United States Patent [19]

Bryson, Jr. et al.

[11] **3,787,035**

[45] **Jan. 22, 1974**

[54] **BLENDER WITH INTEGRAL INTENSIFIER**

[75] Inventors: **Wilmer G. Bryson, Jr.; Donald D. Lyle; Jack S. Wilda,** all of East Liverpool, Ohio

[73] Assignee: **Banner Indstries, Inc.,** East Liverpool, Ohio

[22] Filed: **May 9, 1972**

[21] Appl. No.: **251,804**

[52] **U.S. Cl.** **259/16,** 259/89

[51] **Int. Cl.** **B01f 9/08**

[58] **Field of Search** ..... 259/84, 85, 81 R, 81 A, 3, 259/89, 16, 58, 9, 10

[56] **References Cited**

UNITED STATES PATENTS

2,915,300	12/1959	Fischer	259/85
3,266,779	8/1966	Fischer	259/3
3,174,728	3/1965	Mack	259/89

Primary Examiner—Robert W. Jenkins

[57] **ABSTRACT**

A separately rotatable intensifier is contained within a rotatable blending vessel as an integral part thereof. A mounting unit carried by the vessel mounts the intensifier therein and couples to an external power source for selective rotation of the intensifier and/or the vessel, to mix, agitate, or blend ingredients enclosed within.

