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Levine

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[54] **MIXING APPARATUS AND METHOD**

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[51] **Int. Cl.**[4] **A23G 9/00**

[52] **U.S. Cl.** **62/342**; 366/203

[58] **Field of Search** 62/342, 68; 366/203

[56] **References Cited**

U.S. PATENT DOCUMENTS

1,846,405	2/1932	Stroud	366/203
1,946,771	2/1934	Strongson	366/203
1,968,268	7/1934	Strongson	366/203
1,982,339	11/1934	Ehrgnfeld	366/203
1,993,024	3/1935	Stroud	366/203
2,300,542	11/1942	Forse	366/203
2,662,489	12/1953	Moffett, Jr.	366/203
3,505,075	4/1970	Black	62/342 X
3,952,538	4/1976	Warlick	62/342
4,448,114	5/1984	Mayer	366/318 X

Primary Examiner—William E. Tapolcai

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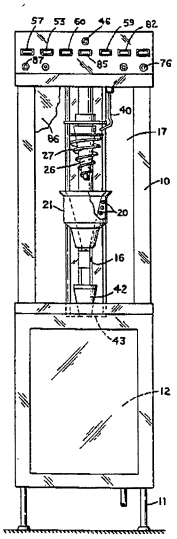
[57] **ABSTRACT**

This invention provides a safe and sanitary apparatus for blending hard ice cream (or other frozen confections) with syrups and other ingredients. The funnel holding the materials to be mixed is advanced in progressively increasing sweeps over the blending auger as the auger is rotated in clockwise and counterclockwise directions to produce a tasty and attractively marbled or blended product. A spray head and suitable automatic washing apparatus also is provided to rinse the auger and funnel surfaces.

