

- [54] **PELLETIZING DISC ASSEMBLY AND CONTROL SYSTEM**
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[58] Field of Search **425/222, 332, 135, 225; 264/109, 117, 309, 310; 71/64 DA, 64 DB**

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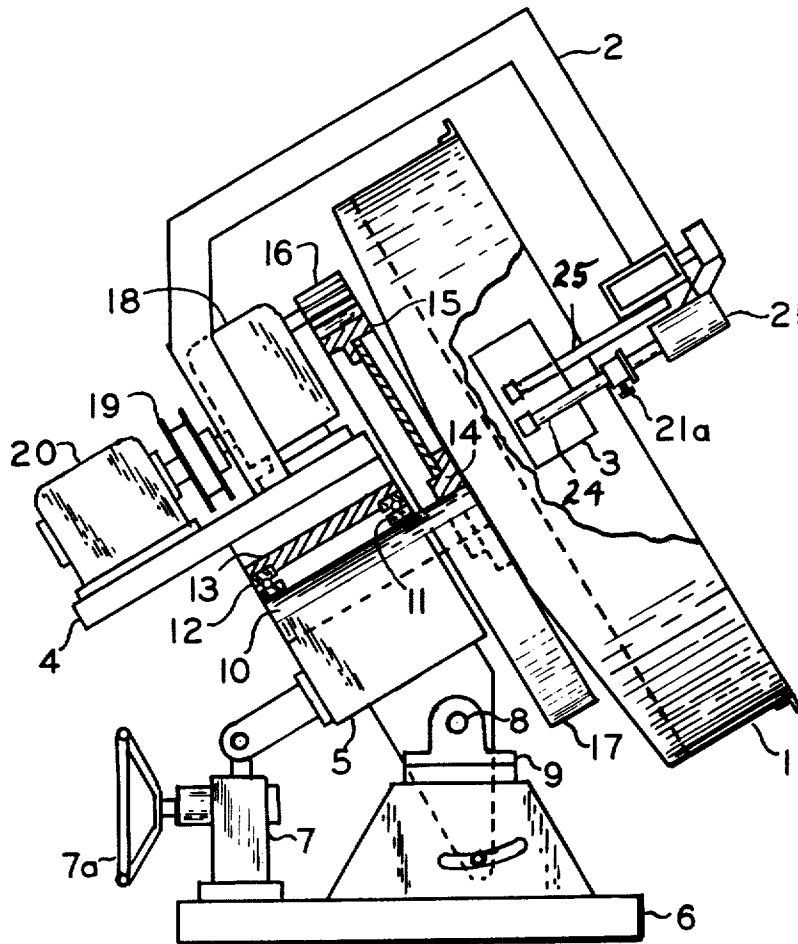
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[57] **ABSTRACT**

A pelletizing disc assembly or the like, including automatically controlled valve means for varying the amount of water sprayed into the pelletizing disc. A Wheatstone bridge is provided in which the variable resistance leg comprises a pair of probes spaced in parallel relationship in the moist mixture in the disc. The probes are driven about their axes at slow speed to keep them clean without excessive wear. The variations in resistance in the gap between probes, caused by variations of moisture content, will control a solenoid valve and vary the amount of water sprayed into the disc.

