Aug. 25, 1959 G. R. RUSSUM 2,901,227

MIXING APPARATUS

Filed Nov. 27, 1956

Fig. 1.

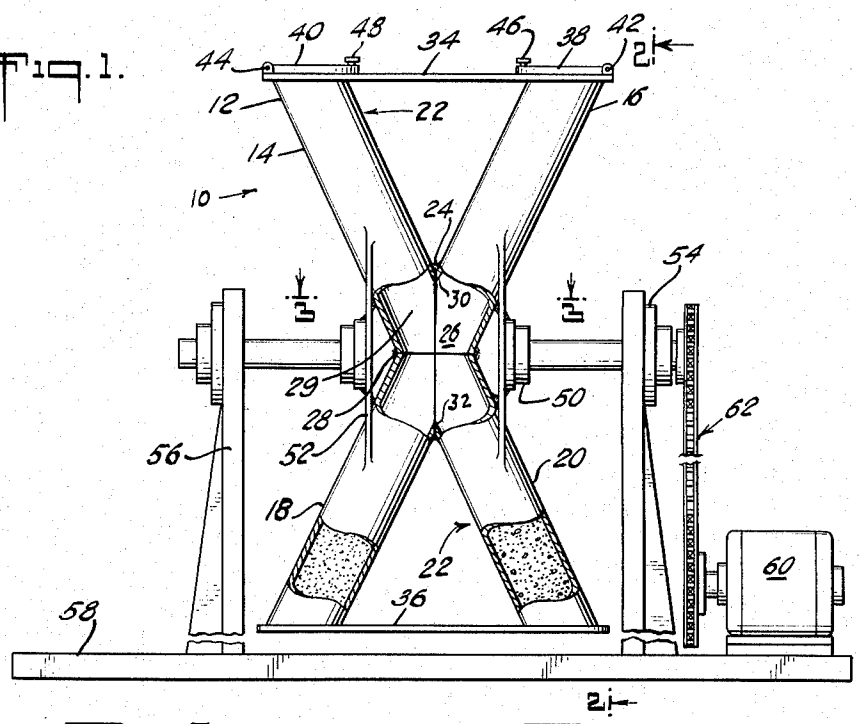



Fig. 2.

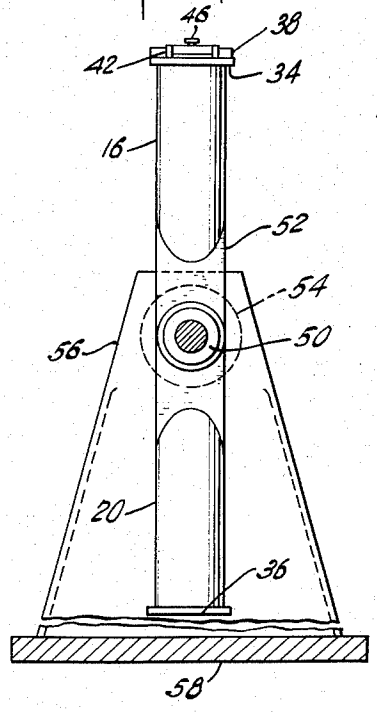



Fig. 3.

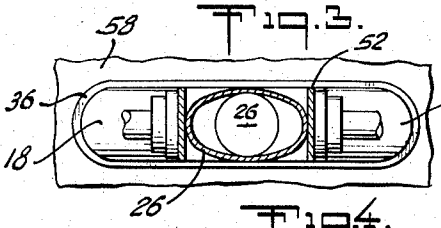
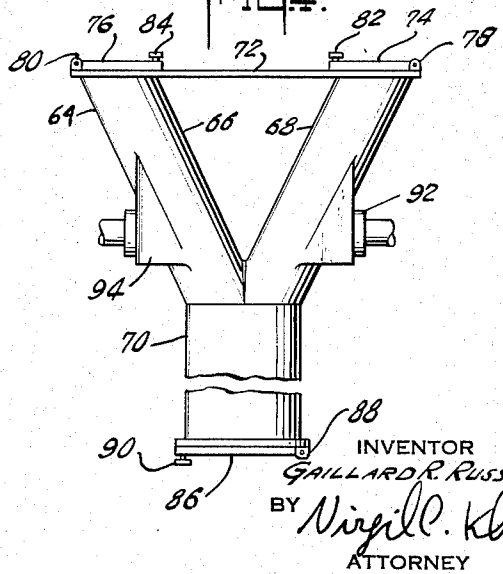



