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METHOD FOR PROCESSING AND PRECOOLING EGGS

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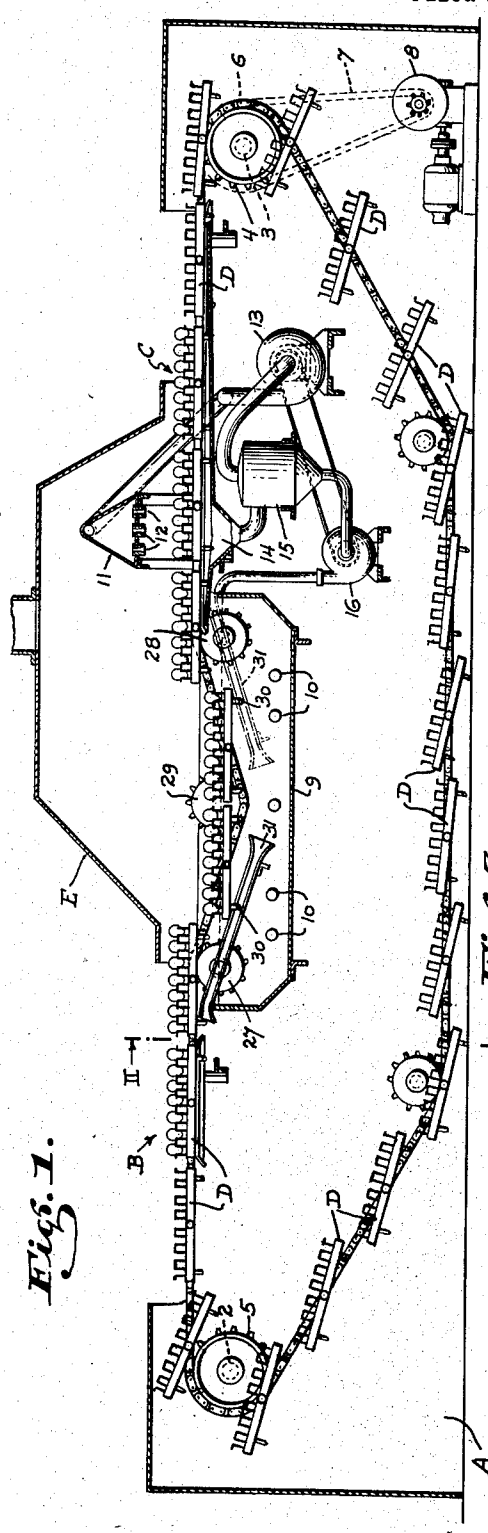


Fig. 1.

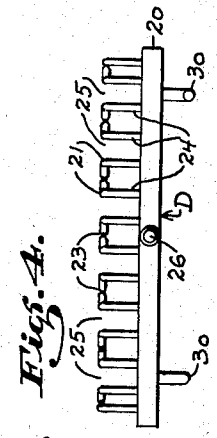


Fig. 4.

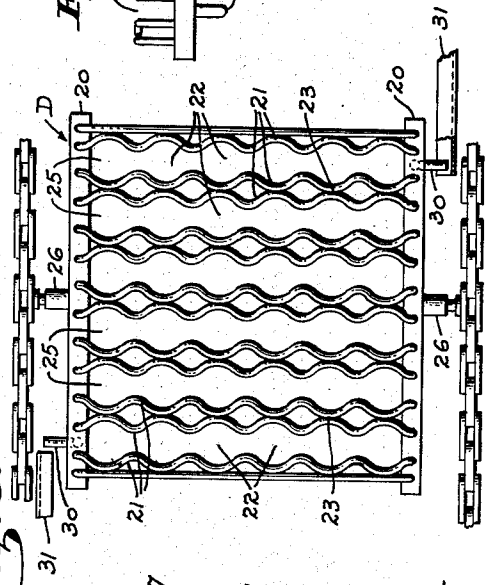


Fig. 3.

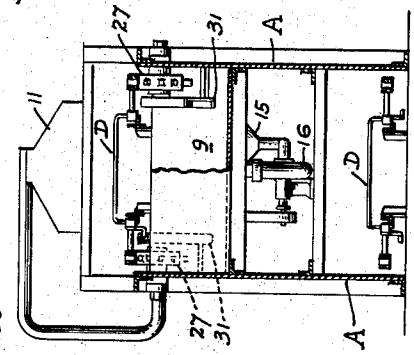


Fig. 2.

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METHOD FOR PROCESSING AND PRECOOLING EGGS

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4 Claims. (Cl. 99—170)

This invention relates to a method and apparatus for processing and precooling eggs.

For a number of years it has been the practice to dip eggs for storage and distant shipment in an odorless and tasteless mineral oil to prevent evaporation within the eggs. The equipment that has been used for this work in the past is wasteful in the matter of the oil that is used and acts detrimentally upon the quality of the eggs.