3 Claims, 3 Drawing Figures



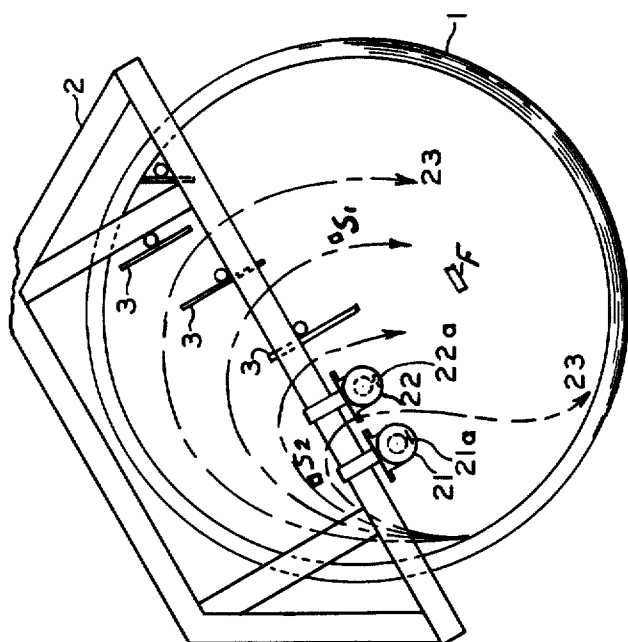


FIG. 2

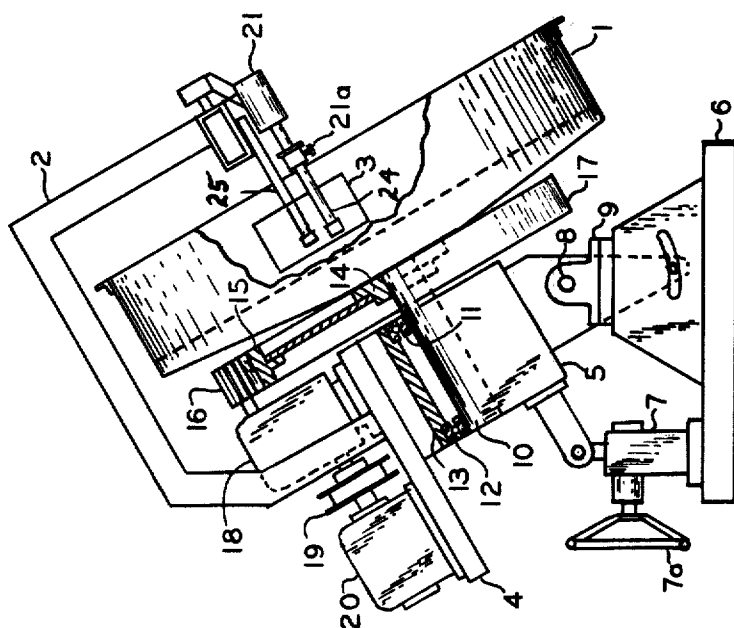


FIG. 1

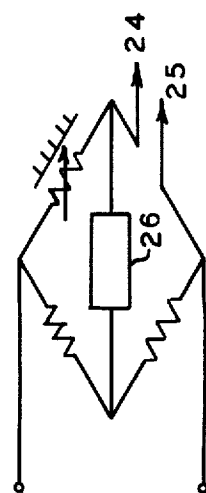


FIG. 3

PELLETIZING DISC ASSEMBLY AND CONTROL SYSTEM

This invention relates to a pelletizing disc assembly and, more particularly, to a moisture control system therefor.

An outstanding disadvantage of presently used pelletizing apparatus and systems is that variations occur in the agglomeration-moisture level on a pelletizing disc which cause objectionable variations in pellet size, density, strength and production rate. Variations over a broad range eventually even cause the cessation of pellet formation and total destruction of the agglomeration process. Attempts to intermittently vary the amount of spray water used by manual control have been very unsatisfactory and ineffective, therefore low density and strength have resulted as well as non-uniform size.

An object of the present invention is to provide a novel pelletizing disc assembly involving the necessary automatic controls to overcome the abovenamed disadvantages of presently used pelletizing apparatus and controls.

Another object of this invention is to overcome the abovenamed disadvantages of known apparatus and systems by not only effecting various mechanical controls of the pelletizing mechanical system but to provide a novel automatic monitoring and control of the spray water and agglomeration-moisture level of the pelletizing process or similar agglomerating process for the automation of such process to provide uniformly sized pellets having high density and strength.

Other objects and advantages will become more apparent from a study of the following description taken with the accompany drawing wherein:

FIG. 1 is a side, elevational view of the pelletizing disc assembly having various controls embodying the present invention;

FIG. 2 is a side view as viewed from the right and angularly downwardly of FIG. 1; and,

FIG. 3 shows a bridge circuit for measuring the agglomeration-moisture level between two probes 24, 25.

Referring more particularly to FIGS. 1 and 2 of the drawing, which show a pelletizing disc assembly, numeral 1 denotes a disc or pan of substantially cylindrical shape which is mounted for rotary movement about its axis and numeral 2 denotes a scraper support from which mounts scrapers 3, 3, 3. A drive base weldment 4 is supported on a main frame weldment or base 5 which, in turn, is pivotally supported on a base stand 6. Selective tilting of the entire assembly, including main frame weldment 5, pan 1 and its drive system is accomplished by jacking screw assembly 7 located centrally of the assembly in substantial alignment with the central most scraper 3. The main frame weldment 5 has, on each side thereof, a pivot pin 8 mounted in a bearing 9 to permit tilting movement of the main frame weldment 5 and assembly mounted thereon.

Shaft 10, mounted in frame weldment 5, is rotatably mounted on bearings 11 and 12 enclosed in bearing housing 13 and connected to the mounting hub assembly 14 which rigidly supports a driven ring gear 15. Pinion gear 16, covered by gear guard 17, is driven by a speed reducer 18 of a variable speed drive pulley 19 which, in turn, is driven by motor 20.

In operation, the pelletizing pan, while normally held at an angle of 45° that is, between its axis and base 6,

may be tilted in a range of between about 40° to 60°. Such selective tilting is accomplished by jacking screw assembly 7 by rotation of its handle 7a in either direction so as to tilt the assembly about the axis of pivot pins 8.