6 Claims, 3 Drawing Figures



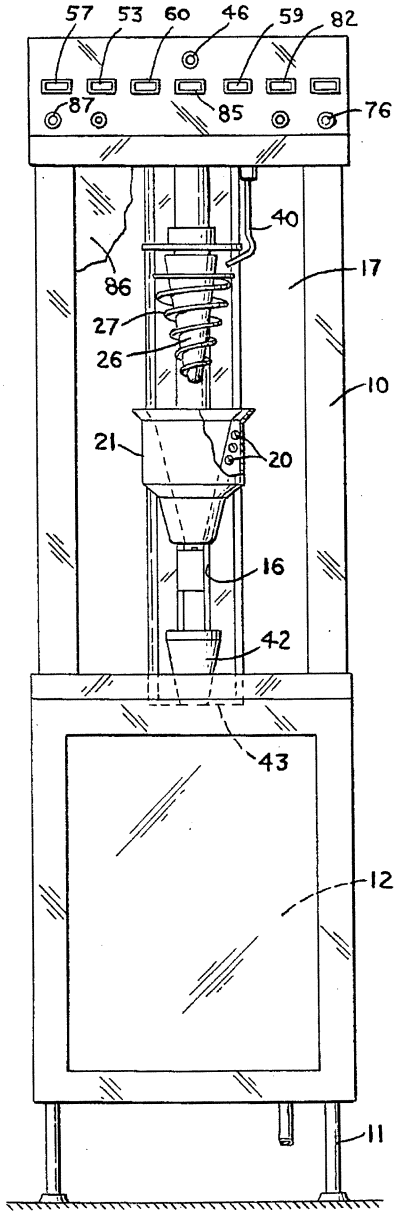


FIG. 1

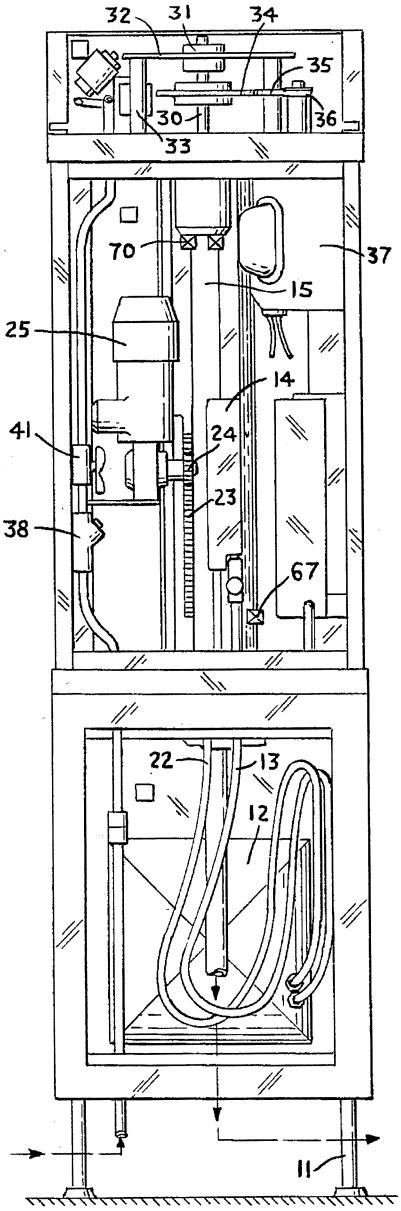


FIG. 2

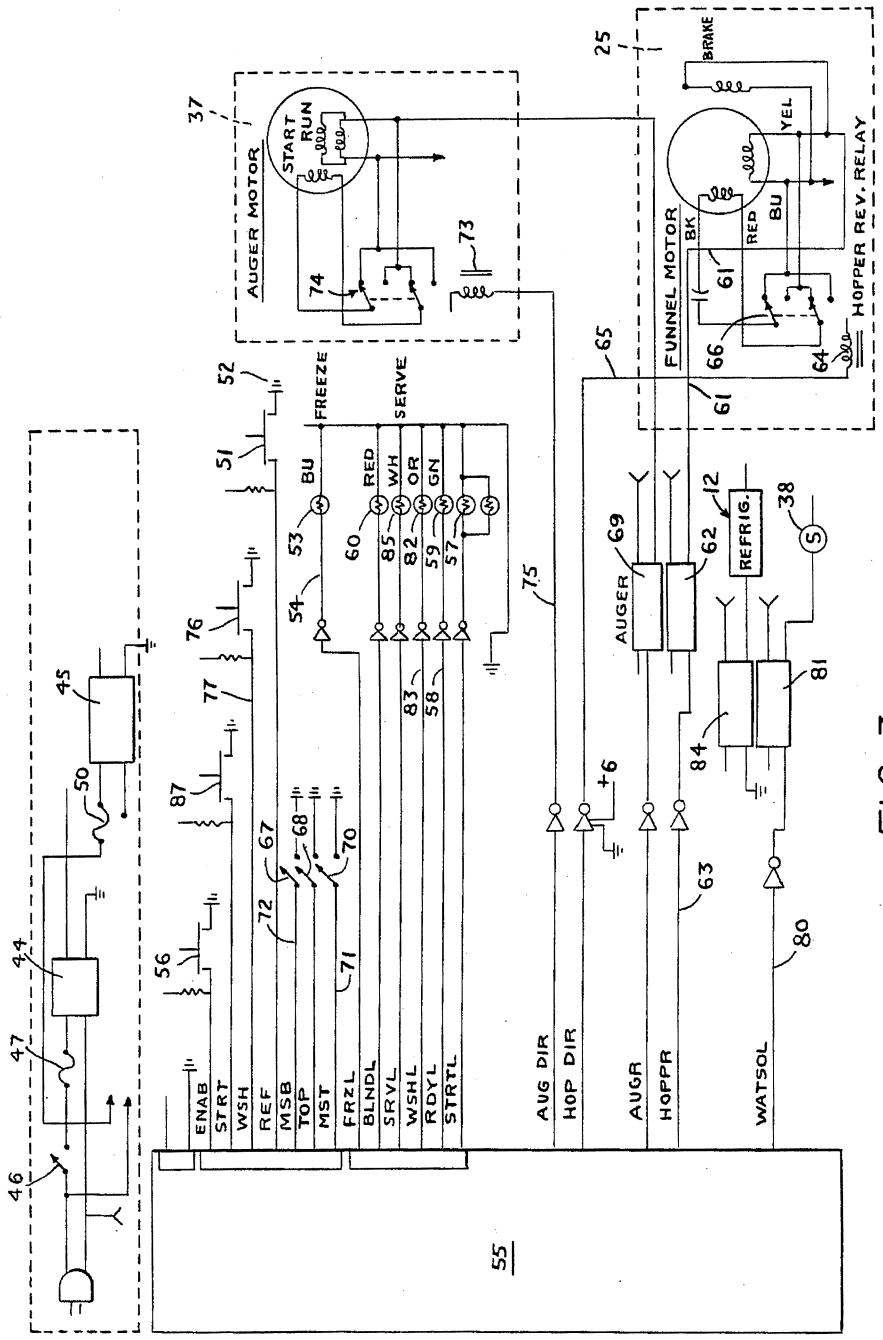


FIG. 3

MIXING APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to mixing machinery and methods and, more particularly, to apparatus and methods for mixing condiments and other edible matter with ice cream and similar frozen confections, and the like.

2. Prior Art Summary

Frozen confections, "hard" ice cream, and similar foods, mixed with bits of fruit, syrup, condiments and other added ingredients are very popular and are consumed by the public in large quantities. Naturally, there is a need to devise machinery to satisfy this large demand through a product in which the added ingredients are suitably marbled or in which these ingredients are well distributed within the frozen confection without, however, either homogenizing the syrup and the confection or pulverizing particulate edible matter within the added ingredients. This mixing may be performed after the confection has been frozen in order to produce the visually pleasing and tasty streaks of syrup, fruit, and the like throughout the body of the confectionary product.

There are a number of problems, however, in mixing, or perhaps, blending the usually viscous and sticky syrups, fruit particles, nuts and other ingredients with a mass of hard, frozen confection. There is a further group of problems that mature from the need to keep the confection in a frozen condition during the mixing operation in order to preserve its freshness and taste as well as to avoid ice formation within the confection if the confection should soften, or melt, and thus make it necessary to refreeze the product.

These, as well as many other difficulties that have characterized the prior art have been the subject of a number of proposed solutions. The following patents are illustrative of some of these proposals.

