

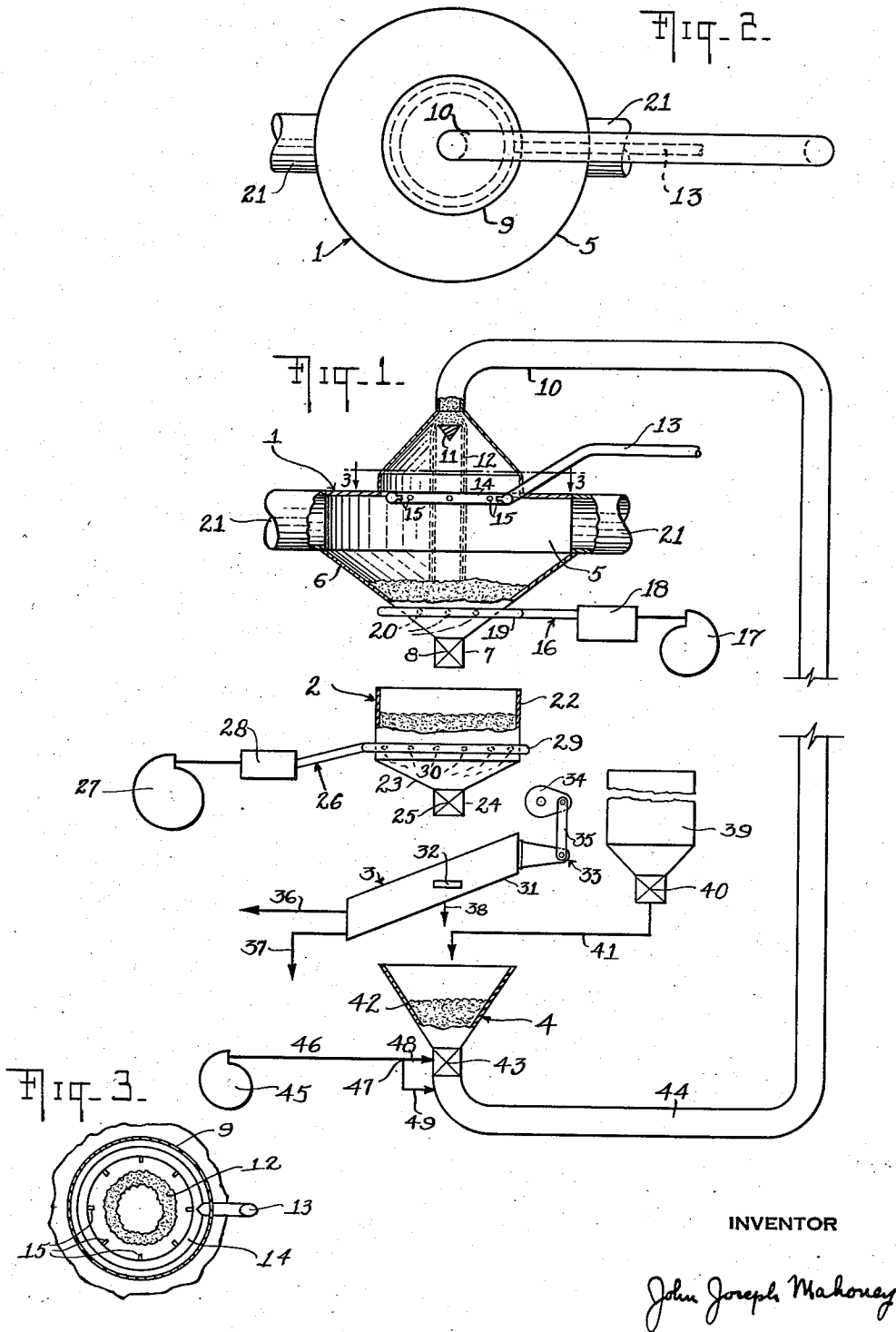
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METHOD OF SPRAYING FREELY FALLING PARTICLES.

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METHOD OF SPRAYING FREELY
FALLING PARTICLESJohn Joseph Mahoney, New York, N. Y., assignor
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2 Claims. (Cl. 117—100)

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The present invention relates to a process of applying a coating to solid particles.

