March 16, 1965 W. R. HALL ETAL 3,173,665

MIXING APPARATUS

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FIG. 1

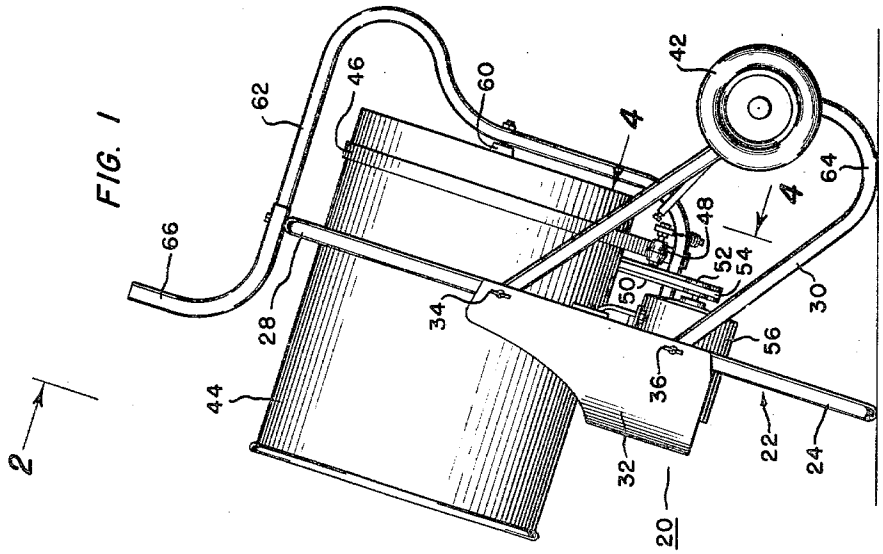
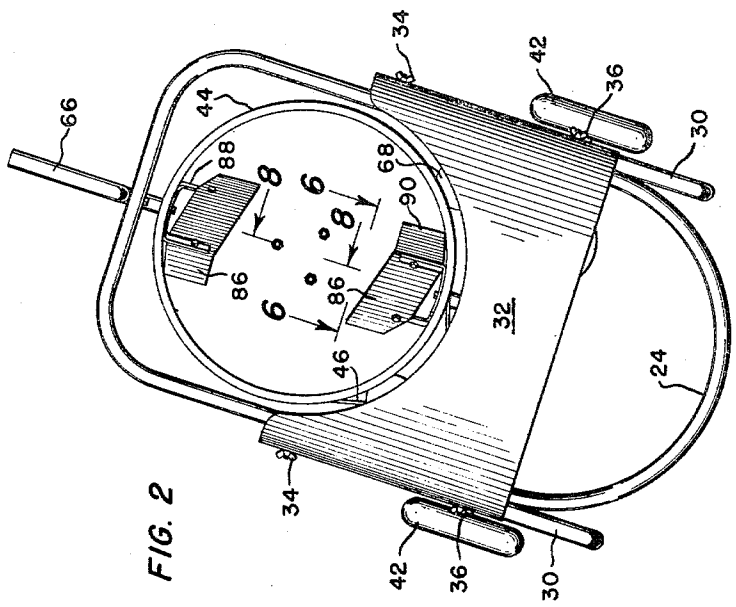


FIG. 2



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MIXING APPARATUS

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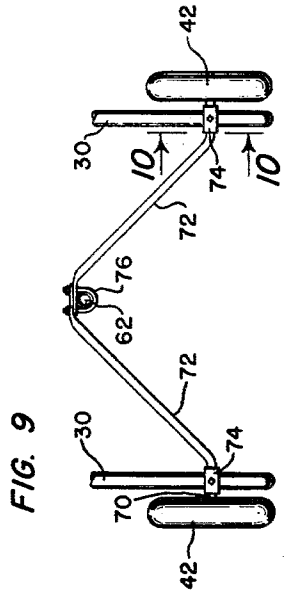


