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[54] METHOD AND APPARATUS FOR PRODUCING MULTICOLORED SPRAY DRIED DETERGENT PARTICLES

8 Claims, 1 Drawing Fig.

[52] U.S. Cl. 159/4, 239/70, 239/305, 252/89, 252/109, 252/134, 252/137, 252/174
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[50] Field of Search ..... 252/89, 108, 109, 110, 371, 134, 137, 174; 159/4, 4 B, DIG. 14, 44, 48; 239/70, 305, 306

[56] References Cited

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3,357,476	12/1967	Tofflemire	159/4
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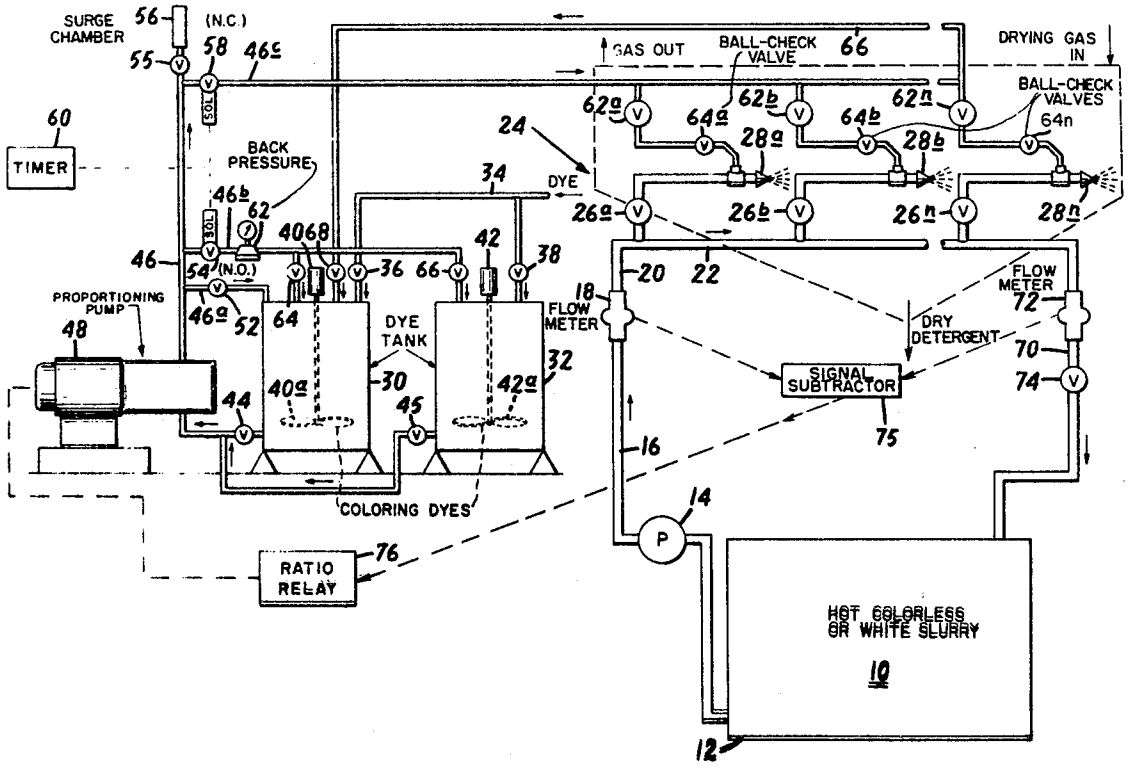
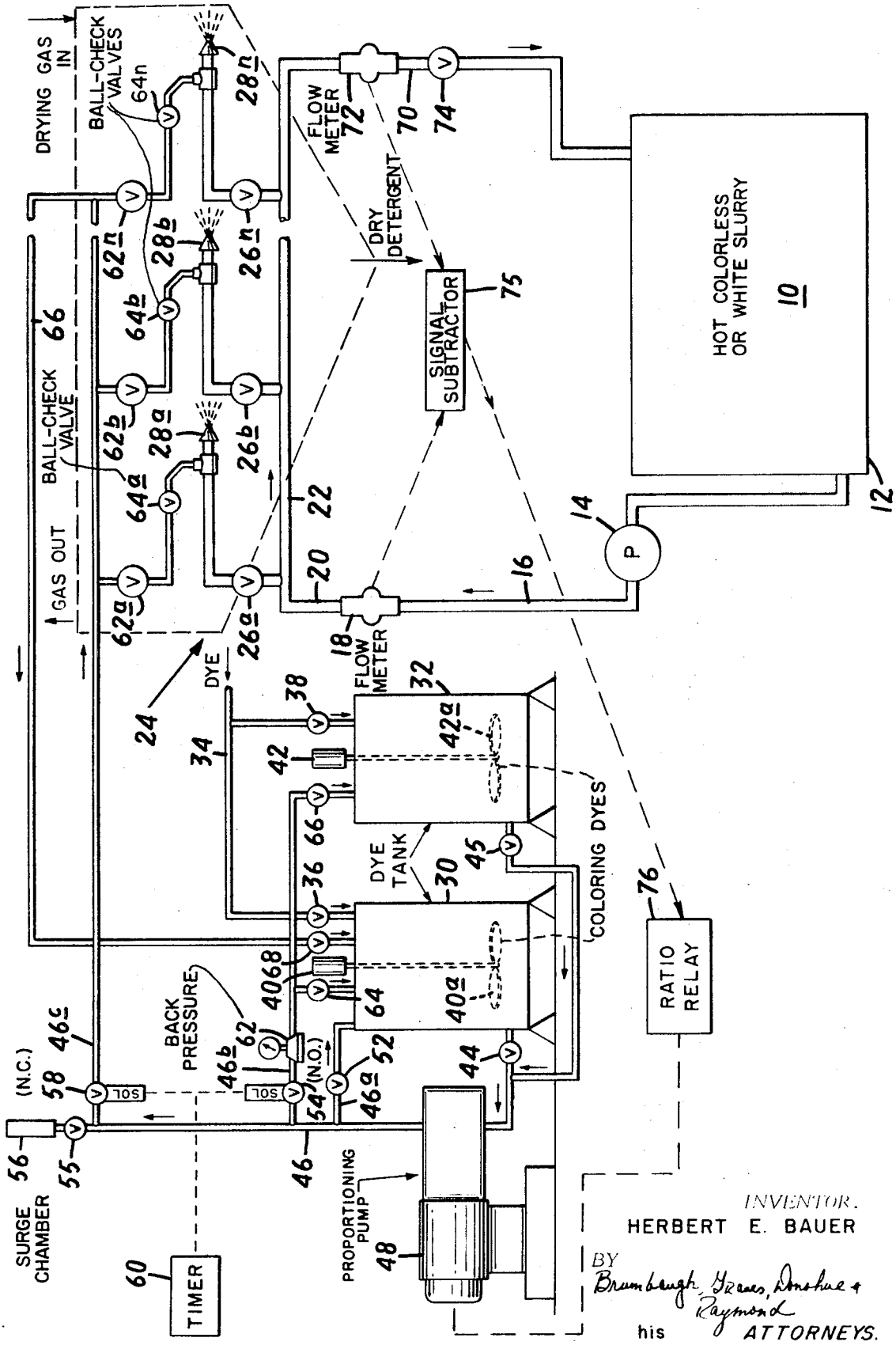
ABSTRACT: As described herein, hot colorless liquid detergent is continuously supplied under pressure to a plurality of spaced nozzles extending into a spray drying tower. A coloring solution is also supplied under pressure for controlled periods of time to the nozzles wherein the liquid detergent and the coloring solution are thoroughly mixed to form a uniformly colored liquid detergent. The nozzles spray either the colorless liquid detergent or the colored liquid detergent into the interior of the tower wherein the sprayed detergent is dried into either discrete colorless detergent particles or discrete uniformly colored detergent particles.