There are numerous industrial processes in which solid particles require or are improved by a surface coating. An outstanding example is in the detergent art. Spray dried soaps, for example, may be improved in a number of ways by the application of a surface coating. It has already been disclosed that soap particles may tend to dry out and become brittle so that during normal transportation and handling undesirable dust is formed. It has been proposed to coat soap particles with materials which improve their strength either mechanically or by retaining the moisture which prevents the development of brittleness. It has also been disclosed that the tendency of sprayed dried soaps to form lumps when poured into heated water can be overcome or substantially minimized by the application of a surface coating of such materials as synthetic detergents, wetting agents, glycerol and other polyhydroxy alcohols, mineral oil, fatty alcohols, sodium silicate, etc. It has also been disclosed that synthetic detergents are improved by the application of a surface coating to overcome or minimize tackiness, or to prevent the formation of undesirable fines during handling, transportation, etc.

The present invention provides a process for applying a surface coating to solid particles. The process may be carried out in the apparatus shown in the drawing and described hereinafter which is particularly adaptable to the present processes, but by no means is the practice of the invention limited thereto. The nature of the present invention will be apparent from the following detailed description taken in conjunction with the drawing in which:

Fig. 1 is a schematic and fragmentary elevational view of the apparatus with parts shown in section:

Fig. 2 is a plan view of the spray chamber; and

Fig. 3 is a section along the line 3—3 of Fig. 1 looking in the direction of the arrows.

Referring now more particularly to Fig. 1, the apparatus comprises a spray chamber 1, a holding chamber 2, a classifier 3, and a recycle system 4.

The spray chamber comprises a cylindrical wall 5, and a conical bottom 6, having a product outlet 7, in which is provided a star valve 8, capable of controlling the rate of discharge of product from the spray chamber. Above the cylindrical wall is an inlet hood 9, communicating with an inlet duct 10, through which the solid particles are fed into the spray chamber. In the mouth of the inlet duct is mounted a baffle 11,

e. g., by brackets (not shown). This baffle, with the walls of the hood 9, forms a narrow passageway for the solid particles entering the chamber from the inlet duct 10. This passageway is preferably of annular shape, but it may take other shapes, for example, it may form a straight slot. The solid particles in passing through the narrow passageway are arranged into a thin curtain 12 and they fall freely from the inlet throat into the conical hopper 6.

The liquid which is to be sprayed upon the particles is supplied under pressure from any suitable supply (not shown) thru a pipe 13, which communicates with a manifold 14 having a plurality of spray nozzles 15 so arranged as to direct the liquid spray onto the falling curtain of solid particles. In the preferred embodiment, the manifold is in the form of a ring as shown in Fig. 3.

It will be seen from Figs. 1 and 2 that the spray chamber has a vertical axis and that the spray nozzles 15 are located at a greater distance from the vertical axis than the passageway formed by the baffle 11. In this way the solid particles in the curtain 12 are exposed over a substantial portion of the path of fall to the liquid spray from the nozzles 15. The particles are subjected to some turbulence which causes them to rotate so that the liquid coating material is applied over all, or at least a very large percentage, of the surface of the particles.

In many cases the liquid sprayed through pipe 13 will be in the form of an aqueous solution of the coating material which is to be applied to the surface of the solid particles. In other cases the coating material may be in solution in an organic solvent. The invention also contemplates merely increasing the moisture content of over-dry particles by water or steam spray, and controlling the final moisture content by a conditioning gas whether water alone or as a vehicle for a coating agent is used. For this purpose a system 16 is provided which comprises a compressor 17 whose inlet is exposed to the atmosphere, where air is used, or to a supply of gas where it is desirable to employ a gas other than air. The outlet from the compressor is connected with a conditioner 18 and a manifold 19 provided with the plurality of nozzles 20 for introducing the air or gas into the spray chamber. In the preferred form of the apparatus these nozzles communicate with the spray chamber adjacent to the bottom thereof, as shown in Fig. 1. This arrangement has the advantage of providing a maximum time of contact of the conditioned air or gas with the

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coated particles. A satisfactory method of operation is to control the output of the product from the spray chamber by star valve 8, in such a way that a bed of the coated particles builds up in the spray chamber to a considerable depth above the nozzles 20. The gas flowing through the nozzles keeps this bed in a fluid state for a sufficient time to evaporate excess moisture or solvent from the particles. The conditioned gas is exhausted from the spray chamber through one or more gas outlet ducts 21.

Ordinarily the conditioner 18 will be a heater for raising the temperature of the air or gas so as to facilitate the drying operation. Any suitable heat exchanger may be used for this purpose. The invention contemplates the use of other air or gas conditioning equipment such as dehydrating equipment, etc.

The holding chamber 2, into which the solid particles pass from star valve 8 comprises a cylindrical wall 22 and a conical bottom 23 leading to a product outlet 24 in which a star valve 25 is mounted. The holding chamber 2 is also provided with a gas supply 26 comprising a compressor 27, a conditioner 28, a manifold 29, and a plurality of nozzles 30 for introducing conditioned air or gas into the holding chamber 2 adjacent to the bottom thereof. The conditioner 28, may be a heater or a cooler and may optionally include means for dehydrating, if desired.

