United States Patent

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[15] **3,685,744**

[45] **Aug. 22, 1972**

[54] **SYSTEM INCLUDING APPLICATOR FOR SPRAYING LIQUIDS**

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[73] Assignee: **Progressive Machine Company, Inc.**, Spring City, Pa.

[22] Filed: **Jan. 18, 1971**

[21] Appl. No.: **125,781**

[52] **U.S. Cl.** **239/552**, 118/25, 239/568

[51] **Int. Cl.** **B05b 1/14**

[58] **Field of Search**.....239/568, 499, 518, 524, 552, 239/553.5, 590.5; 118/25

[56] **References Cited**

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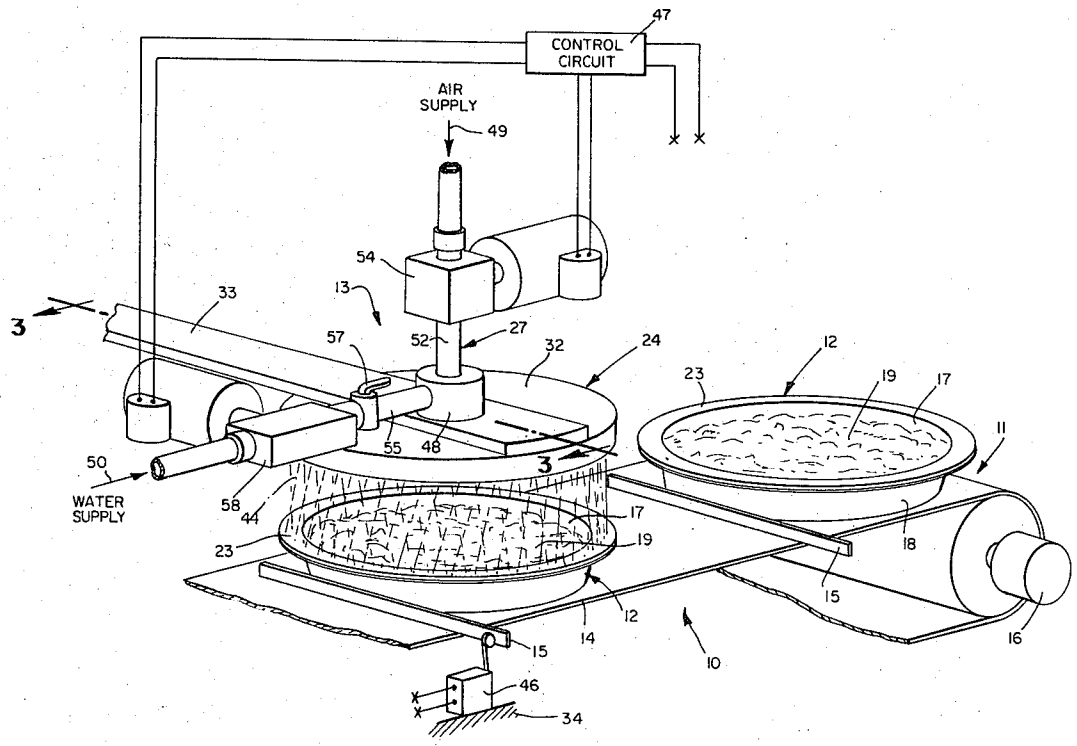
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[57] **ABSTRACT**

An applicator applies a downward annular spray of water that impinges upon the annular upwardly facing surface at the peripheral edge of a bottom crust of an unbaked pie shell to prepare such surface for being sealed to a top crust by crimping. The applicator has a housing with a circular peripheral flange on one surface defining a circular recess into which a spray disc fits. The disc has a grooved surface in contact with the housing for conveying a pressurized mixture of air and water to the peripheral edge of the disc which is provided with transverse X-shaped slots that function as nozzles spraying the air-water mixture in an annular pattern.

