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W. H. CHEYNE

MIXING AND GRINDING MILL

Filed March 20, 1923

2 Sheets-Sheet 1

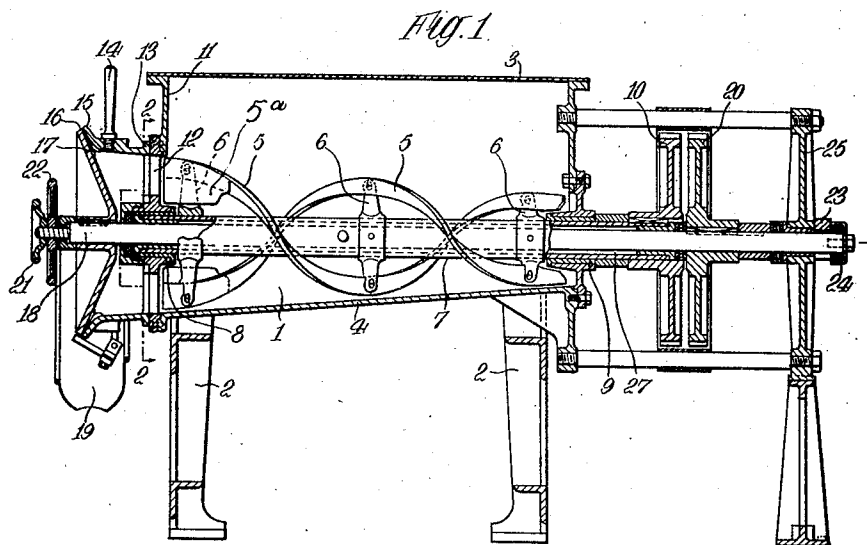
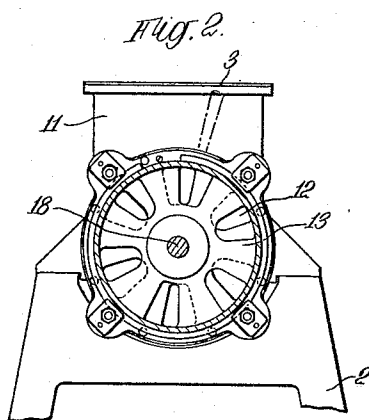
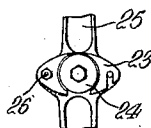


Fig. 3.



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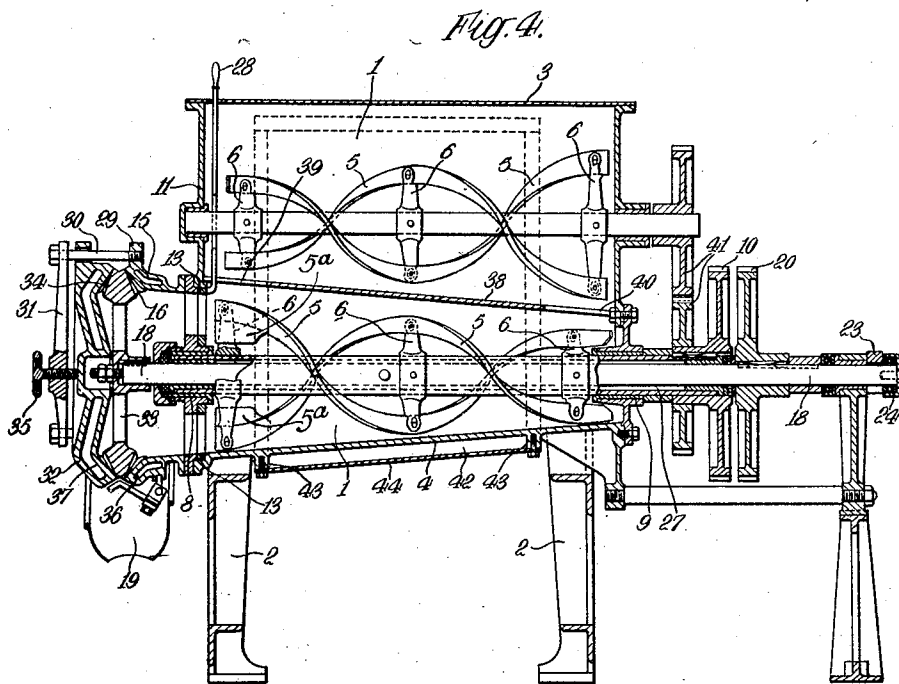
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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MIXING AND GRINDING MILL.

Application filed March 20, 1923, Serial No. 626 395, and in Great Britain May 1, 1922.