The classifier 3, is arranged below product outlet 24 and it comprises a frame 31 within which may be mounted a coarse screen and a fine screen (not shown). The frame is mounted in trunnions 32 and is connected to an oscillating mechanism 33, which may comprise a rotating eccentric 34 and a link 35 connecting the eccentric with the frame 31. The coarse screen is adapted to remove oversized particles through an outlet 36. The oversized particles may then be ground to smaller size and re-introduced into the system or be packaged, etc., as desired. The fine screen separates the product of desired size from the fines and feeds the former to the product outlet 37 and the latter to the fines outlet 38. The product outlet 37 is associated with packaging mechanism (not shown) which forms no part of the present invention.

A storage container 39, is provided for the solid particles which are to be treated. The flow of solid particles from this tank is controlled by a star valve 40 in the outlet thereof and a conduit 41 carries the material from the storage tank to the recycle system.

The fines from the classifier 3 which are discharged through the outlet 38 and the material from the storage container 39 which is introduced into the system through conduit 41 go into a hopper 42 having a star valve 43 in the outlet thereof which controls the rate of discharge of material from the hopper into a duct 44 which connects with the inlet duct 10. The materials entering the duct 44 are preferably conveyed or transported through the recycle system by a current of air. This air under pressure is provided by a compressor 45 which discharges through line 46, 47 and lines 48 and 49. Line 48 is connected with the star valve 43 to keep the same clear by a blast into each pocket as it arrives in discharging position, while line 49 goes directly into duct 44. The quantity of air is preferably so arranged that the particles are fluidized in the conduit 44 and flow gently through the recycle system into the spray chamber 1.

The following example is given to illustrate the

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application of the invention to the treatment of spray dried soap, but it is to be understood that the invention is not limited to this application and that other materials may be treated in a similar manner.

Example

Sprayed dried soap from the production line of a tower is introduced into storage tank 39 and fed from there into the recycle system at the rate of about 500 pounds per hour. The system contains approximately 5,000 pounds of spray dried soap. A slurry of sodium silicate is pumped through pipe 13 at the rate of about 678 pounds per hour. The temperature of the particles introduced into the spray chamber is approximately 90° F. The gas supply system 16 introduces about 2,620 cubic feet of air per minute at a temperature of about 130° F. This air after contact with the coated particles is discharged through the exhaust ducts 21 carrying with it the water vapor which is evaporated from the coated particles. This air is preferably passed through a cyclone separator (not shown) to remove the solid particles which are entrained in the gas stream and these may be returned to the system, for example, to the hopper 39. The product leaving the spray chamber through star valve 8 is at a temperature of about 100° F.

It is preferred to cool the product somewhat in order to prevent caking in the package. This is done in the holding chamber 2 into which cooled air is introduced from the conditioning system 26. The product leaving holding chamber 2 through star valve 25 is at about 90° F. The classifier separates the soap particles into an oversized fraction, e. g. larger than 20 mesh, which is a very minor part of the product, a fraction having the desired size within the range of about 20 to 150 mesh, and a fines fraction which passes through a 150 mesh screen. The product of desired size is discharged from the classifier through line 37 to an automatic packaging machine. The oversized particles discharged through line 36 are ground to small size and re-introduced into the system at hopper 42. The fines discharged through outlet 38 go into hopper 42 and are recycled for building up a coating of material thereon until they reach the desired product size. The finished product does not cake in the packages, it is readily soluble in hot or cool water without formation of undesirable lumps, there are substantially no fines in the product as made and there is practically no dust formation during normal transportation handling, etc.

Having thus described the invention what is claimed is:

1. The process which comprises dropping pre-formed solid particles of organic detergent in a thin curtain which is annular in horizontal section, spraying said particles while freely falling with a liquid coating fluid, the spray being directed toward said curtain from a plurality of points surrounding the curtain, accumulating a mass of said sprayed particles, fluidizing said mass with air heated to a temperature of about 130° F. to remove excess moisture whereby the particles are heated to a temperature at which caking would result if the particles were packaged at that temperature, withdrawing particles from said mass at a temperature of about 100° F. and accumulating said withdrawn particles into a second mass, fluidizing said second mass with cooling air to cool the particles to a temperature of about 90° F. at which caking does not occur when the

particles are packaged, and withdrawing cooled particles from said second mass.

2. The process as set forth in claim 1 in which said liquid coating fluid contains sodium silicate which forms a surface coating on said preformed particles.

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