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DISPENSING HOPPER HAVING AUGER AND AGITATOR MEANS

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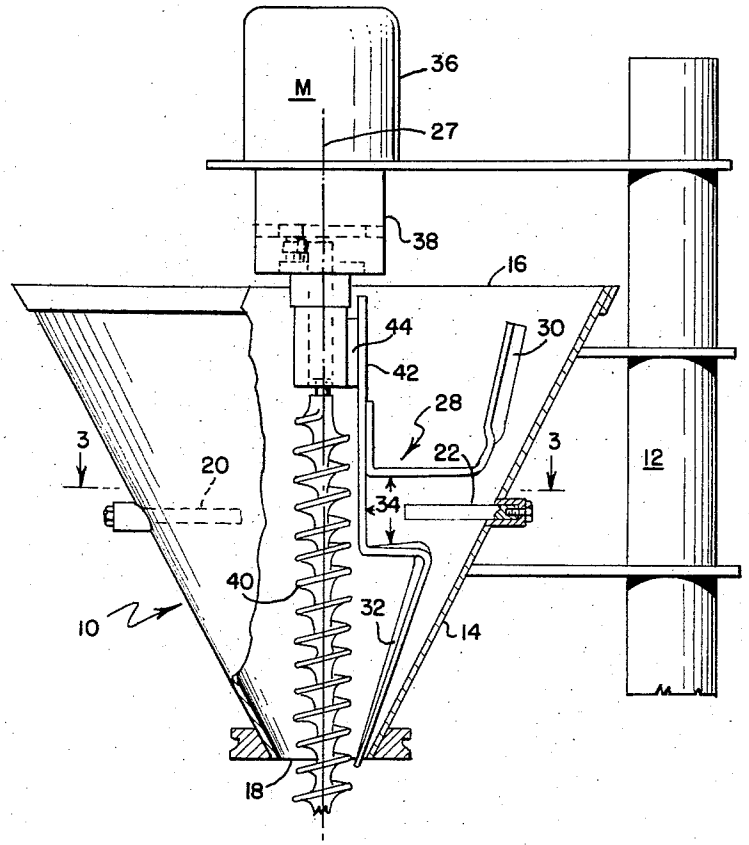


FIG. 1

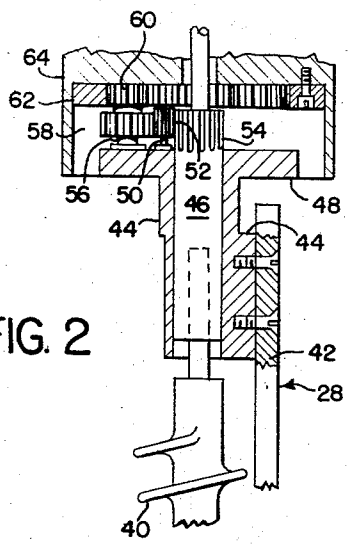
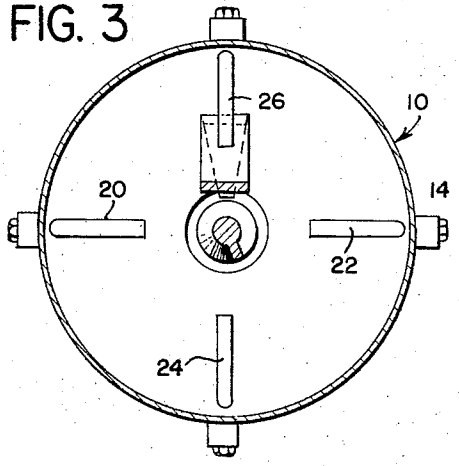


FIG. 2

FIG. 3



INVENTOR.
KARL A. KOHLER
BY Kenneth D. Ohm
ATTORNEY

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DISPENSING HOPPER HAVING AUGER AND AGITATOR MEANS

Karl A. Kohler, Minneapolis, Minn., assignor to General Mills, Inc., a corporation of Delaware

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The present invention pertains to a modified dispensing hopper useful in overcoming mass rotation of products which tend to agglomerate while in a dispensing hopper.

One feature of the present invention is to provide rod means in the interior of a hopper which tends to minimize mass rotation of the material in the hopper.

Another feature of the present invention is the provision of a unique correlation between the shape of the agitator and the length of the rod means positioned in the interior of the hopper.

Other features and advantages of the present invention will be apparent from the following description in which certain preferred embodiments of the invention are disclosed. In the drawings which form a part of this description,

FIGURE 1 is a side elevational view of a hopper embodying the present invention with portions of the drawing shown broken away for clarity;

FIG. 2 is an enlarged fragmentary sectional view of a portion of the device shown in FIG. 1; and

FIG. 3 is a transverse sectional view taken on line 3—3 of FIG. 1.