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METHOD AND APPARATUS FOR PRODUCING MULTICOLORED SPRAY DRIED DETERGENT PARTICLES

BACKGROUND OF THE INVENTION

This invention relates to methods and apparatus for producing multicolored, spray-dried detergent particles.

Generally, in producing colorless or white spray-dried detergent particles, a hot colorless liquid detergent is supplied under pressure to a plurality of spaced nozzles mounted on the wall of a spray drying tower. The nozzles spray the detergent into the tower in droplet form and the droplets are dried into discrete particles by a drying gas generated in the tower.

Recently, there have been marketed multicolored or speckled detergents which combine differently colored detergent particles, such as, for example, blue and white detergent particles. Exemplary of the presently devised systems for spray drying such speckled detergents are the systems described in U.S. Pat. No. 3,357,476. In one embodiment, one spray nozzle located in the wall of a spray drying tower intermittently receives a colored liquid detergent for injection into the tower. The remaining nozzles continuously inject a colorless detergent into the tower. A disadvantage with this system is that a separate mixer is required to mix the colorless liquid detergent and the coloring solution and that the appearance of the final product is controlled by the number of colorless nozzles being sprayed. In order to achieve a relatively consistent appearance, the number of colorless nozzles in use or amount of colorless liquid being sprayed must be kept constant. This substantially limits the operation and throughput rate of the spray tower. It will further be appreciated that in a commercial installation comprising a multiplicity of nozzles, the cited system will be effective only in producing a product wherein the colored particles are in the minority. In a second embodiment, a coloring solution is intermittently gravity fed to a spray nozzle and mixed with colorless liquid detergent therein for injection into a spray tower. A disadvantage with this system is that the colorless liquid detergent, which is fed to the nozzle under pressure, tends to sweep past the gravity fed coloring solution such that a nonuniform and fringe coloring of the liquid detergent results.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a method and apparatus for producing multicolored spray-dried detergent particles which overcome the disadvantages of the prior art.

This and other objects are accomplished in accordance with the present invention by continuously supplying under pressure a hot liquid detergent to a plurality of spaced nozzles extending into a spray drying tower. A coloring solution is also supplied under pressure for controlled periods of time to the nozzles and thoroughly mixed therein with the hot liquid detergent to uniformly color the liquid detergent. The nozzles spray the liquid detergent into the interior of the drying tower wherein the spray is subjected to a drying gas and dries into discrete uncolored detergent particles or into discrete colored detergent particles. In a preferred embodiment of the invention, the coloring solution is continuously circulated under pressure in a fixed flow path when not supplied to the nozzles.

BRIEF DESCRIPTION OF THE DRAWING

In the Drawing:

The FIGURE is a schematic block diagram of an illustrative system for producing multicolored spray-dried detergent particles arranged according to the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the representative system for producing multicolored spray-dried detergent particles arranged according to the invention, as shown in FIG. 1, hot colorless liquid detergent **10** is stored in a tank or receptacle **12**. The hot liquid detergent **10** is extracted from the receptacle **12** by a high pressure pump **14** which supplies the detergent **10** under high pressure through a conduit **16** to a flow meter **18**. The flow meter **18**, which may be of conventional construction, measures the quantity of liquid detergent passing through the conduit **16** and provides a visual indication of the quantity in units of rate, such as, for example, gallons per minute. From the flow meter **18**, the detergent is fed through a conduit **20** to a ringlike conduit **22** mounted in the wall of a spray drying tower **24**. The detergent is then simultaneously supplied to a plurality of valves **26***a*, **26***b*–**26***n* situated in parallel with the conduit **22** and in series with a plurality of spray nozzles **28***a*, **28***b*–**28***n*, respectively. The nozzles **28***a*, **28***b*–**28***n* are mounted in the wall of the tower **24** and include apertured heads which extend into the interior of the spray drying tower **24**.

