This invention is directed to an improvement in automatic machinery for the production of ice-cream.

The primary object of the present invention is the provision of a container immersed in an unsealable liquid in which a plurality of independent arms are mounted for relative movement with respect to the container, with the arms developing in such rotation relative distinctive effects upon the material being frozen.

A further object of the invention is the provision of the material-affecting arms constructed and operated to cause one arm to present an active scraping edge in contact with the internal surface of the container, with such arm constructed to raise the material during the operation, and the other arm designed to leave a thin film on the internal surface of the container, and at the same time to cause the material beyond the film to be moved downwardly of the container.

The invention is illustrated in the accompanying drawings, in which

Figure 1 is a view in elevation partly in section of one form of the improved machine.

Figure 2 is a plan of the same, the container being shown in section.

Figure 3 is a view of the second form of the improved machine shown in vertical section and partly in elevation.

Figure 4 is a plan view of the form shown in Figure 3, the container driving mechanism being omitted.

In the construction as particularly illustrated in Figures 1 and 2, a container 1 mounted for rotation and designed to be immersed in a congealing mixture is interiorly provided with arms 2 and 3. The arm 1 is in the form of a branch of a helicoid with the active edge slightly spaced from the interior surface of the wall of the container. The arm 2 is a branch of a helicoid having opposite direction to that of the arm 1. The arm 3 is arranged in scraping contact with the interior surface of the container. The active portion of the arm 1, indicated at 12, is spaced from the internal surface of the container to that extent necessary to leave a thickness of material on such surface in accordance with the nature of the material and the requisite of the freezing contents. The arm 1 in addition to the active area 12 has an additional operative area 13 formed at its lower end portion and operating in active scraping relation to the internal surface of the bottom of the container, as indicated in Figure 3. The inclination of the form of the arm 1 is such that in its relative motion with respect to the container, the material within the container is compelled to move upwardly, while the inclination of the form of the arm 3 is such that in the relative movement of the arm and container, the material within the container is compelled to move downwardly.

The upper end of the arm which is indicated at 4 and the upper end of the arm 3 is indicated at 6, with such point 6 at a higher elevation than the point 4. The upper and lower ends of the respective arms are connected through relatively integral elements to upper and lower hubs 8 which are slidable mounted on a shaft 9. A wheel 10 is keyed or otherwise fixed to the upper hub 8 and is supported to an annular member 11, mounted on the frame within which the container is rotatably supported as indicated more particularly in Figure 1.

The inclination of the arm 1 with respect to the wall of the container is such that a section made perpendicular to the common axis of the container and arm 1 provides an acute angle the vertex of which lies in the direction of relative movement of rotation between the container and the arm.

The inclination of the arm 3 with respect to the wall of the container is such that a section made perpendicular to the common axis of the container and of the arm 3 provides an acute angle, the vertex of which is directed against the direction of relative movement of rotation between the container and the arm.

The operation of this form of the device is as follows:

Incident to relative rotation between the container and arms, the material within the container descends itself by centrifugal force to accumulate on the lower wall of the container, but the lower portion 13 of the arm 1 compels an upward current of this material from the bottom, while the main length of the arm 1 permits a limited accumulation of material on the inner surface of the container wall, and at the same time forces the body of the material upwardly.

The arm 3 scrapes the material from the inner wall of the container and compels such material to move toward the bottom of the container.

The beating up of the material and, therefore, its emulsion and the incorporation of air into the material are materially increased as a result of the operation described, due to the fact that upon each rotation of the container all of the cream is compelled or forced into contact with the cold wall of the container, and
then detached from such wall in a continuous cycle of operation.

In the construction shown in Figures 3 and 4, wherein a slightly different form of machine as a whole is described, the container and arms 1 and 5 are identical with the first form, carry the same reference numerals as in the first form, and do not require additional detail disclosure.

