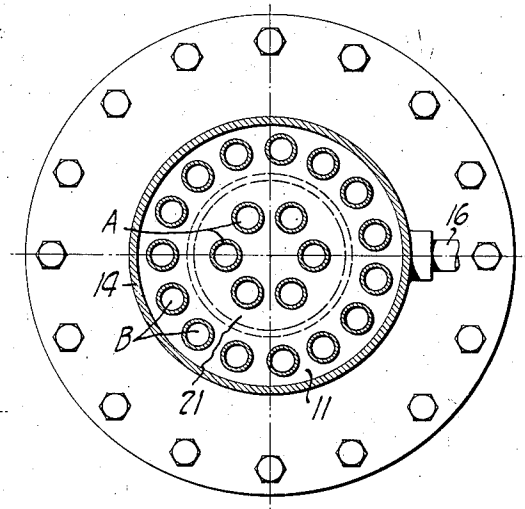


FIG_2_

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PROCESS FOR THE MANUFACTURE OF PRESERVED FOOD PRODUCTS

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Application July 31, 1940, Serial No. 348,979

4 Claims. (Cl. 99—205)

This invention relates generally to processes for the manufacture of food products, particularly products of paste-like form. More specifically, the process is applicable to the processing and canning of tomato paste.

In the preparation of tomato paste, it has been common practice to either concentrate the pulp by open kettle evaporation, or by vacuum evaporation. Evaporation in open kettles gives the paste a desirable body, but impairs color and like heat sensitive properties. By desirable body, I have reference to the ability of a final product containing at least 25% solids to stand up when poured out on a flat surface, and to have a grainy surface texture. Vacuum evaporation is capable of producing a paste without serious color impairment, but will not produce a product having the desired body. Because of serious color impairment with open kettle evaporation, it has been common practice to introduce artificial coloring materials in order to simulate a natural fresh color.

I have found that the natural fresh color of tomato paste or like material, and other desirable heat sensitive properties, can be retained by proper treatment of the material prior to introducing the paste into cans, and at the same time the desired body can also be imparted to the product. It is consequently an object of the present invention to provide such an improved process, applicable particularly to tomato paste, but which can also be used on related products involving somewhat the same problems.

In carrying out the present process, I first form a suitable pulp of the material which is to be preserved, as for example tomatoes. Thus the tomatoes can be crushed or passed through a suitable pulping machine, and the skins and seeds removed by suitable separating equipment. The tomato pulp is then subjected to an evaporating operation which may be carried out in a number of stages, but which proceeds substantially continuously at a rapid rate without substantial rest or storage of the hot material. The type of evaporating equipment which is best suited for this purpose is one in which the material passes at high velocities through relatively long evaporating tubes.

I have found it particularly desirable to carry out the last stage of evaporation by use of equipment such as illustrated in the accompanying drawing. To briefly describe this equipment, it consists of two groups of evaporating tubes A and B. The upper ends of these tubes are attached to a tube sheet 10, and the lower ends to the tube sheet 11. Surrounding the evaporator tubes A and B there is a heater jacket 12 into which steam can be introduced through the pipe connection 13.

Extending upwardly within the steam jacket 12, there is a conduit or shroud 14, which surrounds the two groups of evaporating tubes. Steam introduced through pipe 13 flows upwardly between the conduit 14 and the outer walls of the jacket 12, before contacting the evaporating tubes, after which the steam flows downwardly about the evaporating tubes to a point near the lower end of these tubes, where condensate is drained away through pipe 16. Below the tube sheet 11 there is a separating chamber 17, which serves to receive material discharged from the lower ends of the evaporating tubes B, and which serves the purpose of separating liquid from vapor. Pipe 18 is a vapor outlet from chamber 17, and a pipe 19 at the lower end of chamber 17 is for the purpose of draining away concentrate. Chamber 21 is secured to the lower side of tube sheet 11, and communicates with the inner group of evaporating pipes A. The liquid to be concentrated is introduced into chamber 21 through pipe 22. Pipe 20 serves to carry away non-condensable gases from the upper part of the heating jacket.