FIG. 9

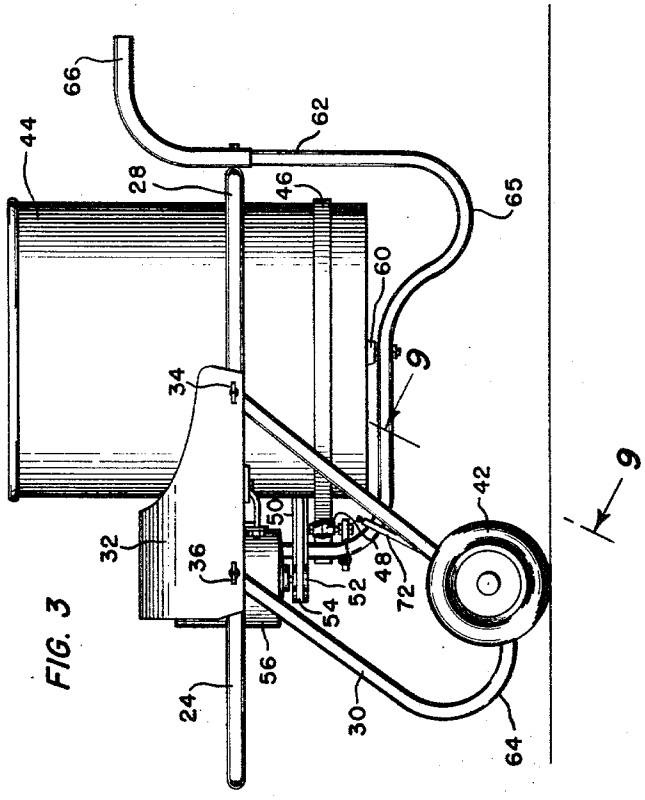


FIG. 3

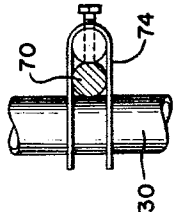


FIG. 10

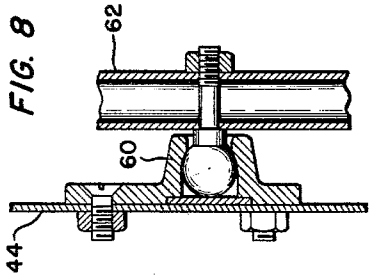


FIG. 8

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MIXING APPARATUS

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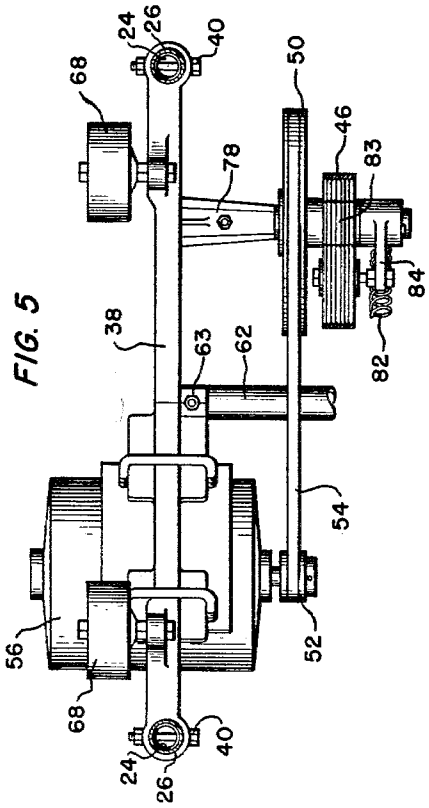


