

[54] GLASS PULVERIZER

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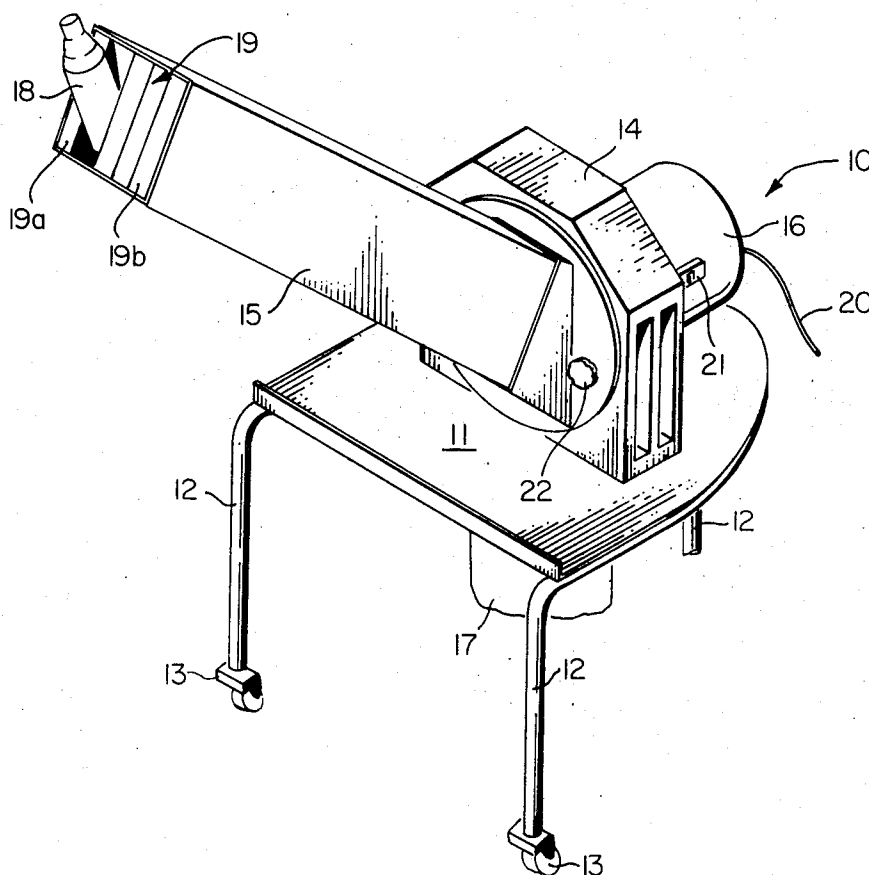
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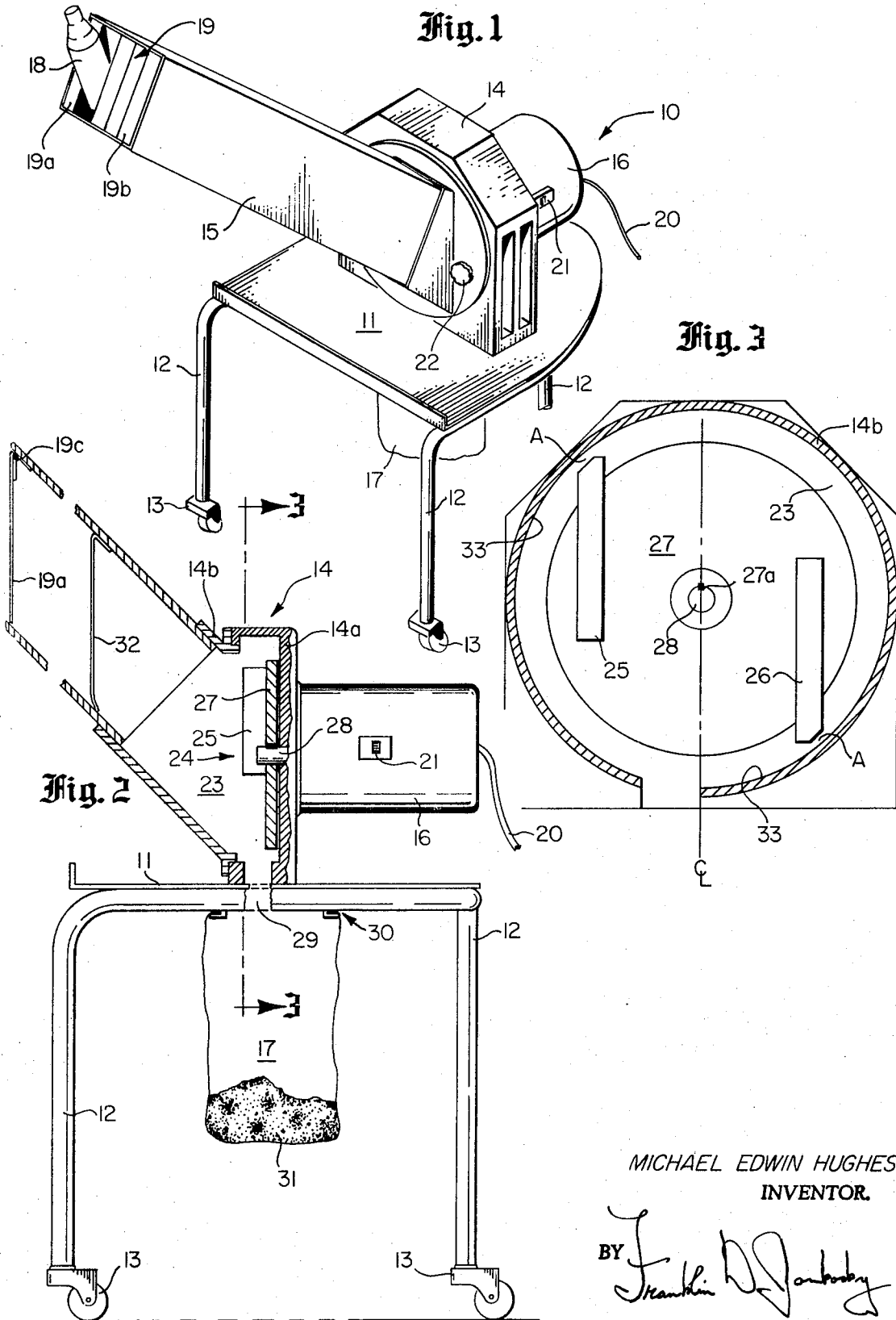
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[57] ABSTRACT

