

Oct. 13, 1959

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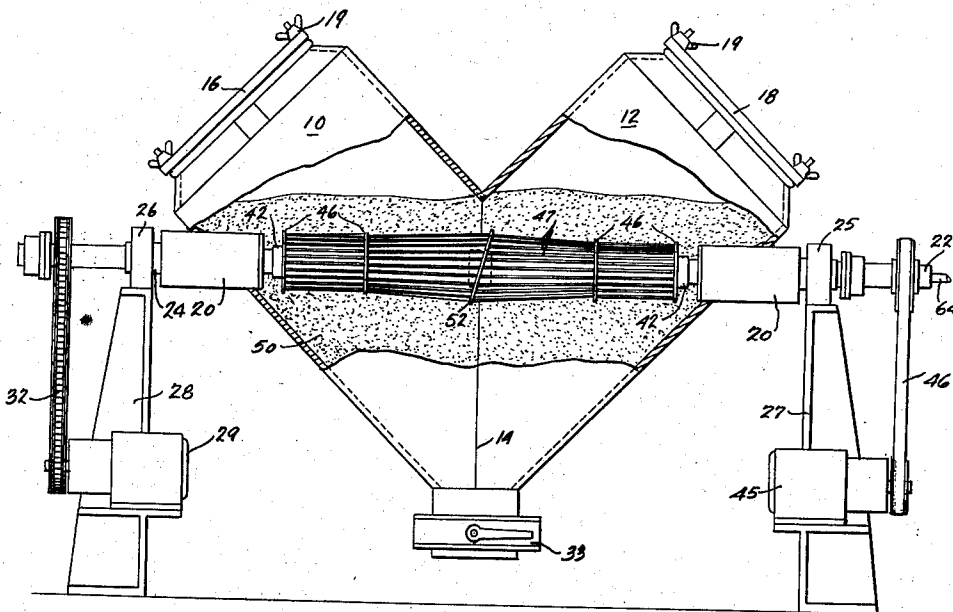
2,908,487

BLENDING MILL AGITATOR AND ADDITIVE FEED

Filed March 29, 1956

2 Sheets-Sheet 1

FIG. 1.



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Fig. 2.

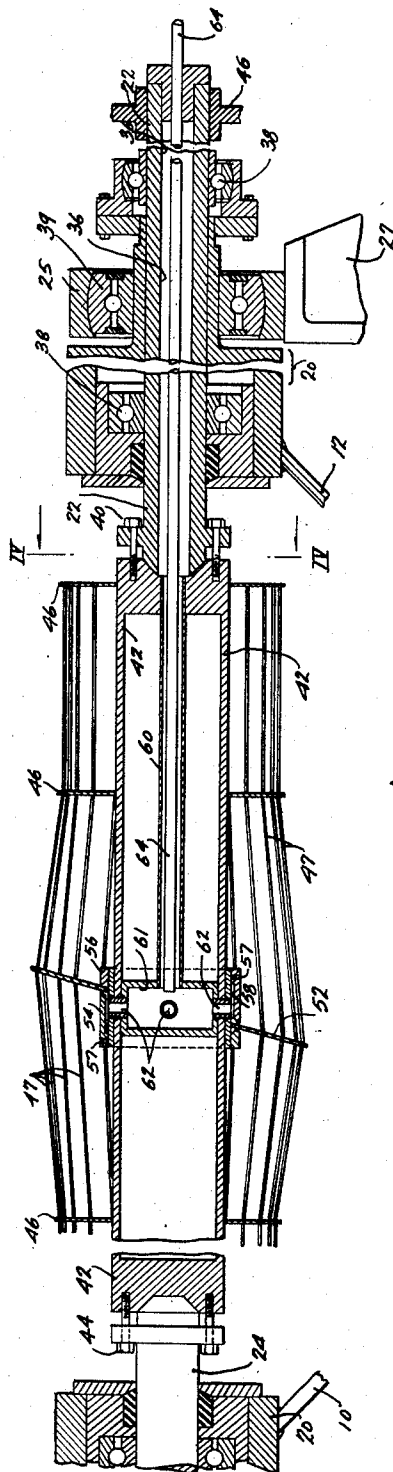


Fig. 4.