FIG. 5

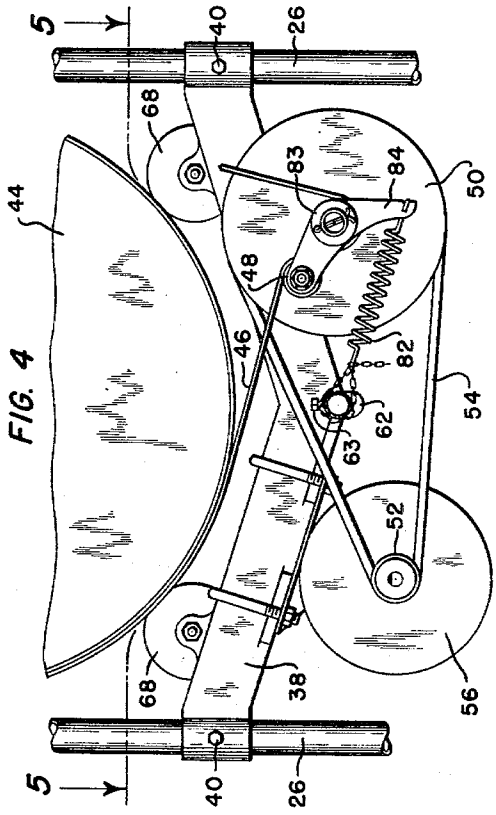


FIG. 4

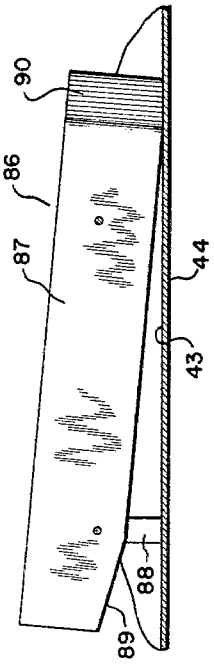


FIG. 7

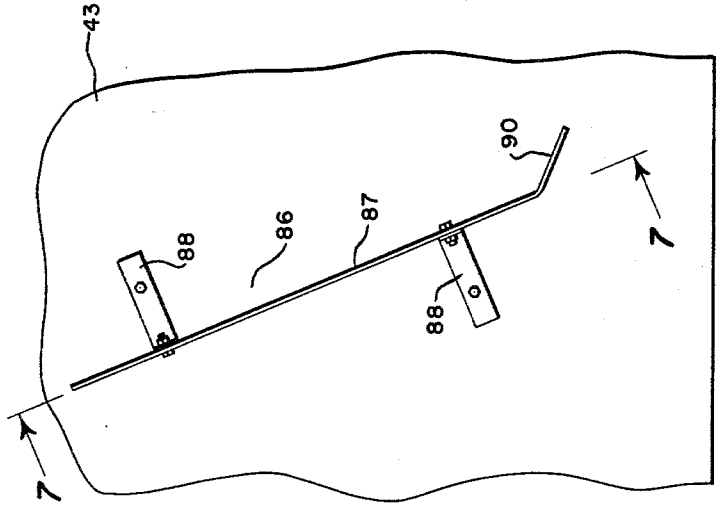


FIG. 6

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3,173,665
MIXING APPARATUS

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Filed May 10, 1963, Ser. No. 279,432
11 Claims. (Cl. 259—72)

This invention relates to a mixing apparatus and more particularly to light weight easily transported mixing apparatus that may be quickly dismantled with the supporting frame, motor and drive mechanism being insertable within the mixing drum.

Rotary mixing apparatus for mixing cement, compost, or other like materials, are well known in the art. Such mixing apparatuses are often if not normally, cumbersome, quite heavy and difficult to move or are bulky to store. When such mixing apparatuses are of light weight construction their strength and rigidity are insufficient for general satisfactory use. Also such mixing apparatuses employ circular mixing drums that have a general conical shape. These mixing drums, while bulky, have a somewhat limited capacity and often do not efficiently mix the materials in the mixing operation.

With the advent of do-it-yourself type use of equipments, including mixing devices and the like, it has become more advantageous to have light, economical and easily transported mixing equipment that may be easily dismantled and stored within or around the user's home. Accordingly, it is therefore an object of this invention to provide a new and improved mixing apparatus.

It is another object of this invention to provide an improved, light weight and easily transportable mixing apparatus.

It is still another object of this invention to provide an improved mixing apparatus that may be rockably moved as desired.

It is still another object of this invention to provide an improved mixing apparatus wherein the frame of the apparatus is capable of being easily and quickly dismantled and placed in the mixing drum member.

It is still another object of this invention to provide an improved mixing drum apparatus that utilizes a simple two-step, self-tensioning, belt drive.

This invention provides a light-weight, easily transportable, mixing apparatus. The mixing apparatus may be quickly dismantled with simple tools and the entire supporting frame structure placed within a cylindrical mixing drum. The drum may then be covered with an appropriate lid and stored. The cylindrical mixing drum has a constant diameter throughout its length and uses unique mixing paddles within the drum. The unique paddles permit the drum to be positioned, when mixing, at a rather small angle to the ground plane. This results in better mixing of the materials. The unique paddle members are attached to the inner surface of the drum and are so shaped that they direct the substances being mixed away from the open end of the relatively flatly positioned mixing drum means.