U.S. Pat. No. 1,846,405 granted Feb. 23, 1932 to W. A. Stroud for "Drink Mixer" shows a motor driven agitator that protrudes into a container which is automatically raised and lowered relative to the agitator, when the agitator is energized.

U.S. Pat. No. 1,946,771 granted Feb. 13, 1934 to H. L. Strongson for "Automatically Timed Drink Mixer" shows an agitator within a cup in which the cup is gradually separated from the agitator as the mixing operation proceeds.

U.S. Pat. No. 1,982,339 granted Nov. 27, 1934 to T. R. Ehrenfeld for "Switch" shows a container that is moved slowly in an upward direction relative to the mixing element and rapidly in a relative downward direction.

U.S. Pat. No. 2,300,542 granted Nov. 3, 1942 to H. D. Forse for "Automatic Fountain Mixer" discloses an apparatus in which the mixing duration is automatically timed and the mixing vessel is lowered from the mixing element as the cycle is complete.

U.S. Pat. No. 3,742,724 granted July 3, 1973 to P. Carpigiani for "Ice Cream Machine" shows an ice cream freezer in which an extrusion mechanism is enclosed within a freezer coil.

U.S. Pat. No. 3,952,538 granted Apr. 27, 1976 to S. W. Warlick for "Portable Self-Contained Apparatus for Freezing Liquids" discloses a device in which the liquid container is rotated relative to the dasher.

U.S. Pat. No. 4,061,275 granted Dec. 6, 1977 to F. W. Herfeld for "Continuous Mixing Apparatus, Especially a Cooling Mixer and a Method for Producing Granulated Material" shows an apparatus for discharging uniformly compounded mixtures of batched input materials.

None of these patents, however, suggest a technique for combining syrups, fruit particles and other confections with hard ice cream or other frozen confections while it is in the frozen state to produce an attractively marbled or carefully blended product with chunks of condiments, and maintain hard ice cream.