13 Claims, 8 Drawing Figures

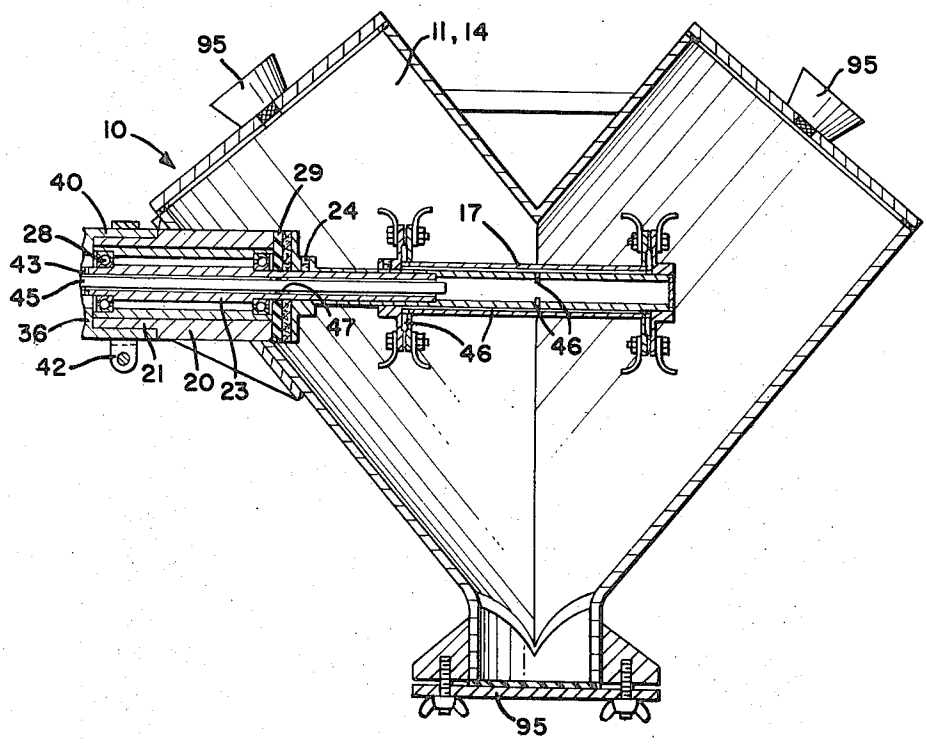


FIG-1

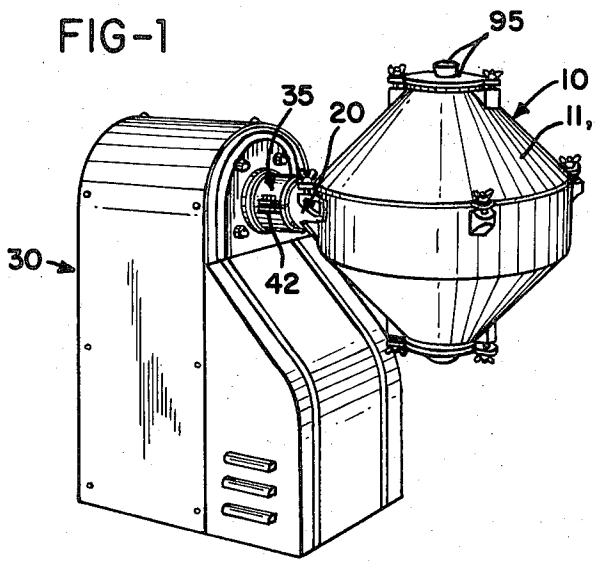


FIG-2

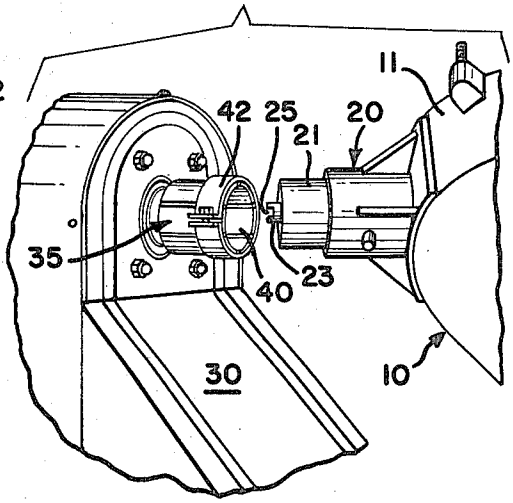
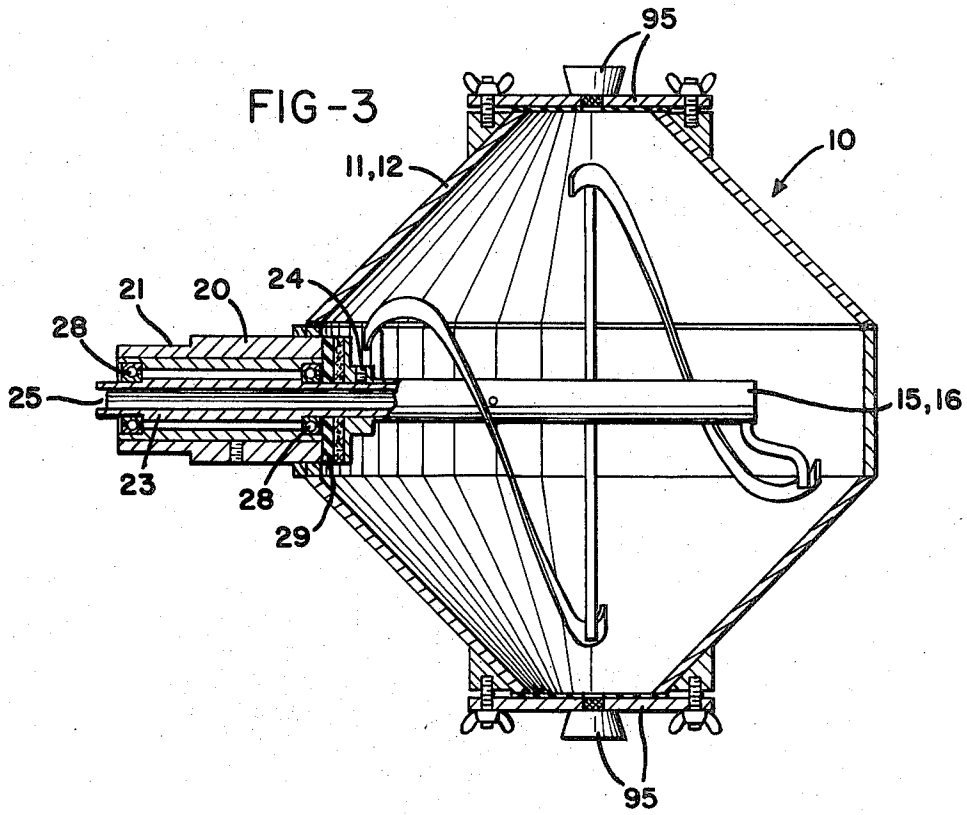


