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Stollman et al.

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[54] FOOD MIXING MACHINE

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[52] **U.S. Cl.** **259/6**, 222/413, 259/21, 259/41

[51] **Int. Cl.** **B01f 7/08**, B01f 15/02

[58] **Field of Search** .....259/6, 21, 41, 64, 104, DIG. 2, 259/DIG. 13, DIG. 14; 107/36; 18/2 EM, 2 EP, 2 ES; 222/318, 413, 424

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[57] **ABSTRACT**

Mixing and extruding apparatus for the preparation of a confection comprises front and rear bearing blocks in which two axles are journaled, mix extrude screws detachably secured to said axles and extending into a mixing chamber, and means for detachably clamping the mixing chamber to the front bearing block. The mixing chamber includes a barrel in which a recirculation plate is positioned to rotate the mix back into the screws for continuous mixing and extruding. A slidable gate can be moved to open an outlet aperture in the mixing chamber so that the mixture can be expelled from the chamber by the screws.

7 Claims, 7 Drawing Figures

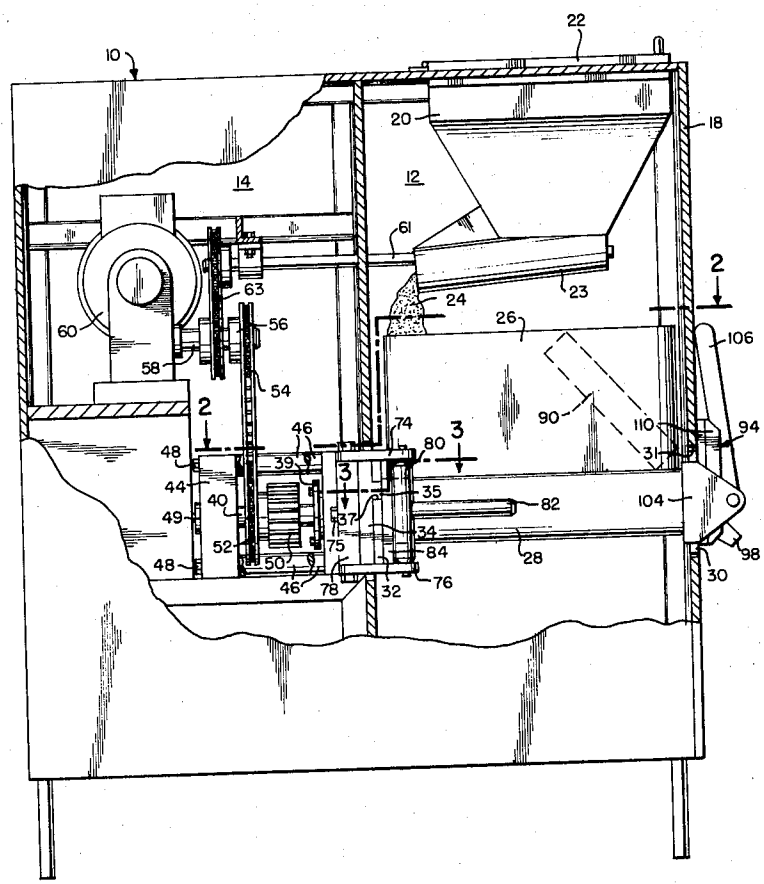
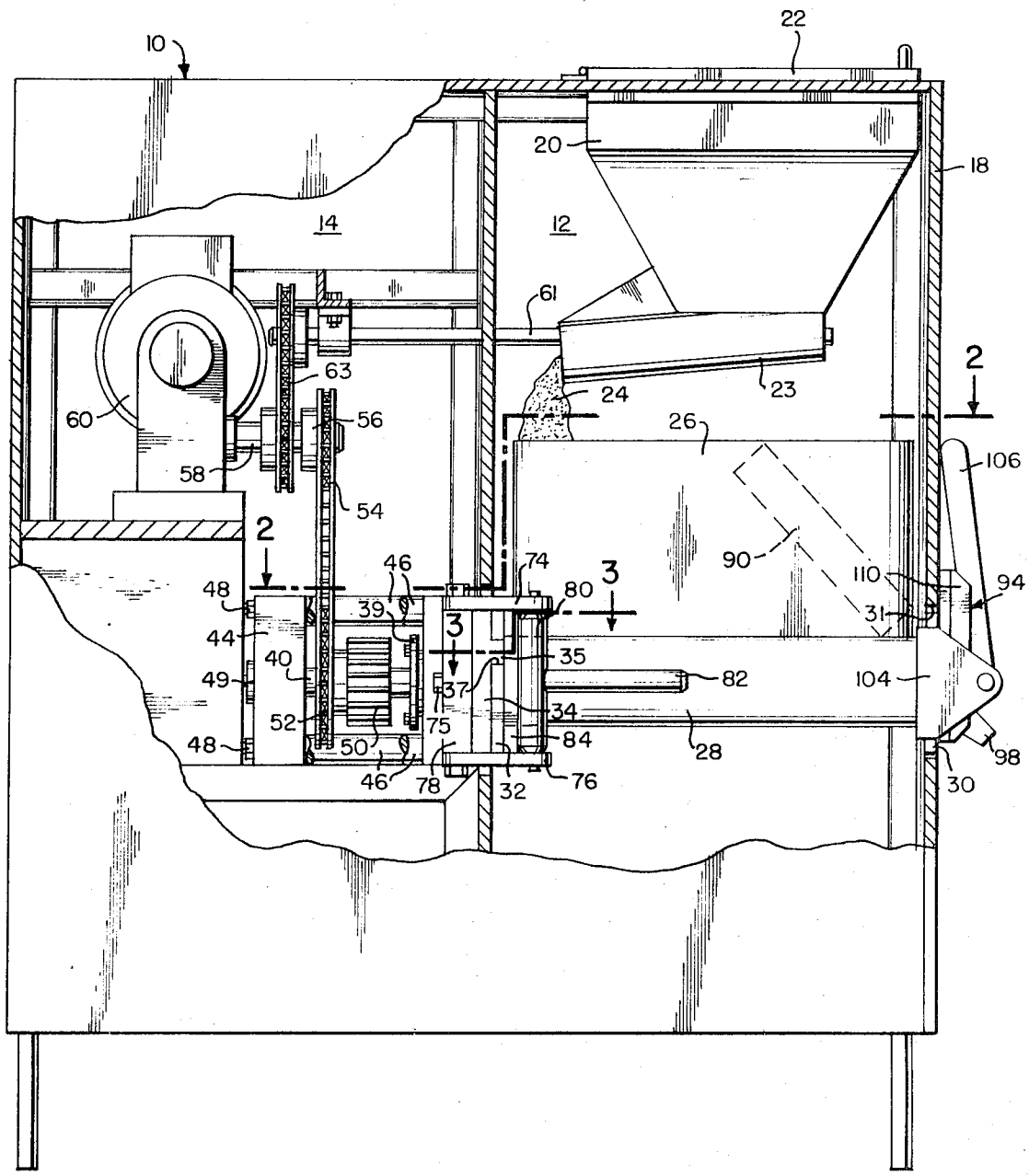