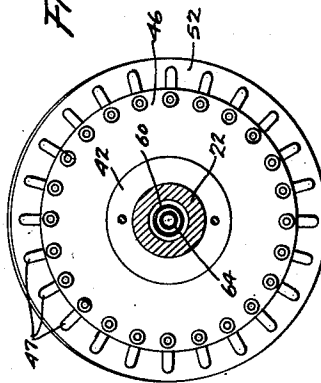
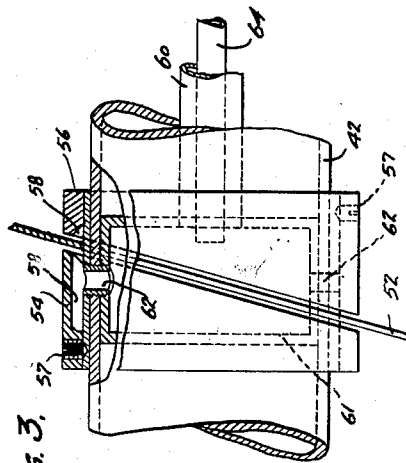


Fig. 3.



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BLENDING MILL AGITATOR AND ADDITIVE FEED

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5 Claims. (Cl. 259—25)

This invention relates to machines of the type sometimes referred to as "Blenders" for mixing materials in the various industries. More particularly, the invention relates to improvements in machines designed, for example, to produce moist or wet mixtures when working with dry powdered materials such as are normally considered to be immiscible because of their tendencies to "lump" when coming in contact with moisture. More specifically, the present invention relates to further improvements in devices such as disclosed for example in prior Patents No. 2,514,126 and No. 2,677,534.

Whereas, theoretically, an intimate mixture of dry powdered material and a liquid may be obtained by spraying the liquid into the powdered dry material while tumbling the latter, it has been determined by practice that in industrial blending operations dry materials are often met with which tend to "lump" when liquids are sprayed or poured or stirred or otherwise introduced thereinto in accord with conventional methods.

It is an object of the present invention to provide an improved method for adding liquids to dry materials such as are normally difficult to "wet" into uniformly moistened and blended form.

Another object of the invention is to provide an improved form of "blending" mill for use in the various industries wherein it is required to uniformly blend relatively small amounts of liquids into dry materials such as are normally non-receptive to moistening or wetting treatments.

Another object of the invention is to provide an improved blending mill as aforesaid which obtains an improved wet-blending operation without use of complicated or expensive accessory equipment.

Other objects and advantages of the invention will appear in the specification hereinafter.

In the drawings:

Fig. 1 is a side elevation of a wet-blending mill embodying the invention, with portions broken away to show the interior thereof;

Fig. 2 is a fragmentary section on an enlarged scale, showing details of the liquid feeding and blending mechanism of the mill of Fig. 1;

Fig. 3 is an enlarged view of a detail of Fig. 2; and

Fig. 4 is a section taken along line IV—IV of Fig. 2.

The invention is shown in the drawing herewith as being embodied in a tumbling mill of the type illustrated in the patents previously referred to; the mill comprising generally a hollow container comprising opposite side leg portions 10, 12 of frusto-cylindrical form disposed with their cylinder axes intersecting at approximately 90° and welded together as indicated at 14. The outer ends of the cylinder portions 10, 12 are closed by end plates 16, 18 which are detachably mounted thereon as indicated at 19 to facilitate loading the machine with feed materials and/or cleaning out the machine, or the like. The container is fitted at its opposite sides with axially aligned cylindrical housings 20—20 which mount upon stub shafts 22, 24 which are in turn carried within trun-

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nion bearings 25—26 supported upon frame or pedestal portions 27—28 at opposite ends of the mill.

As shown in Fig. 1, the housings 20 are welded to the container shell 10 and the stub shaft 24 is keyed or otherwise fixed to the housing 20 so that the mill container and the shaft 24 are integrally connected together. Means for driving the mill to rotate may be supplied in any preferred form. As illustrated in the drawing, for example, a motor 29 mounted on the pedestal 28 and connected to the shaft 24 by means of a chain and sprocket system as indicated at 32 is employed to cause the mill to rotate upon the bearings 25, 26, whereupon the material loaded within the mill will be subjected to a thorough admixing action, as explained in the aforesaid patents. A discharge spout and control valve as indicated at 33 is conveniently provided at the apex of the mill container structure, to facilitate dumping of the blended batches of material from the mill into a wheelbarrow, conveyor, or the like.