FIG-3



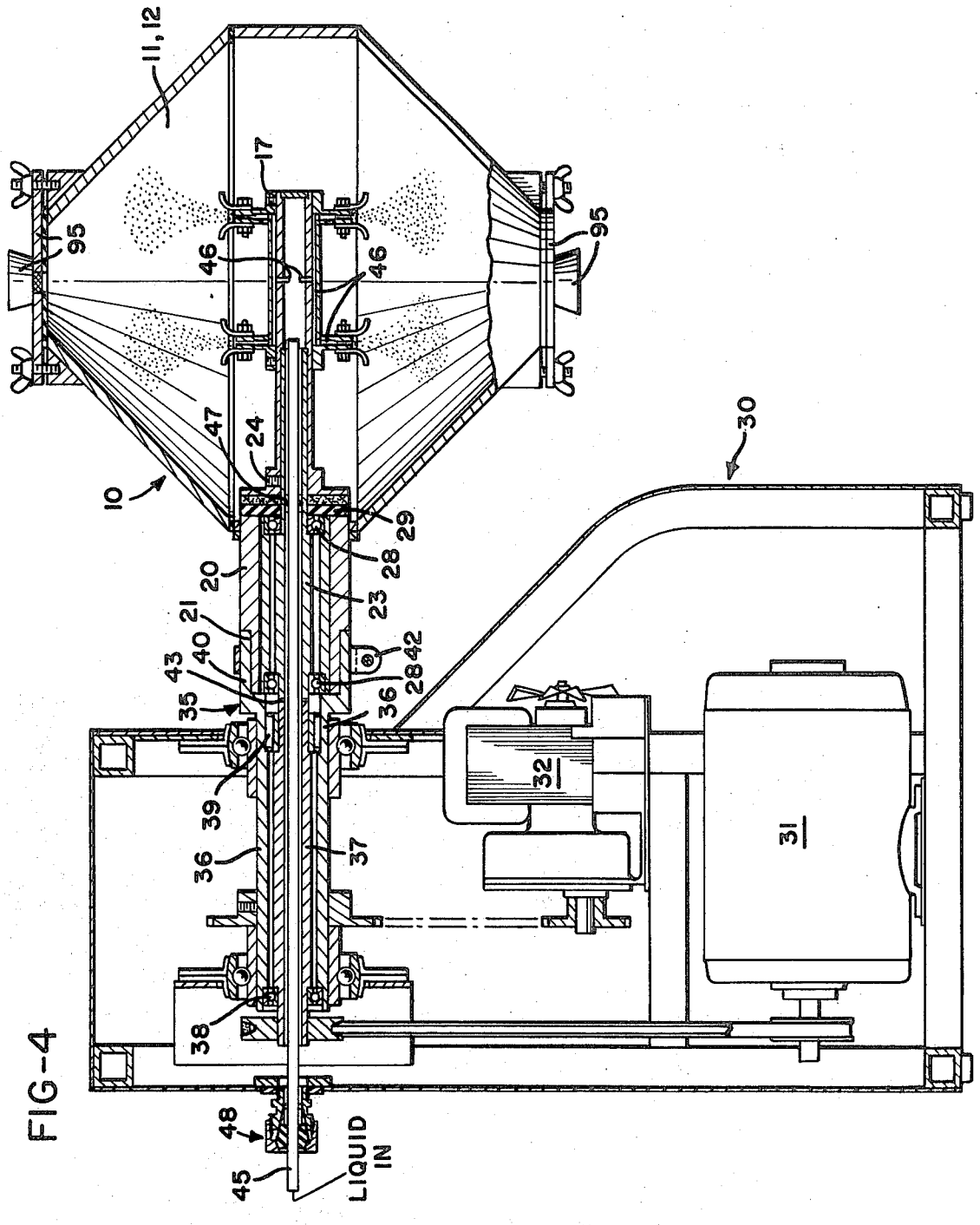

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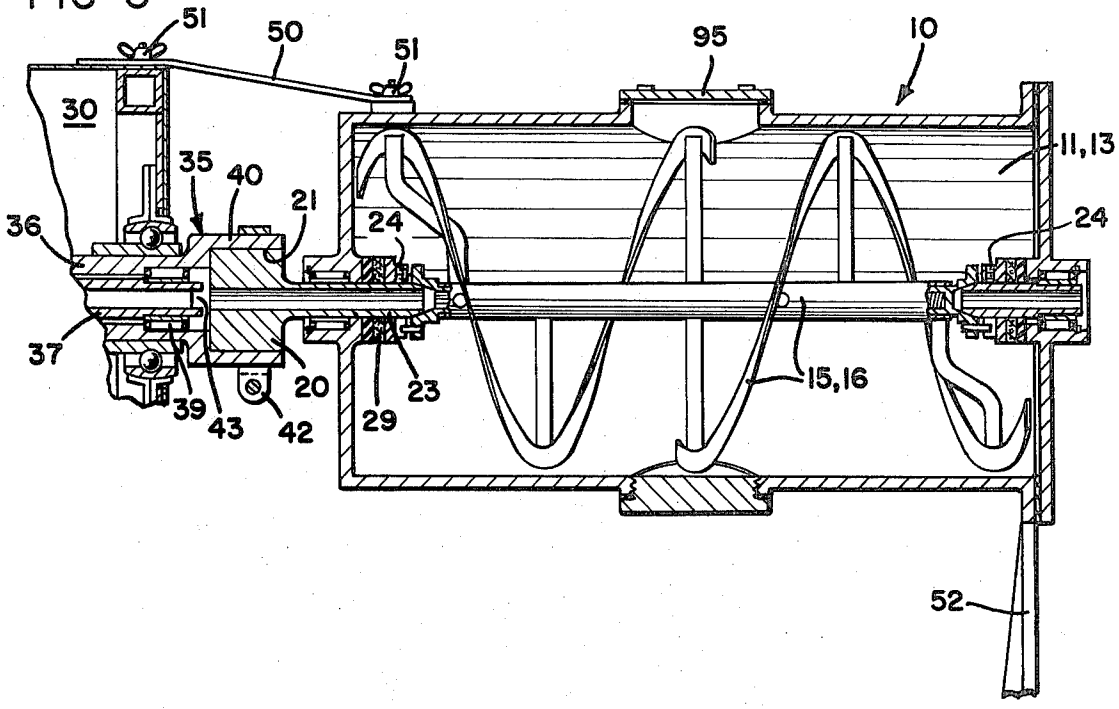