FIG. 1



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FIG. 2

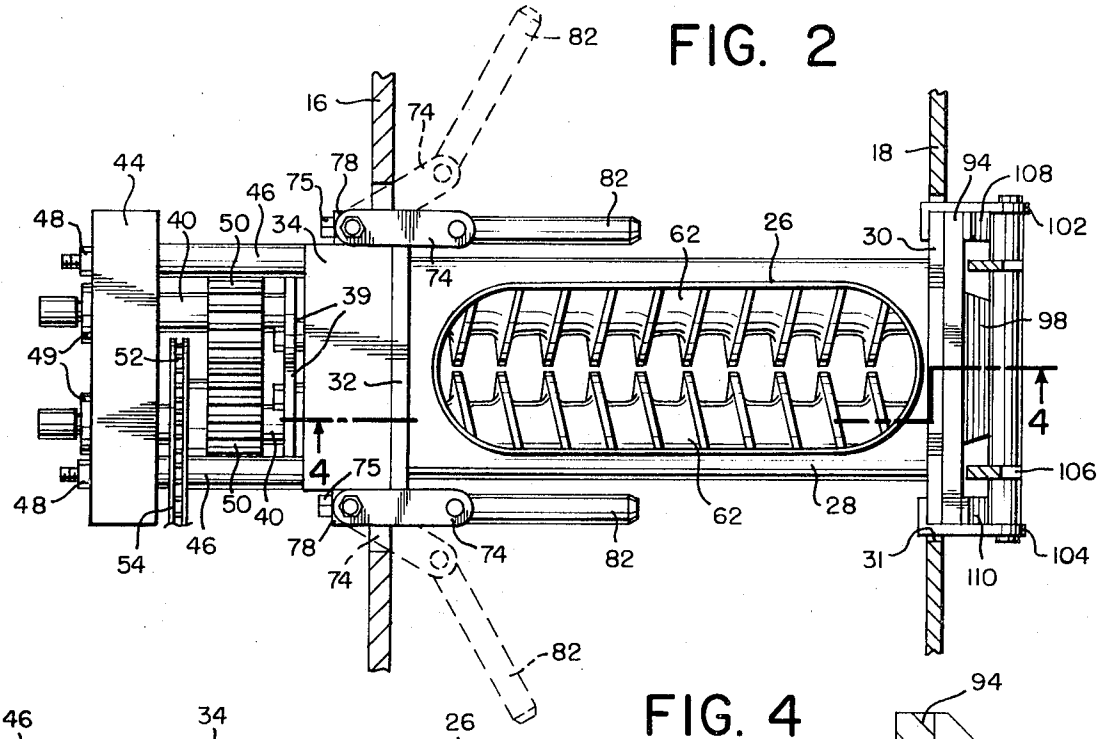


FIG. 4

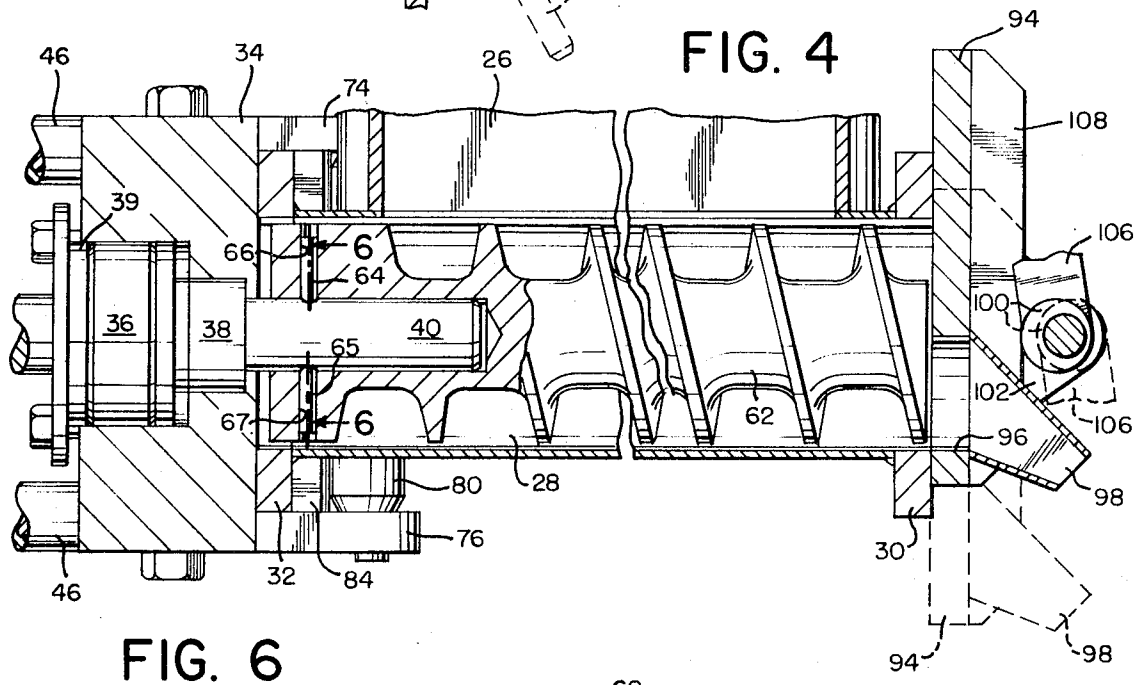
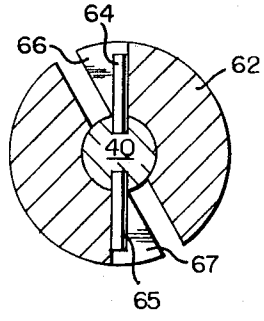