First, consider the oil to be used. This oil is an odorless and tasteless mineral oil, and the present cost varies from forty cents per gallon to the large packer to about sixty cents per gallon to the small packer who only uses a sufficient amount of oil to pack about 10,000 cases of eggs in a season. I have made a careful study in attempting to find out just what the oil does and the quantity necessary for satisfactory packing, and have found that each egg passed through a bath of the best oil, where the oil is heated to about 160° Fahrenheit, will take out of the bath between .4 and .5 of a gram of oil. I have further found that when the eggs are placed in their fillers and packed and permitted to stand for approximately 24 hours, 60% to 80% of the oil has disappeared, being absorbed by the packing material, or, in other words, the fillers and separators in the egg case. Plainly speaking, about 30% of the oil employed during the processing operation is absorbed by the shell and may be termed useful oil, while about 70% of the oil used is lost in filler absorption.

The only purpose in heating the oil is to reduce its viscosity so the eggs will drain reasonably well. I have discovered that the viscosity may be reduced by the addition to the oil of a volatile solvent, such as carbon tetrachloride, petroleum ether, and the like, and that by so doing, heating of the oil is eliminated. It is well known in the art that heating of the oil damages the eggs. For instance, when eggs are held at room temperature, or about 68° Fahrenheit, for five days, it has been found that the chalaziferous layer, or that layer which ties the yolk within the egg, weakens to such a point that a dark yolk condition appears when the egg is candled, placing the egg in a low government grade. The middle fluid, or the socalled "firm white," also becomes weakened at the above temperature in five days to such a degree that when the egg is broken to be fried the albumen covers a wider area. If eggs are held at low temperatures, these changes do not take place.

With the common practice for processing eggs in oil which is heated to 160° Fahrenheit, the eggs in passing through the oil, whether by submergence, spraying or otherwise, reach a temperature of approximately 140° Fahrenheit, a temperature just below the coagulating point of the albumen. This high temperature is retained after the eggs leave the processing machines and is only gradually reduced during a period of several hours, even though placed in iced refrigerator cars or cold storage, as it has been found that after 24 hours the eggs are still above the minimum temperature required for best keeping. This heating of the eggs to a comparatively high temperature during processing and a long period of cooling following the same brings about more rapid proteolysis.

By reducing the viscosity of the oil with the volatile solvent, heating of the oil is entirely obviated, and in fact permits cooling of the oil to 30° Fahrenheit or less, thereby making it possible to not only process the eggs but also to pre-cool the eggs prior to placing them in refrigerator cars or storage. By a process of air-blast and partial vacuum it is possible to remove the volatile solvent and the excess oil, leaving the heavy oil in the shell of the egg. The eggs thus arrive at the market in a substantially fresh condition, as the quality of the egg has been little, if any, changed, and it may furthermore be stated that the eggs have a better appearance, as all excess oil has been removed.

An apparatus employed for processing and precooling of eggs by my method is shown by way of illustration in the accompanying drawing, in which—

Fig. 1 is a central vertical longitudinal section of the apparatus;

Fig. 2 is a cross-section taken on line II—II of Fig. 1, said view showing the tank partially broken away;

Fig. 3 is a plan view of one of the egg carriers or frames; and

Fig. 4 is a side elevation of the egg carrier shown in Fig. 3.

Referring to the drawing in detail, and particularly Fig. 1, A indicates an elongated frame, at opposite ends of which are journaled stub-shafts 2 and 3. Secured to the shafts 3 are a pair of sprocket gears 4, and similarly secured on the shafts 2 are a pair of sprocket gears 5. Carried by the sprockets 4 and 5 are a pair of sprocket chains which form an endless conveyor, and adapted to transmit continuous movement to said conveyor is a sprocket gear 6 which is driven by a chain 7 from a motor-driven reduction

gear drive generally indicated at 8. Pivotally supported between spaced lugs on the chains or endless conveyor are egg-receiving carriers or frames D, to which eggs may be readily delivered by a fork and similarly removed. Arranged below the upper reach of the endless conveyor, substantially midway of the frame A, is a tank 9, which is filled with an odorless and tasteless mineral oil, in which the eggs are immersed to coat the eggs with oil and to precool them. The oil is maintained at an approximate temperature of 30° Fahrenheit by cooling coils 10 through which a brine solution or similar cooling medium is circulated. The viscosity of the oil under the cool temperature maintained would be entirely too high, but is in this instance reduced to the desired degree by the addition of a volatile solvent such as carbon tetrachloride, the amount of solvent required being approximately 20% by volume of the oil employed.

Directly after immersion and precooling, the eggs are passed under a hood 11, which is provided with a series of nozzles 12. Air under pressure from a blower 13 is delivered to the nozzles and the eggs are thus subjected to the action of an air blast on their upper surfaces and simultaneously to a partial vacuum on their lower surfaces, as an inverted cone-shaped pan 14 is disposed below the path of travel of the egg frames and is connected with the suction side of the blower. This exposure of the eggs to a simultaneous air blast and partial vacuum causes rapid removal of substantially all excess oil and at the same time almost instantaneous evaporation of the volatile solvent, thereby further cooling the eggs. A cyclone separator 15 is interposed between the suction pan 14 and the blower. All surplus oil removed from the eggs is there separated from the air and drains downwardly to a pump 16 which returns the oil to the tank 9.