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FIG-6

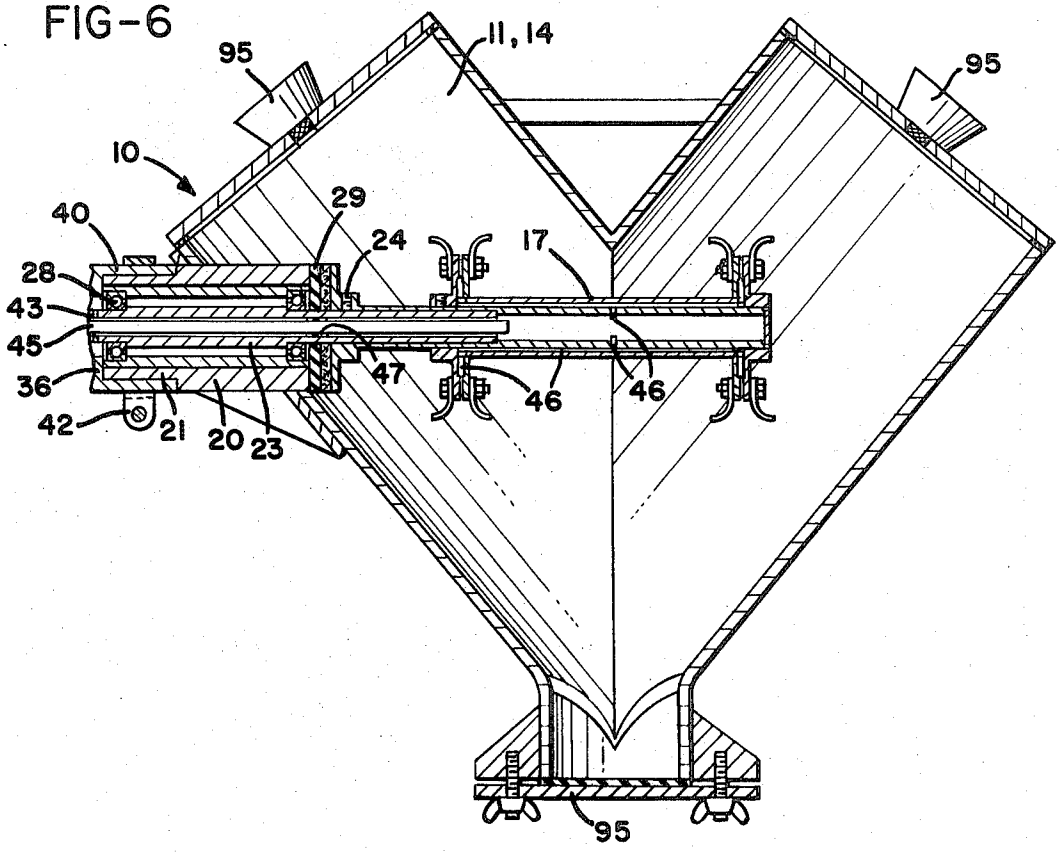

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FIG-7

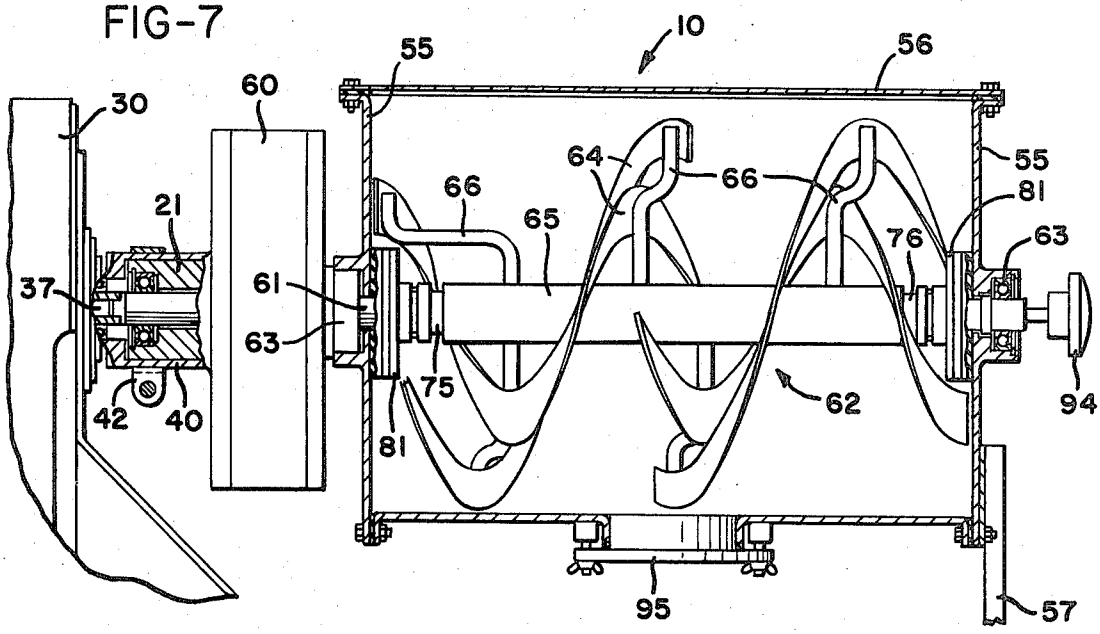
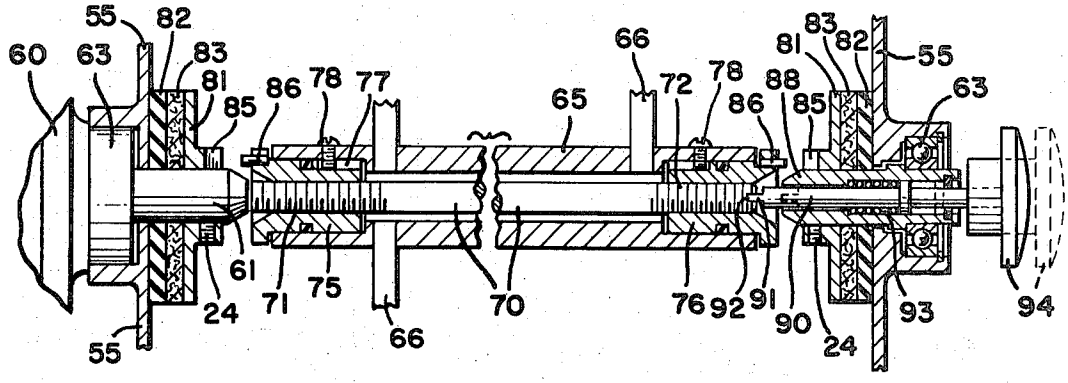