FIG. 6



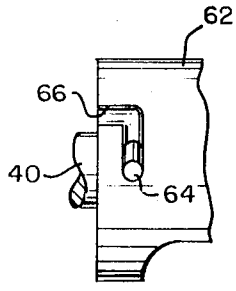


FIG. 7

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FIG. 3

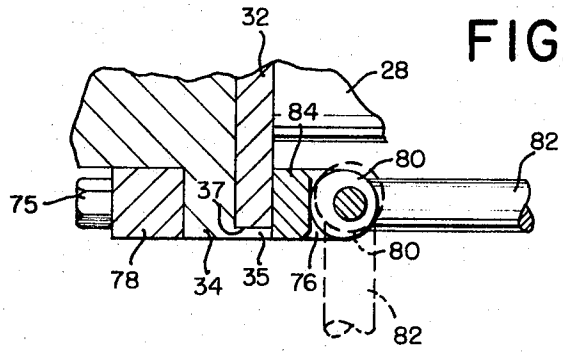
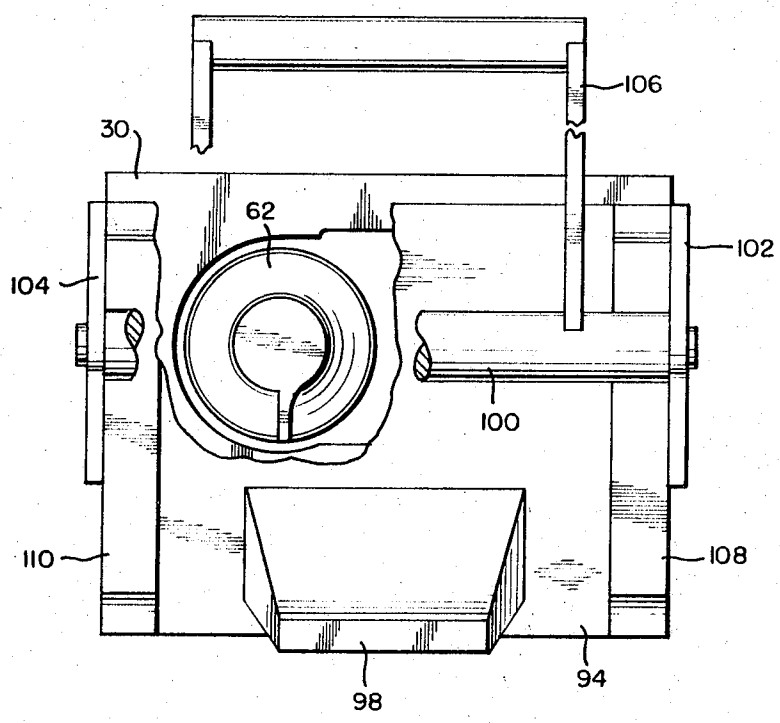


FIG. 5



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FOOD MIXING MACHINE

This invention relates to apparatus for mixing and extruding food material such as confections and the like.

There are many known devices which are capable of mixing and/or extruding food materials, including confections, on a large scale. Because of the expense, size and complexity of such known machines, and the difficulty involved in operating and cleaning them, their use has been generally confined to commercial installations from which the finished product is shipped to retail outlets for sale to the general public.

For commercial reasons, it may be desirable to ship the ingredients of certain confections to retail outlets where they can be properly mixed to form a confection product at or just before the time it is to be sold to the consumer, An example of such a product is fudge which can now be prepared as a powdered mix to be combined with water, in proper proportions, to form an "instant" fudge. The product is appealing to consumers, particularly where it is prepared "to order." It can be prepared in a suitable mix extrude machine in small batches (e.g., 10 pounds) and in a short time (e.g., about 15 minutes). However, there are no presently available machines which (a) can conveniently be used for such relatively small quantities, (b) can be used and cleaned by unskilled personnel, and (c) are priced to sell to the type of small eating place which would ordinarily desire to sell the confection.

This invention provides a mix extrude machine which satisfies the above criteria. It is a relatively simply device which can be easily disassembled for cleaning and maintenance. It can be operated semiautomatically and requires relatively little power to operate. The machine can be produced readily in large numbers for sale throughout the country.

Briefly, in accordance with the invention, a pair of axles are supported in front and rear bearing blocks. The axles extend into a mixing chamber where they are interlocked with respective mix extrude screws. The mixing chamber includes a recirculation plate which causes the food mixture to continually recirculate through the screws until it is desired to extrude the finished product through a gate at the base of the mixing chamber. Special means are provided for detachably clamping the mixing chamber to the front bearing block in such a way as to permit ready separation of the two, yet secure and reliable operation of the machine.