As is understood in the art, the pressure pump **14** supplies the hot liquid detergent to the conduit **22** at sufficiently high pressures to ensure that the nozzles **28***a*, **28***b*–**28***n* operate to spray the liquid detergent into the spray drying tower **24** in droplet form. Moreover, in the spray drying tower **24**, which may be of conventional construction, the sprayed liquid detergent is subjected to a drying gas which dries the spray into discrete detergent particles, as is understood in the art.

Also provided are a pair of storage tanks **30** and **32** which contain the appropriate coloring solution or dye. As abovementioned, the hot liquid detergent contained in the receptacle **12** is preferably colorless. When the liquid detergent is colorless or white, an appropriate coloring solution, such as, for example, a green dye, is supplied to the tanks **30** and **32**. The colorant is supplied simultaneously to the tanks **30** and **32** from a source (not shown) through a conduit **34** and a pair of valves **36** and **38** disposed between the conduit **34** and the tanks. The colorant is kept in a state of turbulence in both tanks by a pair of agitators **40** and **42** which include propellors **40***a* and **42***a*, disposed adjacent the bottom walls of the tanks **30** and **32**, respectively.

The colorant is drawn out from the tanks **30** and **32** through a pair of valves **44** and **45** and supplied under pressure to a conduit **46** by a proportioning pump **48**. The pump **48**, which may be of the type manufactured by the Milton Roy Company, has an adjustable stroke length or stroking speed such that the quantity of colorant withdrawn from the tanks **30** and **32** can be controlled and, as will be apparent hereinbelow, the colorant concentration in the hot liquid detergent can thereby be controlled.

The colorant forced through the conduit **46** by the proportioning pump **48** is coupled simultaneously to a relief valve **52** located in a branch conduit **46***a* of the conduit **46**, to a normally open solenoid actuated valve **54** located in a branch conduit **46***b*, to a valve **55** in series with a surge chamber **56** and to a normally closed solenoid actuated valve **58** included in a branch conduit **46***c* of the conduit **46**. In response to an excessive buildup of pressure in the line **46**, the relief valve **52** opens to create a flow path between the conduit **46** and the storage tank **30** and thereby relieve the pressure in the conduit.

The operation of the two solenoids associated with the valves **54** and **58** is controlled by a timer **60** which periodically supplies energization current to the solenoids to implement either the opening of the valve **54** and the closing of the valve **58** or the opening of the valve **58** and the closing of the valve **54**. As will be more apparent hereinafter, the timer **60** controls the proportionate amount of colored detergent particles spray dried in the spray drying tower **24**. When it is desired to produce a detergent having a greater percentage of colored particles, the timer **60** is set to implement the opening of the valve **58** for a relatively long period of time with valve **54** closed. Conversely, when it is desired to have a preponderance of uncolored particles, the timer **60** is set to maintain the valve **54** open and valve **58** closed for relatively long periods of time.

Also included in the branch conduit **46***b* is a back pressure valve **62** connected in series between the solenoid actuated valve **54** and a pair of valves **64** and **66**, respectively, leading to the storage tanks **30** and **32**. When the valve **54** opens, the coloring solution is drawn through the conduit **46** and fed under pressure through the valve **54**, the back pressure valve **62** and the valves **64** and **66** to the tanks **30** and **32**, respectively, such that the colorant is maintained in circulation. It may be noted that the back pressure valve **62** is provided to make certain that a sufficient amount of pressure buildup occurs in the conduit **46** such that the colorant is always present under pressure at the input of the solenoid actuated valve **58** and will quickly pass through the valve **58** when the valve is opened to provide for quick injection of the colorant. An optional surge chamber **56** may be provided for more uniform flow of colorant.