Referring now to FIG. 1, numeral **10** denotes a dispensing hopper mounted on a stationary post **12**. The hopper **10** is a vertically extending funnel or conical-shaped device which is circular in horizontal cross-section with its side wall **14** sloping downwardly and inwardly. The upper end or top portion **16** of the hopper is circular while the lower end or bottom portion **18** is also circular, but with a smaller diameter. The top portion **16** and the lower portion **18** are interconnected by the intermediate cone-shaped side wall portion **14**. The opening in the top portion **16** is sometimes called the inlet while the opening in the bottom portion **18** is sometimes called the outlet.

A plurality of rigid stationary stainless steel rods **20**, **22**, **24**, and **26** are securely affixed to the intermediate side wall portion **14** of the hopper by means well known in the art, such as threaded fastening means. The rods **20**, **22**, **24**, and **26** are circumferentially positioned along the side wall **14** in a horizontal plane. The rods **20**, **22**, **24**, and **26** extend toward the center of the interior of the hopper **10** from the interior surface of the side wall **14** toward the vertical axis **27** of the hopper. The vertical axis **27** passes through the center of the horizontal circle formed by the horizontal plane of the rods as said horizontal plane intersects the side wall **14**.

An agitator **28** adapted to rotate about the vertical axis **27** is positioned in the interior of the hopper **10**. The agitator **28** has a portion **30** which extends close to, but is free from contact with, the interior surface of the side wall **14** which is above the horizontal plane formed by the rods **20**, **22**, **24**, and **26**. The agitator **28** has another portion **32** which extends close to, but is free from contact with, the interior surface of the side wall **14** which is below said horizontal plane. The upper portion **30** and the lower portion **32** are connected by a U-shaped portion **34** of the agitator. The U-shaped portion **34** is adapted to pass close to, but to be free from contacting, i.e., to bypass, the rods **20**, **22**, **24**, and **26**, as the agitator **28** rotates about the vertical axis **27** of the hopper **10**. That is, the rods **20**, **22**, **24** and **26** are short enough in length to be bypassed by the U-shaped portion **34** of the agitator as said agitator portions **30** and **32** move along the interior surface of the side wall **18** as said agitator rotates about the vertical axis **27**.

An electric motor **36** is mounted on the stationary support **12**. The electric motor **36** is coupled through a drive means **38** to a vertically extending auger or feed screw **40**. The auger **40** is in substantial alignment with the vertical axis **27** of the hopper **10** and with the circular opening in the lower portion **18**.

Also coupled to the electric motor **36** through the drive means **38** is a portion **42** of the agitator **28**. The electric motor **36** drives both the agitator **28** and the auger **40** in a controlled manner through the gearing of the drive means **38**. Depending upon the selection of the gearing of the drive means **38**, the speed at which the agitator **28** and the auger **40** rotate can be made identical or not as desired.

As shown in detail in FIG. 2, the agitator **28** is secured to a sleeve **44** encircling and rotatable relative to a drive shaft **46** for the auger **40**. Journaled on and upstanding from a radial flange **48** on the upper end of the sleeve **44** is a stub shaft **50** to which is fastened a spur gear **52** meshing with the spur teeth **54** formed on the auger drive shaft **46**. Also journaled on and upstanding from the radial flange **48** is a stub shaft **56** to which is fastened a gear **58** meshing with the spur teeth formed on the gear **52**. A second gear **60** fastened on the stub shaft **56** meshes with an internal ring gear **62** bolted to the underside of a stationary casing **64** which depends from the housing of the motor **36**. Thus, as the auger drive shaft **46** is turned, the gears **52** and **58** cause the stub shaft **56** to rotate. As a result, the gear **60** moves around the ring gear **62** causing the sleeve **44** and hence the agitator **28** to turn about the hopper vertical axis **27** in a direction opposite to which the auger drive shaft **46** is turned. The gears of the drive means **38** can be selected as desired and as is known in the art to effect a speed reduction so that the agitator turns more slowly than the auger or vice-versa or so that the agitator and auger turn about the vertical axis **27** in the same direction.

In operation the dispensing device **10** shown in FIG. 1 is filled with material, such as heavy-greasy mixes and mixes containing large flakes, chunks or pieces of fragile ingredients, which are subject to breakage and loss of identity, through the inlet or opening of the upper end portion **16**. The material is dispensed from the hopper through the outlet or opening in the lower end **18** by means of the auger **40**. The auger **40** is turned or rotated about the vertical axis **27** by the motor **36** through the gear means **38** in a predetermined controlled manner to dispense measured quantities of the material.