Many other technical problems also must be solved for a mixing machine to be a truly satisfactory device. A machine of this nature must be able not only to process commercially significant quantities of product, but it also must be capable of being cleaned swiftly and thoroughly as well as being safe to operate.

These and other problems that have characterized the prior art are overcome, to a large extent, through the practice of the invention. A typical embodiment of the invention has auger, or Archimedes' Screw that is rotated about its longitudinal axis. A double-walled hopper in which refrigerating coils are encased between the hopper walls is moved in the longitudinal direction to engage the condiments with the hopper with the rotating auger. The auger makes the ice cream and condiments turn and twist as the auger rotates first in one direction, then in the opposite direction and so on while the condiment mixes with the ice cream. The refrigerating coils, interposed between the inner and outer hopper walls, moreover, continuously refrigerate the product that is being processed within the hopper to maintain the ice cream hardness.

To prevent intermixing of flavors, a spray head is mounted on the apparatus close to the auger and the hopper when the hopper is telescoped over the auger. The spray head is thus enabled to direct a flow of water over the residue of ice cream and condiments on the contacting parts of the apparatus in order to swiftly cleanse the device and to prepare it to process the next order of condiment and ice cream.

Thus, there is provided in accordance with the invention, an apparatus for mixing syrups, nuts, fruit particles and the like with hard ice cream to produce an attractively marbled or uniformly blended and tasty product. The apparatus is, in this respect, a sanitary, easily and swiftly cleaned device and one in which specific provision is made for operator safety. In this respect, operator safety is achieved through the electrical circuit that requires the operator to continuously manipulate two switches during the time needed to raise the hopper to the auger. In this manner, the operator's hands must be positioned in a safe orientation relative to the moving parts of the apparatus, or all motion will stop.

These and other features of the invention are presented in more complete detail in the following description of a typical embodiment of the invention when taken with the figures of the drawings. The scope of the invention, however, is limited only through the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a front elevation of a typical embodiment of the invention;

FIG. **2** is a rear elevation of the entire apparatus, a portion of which is shown in FIG. **1**; and

FIG. 3 is a wiring diagram for the electrical circuit associated with the apparatus shown in FIGS. 1 and 2.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

For a more detailed understanding of the invention, attention is invited to FIG. 1 which shows a generally rectangular frame 10 standing on legs 11. A refrigerator compressor and condenser assembly 12 (FIG. 2) is supported in the frame 10 immediately above the legs 11 in order to provide refrigeration for ice cream that is being processed as described subsequently. Refrigerant, of which Freon-12 (FR-12) is typical, flows from the condenser assembly 12 through flexible tubing 13 to a vertically moveable refrigeration assembly 14.

The vertical motion of the refrigeration assembly 14 is controlled by means of a sliding Teflon guide 15 that is mounted in a slot 16 (FIG. 1) that is formed in a panel 17 which is secured to the frame 10 above the condenser assembly 12. Not shown in the drawing, the coolant flows through a conduit in the refrigeration assembly 14 to a cooling coil 20 which is mounted between the walls of a hopper, or funnel 21, by way of a funnel block (not shown) that joins the funnel to the refrigeration assembly 14. Coolant, flowing through the coil 20 is returned to the condenser 12 (FIG. 2) by way of the funnel block, the refrigeration assembly 14 and a flexible hose 22.

It will be recalled that the refrigeration assembly 14 is vertically moveable, just as the funnel 21 (FIG. 1) and the funnel block to which it is attached also are vertically moveable. This vertical motion is imparted to the funnel 21 through a gear motor with a brake, which includes a rack 23 that is rigidly secured to the frame 10 and a meshing pinion gear 24. To drive the pinion gear 24, and the refrigeration assembly 14 to which the gear is attached, an electrical funnel motor 25 is provided to drive the gear.