In the drawings:

FIG. 1 is a side view, partially in section, of a mix extrude machine according to the invention;

FIG. 2 is a top plan view of the machine;

FIG. 3 is a sectional view along the line 3—3 of FIG. 1;

FIG. 4 is a side sectional view along the line 4—4 of FIG. 3;

FIG. 5 is a front view showing the outlet gate of the machine;

FIG. 6 is a sectional view along the line 6—6 of FIG. 4; and

FIG. 7 is a detailed view of the axle and screw interlocking means of the invention.

The device is retained in a rectangular housing **10** (FIG. 1) which is divided into forward and rear compartments **12** and **14** by a vertical divider **16**. The driving means are located in the rear compartment **12** while the feed and mixing apparatus are in the forward compartment **14** and accessible for cleaning or maintenance purposes by removal of a front panel **18**.

The powdered confection is loaded into a funnellike hopper **20** through a hinged lid **22** in the top of housing **10**. Hopper **20** may be detachably secured to the interior of housing **10** in any suitable fashion for quick removal through the front of the housing when front panel **18** is removed. Powder in hopper **20** drops into a tubular outlet **23** in which a feed screw (not shown) rotates to provide a steady flow of powder as shown at **24**.

A mixing chamber including an oblong barrel **26** is positioned to receive the powdered discharge from hopper outlet **23** at a convenient height within housing **10**. Barrel **26** extends upwardly from a rounded casing **28** which is horizontally disposed and terminates in forward and rear flanges **30** and **32**, respectively. Front flange **30** extends through a complementary opening **31** in the front panel **18** and is flush therewith, As explained in further detail below, the rear flange **32** is clamped against a bearing block **34** (during normal operation) which in turn is bolted or otherwise permanently secured to the frame of housing **10**. Block **34** may include tabs **35** which mate with respective notches **37** in the edges of flange **32** for registration purposes.

Two standard ball bearings **36** (FIG. 4) with appropriate packing **38** are fitted into suitable openings in bearing block **34**. An annular bearing pusher **39** is bolted to the rear of bearing block **34** to hold the bearings **36** within the block. A pair of parallel axles **40** are rotatably received within front bearing block **34** with an end of each axle extending slightly into the rounded casing **28**. The opposite ends of the two axles **40** are also supported in suitable ball bearings and thrust bearings (not shown) within a rear bearing block **44** (FIG. 2). The rear bearing block **44** is secured to the front bearing block **34** by four threaded corner struts **46** which are inserted into block **34** at their front ends and secured by cooperating nuts **48** at the rear. Hardened thrust washers **49** are mounted on each axle **40** behind block **44**.

Axles **40** include meshing gears **50** mounted between bearing blocks **34** and **44** for reasons which will become apparent below. Additionally, one of the axles **40** includes a sprocket wheel **52** to the rear of its gear **50**. Sprocket **52** is driven through a chain **54** which engages a second sprocket **56** driven by the output shaft **58** (with suitable gear reduction) of an electric motor **60**. The motor is also secured in a suitable fashion to the frame of housing **10**. The powder-dispensing screw (not shown) within hopper outlet **23** may also be driven by motor **60** through a drive shaft **61** and a second chain drive **63**.

Each of the axles **40** engages a mix extrude screw **62** (FIGS. 2 and 4) which extends horizontally through casing **28** beneath the barrel **26**. The screws **62** are detachably retained on their respective axles **40** by an interlocking arrangement in which a pair of keys **64** and **65** (FIGS. 6 and 7) extending radially from each of the axles **40** engage respective slots **66** and **67** within each axle. The screws, of course, during operation are rotated so as to retain this locking relationship (i.e., counterclockwise in FIG. 6). Casing **28** is open in the area beneath barrel **26** so that the food mix fed into the barrel from the hopper **20** can be exposed to the mixing and kneading action of the rotating screws.

It is very important that the machine be capable of quick and easy disassembly for cleaning purposes. The foregoing interlocking arrangement of the screws and axles is advantageous in this respect. However, the invention also provides a simplified clamping device which enables the user of the equipment to remove the entire mixing chamber from housing **10**.

In the preferred embodiment, separate clamping devices are arranged on each side of the machine. Each clamping device includes upper and lower links **74** and **76** (FIG. 1) pivotally secured at one end to opposite ends of a rectangular block **78** which is retained at the back of bearing block **34** by bolts **75**. An eccentric cam roller **80** (FIG. 3) is rotatably mounted in the opposite ends of links **74** and **76** and a handle member **82** extends outwardly from the center of cam roller **80**. A stiffener strip **84** may be welded to flange **32** and adapted to be contacted by cam **80**. When the handle **82** is rotated from the dashed line to the solid line position (FIGS. 2 and 3), the cam member **80** rotates to jam or clamp flange **32** between stiffener **84** and bearing block **34**. Stiffener **84** may be omitted if the flange **32** is thick enough to support the mixing chamber without stiffening.