Fig. 4.




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# MIXING APPARATUS

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5 Claims. (Cl. 259—81)

This invention relates to a mixing apparatus, and more particularly, to a blending or mixing device of the type employed for use in blending various materials.

Heretofore, various types of blenders or mixers comprising tumbler devices of a variety of shapes have been developed for use in blending together materials or substances of granular or powder form. Such blending devices have met with various degrees of success in effecting a thorough mixing of materials in a minimum of time. A blending device of the general type with which this invention is concerned is disclosed in Patent No. 2,514,126 to John J. Fischer, issued July 4, 1950. As shown in the patent, a V-shaped container having a pair of diverging leg portions is arranged to rotate about a horizontal axis for tumbling loose materials occupying the leg portions of the unit and thereby effecting blending of the materials.

The main purpose of the present invention is to provide a new and improved blending or mixing device of novel shape, whereby such materials are expeditiously and thoroughly mixed in a minimum of time.

It is further the purpose of the present invention to provide an improved blending device of the type described, which is characterized by the provision of hollow side leg portions arranged in such a manner that all of the materials contained therein, and not merely portions of the materials will simultaneously be moving from opposite leg portions of the container so as to drive into and through each other, thereby effecting an improved blending operation with exceptional blending results.

The blending or mixing device of the present invention is further characterized by a simple and rugged casing structure which is easily and economically fabricated by standard shop methods, and which is easily filled with materials to be blended, operated, and discharged.

The blending device of the present invention is also adapted for mixing materials of either the same or different sizes and specific gravities, and in either dry or wet state.

In brief, a blending or mixing device constructed in accordance with the present invention comprises a rotating or "tumbler" type container having a casing structure of novel shape formed with oppositely disposed side portions so that when rotated, it tumbles all of the material contents in a novel manner, thereby providing an expeditious and thorough mixing of the materials therein in a minimum of time.

These and other features of the present invention are further described in detail below in connection with the accompanying drawing, in which like numerals designate like parts, and in which;

Fig. 1 is a side elevation of a blending device embodying the present invention, with parts broken away for purposes of illustration;

Fig. 2 is a section taken substantially along the line 2—2 in Fig. 1;

Fig. 3 is a section taken substantially along the line 3—3 in Fig. 1; and,

Fig. 4 is a side elevation of a modified form of the blending device of Fig. 1.



The blending or mixing device illustrated in the drawing as an embodiment of the present invention, is indicated generally by the reference numeral **10**, and, as shown, comprises an essentially X-shape container **12** having opposite side leg portions **14**, **16**, **18**, and **20**, of substantially cylindrical form, disposed in oppositely diverging directions, and with their longitudinal axes lying in the same plane and intersecting substantially at the center of the container **12**. Though the cross-section of the leg portions is shown as being circular in the illustrated embodiment of the present invention, it will be understood that the leg portions may be of any other preferred sectional form, such as a modified circular or polygonal form, without departing from the scope of the present invention.