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FIG-8


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BLENDER WITH INTEGRAL INTENSIFIER

BACKGROUND OF THE INVENTION

This invention relates to blenders for combining or agitating various ingredients, either liquid or solid, and more particularly to a blender system for use with a separate power drive means. This invention discloses a blending system wherein the blending vessel, once closed, may be removed from the drive means at will, transported and/or stored as desired, and so on, without the need to open the vessel for partial disassembly of the blending system before removal from or attachment to the power drive means.

Blending systems using rotatable vessels of various configurations, to contain and mix, blend, or agitate the contents thereof, are well known in the art. Such vessels have many different configurations and are operated at a wide variety of speeds, according to the desired result.

It is also known in the art to equip such vessels with internal agitators or intensifiers which may be operated independently of the vessel itself. Frequently the intensifier is rotated at a speed much greater than that of the vessel, resulting in partial pulverization of the contents, in addition to the blending thereof. U.S. Pat. Nos. 2,890.027 and 3,174,728 provide examples of such blending systems, and further suggest the use of the intensifier to introduce fluids into the contained materials during the blending process. These references also disclose several means for removing the contents of the vessels after blending.

Until now, however, it has generally been necessary to remove the finished ingredients from the vessel before they could be transported. This has been especially true where an internal intensifier has been employed, since the entire system is constructed as integral unit, including the power drive sources. Thus, in a blending system using internal intensifiers, the entire blending system requires expensive and time consuming disassembly in order to transport the finished ingredients within the blender itself. Frequently, the intensifier must first be separately removed, a highly burdonsome requirement when the vessel is already nearly full of ingredients.

As a result, blending systems having internal intensifiers are rarely portable. Whenever the ingredients are to be transported, stored, re-agitated, and so on, they must be transferred and re-transferred again and again to other containers. This is not only expensive and time consuming, but there is always the risk of product and/or environmental contamination when the products and environment are brought into contact. Furthermore, to clean the blending system, the cleaning means must come to the vessel, not vice versa, another source of inconvenience.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide a blending system for the blending or agitation of ingredients wherein a closeable blending vessel and an internal intensifier are jointly removable and transportable, as a unit, from the power drive means; a blending system wherein the intensifier within the vessel may be rotated independently of the vessel; a convenient mounting means for mounting the intensifier rotatably and removably within the vessel; a convenient coupling means for quickly and easily coupling the vessel and the intensifier to a separate power drive means for independent powered rotation of the vessel and/or the intensifier; a blending system wherein liquid may be introduced through the intensifier into the ingredients within the closed vessel; and to accomplish all of the above objects and purposes in both a method and apparatus which are functional, inexpensive, reliable, durable, and highly convenient in construction and operation.

Briefly, one embodiment of this invention includes a closeable blending vessel having an intensifier rotatably mounted therewithin.

The blending vessel carries a mounting unit which rotatably mounts and supports the intensifier within the vessel, and connects through the side of the vessel for rapid attachment to or removal from a power drive unit. The mounting means also connects rigidly to the vessel itself, for separate support and rotation of the vessel as well.

The mounting means on the vessel has a collar on the outside thereof which can be grasped by the power drive means for rotating the vessel. A slotted central shaft in the mounting means is engageable by a slotted central drive shaft on the power drive means for separately rotating the intensifier within the vessel.

The power drive means has a jaw type compression coupling into which the collar of the vessel mounting means is inserted. A single bolt clamp compressibly engaged about the coupling tightens the jaws thereof to grasp and hold the collar.