When the valve **58** opens, a flow path is created between the conduit **46** and the branch conduit **46***c* and the coloring solution is fed under pressure to a plurality of valves **62***a*, **62***b*–**62***n* situated in series between the branch conduit **46***c* and the plurality of spray nozzles **28***a*, **28***b*–**28***n* mounted within the wall of the spray drying tower **24**. A plurality of ball-check valves **64***a*, **64***b*–**64***n* are placed in series with and between, valves **62***a*, **62***b*–**62***n* and nozzles **28***a*, **28***b*–**28***n*. The ball-check valves **64***a*, **64***b*–**64***n* provide a flow path only for the colorant to the heads of the nozzles. Accordingly, when only the hot liquid detergent is supplied through the valves **26***a*, **26***b*–**26***n* to the nozzles or when the detergent is fed to the nozzles under a pressure which exceeds the pressure at which the colorant is supplied, there will not be an undesired flow of the unsprayed colorless or white liquid detergent through the valves **62***a*, **62***b*–**62***n* to the branch conduit **46***c* because of the presence of the ball-check valves **64***a*, **64***b*–**64***n*. When the colorant and the liquid detergent meet within the nozzles **28***a*, **28***b*–**28***n*, the colorant and the liquid detergent mix together with the result that the detergent is uniformly colored by the colorant. The detergent then sprayed into the tower **24** is dried in the tower and colored detergent particles of equal color concentration are produced.

It will be noted that the nozzles **28***a*–**28***n* spray either colored liquid detergent or uncolored liquid detergent into the spray drying tower **24**. Accordingly, there will be developed in the tower **24** a stratified detergent consisting of alternate layers of colored detergent particles and uncolored detergent particles. However, normal swirl patterns within the tower will produce a uniformly speckled or multicolored detergent as discharged from the tower, provided the dye injection cycle time does not exceed the tower residence time of the spray-dried particles. Provisions for subsequent blending of the detergent particles in a conventional blender is desirable to assure uniformity of appearance and to provide additional flexibility in the selection of an injection time cycle.

Coupled to the branch conduit **46***c* is a return conduit **66** which provides a flow passage for the coloring solution back to the storage tank **30**, through a valve **68**, during startup periods when valves **62***a*–**62***n* are closed. The ringlike conduit **22** mounted on the tower **24** is also connected to a return conduit **70** which feeds the overflow hot liquid detergent not supplied to the nozzles **28***a*, **28***b*–**28***n* back to the storage tank **12** through a flow meter **72** and a valve **74**. Operatively coupled to the flow meter **18** disposed in the liquid detergent supply conduit **16** and the flow meter **72** disposed in the liquid detergent return conduit **70** is a signal subtractor **75**. The subtractor signal output which is proportional to the flow of liquid detergent through the nozzles **28***a*–**28***n*, is in turn operatively coupled to the proportioning pump **48** through a ratio relay **76**. The relay **76** which comprises a continuously flow-measuring and signal-transmitting means and which may be of conventional construction, automatically controls the operation of the proportioning pump **48** on the basis of the volume of liquid detergent being drawn through the conduit **16** and supplied to the nozzles **28***a*, **28***b*–**28***n*. Specifically, once the ratio between the volume of liquid detergent and the volume of colorant to provide colored particles of a desired color concentration is ascertained, the relay may be set to control the output of the pump **48** to insure that the ratio is maintained, notwithstanding fluctuations in the volume of liquid detergent being supplied through the conduit **16**.

In operation, hot colorless or white liquid detergent is continuously supplied under pressure by the high pressure pump **14** to the nozzles **28***a*, **28***b*–**28***n* which spray the liquid detergent in the form of minute droplets into the interior of the spray drying tower **24**. In the tower, the sprayed detergent droplets are acted upon by a drying gas and are dried into discrete detergent particles. Under control of the timer **60**, the coloring solution, which may be, for example, a green dye, is intermittently supplied under pressure from the tanks **30** and **32** and through the conduit **46** and the solenoid actuated valve **58** to the nozzles **28***a*–**28***n*. The proportionate amount of colored detergent particles spray dried in the tower **24** may be varied by appropriately varying the setting on the timer **60**. Because both the colorant and the liquid detergent are injected into the nozzles **28***a*, **28***b*–**28***n*, the colorant and the detergent are thoroughly mixed and the colored detergent particles produced in the tower **24** each have an equal color intensity. This uniform coloring of the detergent is also insured by continuously circulating the colorant between the conduit **46** and the tanks **30** and **32** when the valve **58** is closed and by maintaining a pressure buildup in the conduit **46** during the time that the colorant is circulated to provide quick injection of the colorant when the valve **58** is opened.