As illustrated in FIG. 1 an auger 26 that has a single helical thread 27 is mounted near the top of the frame 10 with the apex of the helix oriented toward the open top or inlet of the funnel 21. Although the auger 26 does not move in a vertical direction it is, nevertheless, supported on the frame 10 for rotation in clockwise and counterclockwise directions by means of a vertical shaft 30 (FIG. 2), the lower end of which is secured to the auger 26 (FIG. 1) and the top end of which is sustained in a bearing 31 that is rigidly fixed in a horizontally disposed plate 32 which, in turn is mounted on the frame 10 in correct relative orientation by means of standoffs 33.

Between the bearing 31 and the auger 26 (FIG. 1) and as illustrated in FIG. 2, a large auger gear 34 also is rigidly affixed to the shaft 30 in order to rotate with the shaft. The large auger gear 34 is driven by means of a toothed belt 35 that also meshes with a small auger gear 36 in order to rotate the auger at a speed of about 350 revolutions per minute. Power for the small auger gear 36, which, in turn drives the auger 26 that is shown in FIG. 1 through a train that includes the belt 35, the large auger gear 34 and the shaft 30 at a speed of about 350 revolutions per minute is provided by an auger motor 37 that also is fastened to the frame 10.

Tap water for equipment washing purposes is supplied to a spray head 40 (FIG. 1) that discharges this water at the maximum diameter of the helical thread 27. The water for the spray head 40 flows, as shown in FIG. 2 through a tube that traverses almost the entire vertical length of the frame 10 from the legs 11 and through a manual valve 41 and a solenoid valve 38 to the spray head.

Turning once more to FIG. 1, the discharge from the funnel 21 is oriented in longitudinal and axial alignment with a cup holder 42 that is mounted in a sink 43 that receives spent wash water, spilled ice cream and the like.

Although a hydraulic system is preferred for operating the dispenser apparatus because of the greater reliability and longer apparatus life that it will provide, an electrical circuit is described herein because it is this electrical circuit that actually was developed at the time of filing the instant application. Accordingly, attention is invited to FIG. 3 which shows a five-volt power supply 44 and a six-volt power supply 45 to provide appropriate voltage levels in the balance of the circuit, as required. Basically the circuit shown in FIG. 3 provides a number of functional results:

a. Drives the auger motor in clockwise and counterclockwise directions;

b. Drives the funnel in longitudinal directions;

c. Activates and deactivates a solenoid valve for the water spray apparatus; and

d. Activates and deactivates the refrigeration mechanism through the operation of the power switch.

The circuit shown in FIG. 3 also provides a number of additional functions, of which energizing lamps to indicate the operational status of the apparatus, to be later described in more complete detail, is typical. Thus, the circuit is energized by closing a main switch 46 to supply line voltage to the power supplies 44, 45 through fuses 47, 50, respectively.

The refrigeration equipment is energized next by operating a switch 51 to complete the circuit through to ground 52 for the refrigerator compressor and condenser assembly 12 (FIG. 2). In addition to starting the refrigeration cycle, a "freeze" lamp 53 also is energized through a conductor 54.

The machine is controlled by a microprocessor system 55 that functions as a universal logic and timing unit configured to this application by the software contained in an EPROM chip which is plugged into the microprocessor board.

There are two power supplies. A five-volt supply 44 that energizes the microprocessor and the six volt supply 45 that energizes the lamps and relays as described subsequently in more complete detail.

The microprocessor 55 receives input signals from three pushbutton switches on the control panel and from three micro switches inside the machine as follows:

A spring biased enable, or first start switch 56 must be held manually in a closed circuit condition when the funnel 21 is down in addition to either a manually operated, spring biased start switch 87 or a spring biased wash switch 76 to insure, for safety purposes, that both of the operator's hands are occupied and kept away from moving parts. Enabling or activating the switches 56 and 76, for example, in the foregoing manner starts the mixing process. After mixing is completed, the funnel 21 is up and the components in contact with the foodstuffs are washed automatically in response to a command from the microprocessor 55. When the funnel 21 is down, wash is started manually by manipulating the switches 56 and 76. A bottom limit micro switch-closure 67 signals the microprocessor 55 that the funnel 21 is at the bottom and the motor 25 must be stopped. A top limit micro switch 70, when closed, signals the

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