After removal of the surplus oil and the volatile solvent, the egg frames pass on to the point C, where one or more operators places fillers over the eggs, inserts a fork and lifts the eggs together with the fillers from the frames and places the same in the egg crates, which, when filled, are closed by a cover and are ready for storage or for direct placement in refrigerator cars or the like. It will be understood that one or more operators are also stationed at the opposite end of the machine, or the point indicated at B, and that they remove the eggs and fillers from the egg crates by means of a fork and place the same on the egg frames, and then remove the fillers and replace the same in empty crates, which are transferred to the other end of the machine, where the fillers are again removed to permit repacking of the crates after the eggs have been processed and precooled.

While egg carriers or frames of different makes may be employed, I prefer the type shown in Figs. 3 and 4. These frames consist of a pair of side bars 20 connected by a plurality of spaced cross-arms 21. These arms have wave formed sides which form narrow and enlarged rounded spaces 22 between them to receive and support the individual eggs. The arms are here shown as formed of wires which are welded or otherwise secured with relation to each other in pairs, as indicated at 23. The ends are bent at right angles and form pairs of legs 24, which are secured to the side bars, the height of the legs and the space 25 between each pair of legs being such that the prongs of a fork may be readily inserted to place or remove the eggs. Pins 26 project laterally and outwardly from the central point of each side bar. These pins support the egg frames with relation to the lugs on the chains or endless conveyor and thereby permit the frames to travel in a horizontal plane when being loaded with eggs and while being unloaded and also during the period when they are submerged in the oil in the tank. To bring about submergence, pairs of sprocket gears are required, as indicated at 27 and 28, and between them a pair of sprocket gears 29 under which the chains pass. To prevent tilting of the frames about their pivots while passing downwardly into the tank and then upwardly again, laterally and outwardly projecting pins 30 are provided at opposite ends of the side bars. These pins enter between guide bars 31, as each frame passes down into the tank and then upwardly again. During this entire period the pins 30 are held between the guide bars and as such maintain the frames in a horizontal position. Other means may obviously be employed.

From the foregoing description, it should be apparent that eggs treated by the process here described will retain their high grade quality and will in no way be detrimentally affected, as they are not subjected to heat at any time during the processing period. Conversely, they are rapidly cooled during their immersion in the oil and during evaporation of the volatile solvent. Again, it should be noted that by the addition of the volatile solvent it is possible to reduce the viscosity of the oil to any degree desired, thereby insuring a material saving of oil, said saving being further promoted by removal of excess oil when the eggs are subjected to a simultaneous air blast and vacuum. In actual practice, a saving of substantially 50% over methods heretofore used has been obtained.

While these and other features of the present invention have been more or less specifically described and illustrated, I nevertheless wish it understood that various changes may be resorted to within the scope of the appended claims, and that the materials and finish of the several parts employed may be such as the judgment and experience of the manufacturer may dictate or other conditions may demand.

During the operation of the process, considerable amounts of gases from the volatile solvent are liberated. To prevent these from affecting the operators, a hood E is provided to collect and carry them away.

Having thus described and illustrated my invention, what I claim and desire to obtain by Letters Patent is as follows:

1. The method of oil coating and precooling eggs for cold storage or shipment in refrigerator cars which consists in adding to the oil a sufficient quantity of a solvent to reduce the oil to a water-like consistency when maintained at a refrigerating temperature, subjecting the eggs to the cooling action of the oil at such temperature and maintaining them in the oil until the eggs have been cooled to a required temperature, and then removing the eggs and draining excess oil from them.

2. The method of coating and precooling eggs with oil for cold storage or shipment in refrigerator cars which consists in adding to the oil a sufficient quantity of carbon tetrachloride to reduce the oil to a water-like consistency when maintained at a refrigerating temperature, subjecting the eggs to the cooling and coating action

of the oil at such temperature and maintaining them in the oil until the eggs have been cooled throughout to a required temperature, and then removing and draining the eggs and evaporating the carbon tetrachloride.

3. The method of coating and precooling eggs with oil for cold storage or shipment in refrigerator cars which consists in subjecting the eggs to the cooling and coating action of an oil containing carbon tetrachloride in sufficient amount to render the same of water-like consistency when maintained at a refrigerating temperature, maintaining the eggs in the oil at such temperature until they have been cooled to a required temperature throughout, removing the eggs and draining the excess oil therefrom.

4. The method of coating and precooling eggs with oil for cold storage or shipment in refrigerator cars which consists in subjecting the eggs to the cooling and coating action of an oil containing a solvent in sufficient amount to render the same of water-like consistency when maintained at a refrigerating temperature, maintaining the eggs in the oil at such temperature until they have been cooled to a required temperature throughout, and then removing the eggs and evaporating the solvent.

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