The intensifier has hollow conduit channels therewithin, and a liquid supply tube may be inserted through the hollow central power drive shaft into the hollow vessel central shaft and into the intensifier, to introduce liquid therethrough during the blending operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates one embodiment of a blending system according to this invention, using a conical type vessel mounted upon a separate power drive means;

FIG. 2 is a partial view of the FIG. 1 apparatus during coupling or uncoupling thereof from the power drive means;

FIG. 3 is a partial sectional view of a blending system such as that of FIG. 1, in which a partial helical internal intensifier is employed;

FIG. 4 is a partial cross sectional view of a blending system such as that illustrated in FIG. 1 and mounted upon the power drive means of FIG. 1, using a disperser bar type intensifier, and showing the liquid supply means therefor;

FIG. 5 illustrates another embodiment of the blending system of this invention, utilizing a fixed position ribbon vessel having a partial helical intensifier therein, and partially illustrating the attachment thereof to a power drive means;

FIG. 6 illustrates a blending system according to this invention using a "V" shaped vessel along with the same intensifier and liquid supply means as in FIG. 4, and also illustrating the mounting thereof on a power drive means;

FIG. 7 illustrates another blending system according to this invention using an open-top "U" shaped vessel along with a double helix intensifier; and

FIG. 8 is an enlarged partial cross sectional view of portions of the ends of the FIG. 7 system showing the intensifier released for insertion or removal.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings, and more particularly to FIG. 1, there is illustrated a blending system 10 according to this invention. Blending system 10 includes a blending vessel 11, such as the conical vessel 12 of FIG. 1, the ribbon vessel 13 of FIG. 5, or the "V" shaped vessel 14 of FIG. 6. Any other appropriate shape may of course be utilized.

The blending vessel 11 has an intensifier 15 mounted therein. The intensifier, similarly, may have any desired configuration, such as the partial helix intensifier configuration 16 (FIGS. 3 and 5) or the disperser intensifier configuration 17 (FIGS. 4 and 6).

A mounting means 20 is carried by blending vessel 11 and is attached rigidly thereto. Mounting means 20 supports vessel 11 during the blending process, and is provided with a collar 21 which may be gripped to support and rotate blending vessel 11. Mounting means 20 also includes a central shaft 23 to which intensifier 15 may be attached by any suitable means, such as screws 24. The external end of central shaft 23 is provided with a slot 25 by which central shaft 23 may be engaged and rotated. Central shaft 23 is rotatably mounted within mounting means 20 by means of ball bearing 28. Suitable seals 29 are provided along the internal end of mounting means 20 to allow for relative rotation between mounting means 20 and central shaft 23 while preventing the ingredients within vessel 11 from escaping.

A power drive means 30 includes a motor 31 for driving intensifier 15, and a motor 32 for driving vessel 11. These motors are suitably connected to a power drive means coupling 35. Coupling 35 is provided with an outer concentric drive shaft 36 driven by motor 32, and an inner concentric drive shaft 37 driven by motor 31. Motors 31 and 32 are separately controllable by a control means (not shown) to allow either motor to be operated or not operated, as desired, and at any speed appropriate to the task.

Ball bearing 38 and roller bearing 39 (FIG. 4) within power drive means coupling 35 support inner drive shaft 37 for rotation within outer drive shaft 36.

Outer concentric drive shaft 36 on coupling 35 also includes a jaw type compressing coupling 40 of a size suitable to receive mounting means collar 21 therein. Jaw coupling 40 is actuated by means of single bolt clamp 42 disposed thereabout, to close around and grip collar 21. By this means the entire blending system 10 may be attached to and supported by the power drive means 30.

Concentric drive shaft 37 is provided with slots 43 which mate with and engage slots 25 in central mounting means shaft 23. By this means drive shaft 37 is able to drive intensifier 15.

A liquid supply tube 45 (FIGS. 4 and 6) conducts liquid into the center of intensifier 15 for dispersion therefrom into the contents of vessel 11 during blending or mixing therein. The liquid is conducted within intensifier 15 through conduits 46 therein. Inner concentric drive shaft 37 and central shaft 23 are hollow in the centers thereof for reception of liquid supply tube 45 therethrough. Liquid supply tube 45 is provided with a seal 47 in order to prevent liquid or other material from escaping through the hollow centers of shafts 23 and 37. Liquid supply tube 45 also has an external seal 48 (FIG. 4) which also prevents rotation of supply tube 45.

FIG. 5 illustrates an alternate arrangement wherein vessel 11 is not rotated. Instead, only intensifier 15 is rotated. A stabilizing bar 50 connects vessel 11 to the frame of power drive means 30 to prevent rotation of the vessel. In this case, mounting means 20 includes only a single shaft, which is fitted to be received and supported by compression coupling 40, similarly as discussed above. Wing nuts 51 provide for quick attachment and removal of stabilizing bar 50. A support strut 52 aids in supporting vessel 11.

FIGS. 7 and 8 illustrate another embodiment of the blending system of this invention similar to that of FIG. 5. However, in FIG. 7 the vessel 11 is an open-top "U" shaped vessel 55 having a removable top 56. Vessel 55 is stationary and is supported both by jaw type compression coupling 40 and a support strut 57.

A speed reducer 60 is mounted between the power drive means 30 and the vessel 55. The speed reducer 60 has an output shaft 61 which is connected to an intensifier 62 rotatably supported within the vessel 55 by means of bearings 63. The intensifier 62 is formed with double helix blades 64 mounted on a hollow drive shaft 65 by means of arms 66. The blades 64, by virtue of being driven by speed reducer 60, are able to exert great force against the material within the vessel 55.

