March 3, 1953 K. W. LENTZ 2,630,301

ROTARY ELASTIC DRUM BLENDER

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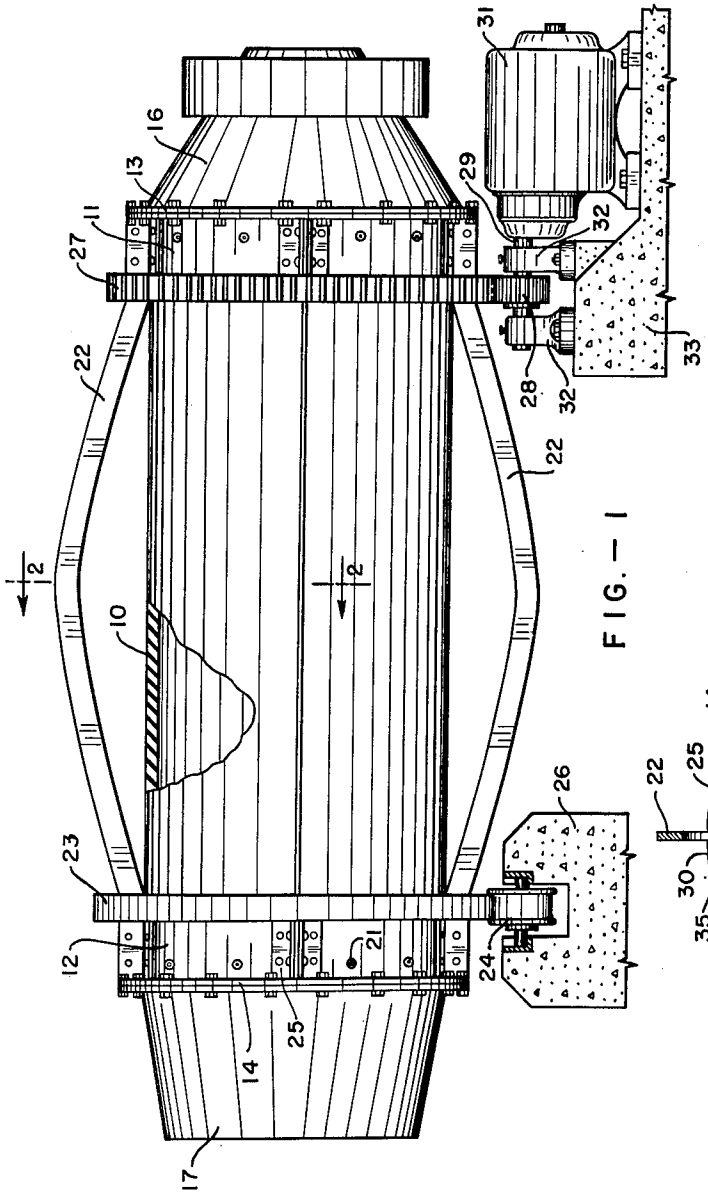


FIG. — 1

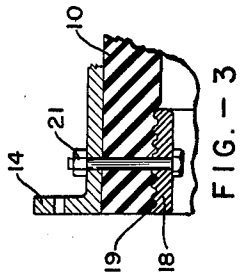


FIG. — 3

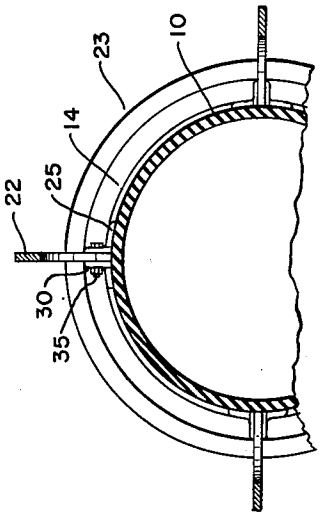


FIG. — 2

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ROTARY ELASTIC DRUM BLENDER

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5 Claims. (Cl. 259—3)

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My invention relates to a rotary blender particularly adapted for blending solids in the form of an aggregate with liquids in a continuous operation.

Various types of rotary blenders are in operation today and in general consist of a rotating cylinder in which dry and moist divided solids are mixed with a liquid and discharged in the form of a pulp. In many instances these pulps are not free-flowing; and as a result, require the incorporation of some mechanism, such as a scraper blade, to free the moist adherent mass from the walls of the mixing vessel and cause it to flow axially towards the discharge end. Scrapers are in many instances undesirable, not only from the standpoint of maintenance, but also because of their frequent inability to properly clean the walls of the vessel and move the materials towards the discharge.

One of the primary objects of my invention is to provide a rotary blender or mixer constructed in such manner as to continuously and automatically free the adherent moist masses of solids from the walls of the mixing vessel and to discharge the materials at a substantially uniform rate after thorough and complete blending without use of scrapers disposed within the mixing vessel.