This invention relates to mixing and grinding mills, and has reference more particularly to such mills constructed for dealing with paint, either in the dry or liquid form.

An object of the invention is to construct a machine which is efficient and simple acting in regard both to the mixing and grinding, and especially such apparatus in which the mixing and grinding can be associated in a single machine.

Another object is to provide a machine adapted for mixing and grinding simultaneously, so that a continuous operation is obtained, while also the mixing may be prolonged before grinding commences according to the material treated.

In the accompanying drawings are illustrated preferred constructions embodying the present invention:

Fig. 1 is a sectional elevation;

Fig. 2 is a transverse view on the line 2—2 of Fig. 1 of a construction employing a single propelling means;

Fig. 3 is a detail hereafter referred to; and

Fig. 4 shows a construction embodying superposed propelling means.

Referring to the drawings, the container 1 is shown carried on supports 2, the container having an opening 3 at the top and an inclined concave bottom portion 4 of conoidal form, which slopes downwardly towards the discharge or delivery end of the container. The propelling means of the mixer is constituted by spiral strips 5 of metal, each wound in a gradually increasing diameter corresponding to the slope of the bottom portion 4 of the container, the strips are of coarse pitch and being carried by short arms 6, fixed to an approximately horizontal hollow shaft 7 supported in bearings 8, 9, at each end of the container, the shaft 7 carrying a driving wheel 10 geared to any suitable motive power to effect rotation of the strips or vanes 5, the material in the container 1 being thereby lifted from all along the bottom face and at the same time pushed towards the lower end of the container, which combined action results in the material being very well mixed. It will, however, be noted that due to the inclined bottom of the container there is a tendency for the material to flow to the lower end. This flow is augmented by the flow caused by the propelling means, and the

result is that the two forces acting together, that is, the force of the propelling mixer constituted by the strips 5, and the force of gravity, cause a piling up of the material at the lower end, and this material falls back into the container so that a still further mixing occurs. The end wall 11 at the delivery end of the container is ported as clearly indicated in Fig. 2 by the reference 12, through which port the mixed material is pushed by the aid of enlargements 5^a on the feed ends of the propelling means when the latter is operated. To control the flow through the ports 12, a ported plate 13 may be fitted against the end wall 11, which plate is adapted for angular adjustment there-against by reason of a handle 14 fitted to an extension of the container 15 incorporated with the plate 13.

By operating the handle 14, the ports 12 can be more or less closed by adjusting the register therewith of the ports in the plate 13. The extension 15 is outwardly flared, as indicated at 16, to form the fixed grinding face of a grinder, a rotatable member carrying a grinding face 17 being fitted there-against and driven from the shaft 18 so that the material exuded from the container 1 after being thoroughly mixed, may be subjected to a grinding operation between the said faces 16 and 17 before it is discharged to the hopper 19. The conveyance of the mixed material to the grinding faces 16, 17 is due in part to the fact that the extension includes a continuation of the inclined bottom 4 so that there is a tendency for the material to flow to the grinding faces from the container. This, of course, is also augmented by the pressure from the propelling mixer, comprising the vanes 5. The shaft 18 of the rotatable member is supported in bearings within the shaft 7 of the propelling means and carries a driving wheel 20 driven in similar manner to the wheel 10 aforesaid.

In order to adjust the position of the grinding face 17 relatively to the grinding face 16, an adjusting screw 21 with a locking wheel 22 is provided which, on operation, relatively moves the grinding face 17 on its shaft 18.

In the case of foreign particles arriving between the grinding faces and thereby damaging the parts, a removable distance piece 23 is interposed between a thrust block 24, or other abutment, on the end of the shaft 18 and the fixed part of the frame-

work, such as 25, which provides an end support for the shaft 18, so that removal of the distance piece 23 by tilting it about its hinge axis 26, clearly indicated in Fig. 3, permits a longitudinal movement of the shaft 18 until the thrust block 24 abuts against the end frame 25, thereby giving a corresponding clearance between the parts 16 and 17 for removal of the foreign body, whereon the parts can be returned to normal position with the distance piece 23 between the parts 24 and 25, that is, there is a definite return to initial position before separation.

It should be noted that the shaft 18 is supported within the shaft 7, so that for the greater part of their length there is a chamber 27, which may be utilized as a container for lubricant, the circulation of which can be assured in any well known manner.

Instead of utilizing a grinder having two faces, such as 16 and 17, the grinder may comprise two sets of grinding faces, and in this construction instead of making the extension 15 integral with the plate 13, it is separate therefrom, a controlling handle 28 being directly attached to the plate 13.