The accuracy with which the auger **40** dispenses the desired measured quantities of the material from the hopper **10** depends upon uniformly feeding such material to the auger. This can only be accomplished by the agitator **28** in the absence of mass rotation of such material. In the present invention the absence of mass rotation of the material in the hopper is accomplished by the use of the rigid rods **20**, **22**, **24**, and **26** which extend from the interior surface of the side wall **14** toward the auger **40**. These rigid rods in conjunction with the agitator **28**, which rotates about the center axis **27** of the hopper **10** in a direction opposite to which the auger **40** rotates and in close proximity to the interior of the side wall **14**, act to keep the material in the hopper that would tend to agglomerate from rotating as a solid mass. This tends to keep such material so it can be uniformly fed to the auger **40**.

In view of the principles set forth herein, I have shown some of the ways of carrying out the present invention and some of the equivalents which are suggested by these disclosures.

What is claimed is:

1. A dispensing device comprising a hopper having an inlet, an outlet and a conical-shaped side wall interconnecting said inlet and outlet, rod means securely affixed to said hopper and extending from said conical-shaped side wall toward the center of said hopper, and an agitator means adapted to rotate about the axis of said hopper and formed to bypass said rod means as it rotates, said agitator having a first portion disposed close to the portion of the interior surface of said side wall located between said rod means and said inlet, and a second portion disposed close to the portion of the interior surface of said side wall located between said rod means and said outlet.

2. A dispensing device comprising a hopper having an inlet, an outlet and a conical-shaped side wall interconnecting said inlet and outlet, a plurality of rigid rod means securely affixed to said hopper, said rods being circumferentially positioned along said side wall and extending toward the center of said hopper, and an agitator adapted for rotation about the axis of said hopper having a first portion disposed close to the portion of said hopper side wall between said rod means and said inlet, having a second portion disposed to bypass said rod means as said agitator rotates about said hopper axis, and having a third portion disposed close to the portion of said hopper side wall between said rod means and said outlet.

3. A dispensing device comprising a vertically extending conical-shaped hopper having an inlet, an outlet, and a cone-shaped side wall, said inlet and said outlet being interconnected by said cone shaped side wall, a plurality of rigid rod means securely circumferentially affixed to said cone-shaped side wall and extending toward the center axis of said side wall, and an agitator adapted for rotation about the center axis of said side wall, said agitator having a first portion disposed close to the portion of said side wall above said rod means, a second portion disposed close to said rod means to bypass said rod means as said agitator rotates about said center axis, and a third portion disposed close to the portion of said side wall below said rod means.

4. A dispensing device comprising a vertically extending conical-shaped hopper having an inlet at its upper end, an outlet at its lower end, and an intermediate cone-shaped portion interconnecting said inlet and outlet, a plurality of rigid rods securely affixed to said cone-shaped portion and extending toward the vertical axis of said cone-shaped portion, an agitator positioned in the space defined by said cone-shaped portion and being rotatable about said vertical axis, said agitator having a first portion disposed close to said cone-shaped portion which extends above said rods, a U-shaped portion disposed close to while at the same time bypassing said rods as said agitator rotates about said vertical axis, and another portion disposed close to said cone-shaped portion which extends below said rods, an auger substantially coinciding with said vertical axis and in substantial alignment with said outlet, and motor means coupled to said agitator and auger to rotate said agitator and auger in a predetermined controlled manner.

5. A dispensing device comprising a vertically extending conical-shaped hopper circular in horizontal cross section having an inlet at its upper end, an outlet at its lower end which is smaller in diameter than said inlet, and an intermediate cone-shaped side wall interconnecting said inlet and outlet, a plurality of rigid rods securely affixed to said side wall in a predetermined horizontal plane and extending toward the center of the horizontal circle formed by the intersection of said horizontal plane and said intermediated cone-shaped side wall, an agitator positioned in said hopper and being rotatable about the vertical axis of said hopper, said agitator having a portion extending above said rods and disposed close to said side wall above said rods, a U-shaped portion disposed close to and free to bypass said rods as said agitator rotates about said vertical axis, and another portion extending below said rods and disposed close to said side wall below said rods, an auger in substantial alignment with said vertical axis and said outlet, and a motor coupled to said agitator and said auger to rotate said agitator and said auger in a predetermined controlled manner.

6. A dispensing device as set forth in claim 5 in which said motor is coupled to said agitator and said auger to rotate said agitator and said auger in opposite directions.

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M. HENSON WOOD, JR., *Primary Examiner.*

LOUIS J. DEMBO, *Examiner.*

A. N. KNOWLES, *Assistant Examiner.*