Other important objects of my invention include the provision of apparatus of the type described which can be constructed at relatively low cost, requires minimum maintenance, which provides for the the simple and rapid replacement of the major component parts, and which may be utilized in processing a wide variety of materials.

Other important objects relating to the various novel combinations and component parts are disclosed in the following description and illustrated in the appended drawings, in which:

Fig. 1 is a partially sectioned elevation of a preferred form of my device;

Fig. 2 is a cross section taken along the lines 2—2 of Fig. 1; and

Fig. 3 is a partial cross section through one of the end rings illustrating the method by which the body is attached.

One of the principal uses of my apparatus is the blending of one or more types of ground ore or aggregate with water or similar liquids to produce a uniform pulp. However, it is to be understood that the same apparatus may without major modification also be utilized in blending other materials, particularly those of a sticky nature, such as for example, asphaltic concretes or mixtures of aggregates such as sand and gravel

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with plastic materials such as natural or synthetic plastics, glues, resins, and the like.

In brief, my device is an elongated cylindrical body formed of a material capable of elastic deformation and supported at opposite ends by hollow rigid rings interconnected by bow-shaped struts which not only translate the torsional force between the ends, but which also limit the maximum elastic deformation of the body. Thus, as the body is rotated and the divided solids and liquids fed to my blender, the central portion of the elastic body will be distorted outwardly away from its normal position with respect to the axis of rotation by the mass of contained material. As each portion of the body passes from a lower to an upper position, its elastic strength causes it to assume a different position, thus continuously flexing and distorting the walls of the mixing vessel to such an extent that the adherent materials are freed from the walls and returned to the rolling mass carried in the lower portion of the body.

For simplicity of description, the material from which the cylindrical rotating body member of my blending apparatus is formed will be referred to in the following description and in the claims as rubber. It will be understood, however, that the word "rubber" as employed herein encompasses both the natural and synthetic rubber compounds as well as the various synthetic plastics having rubber-like qualities, such as a high order of elasticity and elastic strength, a smooth impervious surface, resistance to the passage of moisture, and resistance to abrasive action. The material actually selected for use in each instance will, of course, be governed by the nature of the service for which the blender is intended, consideration being given in the selection to the chemical resistance of the material selected with respect to the liquids and solids to be mixed.

A preferred form of my invention is illustrated in Fig. 1 and includes an elongated hollow cylindrical body 10 of rubber. The extremities of the body 10 are secured to an inlet end ring 11 and discharge end ring 12, each being substantially similar and provided with end flanges 13 and 14, respectively, to which a conventional inlet cone 16 and outlet cone 17 are secured. The rings 11 and 12 are fitted over the extremities of the body 10 and are secured in position by a series of rigid clamp strips 18 formed of curved strip material and corrugated as at 19 on their inner surface. Bolts 21 extend through the clamp strips 18, the body 10, and through rings 11 and 12, thereby securing the body 10 in position. Preferably eight bolts are employed on each end ring, thereby per-

mitting rapid replacement of the body 10 when necessary without dismounting the balance of the structure. The rings 11 and 12 are interconnected by four rigid struts 22 each fastened at their extremities to the end rings 11 and 12, as by bolts 25 extending through flanges and bowed outwardly away from the body 10 near their midpoint. These struts 22 serve to transmit torsional force applied to one of the rings 11 to the other of the rings 12, thereby relieving the body 10 of torsion. They also serve to limit maximum deflection of the body 10 from its normal position under the influence of a mass of material. The support ring 23 extends around the struts 22 near one of the rings, as for example the ring 12 and is rotatably supported by a flanged idler wheel 24 rotatably mounted in a suitable support 26. A large circular gear 27 extends around the struts 22 near the opposite end and engages a driving gear 28 secured to a shaft 29, the latter being coupled to a suitable motor 31 and supported in pillow blocks 32 mounted on a suitable support 33. The ring 23 and gear 27 are secured to the struts 22 by suitable flanges 30 and bolts 35. The axis of the body 10 may be horizontal or inclined slightly towards the discharge cone 17.

In operation, the solids in the form of aggregates are fed to the inlet cone 16, together with a predetermined quantity of liquid, such as water. The motor 31 is energized, thereby driving the body 10 and causing the solids to move axially towards the discharge cone 17. As the mass of partially blended liquid and solids approaches the central portion of the body 10, the lower portion thereof will be deflected outwardly away from the axis, thus stressing the body and causing an elastic movement of the inner surface. As this particular point on the body progresses upwardly towards the uppermost position, a majority of the solids will fall therefrom towards the bottom, thus creating a tumbling action. A certain quantity of the material, however, normally will adhere to the inner surface. As the body, under the influence of elastic force, resumes its normal position, the inner skin is again flexed and caused to move. This movement loosens the adherent material causing it to fall towards the bottom of the body 10, where it is blended with the main body of material.