In order to provide the second grinding face the extension 15 is provided with lugs 29, preferably three in number, tapped to receive bolts 30 utilized to fix a spider 31 bearing on a disc 32 carrying a grinding face 34 which is spaced from the grinding face 16. The rotatable member of the grinder fitted to the shaft 18 in this construction is shown interposed between the two fixed grinding faces 16 and 32 and is indicated by the reference 33, and as shown, comprises two grinding faces, one opposed to the face 16 of the extension 15, and the other to the face 34 of the fixed disc 32. Adjustment of the bolts 30 will initially regulate the pressure between the grinding faces on the rotatable member 33 and the two grinding faces 34 and 16, while a final adjustment is permitted by means of a threaded stud 35 carried by the spider 31 and bearing on the central boss of the disc 32. The extension 15 may be provided with an internal chamber 36 adjacent the grinding face 16 and the disc 32 may have a hollow interior 37, so that a heat transfer medium may be introduced adjacent the grinding faces to heat or cool them as circumstances require.

A grinder comprising two elements, such as 15 and 17, or a grinder element comprising two sets of faces as shown in Fig. 4, may be associated with a single propelling means as described with reference to Fig. 1, or either type of grinder may be associated with superposed propelling elements, as indicated in Fig. 4, in which case it is preferred to separate the superposed elements by a partition 38, ported at each end as in-

dicated at 39 and 40, to permit flow of material being mixed from one propelling means to the other, i. e., from one side of the partition to the other, the propelling means being connected by gear, such as 41, so that they rotate at equal speeds.

The rest of the construction shown in Fig. 4 is similar to that shown in Fig. 1, like parts being indicated by similar reference numerals.

In either construction the container may be provided with a jacket 42 for the reception of a heat transfer medium, and the jacket may be either cast on the container, or the container may be provided with annular ribs, such as 43, which are faced and tapped so that a suitable sheet of material, such as 44, may be fitted thereto, as indicated in Fig. 4.

Very excellent results are obtainable by a machine made according to this invention and that without any skilled attention, and the invention may even be used for dealing with dry powders which are known to be more difficult of admixture than wet materials, especially when dealing with paint ingredients. Further, the trough can be completely emptied by simply continuing the rotation of the propelling means.

By use of a ported plate such as 13, the mixer can be isolated from the grinder for separate use so that material may be subjected to the mixing operation for any predetermined time before it is passed on to the grinder, and in such case the material will be forced to take a circular path in the container by reason of the action of the propelling means in combination with the inclined bottom portion.

The grinding faces may be constructed from marble or materials other than metal, and either the grinding chamber, or the trough may be lined with enamel.

I claim:

1. A paint mixing machine comprising in combination a container for the material to be treated, an inclined concave interior bottom face to said container, and a mixer in the form of propelling means arranged on a horizontal shaft, including spiral strip members of coarse pitch spaced from the shaft, extending over the length of the bottom face adapted to lift material towards the lower end thereof, thereby augmenting the tendency of the material to flow to said lower end due to the incline of said bottom face, a discharge opening in said end wall, an enlargement on the feed end of the propelling mixer adapted to push mixed material through said discharge opening when the propelling mixer is operated and means for closing said opening during mixing, the end wall at the lower end of the container extending vertically above the mixer so as to provide further space in which the mate-

rial may pile up at the lower end of the container under the combined forces of the propelling mixer and gravity, whereby further mixing, due to back falling of the piled up material in the container obtains.

2. A paint mixing machine comprising in combination a container for the material to be treated, an inclined concave interior bottom face to said container, and a mixer in the form of propelling means arranged on a horizontal shaft, including spiral strip members of coarse pitch spaced from the shaft, extending over the length of the bottom face adapted to lift material from all along the bottom face and push the material towards the lower end thereof, thereby augmenting the tendency of the material to flow to said lower end due to the incline of said bottom face, a discharge opening in said end wall, an enlargement on the feed end of the propelling mixer adapted to push mixed material through said discharge opening

when the propelling mixer is operated and means for closing said opening during mixing, the end wall at the lower end of the container extending vertically above the mixer so as to provide further space in which the material may pile up at the lower end of the container under the combined forces of the propelling mixer and gravity, whereby further mixing, due to back falling of the piled up material, obtains, an extension of the container on said end wall including a continuation of the inclined bottom face of the container, and a grinding face on said continuation and a complementary rotatable grinding face, the continuation of the bottom face of the container functioning as a means of conveying the material leaving the mixing machine, to the said grinding faces.

In testimony whereof I affix my signature.

WILLIAM HARDIE CHEYNE.