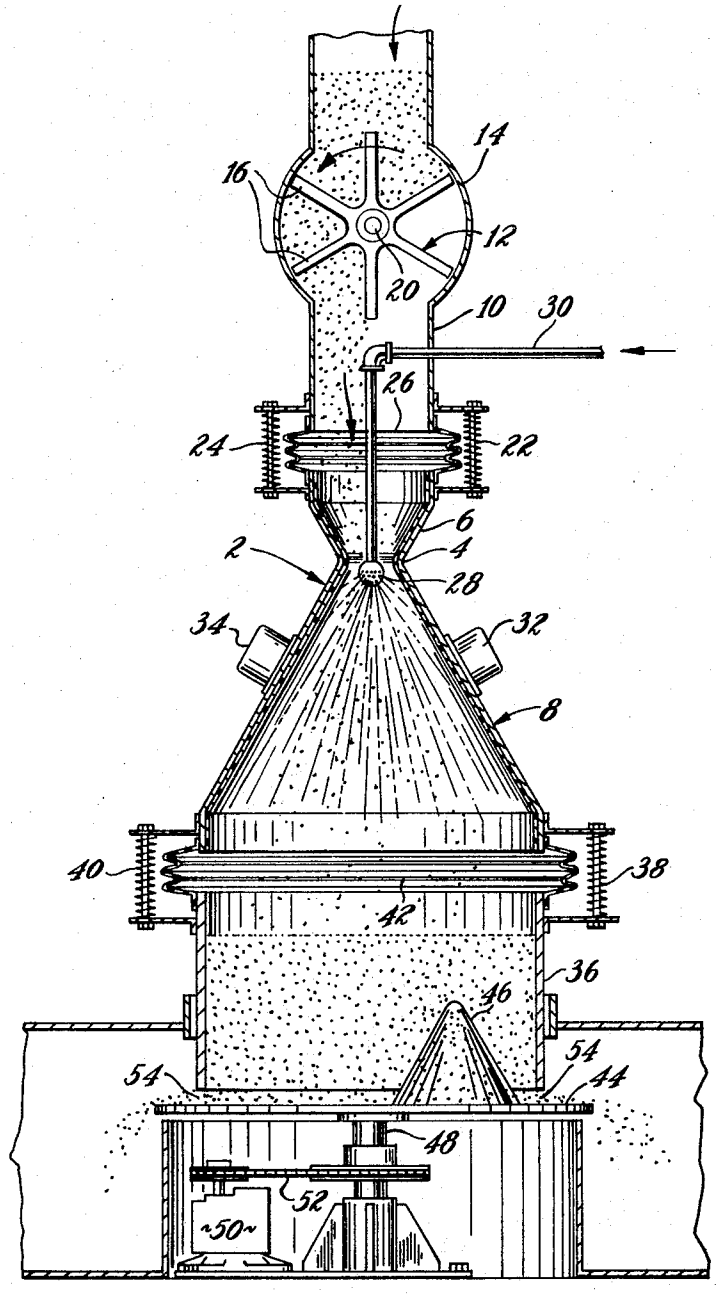
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CONDITIONER FOR PREMOISTENING DRY POWDERS

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CONDITIONER FOR PREMOISTENING DRY POWDERS

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This application is a continuation-in-part of my co-pending application Serial No. 375,180, filed June 15, 1964, now abandoned.

As indicated this invention relates to a conditioner or apparatus for premoistening dry powders.

Many forms of dried powders require premoistening in order to facilitate handling and subsequent operations such as pelletizing where additional moisture is added to effect a binding together of smaller particles to form "green" pellets. Generally, preconditioning with moisture can be accomplished to a certain extent through use of well-known types of blenders such as pug mills and ribbon blenders. However, these devices have certain disadvantages concerning maintenance and power requirements of moving mechanical parts. Also, mechanical devices generally do not enable complete dispersion of moisture with dry powder.

Pellets usually are quite uniformly spherical, and have an average particle size such that 90% of the batch has a substantially uniform particle size in the range of from about ¼ inch to about ½ inch diameter. By the term "green" in reference to pellets or aggregates, is meant the moist, unfired particles. In general, the "green" aggregates, of this invention have random particle sizes larger than the particle size of the dry powder, e.g. −100 mesh to about −200 mesh in average diameter.