Above the tube sheet 10 and communicating with the upper ends of all of the evaporating tubes, there is a distributing chamber 23. The purpose of this chamber is to transfer and distribute material discharged from the upflow evaporating tubes A to the downflow tubes B. Note that this chamber 23 is of substantial height whereby the top wall 24 is considerably elevated above the upper ends of the evaporating tubes. The purpose of this arrangement is to prevent plastering of the top wall 24, with the material discharged from tubes A, since it has been found that such plastering (which results from the use of a relatively short chamber 23) prevents proper operation of the evaporator, particularly in that it makes for uneven distribution of the liquid material into the downflow tubes B.

In conjunction with chamber 23, I have shown spaced diffusion screens 26. These diffusion screens extend across the lower portion of the chamber 23, and are in the path of material discharged from the upper ends of the tubes A. They can be made of relatively coarse mesh wire, such as a woven wire screen of one-quarter inch mesh. These screens act in effect as a brake against upward velocity of material, and in addition they aid in securing uniform distri-

bution of small droplets of liquid to the tubes B.

As will be evident from the foregoing description, the evaporating cycle of the equipment described involves an upflow through the tubes A, followed immediately by downflow through the tubes B. In the separator 17 the concentrate separates from vapor and is immediately withdrawn through pipe 19. There are in this instance about twice as many downflow tubes B as upflow tubes, because of the larger volume of vapor passing through tubes B.

In operating the above evaporator the mixed vapor-liquid phase material attains relatively high velocities in the evaporating tubes. As the mixed phase material discharges from the upper ends of the tubes A, it is impacted upon the screens 26, and immediately thereafter is discharged downwardly through the tubes B. There is no plastering of the walls of chamber 23 with concentrate, and there is a relatively even distribution in the downflow tubes B, with the liquid phase material being introduced into these tubes in the form of droplets or atomized particles. There is a continuous increase in concentration as the material passes through the evaporator, and concentrate is not intermingled with more dilute material.

The evaporating tubes are relatively long in order to secure high velocities and in order to make possible a relatively high degree of concentration by one pass of the material through the equipment. For example, in one installation where the evaporating tubes are 1¼ inches inside diameter, they are 20 feet in length. The chamber 23 can vary in height from say 12 to 36 inches. Greater height can be used if desired. When using the evaporator for the concentration of tomato paste, it is operated at atmospheric pressure, that is, with the pressure in separator 17 at substantially atmospheric. Steam at suitable pressure is supplied to jacket 12, as for example about 30 pounds per square inch. Immediately before being introduced through pipe 22 the paste is preheated to a suitable temperature such as about 180° F.

To continue with the description of my process, the tomato paste can be passed twice through evaporating equipment of the type described, whereby assuming that the paste originally contains around 6.5% solids, it is concentrated to, from say about 15 to 20% solids in the first pass. In the second pass it can be concentrated to from 30 to 65% solids. It is particularly desirable that equipment of the type illustrated, involving high velocity flow through long evaporating tubes, be used for the final stage of concentration. The first stage up to say about 15% solids can be carried out in conventional vacuum evaporating equipment. Between evaporating stages care is taken to avoid storage at high temperature for a sufficient length of time to deteriorate color. The entire evaporating procedure is preferably maintained substantially continuous until the desired concentrate is obtained.

The paste-like concentrate, as it is removed from the separator 17, is at a temperature depending upon pressures maintained within the evaporator. With operation at atmospheric pressures, the temperature will vary from 190° F. to 220° F., depending upon the barometric pressure existing at the plant location. In a typical instance the temperature has been 215° F., and in most instances it will range from 210° F. to 220° F. Assuming that the temperature is in excess of about 195° F., the paste is immediately passed through a suitable cooling appliance. The cooler is directly connected with the separator 17 so that the paste is not contacted by air and its sterility is preserved. It serves to rapidly reduce the temperature of the paste to a value which is still capable of sterilizing, but at which color is not impaired at a rapid rate, as for example 190° F. to 195° F. While at this temperature, it is introduced into cans by means of suitable canning machinery, and immediately after the cans are sealed they are tipped over to insure proper sterilization of the head spaces in the cans. By using sterilized cans and by preventing introduction of micro-organisms while the cans are being filled and sealed, the paste can be cooled to lower temperatures than those specified, such as 100° F., thus avoiding an extended cooling period after the cans are filled and sealed.