The casing of the container **12** may be constructed of two similar half-sections **22** of equal volume and of a generally V shape, each half section **22** being formed of a pair of the cylindrical side leg portions **14**, **16**, **18** and **20** joined together at obliquely cut-out end portions thereof, making an angle substantially less than 180° therebetween, and preferably an acute angle, in any suitable manner, such as by welding, as indicated at **24**. Each similar half-section **22** further has the tip portion of its apex truncated to form an open apex portion **26** of a generally elliptical cross-section developed into a substantially circular cross-section at the tip end thereof, as shown in Fig. 3. The two truncated V-shaped half-sections 22 may then be joined together at the tip ends of the open apex portions **26**, as by welding, as indicated at **28**, with the adjacent leg portions **14** and **18**, or **16** and **20**, of the two half-sections **22** making an angle substantially less than 180° therebetween, preferably an acute angle. The container **12** is thus formed with the cylindrical side leg portions **14**, **16**, **18** and **20** disposed in oppositely diverging directions from the ends of a continuous center portion **29** in communication therewith. The container center portion **29** is also provided with a pair of diametrically opposed inner edges **30** and **32** formed respectively at the juncture of each pair of the cylindrical leg portions **14**, **16**, or **18**, **20**, of each half-section **22**, the plane of which edges **30** and **32** intersects the longitudinal axis of the cylindrical legs **14**, **16**, **18** and **20** at an acute angle, as shown in Fig. 1.

The outer ends of the cylindrical leg portions **14**, **16**, **18** and **20** may be closed with end plates **34** and **36**, which may extend across each pair of the leg portions, as shown best in Fig. 1, thereby providing additional rigidity to the casing of the hollow container **12**. The material loading and unloading of the container **12** may be obtained through openings in the outer ends of two of the cylindrical legs, as in legs **14** and **16**, adapted to be closed by suitable dust-tight cover plates **38** and **40** hinged thereto, as at **42** and **44**. The cover plates **38** and **40** may also be provided with locking means, as indicated at **46** and **48**, to be locked in the closed position. In this manner, the openings adapted to be closed by the cover plates **38** and **40** may be employed for filling or emptying the container **12** with the materials to be blended, while the outer ends of the other two cylindrical leg portions **18** and **20** may be permanently closed by the end cross plate **36**, or may be likewise provided with cover plates as legs **14** and **16**.

The hollow container **12** is mounted for rotation about a horizontal axis lying in the plane of and extending transversely of the longitudinal axes of the cylindrical leg portions **14**, **16**, **18** and **20**, by a pair of aligned trunnions **50** extending laterally from opposite sides of the casing of the container **12**, to which they are secured by plates **52** fastened in a vertical position to the respective adjacent cylindrical leg portions, **14**, **18**, and **16**, **20**, as

shown in Figs. 1 and 2. The trunnions 50 are arranged to turn in bearings 54, which are mounted on standards 56 disposed on either side of the container 12 and supported in an erect position on a base 58. The container 12 is rotated by an electric motor 60 connected to one of the trunnions 50 by a gear and chain arrangement, as indicated at 62. It will be understood, however, other power transmission systems can be used for rotating the container 12, such as gear system, a direct drive, etc.

In Fig. 4, there is shown a modified form of a blending device 10 constructed in accordance with the present invention, in which a container 64 is formed with only two cylinder-like side leg portions 66 and 68 oppositely diverging from, or converging into, a third leg 70. The elongated leg portions 66 and 68 likewise form an open apex portion in communication with the third leg portion 70. In this arrangement, the volume of the third leg portion 70 should be at least approximately equal to the combined volumes of the leg portions 66 and 68.

The container 64 is similarly provided, as the container 12, with an end plate 72 extending across the outer ends of the elongated leg portions 66 and 68. Material inlet ports in the outer ends of the leg portions 66 and 68 are adapted to be closed by cover plates 74 and 76 hinged thereto, as at 78 and 80, and adapted to be locked in closed position by locking means 82 and 84. In addition, the hollow container 64 is provided with a third cover plate 86 hinged, as at 88, on the outer end of the third leg portion 70 for closing a material outlet port therein. Similar locking means, as indicated at 90, may be provided for locking the cover plate 86 in closed position.