In accord with the present invention, it is arranged that the material to be blended within the rotating mill is at the same time subjected to a novel progressive wetting operation, as will now be described in detail. As shown in Figs. 1, 2, the stub shaft 22 at the right hand side of the machine as viewed in Fig. 1 is hollowed as indicated at 36 and is rotatably mounted within the cylindrical housing 20 by means of ball bearings 38—38. The pedestal bearing for the housing 20 is indicated in Fig. 2 at 39; and thus it will be appreciated that the mill is rotatable upon the bearing 39 while the stub shaft 22 is freely rotatable within the housing 20. Interiorly of the container the stub shaft 22 is bolted or otherwise coupled as indicated at 40 to a hollow "agitator" shaft 42 which spans the interior of the container and rotatably engages as indicated at 44 at its other end (Fig. 2) with the stub shaft 24. A motor as indicated at 45 is mounted on the pedestal 27 and is geared to the stub shaft 22 by means of a pulley and belt drive mechanism or the like as indicated at 46. Thus, it will be appreciated that operation of the motor 45 will drive the shaft 22 and the agitator shaft 42 to rotate interiorly of the mill independently of rotation of the latter upon the trunnion bearings 25—26 in response to operation of motor 29.

The shaft 42 is provided with radially extending "spiders" or discs as indicated at 46 at intervals along the agitator shaft, which support wires or rods 47 at intervals therearound to lie generally parallel to the axis of rotation of the shaft 42. This shaft is preferably driven to rotate at a substantially greater speed than the speed of rotation of the mill casing. Hence, the material load within the mill container, as indicated at 50 (Fig. 1) is subjected to a relatively intense agitation locally in the range of the wires or rods 47 as the load material flows back and forth through the area of the agitator shaft 42 in response to rotation of the mill casing.

To introduce the liquid feed into the dry material of the mill feed, I provide one or more liquid film feed disks as indicated at 52 in the drawing. As shown in Fig. 1 of the drawing, a liquid feed disk is illustrated as being employed at the preferred position of mounting thereof in the center of the mill casing, but it is to be understood that any other desired number of liquid feed disks may be employed at variously spaced positions along the agitator shaft 42, if preferred. In any case, the liquid feed discs each comprise a flat circular plate of sheet metal or the like, centrally bored so as to freely slip-fit upon the shaft 42 and is then held in place thereon in cant attitude as shown in Figs. 1, 2 and 3 by means of eccentric housing or bushing devices 54, 56. The bushing devices are locked on the shaft 42 by means of set screws or the like as indicated at 57, and at their inner ends relative to the disc 52 the bushing devices are chambered as in-

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indicated at 58 to provide liquid supply reservoirs at opposite sides of the disc 52 at its "hub" portion. The shaft 42 is provided with a reduced diameter bore or tube as indicated at 60 to receive a liquid feed tube 64 to deliver liquid into a "box" 61 disposed at the center of the disc 52 and having one or more outlet ports 62 in open communication with the liquid chamber portions 58—58 at opposite sides of the disc 52. The liquid supply tube as indicated at 64 is slip-fitted through the hollow interior of the stub shaft 22 so as to deliver liquid from a suitable supply reservoir (not shown) to the interior of the box 61. It then runs into the chambers 58—58 at opposite sides of the disc 52 in response to the action of centrifugal forces thereon.

The objective of the invention is to maintain a constant feed of liquid in surface film form to the opposite sides of the disc 52 externally of the bushings 54, 56, as the disc 52 rotates with the shaft 42 and is thereby carried to wobble about interiorly of the dry feed material of the mill. The liquid films thereon are thereby constantly slung and/or wiped off the disc 52, and the liquid is thereby dispersed into the dry mill feed material in such manner as to provide an intimate admixing thereof without permitting the dry material to "lump."

The rate of liquid feed to the disc 52 will of course be regulated so as to best suit various blending conditions, as will be understood by anyone versed in the art. Thus, for example, in event it is determined that when working with a relatively thin liquid and only a low rate of supply thereof is required, the bushing devices 54, 56 may be relatively tightly adjusted against the disc 52, thereby leaving only minute liquid escape passageways between the edges of the bushings and the surfaces of the disc 52. If necessary the coacting surfaces of the bushings and the disc 52 may be quite precisely machined or ground so as to meet in more accurately fitting relation so as to provide therebetween only microscopically small liquid escape channels. Or, in event the feed liquid is relatively heavy and/or viscous the bushings may be appropriately spaced away from the disc 52 by any suitable spacer devices disposed therebetween, and thus relatively large liquid escape passageways will be provided for flow of liquid outwardly along the external surfaces of the disc 52 into the zones of slinging of the liquid from the disc 52 into the dry mill feed material.

It has been determined that the mounting of the liquid film feed disc upon the shaft in canted attitude thereon provides a preferred liquid feed action because the liquid is thereby caused to continuously scatter throughout the mill feed material in all directions incidental to rotation of the shaft 42.