It is necessary to recirculate the confection mixture during the actual mix extrude operation. For this purpose, a recirculation plate **90** is mounted in barrel **26** slanting upwardly and to the rear from the front of the apparatus. As the screws **62** push the food mixture to the front of the chamber, recirculation plate **90** pushes the mix up and back over itself and into the front of the machine.

A rectangular gate **94** (FIGS. **4** and **5**) is mounted to slide vertically along the front flange **30**. Gate **94** includes an aperture **96** which opens into a nozzle **98** through which the finished product can be extruded. To hold the gate open (as indicated in solid lines in FIG. **4**), an eccentric cam roller **100** is pivotally supported in opposing brackets **102** and **104** which are bolted to the interior surface of flange **30**. Cam roller **100** is operated by a handle **106** and is adapted to press against two walls **108** and **110** projecting from gate **94** when the handle **106** is pulled upwardly. Suitable stop means (not shown) may be included to limit the downward movement of gate **94**.

Where the finished product is a solid (such as fudge) containing fats, heating of the mix will reduce power requirements if the fats are caused to melt slightly during mixing so that they will act as a lubricant. Such heating may be provided by warming the barrel **26** to a temperature of about 95° F. by convection heating means (not shown).

The operation of the device may be controlled by suitable electric circuits under control of the user. In a typical cycle, the powdered confection is first loaded into hopper **20** and the total water required dumped directly into barrel **26**. After a "start" switch is actuated, the metal parts are allowed to warm up for about 5 minutes. Then the motor **60** is operated to drive the hopper feed and mixing screws **62**. This portion of the cycle continues for about 10 minutes during which the powder and water are mixed and continually kneaded. After 10 minutes the motor and heating means may be turned "off," and a "ready" signal given. The operator can then dispense the confection by sliding gate **94** into its open position and actuating the motor again until the confection has been emptied from the mixing chamber.

To clean the device, the front panel **18** is first removed. The camming rollers **80** are released to enable removal of the mixing chamber from the bearing assembly. The screws may then be unlocked from their respective axles **40**, and the parts all cleaned separately. Desirably, the parts of the machine which will contact food should be made of stainless steel.

The invention, of course, is not limited to the specific configuration illustrated. By way of example, where 10 pounds of a fudge confection are to be prepared in a batch, the screws **62** may be 3 inches in diameter with a 1½-inch pitch. They may be rotated at 68–70 r.p.m. by a 1-horsepower motor **60**. Numerous modifications of these and other features of the invention will be obvious to those skilled in the art.

What is claimed is:

1. Apparatus for mixing and dispensing confections, comprising

a bearing assembly including front and rear bearing blocks,

a mixing chamber including a lower casing and an upwardly extending barrel, said casing including a rear flange adapted to engage said front bearing bock, a dispensing opening in its front end, and recirculation means for recirculating a mixture within said barrel,

two axles, each being supported in said front and rear bearing blocks and extending into said casing,

material-conveying screws detachably interlocked with respective ones of said axles and extending through said casing beneath said barrel,

clamping means for detachably securing said mixing chamber to said bearing assembly, and

a gate for selectively opening or closing said dispensing opening.

2. Apparatus according to claim **1**, wherein said recirculation means comprises a recirculation plate mounted in said barrel for recirculating the mixture from the front of the screws to the back thereof.

3. Apparatus according to claim **2**, wherein said clamping means includes an eccentric cam roller on each side of said mixing chamber, said cam rollers being secured to said bearing assembly and rotatably to urge said rear flange against said front bearing block.

4. Apparatus according to claim **3**, including a hopper for dispensing powder into said barrel.

5. Apparatus according to claim **1**, wherein each of said axles includes a locking key and each of said screws includes a locking slot into which a corresponding key is inserted.

6. Apparatus according to claim **1**, wherein said clamping means includes an eccentric cam roller on each side of said mixing chamber, said cam rollers being secured to said bearing assembly and rotatable to urge said rear flange against said front bearing block.

7. Apparatus according to claim **1**, wherein said gate includes a movable handle including locking means for securing said gate in an open position.

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