This invention concerns a new conditioner or apparatus having a venturi type spray chamber for premoistening solids with a fine moisture spray in the throat of the venturi section. The advantage of this type of device is substantially uniform blending of water or liquid medium with the powders in the absence of moving parts.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the appended claims, the following description and annexed drawings setting forth in detail a certain illustrative embodiment of the invention, such disclosed means constituting, however, but one of the various forms in which the principle of this invention may be employed.

The annexed drawing shows a cross sectional view of one embodiment of a conditioner for premoistening dry powders.

Briefly stated, this invention is in a conditioner for premoistening dry powder. The conditioner is characterized by a venturi spray chamber which is vetrically disposed. The dry powders are fed into the upper open extremity of the conditioner by any suitable feeding means. Means for moistening the dry powders including a conical spray are located in the throat section of the venturi section. Also provided are means for vibrating the spray chamber to more uniformly blend the aqueous medium with the water insoluble dry powders. Also provided, are means for aggregating the moistened dry powders.

Referring more particularly to the drawing, there is shown a conditioner venturi spray chamber generally indicated at **2**. The conditioner **2** has a restricted throat section **4** which joins an upper truncated cone **6** with a lower truncated cone **8**. The surfaces of the upper and lower cones converge towards the throat section **4**. The upper cone **6** is preferably smaller than the lower cone **8**. Adjacent the upper extremity of the cone **6** and extending

therefrom is a tubular feed portion indicated at **10**. The feed portion **10** is rigidly supported in spaced relation to a rotating table feeder **44**. Located in the feed tube **10** are means for feeding the dry powders through the upper open extremity of the cone **6**. In the preferred embodiment of the invention the means for feeding is a rotating star gate feeder generally indicated at **12**. The star gate feeder **12** is located in a bulbed portion **14** of the feed tube **10**. The feeder **12** is composed of a plurality of radially extending blades; for example, blades **16** which extend from a hub which rotates on a pin **20**. The feeder **12** can be rotated at variable speeds thus permitting the material to be fed into the conditioner **2** at different rates of speed with proportional amounts of water to provide an accurately blended mass or material.

The conditioner **2** is resiliently supported from the stationary feeder tube **10** by a plurality of resilient springs coacting therebetween, for example, springs **22** and **24**, and a bellows-type seal indicated at **26**. It should be noted that a foam rubber joint could be substituted for the bellows-type seal. In the throat section of the conditioner **2**, is located a downwardly directed spray **28** through which water, from a source carried through pipes indicated at **30**, is forced. Located around the outer surface of the lower cone **8** are a plurality of vibrators; for example, vibrators **32** and **34**. Preferably the vibrators are located near the center of gravity of the conditioner **2** to produce a more even vibrating action. Adjacent the lower extremity of the cone **8**, and extending therefrom, is a circular bin collar indicated at **36**. The collar **36** is resiliently supported by or mounted to the open extremity of the lower cone **8** by a plurality of springs coacting therebetween, for example, springs **38** and **40** and a bellows type seal indicated at **42**. It should be noted that the springs **38** and **40** and the bellows seal **42** may be similar to the springs **22**, **24** and the bellows seal **26**. Also a similar foam rubber joint may be substituted for the bellows seal **42**.

Adjacent the lower annular extremity of collar **36** is a rotating table feeder **44**. The table **44** has a diameter larger than the diameter of the collar **36**. Eccentrically mounted on the table **44** is a cone **46**, which has its apex extending into the collar **36**. The rotating table **44** and cone **46** are used to aggregate the moistened powders. As the moistened powders hit the sides of the rotating cone **46** and roll down its sloped surfaces, they have a "snow balling" effect which aggregates the moistened particles into larger particles of random size. The table **44** is mounted on a centrally disposed shaft **48** which is rotated by any conventional rotating means, e.g. motor **50** and belt **52**. As the aggregated moistened powders begin to accumulate on the rotating table **44** they are forced through the annular space indicated at **54**, between the lower annular extremity of the bin **36** and the top of the table **44**. Also, a single opening can be used within the bin section **54** to enable aggregated powders to emit from a single location. The aggregated powders fall from the rotating table **44** into bins or upon conveyors and are then taken to storage areas.

