

April 4, 1961

W. L. MORRISON

2,978,336

METHOD OF PRESERVING EDIBLE MATERIAL

Filed June 25, 1957

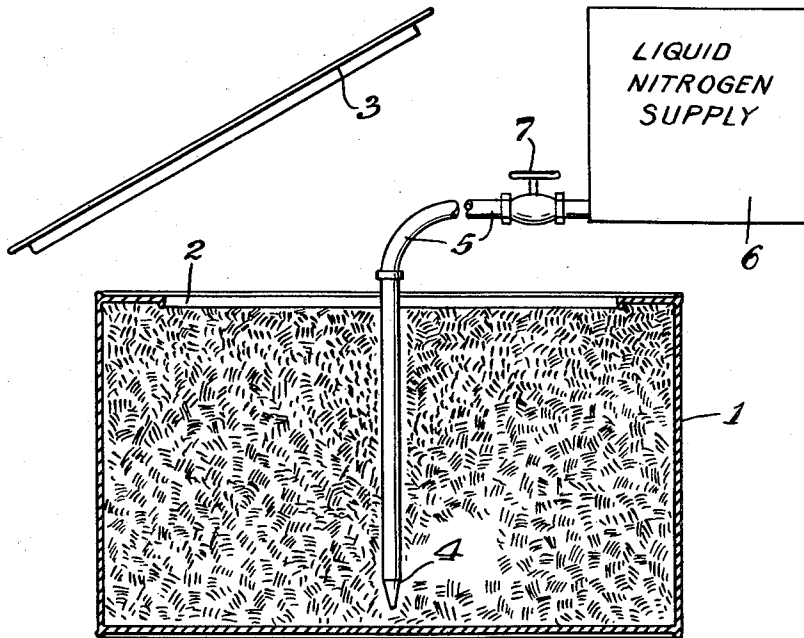


Fig. 1

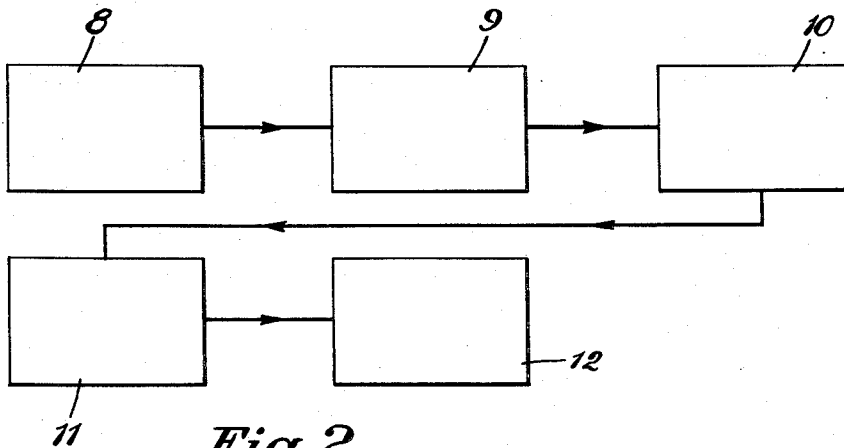


Fig. 2

INVENTOR.
Willard L. Morrison
BY *Parker & Carter*
Attorneys

1

2,978,336

METHOD OF PRESERVING EDIBLE MATERIAL

Willard Langdon Morrison, Lake Forest, Ill., assignor, by mesne assignments, to Liquefreeze Company, Inc., New York, N.Y., a corporation of New York

Filed June 25, 1957, Ser. No. 667,931

1 Claim. (Cl. 99—192)

My invention relates to improvements in method of preserving perishable material and is especially well adapted to the preservation of edible granular, powdered, fluid or semi-fluid materials such for example as coffee, cereals, sauces, juices, dressing, emulsions and the like.

My invention is also well adapted for the preservation of other objects even though not edible against deterioration resulting from contact with the air.

This application is a continuation in part of my co-pending application Serial No. 577,583, filed April 11, 1955, now abandoned.