The intensifier 62 is removably mounted within the vessel 55. The hollow shaft 65 includes shaft 70 having threads 71 and 72 formed on either end thereof. The threads 71 are threaded in reverse direction from the threads 72. Retractable coupling members 75 and 76 are slidably mounted in each end of the shaft 65 and are threaded internally to receive the threads 71 and 72, respectively. The coupling members 75 and 76 each include a slot 77 which cooperate with screws 78 to prevent their rotation relative to the shaft 65 while permitting longitudinal movement thereof.

The output of the speed reducer 60, as shown in FIG. 8, is carried by a drive shaft 61. Surrounding this shaft is a seal plate 81 which is secured to the shaft by means of a set screw 24. Between the plate 81 and the wall of the housing 55 is a rubber seal member 82 and a felt seal member 83. The plate 81 is adjusted on the shaft 61 to compress the rubber and felt members slightly with the result that the rubber and felt members do not rotate relative to vessel 55 and therefore all relative rotation occurs between the felt member 83 and the plate 81.

The seal plate 81 includes a plurality of slots 85 for receiving pins 86 which extend outwardly from the retractable coupling member 75. Similar construction may be found at the right of the device as shown in FIG. 8 where the coupling member 76 may be supported for rotation on a shaft 88. This shaft is also rotatably supported within the vessel by a bearing 63. Both shafts 61 and 88 have frustoconical end portions which may be received into corresponding reliefs in the retractable coupling members 75 and 76 in order to align the hollow shaft 65 with the axis of rotation.

The threaded shaft 70 may be rotated relative to shaft 65 by an external device including a shaft 90 having a tip 91 which is received into a slot 92 in the shaft 70. The shaft 90 is held in a retracted position by means

of a spring 93. A knob 94 serves as an external locking control and is mounted at the end of shaft 90 to allow the operator to insert the shaft, against the bias of the spring 93, into locking engagement with threaded shaft 70. The knob may then be rotated to rotate shaft 70 and to cause the retractable coupling members 75 and 76 to move toward or away from the plates 81, thereby to engage or release the intensifier from its driving connection with the source of rotational power. By this means, the intensifier may be quickly and easily inserted and locked into, or unlocked and removed from the vessel 55. In FIG. 7, the intensifier is shown in locked position, while in FIG. 8 it is shown with the retractable coupling members retracted in preparation for removal.

Each vessel 55 is provided with an appropriate port 95 which permits the operator to insert or remove ingredients from the vessel without removing the cover plate 56.

This invention therefore supplies an integral blending system in which the intensifier is supported within the blending vessel on a suitable shaft, bearings, and seals which remain with the blending vessel after the removal thereof from the support coupling and drive assembly. The invention therefore makes possible the use of an unlimited variety of intensifier configurations and of vessel sizes and shapes, each being appropriate to the particular task, and each being operable independently at speeds appropriate to the joint task. As indicated, either the intensifier or the vessel may also be nonrotated.

With this invention each vessel may be charged with ingredients at any convenient location, and at any time. A large number of vessels may be employed without the need for a large number of power drive means. Various operations may be performed upon the vessels at various times without the need to open them or to drain the contents to free the power drive means for performing other tasks. The contents may thus be sealed within each vessel for any length of time, protecting the contents from environmental contamination, and protecting the environment from contamination from the contents. Similarly, with the use of interchangeable shells, cross contamination from different charges can be entirely eliminated. At the same time, the desired combination of intensifier and vessel may be used, appropriate to the particular task, without requiring extensive assembly or disassembly of the complete system. Once the vessel and the intensifier are selected and assembled and the appropriate charge placed therein, they may be very quickly and conveniently attached to and removed from the power drive means, and a minimum of time and effort is involved in changing from one to another.

While the method and forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to the precise method and forms of apparatus, and that changes may be made therein without departing from the scope of the invention.

What is claimed is:

1. A blending system for the blending or agitation of ingredients, comprising:
   a. a closeable blending vessel,
   b. an intensifier internally mountable within said vessel,
   c. mounting means attached to said vessel for attaching said vessel to an external power drive means and for rotatably mounting said intensifier inside said vessel,
   d. a collar portion on said mounting means for driving and supporting engagement by a corresponding coupling on such a power drive means, and
   e. coupling means in said mounting means for attaching a second external drive means to said intensifier for transmission of rotative forces thereto through said mounting means, said means enabling said vessel and said intensifier to be quickly and removably attached, as an open or closed integral unit, to such power drive means for powered rotation relative to one another and to be wholly portable, as an integral unit, with intensifier and ingredients within the vessel, independently of the power drive means.

2. The blending system of claim 1 further comprising a coupling in said mounting means for feeding liquid to said intensifier, and wherein said intensifier includes means for receiving the liquid and distributing it within said vessel.

3. The blending system of claim 1 further comprising speed reducer means incorporated into said mounting means for reducing the rate of rotation of at least one of said vessel and said intensifier relative to that otherwise resulting from the power drive means.

