Nov. 6, 1962 G. E. GARD 3,062,511

CONTINUOUS BLENDER

Filed March 16, 1960

Fig. 1

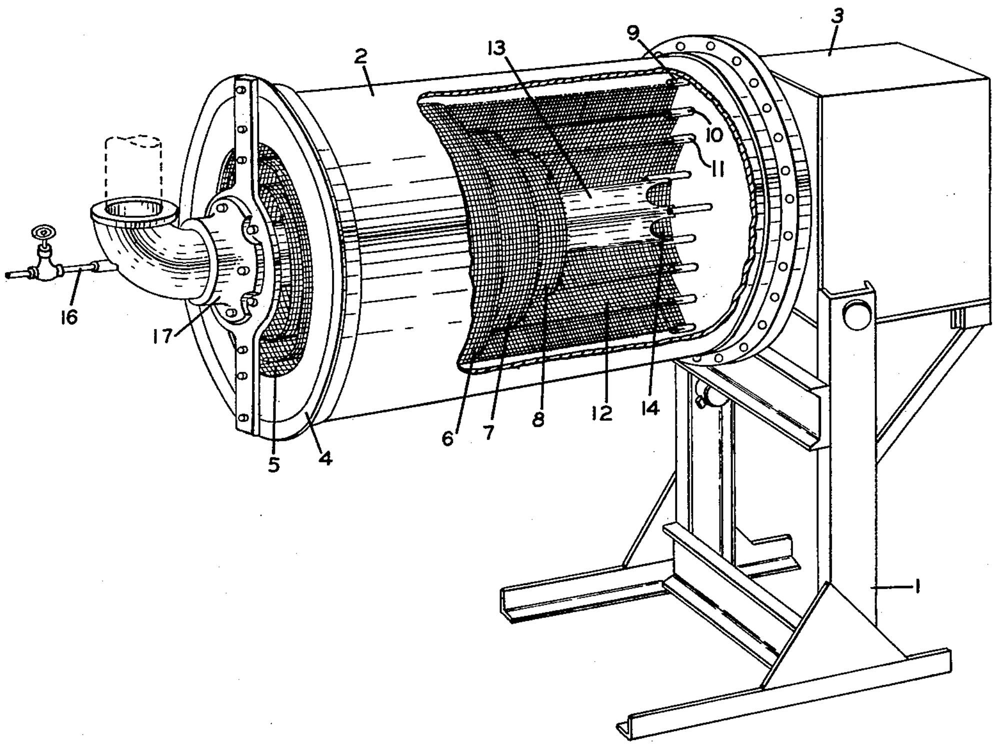
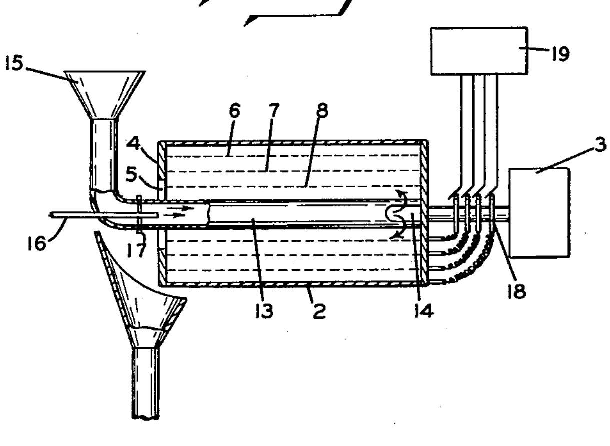



Fig. 2




INVENTOR
GEORGE E. GARD
by
Theodore L. Thomas
ATTORNEY

# 3,062,511
# CONTINUOUS BLENDER

George E. Gard, East Hempfield Township, Lancaster County, Pa., assignor to Armstrong Cork Company, Lancaster, Pa., a corporation of Pennsylvania

Filed Mar. 16, 1960, Ser. No. 15,474
6 Claims. (Cl. 259—3)

This invention relates generally to a blending apparatus and more particularly to a blending apparatus suitable for continuous operation. Still more particularly the invention relates to a blender adapted to intimately mix materials in particulate form with materials in the form of extremely flexible fibers, slivers and the like.

It has always been difficult to admix materials which are physically dissimilar. In the present instance the problem arises in admixing two or more materials having exceedingly diverse physical shapes and densities. As illustrations of these materials there may be mentioned foamed polystyrene beads measuring approximately ⅛" up to ½" in diameter having exceedingly low specific gravities. The material with which these foamed beads are to be mixed is exemplified by metallic slivers of a metal such as aluminum wherein the slivers may measure ⅜" long by 4 mils wide by 0.5 mil thick. Paddle-type agitation will not readily mix these two materials since the paddles simply cause felting of the slivers in the absence of special techniques. If there are any moving parts of an agitator, the slivers will ball up on the part. Mere tumbling does not suffice due to the great difference in the specific gravity of the two materials. Therefore the blending of these two materials in particular has always presented a problem in the forming of a homogeneous product having controlled dielectric properties.

It is the primary object of the present invention to present a blending apparatus which will overcome these difficulties. It is a further object of the present invention to present a continuous blending apparatus which allows the thorough admixing of dissimilar materials, one of which is in the form of flexible slivers or fibers, without waste of one of the materials.