I propose to pack the material which I wish to preserve in a gastight container. Then to inject into the mass of material in the container, preferably far removed from the open mouth thereof, a supply of a cold boiling liquid such for example as liquid nitrogen at atmospheric pressure and temperature far below zero degrees F. The relatively warm material will furnish the latent heat to boil the liquid and the resultant gas will expand and be permeated throughout the entire mass, thus expelling most if not all of the air. The container may then be sealed containing the material to be preserved and an atmosphere of gaseous nitrogen. Under some circumstances the container and contents may be warmed before sealing. Under other circumstances, the container and contents may be chilled after sealing but in each case the sealed container will contain little if any atmospheric air to promote any of the deterioration processes to which such materials are subject.

Emulsions, dressings, shortenings, oleomargarine and the like which are at times in semi-solid or semi-fluid condition may also be similarly treated by the injection of liquid nitrogen and when that occurs, the gas expanding from the liquid will permeate and inflate the mass.

One of the important advantages of my invention is that a minimum of machinery is required. All that is necessary is a supply of liquid nitrogen and a nozzle for discharging it into the mass of material. Another advantage is that the discharge of a relatively small amount of liquid nitrogen and subsequent evaporation and expansion can take place very rapidly without long delays necessary when air or gas is to be churned into a thick viscous material.

Other objects will appear from time to time throughout the specification and claim.

The amount of liquid nitrogen injected into the vessel depends, of course, on the size of the vessel and the type of material stored therein and the temperature at which it is desired to seal the can. The nitrogen in gaseous phase evolved as the liquid boils will be at the temperature of -320° F. Since there was no water in the liquid nitrogen, there will be no water in the nitrogen in gaseous phase as it boils off from the liquid. The "gaseous phase" nitrogen being much colder and heavier than the air will tend as it expands to fill the chamber and expel the air with any water vapor in vaporious form in suspension therein. Since the gaseous nitrogen will be much colder than the air, there will be no tendency for any

2

water vapor to migrate from the relatively warm air to the much colder nitrogen and as a result as boiling of the liquid nitrogen continues, the chamber will be filled with an atmosphere of nitrogen, which atmosphere of nitrogen expels the air and water vapor previously in the chamber.

When the air and water vapor therein have been expelled from the chamber and when all the liquid nitrogen has boiled to gas, sealing of the chamber will prevent subsequent entry of air and water vapor. This sealing may take place while the temperature of the chamber and contents, having been cooled by the introduction of the cold liquid nitrogen are still below the ambient temperature. Under some circumstances, subsequent rise in temperature of a can, the contents of which was filled with cold nitrogen might be undesirable. Where that is the case, the container might be warmed before sealing. Usually this will not be necessary but such warming before sealing should always be so controlled that no air or water vapor will be drawn into the chamber. If after the can is sealed, cooling results in a vacuum or reduced pressure, this will do no harm if the seal is adequate to prevent entrance of air into the can until it is open for use.

I have illustrated my invention diagrammatically in the accompanying drawings, wherein—

Figure 1 is a diagrammatic view in part section;

Figure 2 is a flow diagram.

Like parts are indicated by like characters throughout the specification and drawings.

1 indicates an open mouth receptacle, the mouth 2 being located at the top thereof. 3 is a removable closure, 4 a tube which may be thrust into the contents of the vessel through the open mouth. 5 is a hose connecting the tube to a source of liquid nitrogen. 6 and 7 indicate a valve which controls the flow of nitrogen into the receptacle. The cans, such as the can 1 of Figure 1, are loaded at station 8. They are then conveyed by hand or machinery as the case may be to liquid nitrogen injection station 9, where the nitrogen is inserted, allowed to evaporate and expand to expel the air with resultant cooling of the contents of the can. If desired, the can may then be conveyed to the can warming station 10 where the can is warmed by any suitable means. The water bath, the warm air blast, exposure to ambient air or any other warming is appropriate. Then the warmed can with the temperature of the contents thereof warmed, for example, up to the intended maximum to which it will be exposed, is taken to the can sealing station 11. There the can is sealed while still warm. Thence the cans are taken to station 12 for storage, shipment or use.