In operation the dry powders are fed into the upper extremity of the tubular portion **10** down into the star feeder **12**. The rotating star feeder forces the dry powders into the conditioner or venturi section **2**. As the dry powders pass through the throat section **4** of the conditioner **2** they are moistened with water which is sprayed from the conical spray **28**. The vibrating of the conditioner **2** helps blend the dry powders with the moisture as well as keeping the moistened particles from sticking to the sides of the conditioner **2**. The moistened powders then fall upon the rotating table **44** and cone **46**, which have a particle size increasing effect upon the moistened

powders. The aggregated powders are then forced through the annular space indicated at **54** onto either conveyors or into bins where they are stored.

The vibrators, for example, vibrators **32** and **34** located on the lower cone **8**, cause the conditioner **2** to vibrate in relation to the fixed tubular feeder portion **10**. The springs and bellows joint connecting the lower cone **8** with the collar bin **36**, permit the collar bin **36** to vibrate relative to the cone **8**. The vibrating motion as indicated keeps the particles from sticking to the inner surfaces of the cone and bin as well as permitting a complete homogenization of moisture with the powders. The inner conical surfaces of the venturi section are preferably waxed so that material build up will not occur. In place of waxing, the inner surfaces of the conical sections may be lined with a non-adhesive liner, e.g. a sheeting coated with a non-adhesive resinous material such as polytetrafluoroethylene.

In the cases of pelletizing processes where precision blending of moisture with dry powders is a requisite, the feed rates of dried pellets are controlled. In cases of building a single model with a wide range of capacities, it may be advisable to have a whole series of conical sprays within the venturi throat section to permit selection of specific sprays to be utilized for specific feed rates of solids from the star gate feeder.

Thus there has been provided a new and novel conditioner, having a venturi spray chamber for premoistening relatively small particle size solids with a fine moisture spray in the throat of the venturi section. The vibrating conditioner substantially eliminates build up of the moisturized particles in the tube as well as permitting a complete homogenization of moisture with the powders in the absence of moving parts.

Other modes of applying the principle of this invention may be employed instead of those specifically set forth above, changes being made as regards the details herein disclosed, provided the elements set forth in any of the following claims, or the equivalent of such be employed.

It is, therefore, particularly pointed out and distinctly claimed as the invention:

1. A conditioner for premoistening dry powder comprising:

(a) a vertically disposed venturi section having open extremities, in which dry powder is conditioned;

(b) means for feeding dry powder through the upper open extremity of the section;

(c) means for moistening the dry powder at the throat section of the venturi section;

(d) means for vibrating the venturi section; and

(e) means for aggregating the moistened dry powder adjacent the lower extremity of the venturi section,

said aggregating means including a circular bin resiliently supported by the venturi section whereby the circular bin is movable relative to the venturi section.

2. The conditioner of claim **1**, including adjacent the lower extremity of said circular bin and in spaced relation thereto, a rotating table having a diameter larger than the diameter of the circular bin, and having eccentrically mounted thereon, a cone whose apex extends into the bin, said rotating table and cone designed to aggregate the moistened particles as it rotates.

3. The conditioner of claim **2**, wherein the means for feeding the dry powders to the venturi section includes a fixed tubular portion, containing a feeder, said portion resiliently secured to the upper open extremity of the venturi section to support the venturi section and permit vibration of the venturi section relative to the tubular portion.

4. The conditioner of claim **3**, wherein the means for moistening the dry powders includes a downwardly directed spray located in the throat section of the venturi section.

5. The conditioner of claim **4**, wherein the means for vibrating the venturi section includes a plurality of vibrators secured to the venturi section intermediate the throat and lower extremity of the venturi section.

6. The conditioner of claim **5**, wherein the inner surface of the lower truncated tubular portion of the venturi section is waxed to prevent material build up on such surface.

7. The conditioner of claim **5**, wherein the inner surface of the lower truncated tubular portion of the venturi section is lined with polytetrafluoroethylene.

8. The conditioner of claim **7**, including a bellows type joint for resiliently securing the venturi section to the parts adjacent its upper and lower extremities.

9. The conditioner of claim **8**, including a plurality of sprays located in the throat section for moistening the powders.

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