Discharge of the blended solids can be controlled either by control of the rate at which materials are fed to my device or by a suitable gate of conventional design on the discharge cone.

Although rubber is highly resistant to abrasion, it is not indestructible and the body 10 will therefore eventually require replacement. When this occurs, the body 10 is easily replaced simply by withdrawing the body section after removal of bolts 21 and clamp strips 18 and inserting a replacement. If the thickness of the wall of the body 10 is not great, this operation can be performed even without the removal of one of the struts 22. If, on the other hand, removal of one of the struts 22 is necessary, the bolts extending through the flanges 25 may be removed, together with ring 23 and bolts 35. Assembly is accomplished by reversal of these operations.

It will, of course, be obvious to those skilled in the art that modifications may be made in many of the details hereinbefore described without departing from the true spirit and scope of my invention. I do not therefore limit myself to these details except insofar as defined in the appended claims.

I claim:

1. Rotary blending apparatus comprising a pair of hollow cylindrical, axially spaced end rings, means for supporting said rings for movement about a common axis, a hollow elastic rubber cylinder extending into said rings, a clamp strip on the inner surfaces of said cylinder within said rings, bolts extending through the clamp strip, the cylinder, and the end rings for compressively securing the cylinder in position, a plurality of axially extending rigid struts disposed at substantially uniform intervals about the circumference of the cylinder and interconnecting the rings for transmitting torsion therebetween, each of said struts being bowed outwardly intermediate the rings and spaced outwardly from the rubber cylinder, and means for driving said rings, the wall thickness of the cylinder being selected for elastic distortion outwardly between the end rings under the influence of a mass of material being blended therein, said struts being disposed for limiting said elastic distortion.

2. Rotary blending apparatus, comprising an elongated cylindrical body having a feed inlet at one end and a discharge outlet at its opposite end, a pair of annular members supporting the cylindrical body at its respective ends in encompassing relation thereto, a plurality of circumferentially spaced struts interconnecting the annular members and spaced from the portion of the cylindrical body intermediate its ends, so as to permit free suspension of said intermediate portion, said cylindrical body being formed of a material capable of elastic deformation and the arrangement of struts limiting the distortion of said body, means supporting the annular members for rotation about a substantially horizontal axis, and means for rotating said body through the intermediary of one of said annular members, whereby the intermediate portion is subjected to a flexing distortion in accordance with the shifting of the mass of material fed into the body through said inlet.

3. Rotary blending apparatus, comprising an elongated cylindrical body having a feed inlet at one end and a discharge outlet at its opposite end, a pair of annular members supporting the cylindrical body at its respective ends in encompassing relation thereto, a plurality of circumferentially spaced struts interconnecting the annular members and spaced from the portion of the cylindrical body intermediate its ends so as to permit free suspension of said intermediate portion, said cylindrical body being formed of rubber capable of elastic deformation and the arrangement of struts limiting the distortion of said body, means supporting the annular members for rotation about a substantially horizontal axis, and means for rotating said body through the intermediary of one of said annular members, whereby the intermediate portion is subjected to a flexing distortion in accordance with the shifting of the mass of material fed into the body through said inlet.

4. Rotary blending apparatus, comprising an elongated cylindrical body having a feed inlet at one end and a discharge outlet at its opposite end, a pair of annular members supporting the cylindrical body at its respective ends in encompassing relation thereto, a plurality of circumferentially spaced struts interconnecting the annular members and outwardly bowed from the portion of the cylindrical body intermediate its ends so as to permit free suspension of said intermediate portion, said cylindrical body being

formed of a material capable of elastic deformation and the arrangement of struts limiting the distortion of said body, means supporting the annular members for rotation about a substantially horizontal axis, and means for rotating said body through the intermediary of one of said annular members, whereby the intermediate portion is subjected to a flexing distortion in accordance with the shifting of the mass of material fed into the body through said inlet.

5. Rotary blending apparatus, comprising an elongated cylindrical body having a feed inlet at one end and a discharge outlet at its opposite end, a pair of annular members supporting the cylindrical body at its respective ends in encompassing relation thereto, a plurality of circumferentially spaced, substantially rigid struts interconnecting the annular members and spaced from the portion of the cylindrical body intermediate its ends so as to permit free suspension of said intermediate portion, said cylindrical body

being formed of a material capable of elastic deformation and the arrangement of struts limiting the distortion of said body, means supporting the annular members for rotation about a substantially horizontal axis, and means for rotating said body through the intermediary of one of said annular members, whereby the intermediate portion is subjected to a flexing distortion in accordance with the shifting of the mass of material fed into the body through said inlet.

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