Incidental to this novel feeding of liquid to the mill feed material the "cage" comprising the spiders 46, the disc 52, and the wires or rods 47, revolves rapidly to assist in scattering the liquid feed and to break up any incipient lump formations in the mill material. It will of course be understood that although only one form of the invention has been shown and described in detail, it will be apparent to those skilled in the art that the invention is not so limited but that various changes may be made therein without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. A mechanism for blending liquid and dry pulverant materials comprising a container for dry material, an agitator comprising a bladed reel carried by a hollow shaft rotatably disposed within said container for churning the material therewithin, and a liquid feeder carried by said agitator to rotate therewith, said feeder comprising a disc mounted upon said agitator shaft for rotation therewith in canted relation to the axis of rotation thereof and supporting the blades of said agitator reel, said agitator shaft including a reduced diameter liquid passageway for conveying liquid from externally of the agitator to a liquid compartment in the interior of said agita-

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tor shaft in the region of said feeder disc, said agitator shaft being ported contiguous to said feeder disc, and means including said ported agitator shaft whereby upon rotation of said agitator the liquid feeding therethrough exits in fine stream form and spreads upon the surface of said feeder disc wherefrom it is wiped and blended into the dry material as the latter is churned by said agitator reel blades.

2. A mechanism for blending liquid and dry materials comprising a container for dry material, an agitator comprising a plurality of blades carried by a hollow shaft rotatably disposed within said container for churning the material therewithin, and a liquid feeder carried by said agitator to rotate therewith, said feeder comprising a disc mounted upon said agitator shaft for rotation therewith in canted relation to the axis of rotation thereof and supporting the blades of said agitator, said agitator shaft including a liquid passageway for conveying liquid from externally of the agitator to a liquid port contiguous to said feeder disc, and means including said port whereby upon rotation of said agitator the liquid feeding therethrough exits in fine stream form and spreads upon the opposite side surfaces of said feed disc wherefrom it is wiped and blended into the dry material as the latter is churned by said blades.

3. A mechanism for blending materials comprising a container, an agitator comprising a bladed reel carried by a hollow shaft rotatably disposed within said container for churning the material therewithin, and a feeder carried by said agitator to rotate therewith, said feeder comprising a disc mounted upon said agitator shaft for rotation therewith in canted relation to the axis of rotation thereof and supporting the blades of said agitator, said agitator shaft including a passageway for conveying material from externally of the agitator to a port contiguous to said feeder disc, and means including said port whereby upon rotation of said agitator the material feeding therethrough exits in fine stream form and spreads upon the surface of said feed disc wherefrom it is wiped and blended into the material within said container as the latter is churned by said blades.

4. In a blending mill, a container for the material to be processed, an agitator disposed within said container and comprising a hollow shaft rotatably mounted within said container and power-driven from exteriorly thereof, said shaft mounting radially extending disc means intermediately of its ends, fluid housing devices cooperating to comprise chambers which function as liquid supply reservoirs, said housing devices being positionally adjustable on said shaft at opposite sides of said disc means and defining therebetween adjustable width fluid exit means, agitator blades mounted upon said disc means and disposed generally parallel to said shaft thereby comprising a reel type agitator, said shaft being ported adjacent said disc means, fluid feed means extending into the interior of said shaft, and means including said ported shaft whereby fluid feeding through said ported shaft will pass into said housing means and through said fluid exit means and will then flow out and spread onto said disc means for mixing into the material being processed upon rotation of said shaft.

5. A mechanism for adding liquids to dry pulverant materials comprising a container for dry material, an agitating device disposed within said container for churning the material therewithin, said agitating device comprising a series of rod like agitator elements spaced around an agitator shaft in spaced relation thereto, and a liquid feed device carried by said agitator to rotate therewith, said feed device comprising a disc mounted upon said agitator for rotation therewith and extending transversely of the axis of rotation thereof, fluid housing devices cooperating to comprise chambers which function as liquid supply reservoirs, said housing devices being positionally adjustable on said shaft at opposite sides of said disc means and defining therebetween adjustable

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width fluid exit means, liquid passageway means for conveying liquid to the interior of said agitator shaft in the region of said feed disc, said agitator shaft being ported contiguous to said feed disc, and means including said ported shaft whereby upon rotation of said agitator the liquid feeding therethrough exits from said exit means in fine stream form and spreads upon the opposite side surfaces of said feed disc wherefrom it is wiped by rubbing contact of the dry material thereagainst.

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