In this form, however, the arm 1 terminates at 14 and both arms are rotatably supported at the lower ends through appropriate integral connections leading from the arms which adjourn bearing block 15 supported upon a journal 16 mounted in the stirrup 17. The upper ends of the arms 1 and 5, while maintaining the same relative height as in the form shown in Figure 1, are rigidly or integrally connected to upstanding branches 18 and 19 respectively, which pass through the upper end of the container 2 and connected to an annular body 37 which, through the medium of levers 20 fixed by set-screws 21 is held in fixed relation to the ring 11 described in the form shown in Figure 1.

The stirrup 17 is connected to an annulus 22 having a horizontal ledge designed to receive the balls 23 for thrust bearing 25 supported on upper balls 24. An annular member 26 is mounted between the balls 23 and 24, the outer peripheral edge of which is formed with a series of teeth 28. The annular member 26 is formed with a conical surface 27 providing for its adjustment relative to the container 2 through the corresponding conical element 28 provided exteriorly of the container 2 and connected to the container by a screw or other coupling 36. The annular member 26, and with it the container 2, are rotated by a pinion 30 operated by a motor 31 mounted on a suitable support 32.

The operation of this form of the device is similar in the treatment of the material to that previously described, the container being driven by the motor and through the intermediate parts in the direction of the arrow 33 of Figure 4, while the casing 22, the element 24 and the arms 1 and 5 remain stationary, thus providing the relative rotation of the parts necessary to the operation of the machine.

Having now particularly described and ascertained the nature of the present invention and in what manner the same is to be performed, I declare that what I claim is:

1. In an automatic machine for the production of ice cream, a container having a vertical axis, two helicoidal arms coaxial with the axis of the container, means to compel a relative rotation between the container and the arms, one of the arms being of right hand helicoidal shape, the other arm being of left hand helicoidal shape, the entire active edge of one of the arms being in scraping contact with the internal surface of the container and serving to scrape off and lower the cream mixture, the active edge of the other arm having two active areas, one in scraping contact with the interior surface of the bottom of the container and the other spaced from the internal surface of the container, the first area forcing the cream mixture upwardly toward the second area, the second area raises the cream mixture and leaves a layer of cream mixture of predetermined thickness on the wall of the container.

2. In an automatic machine for the production of ice cream, a container, two helicoidal arms coaxial with the axis of the container, means to compel a relative rotation between the container and the arms, one of the arms being of right hand helicoidal shape, the other arm being of left hand helicoidal shape, the active edge of one of said arms serving as a scraping and cream lowering element, and being in scraping contact with the interior surface of the container, the active edge of the other of said arms serving to coat the cream mixture on the container surface and raise the body of the cream mixture within its influence, said latter arm having two successive areas, one of which presents a lesser pitch than the other and has an active edge in scraping contact with the interior surface of the bottom of the container, the other area being of relatively greater pitch and having its active edge spaced from the interior surface of the container.

3. In an automatic machine for the production of ice cream, a container, two helicoidal arms coaxial with the container, means to compel relative rotation between the container and the said arms, one of the arms being of a right hand helicoidal shape, the other of said arms being of left hand helicoidal shape, the active edge of one of the arms being in scraping contact with the internal surface of the container and serving to scrape and lower the material in the container, the other arm having its active edge in spaced relation to the internal surface of the container and serving to apply a coat of the material of predetermined thickness to the container and raise the material within the container, the first of the arms terminating at the top beyond the second of the arms, the arm having its active edge in spaced relation to the internal surface of the container having an additional area in scraping cooperation with the interior surface of the bottom of the container.

4. In an automatic machine for the production of ice cream, a container, two helicoidal arms coaxial with the container, means to compel a relative rotation between the container and arms, one of the arms being of a right hand helicoidal shape, the other of said arms being of a left hand helicoidal shape, the active edge of one of the arms being in scraping contact with the internal surface of the container and serving to scrape and simultaneously lower the material in the container, the active edge of the other arm presenting two successive areas, one of which has lesser pitch than the other and is at all its points in scraping contact with the interior surface of the bottom of the container, the other area of relatively greater pitch is at all its points spaced from the interior surface of the container, the lower point of said last named area being substantially at the same height at which the first named helicoidal arm terminates inferiorty.

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