The mixing apparatus is supported on a tripod stand which can be stabilized on uneven ground. Wheels are attached to the frame slightly above ground contact so that they may be moved to a disengaged position to stabilize the apparatus on the tripod stand when the apparatus is in mixing position. The tripod stand includes curved leg portions on which the apparatus may be conveniently rocked to desired unloading positions.

Other objects and many attendant advantages of this invention will be readily apparent as the same becomes better understood by reference to the following description when considered in connection with the accompanying drawing in which like reference numerals designate

like parts throughout the figures thereof and wherein—

FIGURE 1 is a side elevational view of the mixing apparatus of the present invention;

FIGURE 2 is a front elevational view taken on the line 2—2 of FIGURE 1;

FIGURE 3 is a side elevational view showing the mixing apparatus resting on its wheels and in position for transportation to or from the desired work location;

FIGURE 4 is an enlarged fragmentary sectional view taken on the line 4—4 of FIGURE 1;

FIGURE 5 is a plan view of FIGURE 4 as viewed from the line 5—5 of FIGURE 4;

FIGURE 6 is an enlarged view of a mixing blade as viewed from the line 6—6 of FIGURE 2;

FIGURE 7 is a sectional view taken on the line 7—7 of FIGURE 6.

FIGURE 8 is an enlarged transverse sectional view taken on the line 8—8 of FIGURE 2.

FIGURE 9 is a view of the frame truss members, wheels, and wheel mounts as viewed on the line 9—9 of FIGURE 3; and

FIGURE 10 is an enlarged cross-sectional view taken on the line 10—10 of FIGURE 9.

Referring now to the drawings, the mixing apparatus 20 embodies a light-weight, tubular frame generally designated by the numeral 22. This frame may be constructed of metal, plastic or any suitable material, however, it has been found that steel tubing affords a light weight construction, having sufficient strength to support the apparatus. Frame 22 comprises a U-shaped front support member 24 having ends that are telescopically inserted within ends of each of a pair of splicing members 26, as shown in FIGURES 4 and 5. A hand rail brace 28, also of tubular construction and having a substantially U-shaped configuration, has its ends telescopically engaged within the other ends of the splicing members 26.

A pair of U-shaped leg members 30 are positioned on the sides of the ends of the members 24 and 28 and are attached to splicing members 26 by bolts and wing nuts 34 and 36. The bolts 34 and 36 pass through the ends of members 24 and 28 as well as through splicing members 26 and hold members 24 and 28 within the splicing members 26. A pair of wheel members 42 are mounted on the leg members 30 in the manner shown, thereby allowing the wheels to be rocked into contact with the ground plane when it is desired to rollably move the mixing apparatus.

The leg members 30 and the U-shaped front member 24 form a tripod stand arrangement with the front member 24 touching the ground in alignment with the center of the unit. This member 24 is formed to a radius of curvature to provide a plurality of points on which the unit can be rotated 360 degrees and then tilted for convenient unloading.

A beam member 38, which may be an alloy casting, is attached at its ends to splicing members 26 by bolts 40. A bottom frame member 62 is secured at one end to the center of the U-shaped member 28. This end has an extension 66 providing a handle. The other end of bottom frame member 62 is secured to center of beam member 38 by bolt means 63. The bottom frame member 62 has an outer curved portion 65 for supporting the apparatus on the ground when the mixing apparatus is positioned for movement on wheels 42.

A mixing drum member 44 is secured to the mixing apparatus frame 22 through a single connection 60, which connection comprises a spherical bearing that provides self-aligning support. Self-aligning bearing support 60 supports the drum 44 when in the vertical position and also rotatably supports the drum 44 when in the mixing position as shown in FIGURE 1. The drum 44 is also rotatably supported in the mixing position by rollers 68,

which rollers are secured to the outer ends of the beam member 38. See FIGURE 4.

The beam member 38 also supports the electric drive motor 56 that rotates the drum member 44. Drive motor 56 drives a small pulley 52 that, through a conventional V belt drive 54, rotates an intermediate pulley member 50 that in turn rotates a drive pulley 83 for moving the drive belt 46. Drive belt 46 encircles the drum 44 and rotates it, thus using the drum to form the second stage of a two stage speed reduction drive mechanism. A unique belt tightening arrangement employs a bell crank 84 that is carried on the axle of pulleys 50 and 83. The bell crank 84 can freely rotate around the axis. One end of the bell crank 84 is connected via a spring means to the bottom frame 62. The spring 82 pulls on one arm of the bell crank member, thereby resiliently biasing the roller on the other end 48 of the bell crank member to rotate it in a clockwise direction and into contact with the drive belt 46 thereby maintaining the desired degree of tension in the drive belt 46. It can thus be seen that the drive belt 46, as tensioned by the bell crank tensioning mechanism 84, tends to pull the drum 44 against the rollers 68, thereby adding stability to the drum member in all positions. The drive belt tightener operates in a radius about the center of the driving pulley 83 axis affording a reliable operation regardless of irregularities in the drum shape. The complete drive mechanism provides adequate torque to drive the unit with a maximum load.

Axle base members 72 are attached at one end to the bottom frame member 62 by axle brace hanger member 76, and at their other ends to the respective pair of U-shaped wheel supports 30 by axle hanger member 74. Axle members 72 extend past frame members 30 to form the wheel axles 70 for supporting the wheels 42. The axle base members 72 serves two purposes, that of diagonal bracing as a part of the frame structure and also as the wheel axles. Clamp members 74 secure the axle base members 72 and the U-shaped wheel supports 30 into a composite structure.

Drum member 44 is a cylinder having a uniform diameter. A pair of mixing paddle members 86 are secured to the drums inner surface 43 by angle members 88. The paddle members, being specifically arranged to accomplish a thorough mix, have a longitudinal member 87 that is positioned, see FIGURES 2 and 6, at an angle to the axis of the cylindrical drum member 44. Each paddle member has an angular portion 90 at the end of the longitudinal member 87 which portion is installed close to the open end of the cylindrical member 44 to retain the mix and prevent spillover. This angular portion is positioned at a greater angle to the drums axis than longitudinal member 87. As may be seen in FIGURE 7, each paddle member 86 is also angularly displaced in its longitudinal dimension from the innersurface 43. The mixing paddle member 87 also has a cut-out portion 89 that increases the opening between the paddle member 86 and the innersurface 43 of the drum 44 thereby allowing greater flow of the mixture under the end of the mixing paddle member 87.

A shield member 32 is secured by wing nut fasteners 34 and 36 to the frame 22. The shield is so positioned that it protects the motor and drive mechanism from materials being mixed. The shield may be constructed of light gauge material, that is strong enough to hold its shape as shown in FIGURES 1, 2 and 3 and yet, when detached from the frame; may be rolled together and placed within the drum 44.

In operation, the mixing apparatus is wheeled into the desired location and is then rotated in a forward direction until the curved portions 64 of legs 30 contact the ground plane. The apparatus is further rotated on curved portions 64 until the U-shaped member 24 contacts the ground plane and the apparatus is supported on a tripod stand in its mixing position. In this position,

it may be seen that the open end of the drum 44 may be moved to many positions by rocking the mixing apparatus on the curved portions of the curved members 24 and 30.

When in the mixing position, as shown in FIGURE 1, the drum member 44 has a relatively flat angle with the ground plane. The material to be mixed is then inserted in the open end of the drum member 44, the motor energized and through belt arrangement 46, the drum member 44 is rotated on the two rollers 68 and bearing 60. The mix passes over and under the mixing paddles 86 in varying quantities, with the greatest portion being at the base of the drum 44. The angularly positioned paddles disperse the mix between the paddles and move the mix along their longitudinal inward side. The angled forward end 90 of the paddle is positioned against or very close to the drum wall 43 and thus functions to oppose spillover of the mix from the end of the drum 44. The angled portion also tends to force the mix away from the end of the drum.

The position and shape of the paddle members permit a very flat axis of drum rotation that affords a very thorough mix, and their shape, by causing the mix to be moved away from the open end of the drum, allows a constant diameter drum to be used. Using a constant diameter drum increases the capacity of the apparatus and the larger end opening in the drum facilitates easier loading and unloading.

When the desired mixing operation has been completed, the mixing apparatus may then be easily disassmbled through the minimum number of connections holding the assembly together, and the entire unit, frames, wheels, motor, base member 38 and the like, may all be inserted into the drum member 44 through the open end.

Various modifications are contemplated and may obviously be resorted to by those skilled in the art without departing from the spirit and scope of the invention as hereinafter defined by the appended claims, as only preferred embodiments thereof have been disclosed.

What we claim is:

1. A mixing apparatus comprising,
drum means for performing a mixing operation when in a mixing position,
frame means including an arcuate leg member and a pair of leg members for supporting said drum means in said mixing position,
said arcuate leg member radially projecting away from the side of said drum means,
said pair of leg members being attached to said arcuate leg member and projecting at a substantially normal angle from said arcuate leg member,
said pair of leg members having curved portions, and
said drum means being capable of being rocked in a supported position on said arcuate member and upon said curved portions on said pair of leg members.

2. A mixing apparatus comprising,
a cylindrical drum member for performing the mixing operation,
frame means including an arcuate leg member and a pair of leg members for supporting said drum member in the mixing position on a supporting surface,
said arcuate leg member radially projecting from the side of said drum member and having a center of curvature substantially in line with the axis of said drum,
said pair of leg members being attached to said arcuate leg member and projecting substantially parallel to said axis,
said pair of leg members having curved portions for contacting said supporting surface, and
said drum member being rockably movable in given directions along said arcuate member and rockably movable in other directions along said curved portions of said pair of leg members.

3. A mixing apparatus comprising,

a cylindrical drum member for performing a mixing operation by rotating around its axis,
frame means including an arcuate leg member and a pair of leg members for supporting said drum member in the mixing position on a supporting surface,
said arcuate leg member being in a plane crossing said axis at substantially a normal angle,
said plane projecting from the side of said drum member,
the center of curvature of said arcuate leg member being substantially in line with said axis,
each of said pair of leg members being U-shaped and being removably attached to sides of said arcuate leg member by two quick disconnect fastening means,
and said pair of leg members projecting substantially parallel to said axis.

4. A mixing apparatus for mixing substances comprising,
frame means for supporting said mixing apparatus on a three point support,
said three point support comprising two rocker supports for rocking said mixing apparatus in a first direction and a third rocker support being positioned substantially normal to said two rocker supports for rocking said mixing apparatus in a direction substantially normal to said first direction,
wheel means secured to said two rocker members and so positioned as to support said mixing apparatus when said mixing apparatus is rocked away from support of said third rocker support member.

5. A mixing apparatus for mixing substances comprising,
a mixing drum,
frame means for supporting said mixing apparatus on a three point support,
said three point support comprising two rocker supports for rocking said mixing apparatus in a first direction and a third rocker support positioned substantially normal to said two rocker supports for rocking said mixing apparatus in a direction substantially normal to said first direction,
wheel means secured to said two rocker members and so positioned as to support said mixing apparatus when said mixing apparatus is rocked away from support of said third rocker support member, and
said drum being secured to said frame means by a single rotatable connection.

6. In a mixing apparatus for mixing substances comprising,
a cylindrical mixing drum having a constant diameter throughout its length and being open at one end and closed at the other end,
said mixing drum in normal mixing operation being positioned in a manner that its axis is at a small angle to ground level,
and mixing paddle means being positioned in said drum at an angle to said axis and adjacent said open end for directing said substances being mixed away from said open end and toward said closed end of said drum, and said mixing paddle having a surface adjacent to the inside surface of said drum and being spaced therefrom and in an increasing angle.

7. In a mixing apparatus for mixing substances comprising,
a cylindrical mixing drum having a constant diameter throughout its length and being open at one end and closed at the other end,
said mixing drum in normal mixing operation being positioned in a manner that its axis is at a small angle to ground level,
mixing paddle means being positioned in said drum at an angle to said axis for directing said substance being mixed away from said open end and toward said closed end of said drum, and
said mixing paddle means directly contacting said drum

adjacent said open end and being spaced at an increasing angle from said drum in the direction toward said closed end.