Although the invention has been described herein with reference to a specific embodiment many modifications and variations therein will readily occur to those skilled in the art. For example, one three-way solenoid actuated valve may be interposed in the conduit **46** instead of the valves **54** and **58** to create two flow paths for the colorant. Also, each nozzle may have associated therewith a solenoid actuated valve under the control of a separate timer to implement the continuous spraying of colored detergent particles into the spray drying tower. Accordingly, all such variations and modifications are included within the intended scope of the invention.

I claim:

1. Apparatus for producing spray-dried multicolored detergent particles comprising: a source of pressurized hot liquid detergent; a source of pressurized coloring solution having an intake means and a discharge means, spray drying tower means including a drying tower having a gaseous drying medium inlet and exhaust gas outlet, a plurality of injector means responsive to liquid under pressure for injecting the liquid detergent as a spray of same into the drying tower and gas flow means to provide a gaseous drying medium within said drying tower for drying the spray into discrete particles; means forming a first open flow path between the source of pressurized hot liquid detergent and the injector means, means forming a normally open shunt flow path for the pressurized color solution between the intake and discharge means of the source of pressurized coloring solution; means forming a normally closed second flow path for the pressurized coloring solution between the discharge means of the source of pressurized coloring solution and the injector means; and timer means including both means for periodically opening the second flow path for the pressurized coloring solution and means for simultaneously closing the shunt flow path for the pressurized coloring solution;

2. Apparatus according to claim **1** wherein the source of pressurized coloring solution comprises receptacle means for containing the coloring solution having inlet and outlet openings and variable pump means coupled to the outlet opening of the receptacle means for drawing out controlled quantities of coloring solution from the receptacle means.

3. Apparatus according to claim **2** further comprising agitator means connected to the receptacle means for maintaining the coloring solution in an agitated state.

4. Apparatus according to claim **2** further comprising back pressure valve means disposed in the normally open shunt

flow path for restricting the flow of coloring solution in the shunt flow path to maintain an elevated pressure in the normally closed second flow path during the transitional period in which transfer of flow between the shunt flow path and the second flow path occurs, thereby minimizing the time required to pressurize the second flow path and effect flow to the injector means.

5. Apparatus according to claim 2 further comprising a continuous measuring and signal transmission means responsive to the quantity of hot liquid detergent flowing in the first flow path for controlling the operation of the variable pump means.

6. Apparatus according to claim 2 wherein the plurality of injector means comprise a plurality of spray nozzles mounted within the wall of the drying tower and wherein a ball check valve is interposed between each spray nozzle and the normally closed second flow path for the pressurized coloring solution.

7. A method of producing spray-dried multicolored detergent particles comprising the steps of:

a. supplying a hot liquid detergent under pressure in a closed first flow path with an exit branch;

b. supplying a coloring solution under pressure in a closed second flow path with an exit branch, said flow paths having a common segment;

c. periodically diverting the coloring solution from the second flow path and supplying the coloring solution under pressure to its flow path exit branch and thence to the hot liquid detergent exit branch;

d. mixing together the hot liquid detergent and the coloring solution when the latter is supplied to the first flow path exit branch to uniformly color the hot liquid detergent;

e. alternately and sequentially spraying first the hot liquid detergent alone and then the colored hot liquid detergent mixed with hot liquid detergent in droplet form into a defined region; and

f. drying the sprayed droplets respectively into discrete detergent particles and into discrete colored detergent particles in the sequence supplied.

8. A method according to claim 7 comprising the further step of:

a. blending the discrete detergent particles and the discrete colored detergent particles to produce a uniform distribution of the colored detergent particles.