On the other hand, if it is not desired to raise the temperature of the can, the can after the nitrogen has been injected into it will by-pass the warming station and go directly to the can sealing station where the can will be sealed at substantially the temperature resulting from the injection of the nitrogen.

If the can or vessel contains a granular powdered material, the tube which may take the form of something like a hypodermic needle may be thrust into the contents of the vessel with the discharge adjacent the bottom thereof and the necessary amount of liquid nitrogen will be injected. Granular materials even though they may contain some moisture will under situations such as this not freeze together though the individual granules may be frozen. Thus, as the liquid nitrogen expands, the gas which is colder and heavier than the air will force the air upward as the level of the nitrogen gas rises until any gaseous content of the vessel other than the cold nitrogen will have been expelled.

Under some circumstances all that is then necessary is to seal the vessel. However, it is sometimes desirable

after the nitrogen has expanded from liquid to gaseous form and expelled the air from the vessel to raise the temperature of the vessel and its content to a point slightly above the maximum temperature to which is expected the cold sealed vessel will be exposed. When this is done, the vessel under ordinary conditions of shipment and storage will be at temperature below the maximum expected temperature and as a result there will be no pressure in the vessel tending to burst it or cause leakage.

As above indicated, while this invention is especially applicable to the preserving of foodstuffs, it may equally well be applied to such objects as metal parts which, if stored in an atmosphere of nitrogen rather than air, will be protected against corrosion, rusting and the like, this without reference to the size of the object or the size of the receptacle. Assuming, for example, that a valuable piece of machinery is enclosed in a gastight chamber and a quantity of liquid nitrogen is deposited in the chamber, sufficient as it evaporates to expel the air and the water vapor, the machinery will then be in an atmosphere of nitrogen which is inert and the chamber may then be closed to maintain such inert nitrogen atmosphere.

If only a few pieces of material are in the chamber, there will be little if any resistance to the expulsion of the air. If, however, the chamber contains granulated coffee for example, there will be substantial areas or voids between the grains which will at first be filled with air and some time may be required before the expanding nitrogen can permeate through all these areas and expel all the air. Therefore, the exact amount of nitrogen required depends on the sizes of the vessel and the character of the voids about the solids contained within the vessel. In every case only sufficient liquid nitrogen needs to be applied to insure that when the nitrogen is all evaporated, the chamber is filled with the nitrogen atmosphere, or if it is desired substantially to lower the temperature, the amount of liquid nitrogen will be increased or the can may be subjected to external cooling methods.

Such external cooling must of course take place after the supply of nitrogen has ceased and the can is cooled because otherwise cooling the contents unsealed, with nitrogen no longer being supplied, could result in return of ambient air to the contents of the can.

I claim:

The method of treating edible material which consists in first packaging the material in an open top fluid-tight container exposed to ambient atmosphere, then discharging into the container adjacent the bottom of the mass of material contained therein in direct and intimate contact with such material at approximately atmospheric pressure and at a temperature far below the temperature of the container contents and ambient air a supply of liquid nitrogen and continuing such supply until the contents of the container have supplied sufficient latent heat to boil and expand the liquid to gaseous phase and the resultant gas has filled the container and expelled the air therefrom, raising the temperature of the container and contents to approximately the temperature of the ambient air and thereafter sealing the container.

References Cited in the file of this patent

UNITED STATES PATENTS

2,131,181	Kantor	Sept. 27, 1938
2,159,835	Waters	May 23, 1939
2,541,441	Sharp et al.	Feb. 13, 1951
2,569,217	Bagdigian	Sept. 25, 1951
2,583,697	Hendry et al.	Jan. 29, 1952

FOREIGN PATENTS

521,715	Great Britain	May 29, 1940
---------	---------------	--------------

OTHER REFERENCES

"Food Industries," September 1949, pp. 37, 38, 190 and 192.