4. A blending system for the blending or agitation of ingredients, comprising:
   a. a closable blending vessel,
   b. an intensifier internally mountable within said vessel,
   c. mounting means attached to said vessel for rotatably mounting said intensifier inside said vessel, said mounting means enabling said vessel and said intensifier to be removably attached, as an open or closed integral unit, to a power drive means for powered rotation relative to one another and to be wholly portable, as an integral unit, with intensifier and ingredients within the vessel, independently of the power drive means,
   d. an external locking control, and
   e. means within said vessel for locking and unlocking said intensifier therewithin in response to operation of said external locking control, for easy insertion and removal of said intensifier within said vessel.

5. The blending system of claim 4 wherein said means for locking and unlocking includes:
   a. a threaded shaft having reverse threads on one end thereof and being rotatable by said external locking control,
   b. coupling members mounted on said threaded shaft for simultaneous movement inwardly and outwardly thereon in response to rotation of said threaded shaft, and
   c. means for receiving said coupling members in engagement therewith to hold said intensifier rotatably within said vessel.

6. A blender system for the blending or agitation of ingredients, comprising:
   a. power drive means having at least two concentric power drive shafts separately capable of being rotated,
   b. drive coupling means on said drive shafts,
   c. a closable blending vessel,
   d. an intensifier internally mountable within said vessel,

e. mounting means attached to said vessel for rotatably mounting said intensifier inside said vessel, said mounting means including a central shaft rotatably connectable to said intensifier for rotation thereof and an outer shaft rigidly connected to said vessel for rotation thereof, and

f. coupling means on said central and outer shafts and forming a part of said mounting means for coupling to said drive coupling means on said power drive shafts, to rotate said intensifier and said vessel independently whenever a corresponding power drive shaft is rotated, said mounting means enabling said vessel and said intensifier to be removably attached, as an open or closed integral unit, to said power drive means for powered rotation relative to one another and to be wholly portable, as an integral unit, with intensifier and ingredients within the vessel, independently of the power drive means.

7. The blending system of claim **6** wherein said coupling means on said vessel mounting means includes a collar portion on said outer shaft and a slotted portion on said central shaft, and wherein said drive coupling means on said power drive shafts includes a tightenable jaw type compression coupling on one of said drive shafts for driveably gripping said collar portion, and a slotted portion on another of said power drive shafts for driveably engaging said slotted portion on said central vessel shaft.

8. The blending system of claim **7** wherein said compression coupling is tightened by a single bolt clamp compressibly engaged thereabout.

9. A blender system for the blending or agitation of ingredients, comprising:

a. a closeable blending vessel,

b. an intensifier internally and rotatably mountable within said vessel,

c. a power drive means having at least two concentric drive shafts capable of being separately rotated,

d. a mounting means attached to said vessel for rotatably mounting said vessel on said power drive means and for rotatably mounting said intensifier inside said vessel,

e. a collar portion on said vessel mounting means rigidly connected to said vessel,

f. a tightenable jaw type compression coupling on the outer concentric shaft of said power drive means, said collar being engageable by said compression coupling,

g. a single bolt clamp engaged about said compression coupling and arranged to actuate and tighten said compression coupling about said collar.

h. a central shaft rotatably carried in said vessel mounting means and attachable at one end to said intensifier within said vessel,

i. a slotted portion on the end of said central shaft exterior of said mounting means and said vessel, and

j. a slotted portion on the inner shaft of said concentric drive shafts rotatably engageable with said slotted portion on said vessel mounting means central shaft to rotate said intensifier independently of the rotation of said vessel, and to cooperate with the remainder of said mounting means and with said jaw type compression coupling for convenient and rapid connection or removal of said vessel to and from said power drive means, while said vessel and said intensifier remain integral and said vessel remains closed.

10. The blending system of claim **9** further comprising a coupling in said mounting means for feeding liquid to said intensifier, and wherein said intensifier includes means for receiving the liquid and distributing it within said vessel.

11. The blending system of claim **9** further comprising a speed reducer means on said mounting means for reducing the rate of rotation of at least one of said vessel and said intensifier relative to that otherwise resulting from the power drive means.

12. The blending system of claim **9** further comprising:

a. an external locking control, and

b. a means within said vessel for locking and unlocking said intensifier therewithin in response to operation of said external locking control, for easy insertion and removal of said intensifier within said vessel.

13. The blending system of claim **12** wherein said means for locking and unlocking includes:

a. a threaded shaft having reverse threads on one end thereof and being rotatable by said external locking control,

b. coupling members mounted on said threaded shaft for simultaneous movement inwardly and outwardly thereon in response to rotation of said threaded shaft, and

c. means for receiving said coupling members in engagement therewith to hold said intensifier rotatably within said vessel.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,787,035 Dated January 22, 1974

Inventor(s) Wilmer G. Bryson, Jr., Donald D. Lyle and Jack S. Wilda

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Assignee: Wilmer G. Bryson, Jr. and Donald D. Lyle of East Liverpool, Ohio, assign their undivided part interest by mesne assignments to Patterson Industries, Inc., East Liverpool, Ohio

Signed and sealed this 9th day of July 1974.

(SEAL)
Attest:

McCOY M. GIBSON, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents