April 28, 1942. B. L. SIMPSON 2,281,329

MULLER AND MOTOR DRIVEN AGITATOR

Filed June 29, 1940 2 Sheets-Sheet 1

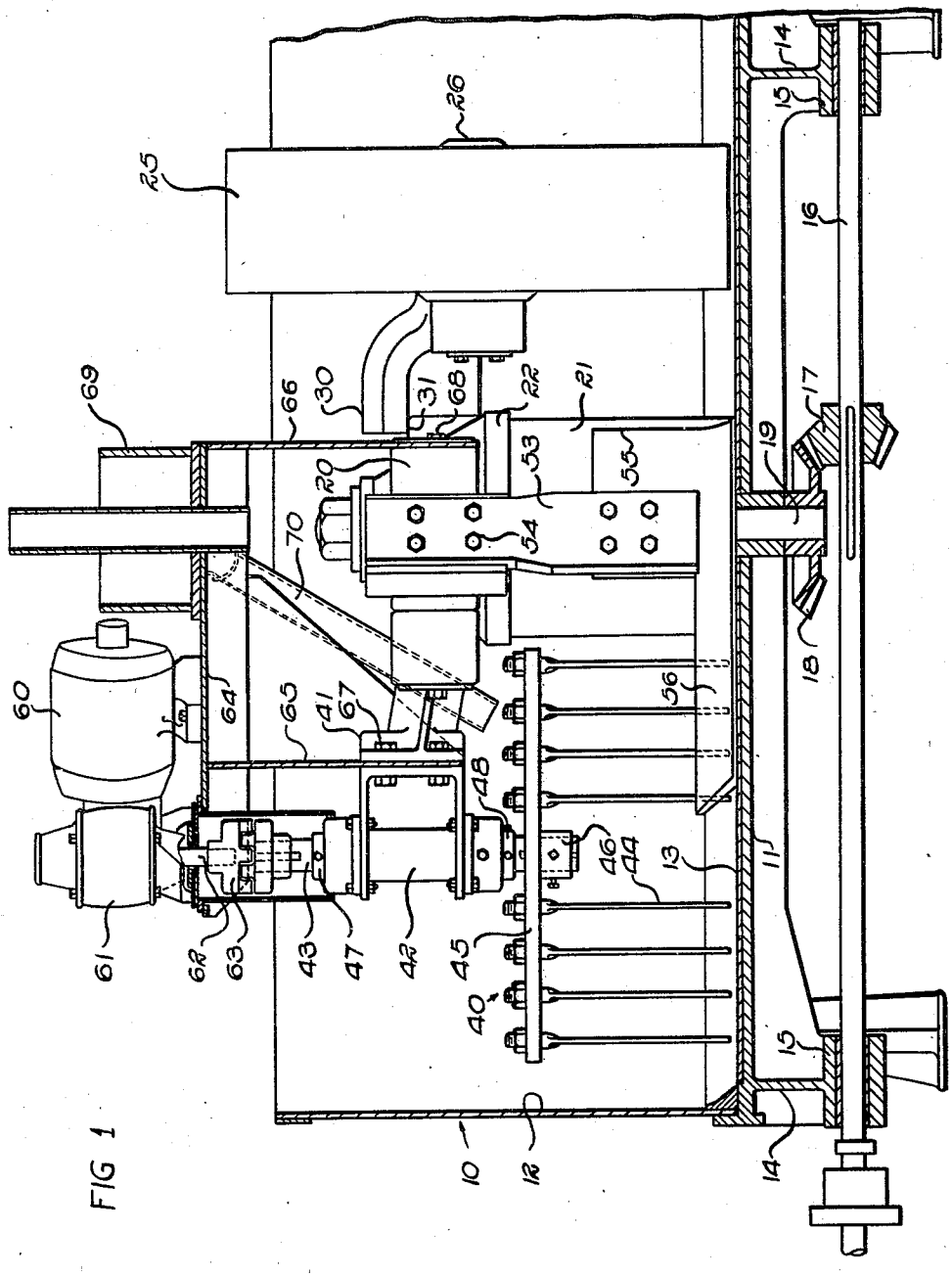


FIG 1

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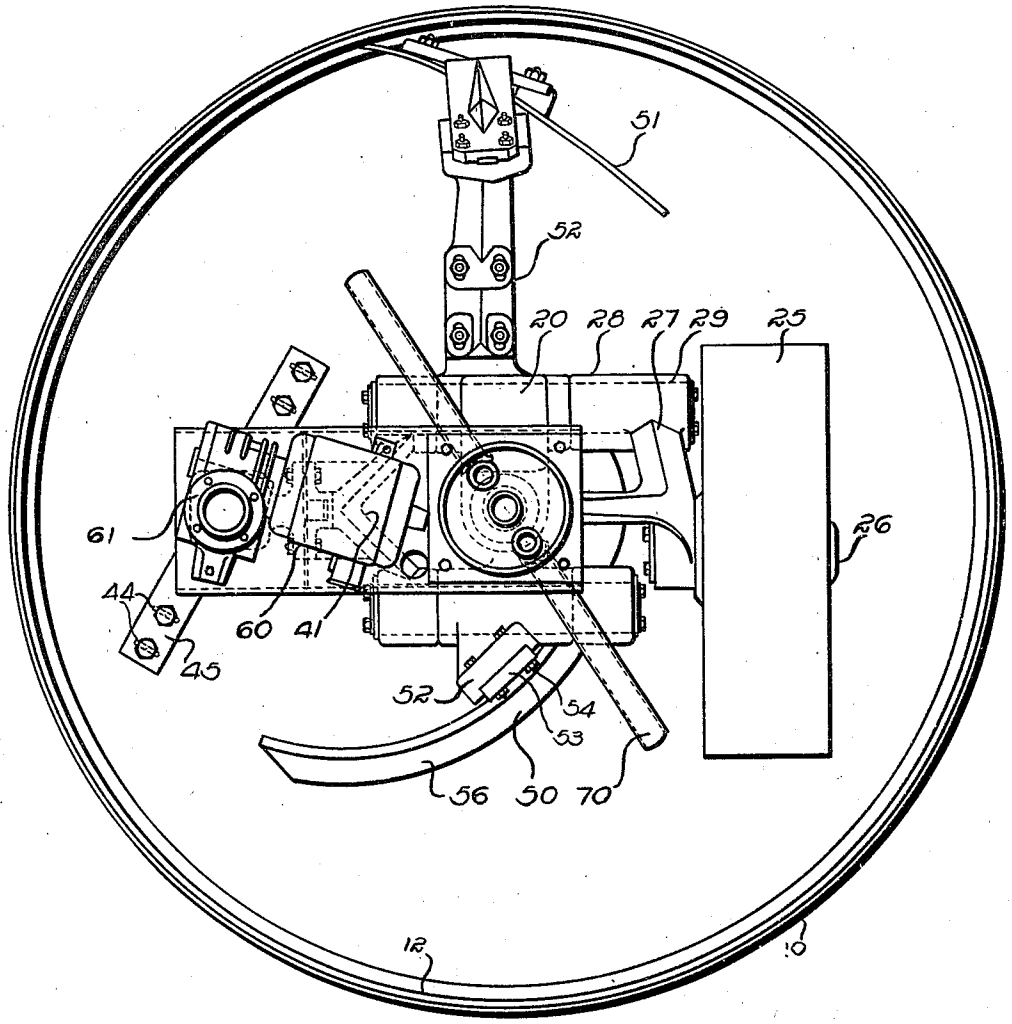
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FIG. 2



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Patented Apr. 28, 1942

2,281,329

UNITED STATES PATENT OFFICE

2,281,329

MULLER AND MOTOR DRIVEN AGITATOR

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Application June 29, 1940, Serial No. 343,253

12 Claims. (Cl. 83—45)

This invention relates to muller-agitators which are used for the preparation of chemical mixtures or ceramic materials. It is of particular use in connection with intimately mixing and mulling a plurality of ingredients to provide an evenly distributed mixture throughout the entire mass of material being worked. It may be employed for mixing dry materials with one another, or the mixing of dry materials with liquids. An example of the mixture of dry material would be the preparation of foundry sand, while an example of the mixing of dry materials with liquids would be the manufacture of battery paste from lead oxides and sulphuric acid.

An object of the invention is to provide a muller-agitator which is adapted to mull materials placed therein while intensively stirring or mixing the materials.

It is a further object of the invention to provide a muller-agitator wherein separate drive means are provided for the muller and the agitator.

A still further object of the invention is to provide driving means for the muller and for the agitator which are entirely separate and independent driving means, having no relation one with the other.

A still further object of the invention is to provide a driving means for the muller of a muller-agitator which is adapted to rotate the muller and the agitator in an orbital path within the mixing pan, and to provide an independent driving means for the agitator which will rotate the agitator about its own axis entirely independent of the rotation of the agitator in its orbital path.

Another object of the invention is to provide a variable speed driving means for rotating the agitator upon its own axis entirely independent of the means for rotating the agitator and the muller wheel about an orbital path within the mixing pan.

A still further object of the invention is to provide an independent driving means for the agitator of a muller-agitator which is adapted to be suitably supported upon the supporting means for the agitator and the mulling wheel and to be rotated therewith when the agitator and muller are rotated in their orbital paths within the mixing pan, whereby a complete operable unit is arranged with independent drive means for orbital rotation of the agitator and axial rotation thereof, the axial rotation being capable of being driven at variable speed.

Further objects and advantages of the present invention will be apparent from the drawings and from the description which follows.

In the drawings:

Figure 1 is a vertical cross-section of a muller-agitator incorporating the features of this application.

Figure 2 is a plan view of the muller-agitator disclosed in Figure 1.

In this invention a muller-agitator is provided with a mulling wheel and an agitating device which are adapted to be rotated within a mulling pan in an orbital path around the central axis of the pan. The mulling wheel is provided for continuously compacting and mulling the material which is stirred, or agitated, by the agitator, the mulling wheel being supported a predetermined distance from the bottom of the mulling pan to provide an arrangement which will produce greatest mulling action with a minimum grinding of the material within the mixing pan. A scraper is provided adjacent the side wall of the mulling pan and is adapted to be rotated with the mulling wheel and agitator in order to remove material adhering to the side of the muller pan and direct the material into the path of the muller wheel and agitator. A combined scraper and plow is also provided and is adapted to be rotated with the agitator and the mulling wheel to lift material from the bottom wall of the mulling pan and direct the same upwardly and outwardly into the path of the mulling wheel and agitator. The scraper, which is a part of the plow, is adapted to engage a central turret positioned within the mulling pan to scrape material from the turret wall and direct the material into the path of the mulling wheel and agitator.

To be able to control the mixing of materials under various conditions, this invention provides a separate driving means for rotating the mulling wheel and agitator in an orbital path around the central axis of the mulling pan from the driving means for rotating the agitator about its own axis while the agitator is being rotated in its orbital path. By providing separate driving means for the axial rotation of the agitator and for the orbital rotation of the mulling wheel and agitator, it is possible to vary the speed of rotation of either of the driving means. An arrangement of this type permits the speed of rotation of each of the devices to be varied during the process of mixing and mulling to obtain best results for the materials being mixed and mulled.

In this invention a mulling pan 10 is provided with a bottom wall 11 and a vertical side wall 12. The mulling pan is circular and the side thereof

is arranged substantially at right angles to the bottom wall 11. The bottom wall 11 is provided with a wear-resisting plate 13 against which the material is pressed by the mulling wheel of the apparatus, and upon which the plow of the apparatus rides to scrape materials therefrom. The bottom wall 11 of the mulling pan is provided with supporting brackets 14 depending from the bottom face of the wall 11 and which support the bearings 15 for a drive shaft 16 which is journaled therein. The drive shaft 16 is connected to a suitable source of power, which source may be either a constant speed source or a variable speed source, whereby the drive shaft 16 is caused to transmit either a constant or a variable speed to a bevel gear 17 mounted thereupon. The bevel gear 17 engages a corresponding bevel gear 18, mounted upon a drive shaft 19 which extends upwardly through the bottom wall 11 of the mulling pan and is positioned at the central axis of the mulling pan.

A cross head 20 is splined or keyed to the drive shaft 19 and is rotated therewith. A turret 21 surrounds the drive shaft 19 and is concentric with the central axis of the mulling pan and the drive shaft 19, the turret protecting the axle bearings and thrust bearings for the drive shaft 19. The shaft 19 supports the cross head 20 thereupon in a suitable manner to permit rotation thereof. The cross head 20 is provided with a flanged skirt 22 which extends downwardly around the turret 21 and prevents material from entering the interior of the turret.

A mulling wheel 25 is journaled upon an axle 26, which axle is supported by an arm 27 extending from a bearing support 28. The bearing support 28 is journaled upon a pin 29 extending horizontally through the cross head 20. The arrangement of the bearing 28 upon the pin 29 is such that the mulling wheel 25 is permitted vertical movement with respect the bottom of the mulling pan, being pivoted about the pin 29. The arm 27 is provided with an extension 30 which engages a shoulder 31, positioned upon the cross head 20. The extension 30 of the arm 27, when in engagement with the shoulder 31, prevents the mulling wheel from engaging the wear-resisting plate 13 even though there is no material within the mixing pan 10. The position of the mulling wheel adjacent the wear-resisting plate 13 can be made to be adjustable to meet varying quantities of material which may be mixed within the mulling pan. In the latter instance the extension 30 of the arm 27 would be made adjustable with respect the shoulder 31.

The agitator 40 is also supported from the cross head 20. The agitator support consists of a bracket 41 extending from the cross head 20 and upon which a bearing block 42 is suitably mounted. The bearing block 42 is arranged in a vertical position so that the agitator drive shaft 43 journaled therein, will cause the agitator 40 to rotate in such a manner that a plurality of fingers 44, extending downwardly therefrom, will rotate in a plane substantially parallel to the bottom wall 11 of the mulling pan. The agitator consists of a bar 45 to which a plurality of fingers 44 are secured in a depending relation therefrom and are spaced substantially equidistant on both sides of the drive shaft 43 to which the agitator 40 is attached. The drive shaft 43 extends through the bar 45, which is keyed thereto. A collar 46 is secured to the drive shaft 43 to prevent the bar 45 and fingers 44, comprising the agitator, from falling downwardly into engagement with the bottom wall 11 of the mixing pan. The drive shaft 43 is further provided with thrust collars 47 and 48 which prevent the drive shaft from moving longitudinally within the bearing support 42.

As thus far described, it can be seen that when the drive shaft 16 is rotated by its suitable power source the shaft 19 will be rotated, thereby driving the cross head 20 upon which the mulling wheel 25 and agitator 40 are supported. The axis of rotation of the agitator 40 and the longitudinal axis of the mulling wheel 25 are substantially equidistant from the drive shaft, whereby the mulling wheel and the agitator are rotated in an orbital path within the mulling pan 10 and follow substantially the same path. The arrangement is such that the mulling wheel 25 will compact and mull the material against which it presses in a vertical direction due to its pivotal mounting upon the pan 29. The mulling action will then be broken up by the agitator 40 which follows in the same path and is rotated upon its axis by the drive shaft 43.

Intermediate the mulling wheel and agitator is provided the combined plow and scraper 50 and the scraper 51. A bracket 52 extends from the cross head 20 and upon which the scraper 51 is mounted, the scraper being adapted to engage the side wall 12 of the mulling pan 10. This scraper 51 is positioned at a reclining angle with respect the wall 12 of the mixing pan, whereby the material removed from the wall 12 when the scraper 51 is rotated by means of the cross head 20 will be directed into the path of rotation of the mulling wheel 25. This scraper also engages a portion of the bottom wall 11 which lies adjacent the side wall 12.

A supporting bracket 52 extends from the cross head 50 and is provided with a vertically depending arm 53 attached thereto by means of bolts 54. The lower end of the arm 53 carries the combined plow and scraper 50. The plow-scraper is provided with a vertical edge 55 which engages the vertical wall of the turret 21, removing material therefrom and directing the same outwardly into the path of travel to agitator 40. The curve of the plow-scraper is reverse to the direction of rotation of the agitator 40, whereby the material removed from the turret wall 21 and whereby material removed from the bottom wall 11 by the plow edge 56 will be directed outwardly into the path of travel of the agitator 40. Further, the plow edge 56 will lift material from the bottom wall 11 of the mixing pan and direct the same into the mixing fingers 44 of the agitator 40.

The agitator 40 is provided with an independent source of power for axially rotating the same whereby the agitator is not dependent upon the source of power for the orbital rotation of the agitator and whereby the orbital and axial speeds of rotation may be varied at will. An electric motor 60 is provided as the prime mover for the drive shaft 43 of the agitator 40. The electric motor 60 is drivingly connected to the drive shaft 43 through a speed reducing mechanism 61 from which a driving shaft 62 extends. A coupling device 63 is provided between the driving shaft 62 from the speed reducing mechanism 61 and the drive shaft 43 of the agitator 40 to permit the electric motor 60 and the speed reducing mechanism 61 to be removed from the apparatus.

The electric motor 60 is supported upon a platform 64 which in turn is supported by the brackets 65 and 66 which extend upwardly from the

cross head 20. The bracket 65 is retained upon the cross head 20 by the agitator mounting bracket 41 and the bearing support 42, the bolts 67 extending through suitable flanges upon the supports 41 and 42 to secure the bracket 65 therebetween. The bracket 66 may be bolted directly to the cross head as at 68.

There is also a container 69 positioned upon the platform 64 from which ducts 70 extend downwardly into the mixing pan. The container 69 and the ducts 70 are provided for the purpose of arranging means for distributing liquids to materials placed within the mixing pan, and prevent the liquids from entering or distributing over the upper ends of the turret 21 and protecting skirt 22 to eliminate the possibility of liquids passing through the turret.

The electric motor 60, driving the agitator 40 through the gear reducing device 61, is adapted to cause the agitator 40 to rotate a plurality of times upon its own axis while it is being revolved in an orbital path within the mixing pan 10. When the muller agitator is in operation the mulling wheel 25 and the agitator 40 are being rotated in an orbital path around the turret 21 by means of the drive shaft 19 through means of the cross head 20. The scraper 51 and the plow-scraper 50 will also be rotated at this same time. While the mulling wheel, the agitator, the scraper and the plow-scraper are being orbitally rotated within the muller agitator, the agitating device 40 will be axially rotated by means of the electric motor 60, whereby the agitating device 40 may be rotated at any speed desired during the process of mulling and mixing the ingredients within the mixing pan 10.

By the arrangement of this invention, it is possible to change the speed of orbital rotation of the muller wheel and the agitator, and the axial speed of the agitator independently during any part of a mixing process. For various materials and for various mixing processes the speed of the agitator may be desired to be varied according to the ingredients being added and the speed with which the ingredients are to be admixed with the ingredients already in the mixing pan.

While it is to be understood that an independent electric motor is the preferred way in which to provide an independent source of power by which the axial rotation of the agitator may be varied in its speed of rotation, yet it is not to be considered that this application is to be so limited thereby, but that other forms of independent drive means can be used for causing axial rotation of the agitator independent from the driving means causing orbital rotation thereof. Further, the independent drive source for axial rotation of the agitator may be either a constant speed source of power or a variable speed source according to the needs for driving the agitator.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a muller-agitator, a mulling pan, a mulling wheel freely rotatable upon a supporting axis therein, an agitator assembly positioned within said pan and supported by a freely rotatable axis, means for supporting said agitating assembly and said mulling wheel in operative relation to the bottom wall of said pan, means for rotating said supporting means to orbitally rotate said agitator and said mulling wheel, and an independently operable prime mover drivingly connected to said agitator for rotating said agitator assembly upon its own axis independently of said orbital rotation to intensely mix material in said pan.

2. In a muller-agitator, a mulling pan, a mulling wheel freely rotatable upon a supporting axis therein, an agitator assembly positioned within said pan and supported by a freely rotatable axis, means for supporting said agitating assembly and said mulling wheel in operative relation to the bottom wall of said pan, means for rotating said supporting means to orbitally rotate said agitator and said mulling wheel, and an independently operable prime mover drivingly connected to said agitator supported upon said supporting means for rotating said agitator assembly upon its own axis independently of said orbital rotation to intensely mix material in said pan.

3. In a muller-agitator, a mulling pan, a mulling wheel freely rotatable upon a supporting axis therein, an agitator assembly positioned within said pan and supported by a freely rotatable axis, means for supporting said agitating assembly and said mulling wheel in operative relation to the bottom wall of said pan, means for rotating said supporting means to orbitally rotate said agitator and said mulling wheel, and an independently operable electric motor drivingly connected to said agitator supported upon said supporting means for rotating said agitator assembly upon its own axis independently of said orbital rotation to intensely mix material in said pan.

4. In a muller-agitator, a mulling pan, a mulling wheel positioned therein, an agitator assembly positioned within said pan, a cross head, means extending from said cross head for rotatably supporting said agitating assembly, means extending from said cross head upon which said mulling wheel is rotatably supported, an independent prime mover carried by said cross head and drivingly connected to said agitator assembly, and means for rotating said cross head to cause said agitating assembly and said muller to rotate in an orbital path within said mulling pan while said independent prime mover provides independent axial rotation of said agitating assembly.

5. In a muller-agitator, a mulling pan, a mulling wheel freely rotatable upon a supporting axis therein, an agitator assembly positioned within said pan and supported b ya freely rotatable axis, means for supporting said agitating assembly and said mulling wheel in operative relation to the bottom wall of said pan, means for rotating said supporting means to orbitally rotate said agitator and said mulling wheel, and an independently operated prime mover capable of speed variation drivingly connected to said agitator assembly to axially rotate the same while said assembly is rotated orbitally by said supporting means to intensely mix material in said pan at varying speeds of agitator rotation.

6. In a muller-agitator, a mulling pan, a mulling wheel freely rotatable upon a supporting axis therein, an agitator assembly positioned within said pan and supported by a freely rotatable axis, means for supporting said agitating assembly and said mulling wheel in operative relation to the bottom wall of said pan, means for rotating said supporting means to orbitally rotate said agitator and said mulling wheel, and an independently operable prime mover capable of speed variation drivingly connected to said agitator assembly through speed reducing means to axially rotate said assembly while said assembly is rotated

orbitally by said supporting means to intensely mix material in said pan at varying speeds of agitator rotation.

7. In a muller-agitator, a mulling pan, a turret for rotationally supporting a cross head centrally within said pan, a mulling wheel carried upon one side of said cross head upon an axis substantially parallel to the bottom wall of said pan, an agitating assembly carried upon said cross head and arranged angularly from said wheel, said assembly comprising a plurality of vertically aligned fingers attached to a rotatable head carried by said cross head upon an axis to permit said fingers to rotate in a plane parallel to the bottom wall of said pan and encompass a mixing area between said turret and the side wall of said pan, a scraper and a plow carried by said cross head for removing material from said walls of said pan and from said turret and for lifting material from the bottom of said pan, means for rotating said cross head, and an independently operated prime mover drivingly connected to said agitator assembly to axially rotate the same while said assembly is rotated orbitally by said cross head to produce an intensive mixing of material in said pan.

8. In a muller-agitator, a mulling pan, a turret for rotationally supporting a cross head centrally within said pan, a mulling wheel carried upon one side of said cross head upon an axis substantially parallel to the bottom wall of said pan, an agitating assembly carried upon said cross head and arranged angularly from said wheel, said assembly comprising a plurality of vertically aligned fingers attached to a rotatable head carried by said cross head upon an axis to permit said fingers to rotate in a plane parallel to the bottom wall of said pan and encompass a mixing area between said turret and the side wall of said pan, a scraper and a plow carried by said cross head for removing material from said wall of said pan and from said turret and for lifting material from the bottom of said pan, means for rotating said cross head, and an independently operated variable speed driving means drivingly connected to said agitator assembly to produce an intensive mixing of material in said pan at various rotative speeds of said agitating assembly.

9. In a muller-agitator, a mulling pan, a turret for rotatably supporting a cross head centrally within said pan, a mulling wheel carried by said cross head upon an axis substantially parallel to the bottom wall of said pan, means extending from said turret for freely rotatably supporting an agitating assembly upon a substantially vertical axis, said assembly comprising a plurality of vertically aligned fingers attached to a rotatable head carried upon said axis to permit said fingers to rotate in a plane parallel to the bottom wall of said pan and encompass a mixing area between said turret and the side wall of said pan, a scraper and a plow carried by said cross head for removing material from said walls of said pan and from said turret and for lifting material from the bottom of said pan, means for rotating said cross head, and means carried by said cross head for supporting an independently operated prime mover mounted above said cross head and carried thereby during rotation thereof, said prime mover being drivingly connected to said agitator assembly to independently axially rotate the same while said assembly is rotated orbitally by said cross head.

10. In a muller-agitator, a mulling pan, a turret for rotatably supporting a cross head centrally within said pan, a mulling wheel carried by said cross head upon an axis substantially parallel to the bottom wall of said pan, means extending from said turret for freely rotatably supporting an agitating assembly upon a substantially vertical axis, said assembly comprising a plurality of vertically aligned fingers attached to a rotatable head carried upon said axis to permit said fingers to rotate in a plane parallel to the bottom wall of said pan and encompass a mixing area between said turret and the side wall of said axis, a scraper and a plow carried by said cross head for removing material from said walls of said pan and from said turret and for lifting material from the bottom of said pan, means for rotating said cross head, and means carried by said cross head for supporting an independently operated variable speed prime mover mounted above said cross head and carried thereby during rotation thereof, said prime mover being drivingly connected to said agitator assembly to independently axially rotate the same while said assembly is rotated orbitally by said cross head.

11. In a muller-agitator, a mulling pan, a turret for rotationally supporting a cross head centrally within said pan, a mulling wheel carried by said cross head upon an axis substantially parallel to the bottom wall of said pan, an agitating assembly comprising a plurality of vertically aligned fingers attached to a rotatable head carried by said cross head upon an axis to permit said fingers to rotate in a plane parallel to the bottom wall of said pan, a scraper and a plow carried by said cross head for removing material from the wall of said pan and from said turret and for lifting material from the bottom of said pan, means for rotating said cross head, an independently operated prime mover drivingly connected to said agitator assembly to independently axially rotate the same while said assembly is rotated orbitally by said cross head, and coupling means drivingly connecting said prime mover to said assembly to permit disconnection of said prime mover from said agitator assembly.

12. In a muller-agitator, a mulling pan, a mulling wheel positioned therein, an agitator assembly positioned within said pan, means for supporting said agitating assembly and said mulling wheel in operative relation to the bottom wall of said pan, means for rotating said supporting means, an independently operable prime mover drivingly connected to said agitator assembly through speed reducing means to independently axially rotate said assembly while said assembly is rotated orbitally by said supporting means, and coupling means interposed between said speed reducing means and said agitator assembly to permit disconnection of said assembly from said prime mover.

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