A glass pulverization apparatus including a cylindrical pulverization chamber having a pair of case hardened steel impeller blades located therein for pulverizing glass articles or the like. The peripheral speed and the unit torque of the impeller blades along with a gap maintained between the end of the respective impeller blades and the surface of the cylindrical pulverization chamber ensures rapid pulverization of glass articles or the like. An escape aperture, which is offset from a vertical line normal to the horizontal axis of the drive shaft that rotates the impeller blades, provides for a secondary means of determining the end size of the pulverized glass. A receiving chute is positioned at a 45° angle to the cylindrical pulverization chamber to facilitate the rapid pulverization of the glass articles or the like.

2 Claims, 3 Drawing Figures





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GLASS PULVERIZER

FIELD OF THE INVENTION

This invention relates to the destruction of glass articles or the like, and more particularly to the rapid pulverization of glass articles or the like to safe, compact, easy to handle bulk form.

DESCRIPTION OF THE PRIOR ART

Glass bottle-breaking machines have been in use for a number of years. There have been simple machines that employ a pair of rotor blades to randomly strike the bottle to pieces, and there have been added features on similar type machines, such as, means for initiating the rotation of the rotor blades upon the insertion of the bottle into the input of a feed hopper. There have also been machines that utilize a complex arrangement of crushing rollers in combination with an anvil and a rotating cutter to crush glass bottles. In addition, rotating drums having extended teeth-like members have been employed to crush glass bottles. However, all of these machines were relatively slow and produced an end product of glass chips which was bulky, harmful, and not suitable for most recycling applications.

Accordingly, it is an object of the present invention to provide a glass pulverization apparatus to rapidly pulverize a large quantity of glass articles or the like in a relatively short period of time.

It is a further object of the present invention to provide a glass pulverization apparatus for pulverizing glass articles or the like into a safe, compact, easy to handle bulk form.

It is a still further object of the present invention to provide a glass pulverization apparatus for pulverizing glass articles or the like into a powder-like form.

It is another object of the present invention to provide a glass pulverization apparatus which pulverizes glass articles or the like to a useable size for recycling tiles, roadways, etc.