To this end the invention contemplates a continuous blender including a supporting base and a rotatable cylindrical shell mounted on the base in a substantially horizontal position. One end of the shell is closed and the opposite end has mounted thereon an end plate provided with an axially-positioned opening. Inside the shell is mounted a series of cylindrical concentric, mutually spaced screens. An axially-positioned charging tube is mounted concentrically within the screens and within the opening in the end plate. This charging tube is provided with an outlet adjacent to the closed end of the shell. The charging tube forms with said opening in the end plate an annular outlet which serves as the discharge for blended materials. The shell, the end plate, the screens, and the charging tube are adapted to rotate as a single unit, there being no moving parts inside the blender.

In the accompanying drawings:

FIG. 1 is a simplified perspective view of a blender of the present invention; and

FIG. 2 is a simplified cross-sectional view of a blender of the present invention.

Like reference numerals apply to similar parts throughout the two views. The supporting base **1** supports the entire blender of the present invention in any convenient manner. The blender itself comprises the outer shell **2** which is closed at one end, preferably the end connected to the drive mechanism **3**. Opposite the closed end of the outer shell **2** is the end plate **4** provided with an axially-positioned opening **5**. Inside the outer shell **2** is the series of concentric screens **6**, **7** and **8**. These screens



**6**, **7** and **8** are mutually spaced to define between themselves and between the outer shell **2** annular regions to be occupied by material being blended. These screens **6**, **7** and **8** are held in position against the closed end of the blender by means of screen mountings as shown at **9**, **10** and **11**. The screens **6**, **7** and **8** possess screen openings **12** which are large compared with the largest dimension of the largest of the particles of material to be blended. These screens do not serve the role of classification or separation, but instead, serve solely as redistributing means while the material inside the blender is being tumbled. These screen openings **12** may be of any configuration and are preferably of a size between 2 and 4 times the largest dimension of the particles or the slivers being blended. The screens may be made of woven rods or wires, or they may be punched plates.

The charging tube **13** is axially-positioned in the blender, passing through the opening **5** in the end plate **4** and abutting against the closed end of the blender. The charging tube **13** is provided with an outlet **14** adjacent the closed end of the shell so that material to be blended is discharged at the furthest closed end of the blender. At the point where the charging tube **13** passes through the opening **5** in the end plate **4** there is formed an annular outlet for discharge of the blended material. It is apparent that the outer shell **2**, the end plate **4**, the screens **6**, **7** and **8**, and the charging tube **13** are adapted to rotate as a unit by being held in rigid position with respect to each other by welding, bolting, or other convenient means.

In operation, the materials to be blended may be fed to the charging tube **13** by means of a hopper **15**. Movement of the materials into the blender may be expedited by means of the air inlet **16** if desired. It is convenient to install a rotary joint **17** in order that materials to be blended may be fed to the blender from above as shown by the hopper **15**. The material to be blended then passes down the full length of the charging tube **13** and is discharged adjacent the closed end. The entire blender rotates at a suitable rate, preferably one where the materials to be blended fall through the screens in a substantially vertical direction. The materials to be blended pass through the screen openings **12** in the screens **6**, **7** and **8** and are driven toward the end plate **4** by the press of additional materials and by the air, if any, entering through the air inlet **16**. The size of the opening **5** in the end plate **4** determines the size of the annular outlet which in turn controls the volume of material in the blender. The annular outlet should not be too small, particularly where air is used as an aid in feeding the materials into the blender, in order not to hinder the ready flow of materials through the blender.

Convenient materials of construction may be used. However, one of the advantages of the blender of the present invention is that the blender may be used to monitor and even control the relative amounts of individual ingredients in the blended mixture. Such control is accomplished by treating the screens **6**, **7** and **8** as the plates of capacitors and measuring the change in capacitance, if any, of the materials being fed through the blender. Thus the screens **6**, **7** and **8** may be made of any conductive material such as black iron or aluminum, electrically insulated from the rest of the blender. Slip rings as shown at **18** may accomplish the necessary electrical connection to a capacitance meter **19** of suitably high resolution. The output of the capacitance meter **19** can be used to control the feed characteristics by increasing or diminishing the amount of any particular fed ingredient. A blender having an outside diameter of about 30", a length of about 6", with three concentric screens spaced about 3" apart, and rotating at about 10 revolutions per minute while blending cellular polystyrene beads and aluminum slivers, has an optimum through-put of about 2 cubic feet per minute.

The blender may be rotated by hand or mechanically as desired, and it may be supported by a cantilever structure as shown in FIG. 1, or it may be supported at each end.

The end plates will be made of wood or suitable insulating material when the blender is used in connection with a capacitance meter to measure or control the ratio of ingredients being blended.

I claim:

1. A continuous blending apparatus including a supporting base, a rotatable cylindrical shell mounted on said base in a substantially horizontal position and being closed at one end, an end plate at the end opposite the closed end of said shell and being provided with an axially-positioned opening, a series of cylindrical, concentric and mutually spaced screens mounted within said shell extending from said end plate to said closed end of said rotatable cylindrical shell, an axially-positioned charging tube concentrically mounted within said screens and said opening in said end plate and being provided with an outlet adjacent the closed end of said shell and forming with said opening an annular outlet for blended material, the shell, end



plate, screens, and charging tube being adapted to rotate as a unit around the longitudinal axis of the shell.

2. A continuous blending apparatus according to claim 1 being mechanically driven.

3. A continuous blending apparatus according to claim 1 having three of said screens.

4. A continuous blending apparatus according to claim 1 wherein said screens are electrically insulated from the remainder of the parts, and being provided with means to measure the electrical capacitance between said screens.

5. A continuous blending apparatus according to claim 1 wherein said charging tube is provided with an air inlet as an aid in blowing feed materials into said blender.

6. A continuous blending apparatus according to claim 1 provided with a feed hopper.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