8. In a mixing apparatus for mixing substances,
a cylindrical mixing drum having a constant diameter throughout its length and being open at one end and closed at the other end,
said drum having at least one mixing paddle member attached to its inner cylindrical surface,
said paddle member including a substantially rectangular blade member positioned at a small angle to the axis of said drum and having an angled end portion at the end of said blade member adjacent said open end of said cylinder,
said end portion having a greater angle to said axis of said cylinder than said small angle,
said end portion having a lower edge fixed against said inner surface of said drum with the lower edge of the remainder of said blade member being spaced at a first angle to said inner surface, and
a portion of said blade member adjacent said closed end of said drum having a lower edge portion with an angle to said inner surface greater than said first angle.

9. In a mixing apparatus for mixing substances,
a cylindrical mixing drum having a constant diameter throughout its length and being open at one end and closed at the other end,
said drum having at least one mixing paddle member attached to its inner cylindrical surface,
said paddle member including a substantially rectangular blade member positioned at a small angle to the axis of said drum and having an angled end portion at the end of said blade member adjacent said open end of said cylinder,
said end portion having a greater angle to said axis of said cylinder than said small angle, and
said end portion having a lower edge fixed against said inner surface of said drum with the lower edge of the remainder of said blade member being spaced at a first angle to said inner surface.

10. A mixing apparatus having a first position for transporting and a second position for mixing comprising,
a cylindrical mixing drum having a constant diameter throughout its length and being open at one end and closed at the other end,
motor drive means for rotating said drum,
longitudinal beam means positioned on one side of said drum midway the length of said drum having at least two rollable members for rotatably supporting said drum at a small angle to the ground plane when said mixing apparatus is in said second position,
first curved support means being secured to the ends of said beam means and projecting away from said drum at substantially a 90° angle for forming a first rocker support for supporting said mixing apparatus on the ground plane in said second position,
drum support means having one end secured to the mid point of said beam means and including swivel means attached to said closed end of said drum for supporting said drum in said first position and for rotatably supporting said drum in said second position,
second curved support means encircling said side of said drum opposite said side adjacent said beam means and being connected to said ends of said beam means,
said second curved support means being connected to the other end of said drum support means,
a pair of U-shaped leg means being secured to said support means adjacent said ends of said beam means for supporting said mixing apparatus in said second position in conjunction with said first curved support means,
a pair of wheel means attached to respective ones of said pair of curved leg means at a point displaced from the ground plane when said mixing apparatus

is in said second position for rollably carrying said mixing apparatus in said first position,

flexible shield means secured to said first and second support means and being positioned between said beam means and said open end of said drum,

said drum having at least one mixing paddle member attached to its inner cylindrical surface,

said paddle member including a substantially rectangular blade member positioned at a small angle to the axis of said drum and having an angled end portion at the end of said blade member adjacent said open end of said cylinder,

said end portion having less than a normal angle to said axis of said cylinder and having a lower edge fixed substantially against said inner surface of said drum,

the lower edge of said blade member being spaced at a first angle to said inner surface, and

a portion of said blade member adjacent said closed end of said drum having a lower edge portion with an angle to said inner surface greater than said first angle.

11. A mixing apparatus having a first position for transporting and a second position for mixing comprising,

a mixing drum having an open end and a closed end,

motor drive means for rotating said drum,

longitudinal beam means positioned on one side of said drum for supporting said motor means and for rotatably supporting said drum at a small angle to the ground plane when in said second position,

first curved support means being secured to the ends of said beam means and projecting away from said drum for forming a first support for said mixing apparatus,

drum support means secured to said beam means for supporting said drum in said first and second positions,

means interconnecting said drum support means and said closed end of said drum for rotatably supporting said drum,

second curved support means encircling said side of said drum opposite said side adjacent said beam means and being connected to said ends of said beam means,

said second curved support means being connected to a portion of said drum support means opposite to that secured to said beam means,

curved leg means being secured to said support means adjacent said ends of said beam means for supporting said mixing apparatus in said second position in conjunction with said first curved support means,

wheel means attached to said curved leg means for rollably carrying said mixing apparatus in said first position,

and flexible shield means secured to said support means between said beam means and said open end of said drum for shielding said motor drive means.

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