SUMMARY OF THE INVENTION

In accordance with the objects set forth above, this invention provides a glass pulverization apparatus which includes a cylindrical pulverization chamber having a pair of case-hardened steel impeller blades located therein for pulverizing glass articles or the like. The peripheral speed and the unit torque of the impeller blades along with a gap maintained between the end of the respective impeller blades and the surface of the cylindrical pulverization chamber ensures rapid pulverization of glass articles or the like. An escape aperture, which is offset from a vertical line normal to the horizontal axis of the drive shaft that rotates the impeller blades, provides for a secondary means of determining the end size of the pulverized glass. A receiving chute is positioned at a 45° angle to the cylindrical pulverization chamber to facilitate the rapid pulverization of the glass articles or the like.

BRIEF DESCRIPTION OF THE DRAWINGS

Additional objects, advantages and characteristic features of the present invention will become readily apparent from the following description of the preferred embodiments of the invention when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a perspective view of a glass pulverization apparatus in accordance with the present invention;

FIG. 2 is a side elevational view of the glass pulverization apparatus with portions thereof exposed to illustrate various components therein in accordance with the present invention; and

FIG. 3 is a sectional view taken along the line 3—3 of FIG. 2 illustrating the various components associated with the cylindrical pulverization chamber of the glass pulverization apparatus in accordance with the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIG. 1, there is shown a perspective view of a glass pulverization apparatus 10 mounted on a stand 11 in accordance with the present invention. While the mounting means, namely, the stand 11, which has three legs 12 and accompanying casters 13, is illustrated to provide portability for the glass pulverization apparatus 10, the glass pulverization apparatus 10 may be mounted within a built-in arrangement. The glass pulverization apparatus 10 generally includes a pulverization housing 14, a receiving chute 15, a motor 16 and a receptacle bag 17. As illustrated, a bottle 18 may be inserted into the glass pulverization receptacle 10 via a spring-loaded door 19, having door members 19a and 19b that are biased by spring members 19c, on the upper end of the receiving chute 15. Further illustrated are a power source connection means 20 and an on/off switch 21.

Referring now to FIG. 2, there is shown a side elevational view of the glass pulverization apparatus 10 with portions thereof exposed to illustrate various components therein. The pulverization housing 14 may be of cast metal, such as aluminum, and includes a main portion 14a and a front panel 14b. The front panel 14b may be secured to the main portion 14a by means of conventional locking means, such as a pair of hand wheels 22 that are respectively illustrated in FIGS. 1 and 2. When the front panel 14b is secured to the main portion 14a, there is formed a cylindrical pulverization chamber 23. Located within the cylindrical pulverization chamber 23 is pulverization means 24 which is mounted to a drive shaft 28, by conventional means, such as, a keyway lock mounting means 27a. The pulverization means 24 includes an impeller blade mounting 27 and a pair of impeller blades 25 and 26, as illustrated in FIG. 3. The pulverization means 24 are constructed of case-hardened steel including not more than a maximum of 1 percent of Tantalite (Ta_2O_5) to provide the necessary strength and durability to accomplish the effective rapid pulverization of the glass for the life-time of the impeller blades 25 and 26. While the pulverization means 24 are shown as a unit construction, the pair of impeller blades 25 and 26 and the impeller blade mounting 27 may be separate components.

An escape aperture 29 allows the glass pulverized by the glass pulverization apparatus 10 to drop into the receptacle bag 17. The receptacle bag 17 may be retained on the glass pulverization apparatus 10 by means of conventional retention means 30, such as, the snap-clamp arrangement illustrated. While the receptacle bag 17 is illustrated as a means to retain the pulverized glass 31, it should be understood that either in a portable or in a built-in glass pulverization apparatus 10, it would still be within the scope of the present invention to utilize a drawer receptacle unit to collect and retain

the pulverized glass. While the size of the aperture 29 plays a part in determining the size of the pulverized glass 31, the illustrated gap A maintained between the ends of the respective impeller blades 25 and 26 and the chamber pulverization surface 33 along with the peripheral speed and unit torque of the pulverization means 24 principally determines the size of the pulverized glass 31.

Referring now to FIG. 3, there is shown a sectional view taken along the line 3—3 of FIG. 2 to illustrate the various components associated with the cylindrical pulverization chamber 23. The drive shaft 28 is centrally mounted with respect to the cylindrical pulverization chamber 23 on bearings, not shown, and extends through the main portion 14a of the pulverization housing 14 to the motor 16. The keyway lock mounting means 27a retains the pulverization means 24 on the drive shaft 28. The escape aperture 29 is located to the left of the vertical line normal to the axis of the drive shaft 28, defined as C/L. It has been found by experimentation that such location of the escape aperture 29, in the working prototype which has impeller blades 25 and 26 rotating in the clockwise direction, prevents clogging of the glass pulverization apparatus 10.

Referring now to both FIGS. 2 and 3, the size of the various components of a working prototype of the glass pulverization apparatus 10 will now be discussed. The motor 16 is a 230/250 volt, $\frac{3}{4}$ horse power, 1425 revolutions per minute, 50-cycle, single phase, totally enclosed, squirrel cage, capacitor start induction run type flange-mounted motor. It should be understood that an equivalent U.S. or other foreign country motor that will produce the same torque and revolutions per minute may be utilized to rotate the pulverization means 24. The diameter of the cylindrical pulverization chamber 23 is 10 inches and the pair of impeller blades 25 and 26 provide a $9\frac{1}{2}$ inch diameter swing within the cylindrical pulverization chamber 23. The ends of the impeller blades 25 and 26 have a $\frac{1}{4}$ inch 45° chamfer to provide the gap A of $\frac{1}{4}$ inch, as illustrated.

In such working prototype, the pulverized glass collected is in a substantially powder-like form. While the working prototype of the glass pulverization apparatus 10 pulverizes glass articles to a substantially powder-like form, it should be understood that various modifications to the gap A, or the peripheral speed and unit torque of the pulverization means 24, to provide pulverized glass of a different size is within the contemplation and scope of the present invention.

Referring now to FIG. 2, the receiving chute 15 is shown mounted at a 45° angle with respect to the vertical orientation of the cylindrical pulverization chamber 23. It has been found that optimum rapid pulverization of bottles may be obtained if such bottles enter the cylindrical pulverization chamber 23 at such 45° angle. On the other hand, if the receiving chute 15 is mounted at an angle substantially over 45° with respect to the vertical orientation of the cylindrical pulverization

chamber 23, the impeller blades 25 and 26 hit the side of the bottles, and the pulverization process takes longer; and if the receiving chute 15 is mounted at an angle substantially less than 45° with respect to the vertical orientation of the cylindrical pulverization chamber 23, the bottles do not have enough impetus and again, the pulverization process takes longer. The receiving chute 15 not only provides safety means in the spring-loaded door 19, but further provides a secondary protective device, namely, a stranded rubber curtain 32 which further prevents any glass particles from being blasted back out of the feed end of the receiving chute 15.

Thus, although the present invention has been shown and described with reference to particular embodiments, for example, impeller blades having a $\frac{1}{4}$ inch 45° chamfer nevertheless, various changes and modifications obvious to a person skilled in the art to which the invention pertains, for example, impeller blades having a curved end, are deemed to lie within the spirit, scope and contemplation of the invention as set forth in the appended claims.

I claim:

1. Apparatus for pulverizing glass-like articles comprising:
 - motor means including a drive shaft for providing rotational motion;
 - a cylindrical chamber having an escape aperture, said cylindrical chamber having an inner cylindrical surface;
 - pulverization means located within said cylindrical means located within said cylindrical chamber, said pulverization means including at least two impeller blades, located in parallel planes to each other and disc-like mounting means, said impeller blades being mounted to said disc-like mounting means, said disc-like mounting means being mounted to said drive shaft of said motor means, said distal end of each said impeller blade having a $\frac{1}{4}$ inch, 45° chamfer to provide a $\frac{1}{4}$ inch gap between said respective chamfered distal ends of said impeller blades and said inner cylindrical surface of said cylindrical chamber;
 - receiving chute means having an input end and an output end said receiving chute means mounted to said cylindrical chamber for providing gravity feed of said glass-like articles to said cylindrical chamber; and
 - receptacle means located below said cylindrical chamber in proximity of said escape aperture for receiving said pulverized glass-like articles.
2. Apparatus for pulverizing glass-like articles as recited in claim 1 wherein said drive shaft of said motor means rotates at a desired speed to provide sufficient unit torque to said impeller blades whereby said glass-like articles are pulverized to a powder-like form.

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