Rotation of the container 64 may be obtained by a similar arrangement as the container 12 of Fig. 1. For example, aligned trunnions 92 may extend laterally from brackets 94 which are secured, as by welding, to the respective cylindrical leg portions 66 and 68, so that the container 64 may be rotated about a horizontal axis in the plane of and extending transversely of the longitudinal axes of the leg portions 66, 68 and 70. Either hollow container 12 or 64 is mounted in such a way that the axis of rotation extends through the casing of the container at approximately the center of gravity thereof in order to minimize eccentric loads on the mounting and the driving mechanism.

It will be appreciated from the above description, that the invention provides a novel blending device 10 which is arranged to tumble and overturn, upon rotation thereof, all of the loose materials therein, alternately from the outer end portions of the cylindrical leg portions of one side of the container and, through the center portion, toward the outer end portions of the side leg portions of the opposite side of the container, so that all of the materials will simultaneously be moving in batches from opposite side leg portions so as to drive into and through each other and thereby effect an improved blending operation in a minimum of time. Furthermore, the blending device 10 is so arranged that all of the materials passing through the center portion of the container from one side to the other will be alternately split and remixed, rather than only portions thereof.

In the modified container 64 of the blending device 10, as shown in Fig. 4, all of the materials are caused to be alternately driven into and through each other and mixed in one batch and then to be split into two batches, instead of alternately being split into batches as in the container 12 of Fig. 1. In either type of container, however, the results are similar. It has been found, that the speed of rotation of the blending device 10 should be between 30 to 60 r.p.m. for best results. A thorough mixing of the materials may be obtained approximately within 10 revolutions of the device between the speed limits indicated above.

The present invention has been described in detail above for purposes of illustration only and is not intended to be limited by this description or otherwise except as defined in the appended claims.



What I claim is:

1. A blending apparatus comprising a material container having an open apex portion and a plurality of hollow side leg portions diverging therefrom, at least one additional side leg portion extending from said apex portion, said additional side leg portion being of approximately constant cross-sectional area and having an internal volume substantially equal to the total internal volume of the plurality of hollow side leg portions and said additional side leg portion extending away from the apex portion in a direction away from said plurality of hollow side leg portions so as to receive freely the contents of the plurality of hollow side leg portions during blending, and means for mounting said container for rotation about an axis extending in the plane of the axes of at least two of said portions.

2. A blending apparatus for masses of material comprising a container having a first section having a plurality of compartments converging into an apex portion, a second section joined to the first section and having at least one compartment extending from the apex portion, said second section being opposite to the first section so as to receive freely the materials to be mixed from the first section during blending, the total compartmental volume of said second section being at least approximately equal to the total compartmental volume of said first section, and means for mounting said container for rotation about a transverse axis extending in a plan common to the axes of at least a pair of said compartments.

3. A mixing apparatus comprising a generally X-shaped hollow container having a pair of sections of generally V shape and of approximately equal volume, each of said sections having an open apex portion and separate, elongated side portions diverging therefrom, said sections being connected at end edges of said open apex portions forming an approximately co-planar center portion adjacent the joined apex portions in communication with said side portions, closure means for the outer ends of said side portions, means for mounting said container for rotation about an axis extending tranversely in the plane of the axes of said side portions, and means for rotating said container about said transverse axis.

4. An apparatus for blending masses of material comprising a container having at least three, approximately similar, intersecting and substantially cylindrical hollow elongated portions disposed in diverging directions and having their axes lying substantially in a common plane, at least one of said elongated portions being in opposing relation to the other of said elongated portions so as to be in a position to receive substantially all the ingredients from the other of said elongated portions during blending, means for mounting said container for rotation about a transverse axis lying within said plane, end closure means for said container portions for material loading, and means for rotating said container about said axis.

5. The blending apparatus as recited in claim 2, wherein said second section has therein only a single compartment extending from the apex portion.


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