As will appear more clearly in FIG. 2, a pair of gear motors 21 and 22 are shown mounted on brackets which, in turn, are mounted on the scraper support frame 2. Gear motors 21 and 22 drive probes 24 and 25, respectively, about their axes. Terminals 21a and 22a are provided to apply a source of electric power. The probes may be of brass or stainless steel and each has an end which is adjustable in spacing relative to the bottom of the pan or disc 1. Such probes may be of the order of ¼ inch in diameter, about 10 inches long with ends spaced about ¾ inches above the cake on the disc of about ¾ feet radius driven between 6 and 15 rpm which will give a pellet depth of about 1 ½ inches on one probe and about 1 inch on the other. Pellet sizes of about ¼ inch by ¾ inch are formed. The spacing between the probes may be of the order of 5 inches. In a test involving a disc speed of 30 rpm at a disc angle of about 47°, a moisture content of about 10 percent was found suitable, whereas one of 14 percent made the material too moist, therefore it started to get muddy.

Of course, other dimensions and sizes may be used, instead, to obtain pellets of different sizes and moisture content.

In accordance with the present invention, continuous automatic monitoring and control of the agglomeration-moisture level of an agglomerating process, such as the pelletizing process, is provided. The control system of the present invention is based upon the relationship between D.C. resistance and moisture content of the material, taking into account the motion and physical consistency (state of agglomeration) of the material at that point in the process as the physical basis of measurement. Specific resistance when plotted against moisture content results in an approximately straight line relationship up to the moisture saturation point. Agglomeration-moisture level is always below the saturation level and generally follows within a small span such that the approximately straight line relationship taken in said span can be said to be a definite straight line or linear relationship.

FIG. 3 shows a Wheatstone bridge including a detector amplifier 26 to obtain high sensitivity provided by electronic amplifiers. An increase in moisture content results in a decrease in resistance value of the material being pelletized. Probes 24 and 25 bridge the moist material being pelletized, which material constitutes a variable resistance which can be balanced out by the variable resistance shown in the upper right hand leg of the bridge.

Spray locations S1 and S2 and feed input F at the center of the radius are shown in FIG. 2. Also shown therein are three short arrows 23 indicating the first, second and third streams,— the last being of fines and seeds. The longest arrow 23 to the left and lower portion of Fig. 2 shows the boundary of finished pellets encircled by the arrow.

Disc settings and operating conditions will vary from one material and application to the next. In most cases, pellet size and, to some extent, quality are controlled by four main variables namely, (1) angle or slope of the pan, (2) speed of rotation of the pan, (3) location and

rate of feed, and (4) location and rate of moisture addition.

The feed should be spread out at least 6 to 8 inches so as to enter the pan in a wide band rather than a thin narrow stream. This will make the fines available to the spray and seed pellets.

A unique feature of the moisture control system of the present invention is the use of 30 to 60 p.s.i.g. water at the sprays. This relatively high pressure provides good moisture control and allows the spray nozzles to break the moisture into tiny droplets for better distribution.

Another very unique feature of the moisture control system is the rotation of the probes at a very low speed of about 6 rpm. This speed is fast enough to keep the wetted material from building up on the probes, but slow enough not to have high wear. The location of the probes can be adjusted and the distance between the probes can be varied to provide the best resistance measurement and, thereby, moisture control. The location normally varies and must be determined for each material.

Although the moisture control system has been described in relation to a pelletizing disc assembly, it is also suitable for other applications, such as the control of moisture added to a pugmill by placing the probes near the discharge.

Thus it will be seen that I have provided a highly efficient pelletizing assembly and a moisture control system therefor which automatically provides the proper amount of moisture by a sensing means comprising ro-

tating probes spaced apart so that a very slight change in the resistance between the probes is an indication of a change in moisture content. This provides a small correction to the amount of spray water added to the pellets, whereby moisture is kept very close to the optimum, giving pellets the greatest density and maximum strength as well as uniform size.

While I have illustrated and described a single specific modification of my invention, it will be understood that this is by way of illustration only and that various changes may be contemplated in my invention and within the scope of the following claims.

I claim:

1. In apparatus for spraying water on granular material and for compressing the mixture into shapes, means for automatically controlling the amount of water sprayed onto the mixture controlled by a Wheatstone bridge in which the variable resistance leg comprises a pair of probes of substantially cylindrical shape extending in spaced parallel relationship into said mixture, and means for driving said probes about their axes to enable cleaning of the probes without excessive wear.

2. In apparatus as recited in claim 1 wherein the speed of rotation of said probes is between about 6 rpm and 15 rpm.

3. In apparatus recited in claim 1 wherein said apparatus comprises a pelletizing disc assembly including a substantially cylindrical container for said mixture and means for adjusting the angle of said container relative to ground level.

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