In the foregoing reference has been made to withdrawal of the paste from separator 17 at temperatures ranging from 190° F. to 220° F. Such temperatures are definitely sterilizing to material like tomato paste. In fact, it is generally considered that temperatures above 185° F. are sterilizing temperatures for tomato paste, although 190° F. or higher is considered to be safer. Thus it may be said that my process carries out the final evaporating step whereby the paste is withdrawn at a sterilizing temperature.

It has been found that if the cans after being sealed are not immediately tipped over, the small space between the lid and the upper surface of the paste may not be properly sterilized, and therefore spoilage may occur, even though the paste may be at a temperature of 190° F. when it is introduced into the cans. When the cans are immediately tipped over after being filled and sealed, the lid of the can is immediately contacted with the hot paste, and complete sterilization of the interior of the can takes place without resorting to additional heat treatment.

Tomato paste canned according to my process retains its fresh color and flavor, due to the fact that the treatment prior to introducing the material into the cans occurs at a rapid continuous rate with proper regard to time and temperature factors, such as cause color and flavor impairment. In addition the paste has a good body in that it will stand up when poured upon a flat surface, and in that the surface has a grainy texture. The desirable body is attributed to a conditioning of certain gel forming ingredients of the paste, such as pectin. During treatment in the evaporator as described, the material is simultaneously concentrated and subjected to sterilizing temperatures over a short interval of time.

This application is a continuation in part of my copending application Serial No. 223,682, filed August 8, 1938.

I claim:

1. The process of preparing a concentrated and sterilized tomato paste from tomato pulp containing solids and water without substantially impairing the color and body of the resulting paste, which comprises passing the tomato pulp in a plurality of elongated flowing streams through a heating zone, maintaining substantially atmospheric pressure in said zone so as to enable a sterilizing temperature for said

paste to be produced in said zone during formation of water vapor, supplying sufficient heat through the walls of said zone to maintain said temperature and cause formation of water vapor in said zone to produce said concentrated paste, maintaining a high velocity of flow of said streams in said zone to produce a mixed vapor-liquid phase material in said zone, discharging the resulting mixture of concentrated paste and vapor from said zone and separating the sterilized concentrated paste from said vapor.

2. The process of preparing a concentrated and sterilized tomato paste from tomato pulp containing solids and water without substantially impairing the color and body of the resulting paste, which comprises, passing the tomato pulp in a plurality of elongated flowing streams through a heating zone, maintaining a temperature between 190 and 220° F. in said zone during formation of water vapor, supplying sufficient heat through the walls of said zone to maintain said temperature and cause formation of water vapor in said zone to produce said concentrated paste, maintaining a high velocity of flow of said streams in said zone to produce a mixed vapor-liquid phase material in said zone, discharging the resulting mixture of concentrated paste and vapor from said zone, separating the sterilized concentrated paste from said vapor.

3. The process of preparing a concentrated and sterilized tomato paste from tomato pulp containing solids and water without substantially impairing the color and body of the resulting paste, which comprises, preheating the tomato pulp to a temperature of approximately 180° F., passing the preheated tomato pulp in a plurality of elongated flowing streams through a heating zone, maintaining a temperature between 190 and 220° F. in said zone during formation of water vapor, supplying sufficient heat through the walls of said zone to maintain said temperature and cause formation of water vapor in said zone to produce said concentrated paste, maintaining a high velocity of flow of said streams in said zone to produce a mixed vapor-liquid phase material in said zone, discharging the resulting mixture of concentrated paste and vapor from said zone and separating the sterilized concentrated paste from said vapor while at a sterilizing temperature.

4. The process of preparing a concentrated and sterilized tomato paste from tomato pulp containing solids and water without substantially impairing the color and body of the resulting paste, which comprises, passing the tomato pulp in a plurality of elongated flowing streams through a heating zone, maintaining a temperature between 210 and 220° F. in said zone during formation of water vapor therein, supplying sufficient heat through the walls of said zone to maintain said temperature and cause formation of water vapor in said zone to produce a concentrated paste containing at least 25% solids, maintaining a relatively high velocity of flow of said streams in said zone to produce a mixed vapor-liquid phase material in said zone, discharging the resulting mixture of concentrated paste and vapor from said zone and separating the sterilized concentrated paste from said vapor while at a sterilizing temperature, and cooling said concentrated paste to a temperature between approximately 190 and 195° F. preparatory to placed said cooled concentrated paste in sealed containers.

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