10 Claims, 4 Drawing Figures

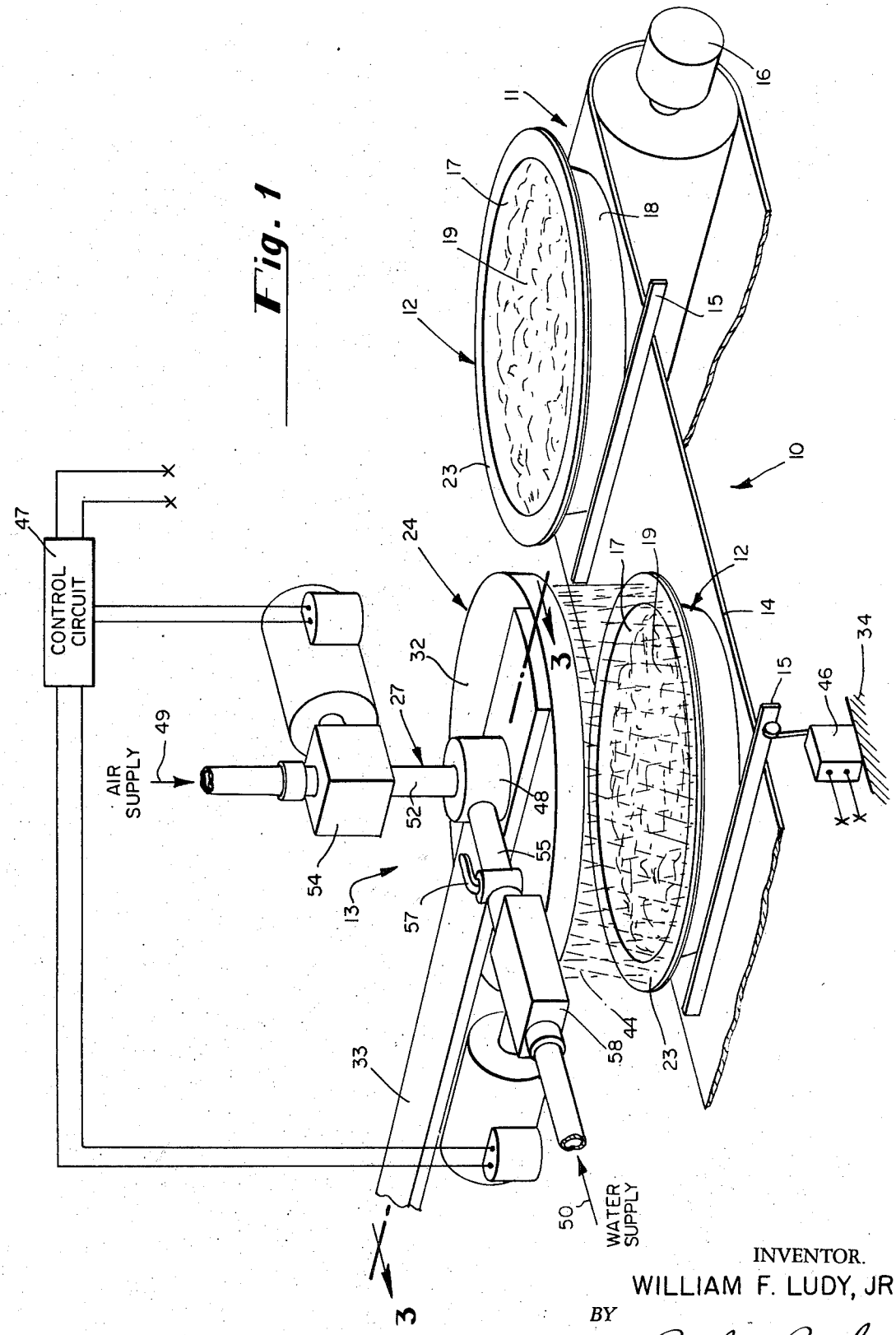


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SHEET 1 OF 2

Fig. 1



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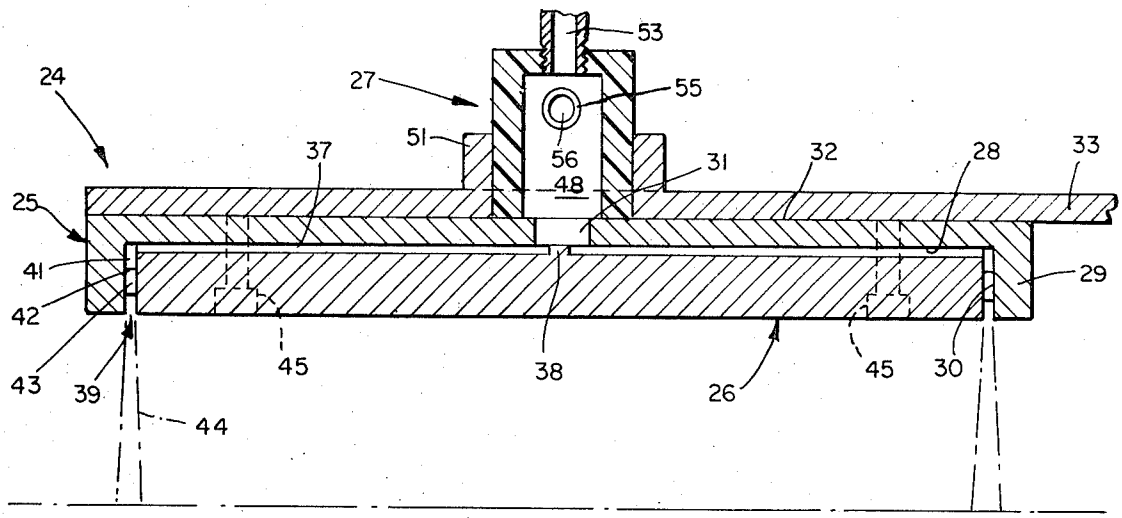


Fig. 3

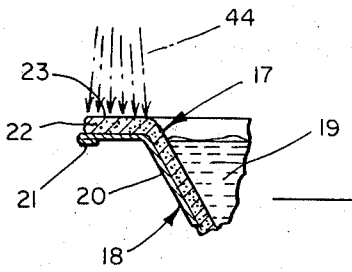


Fig. 2

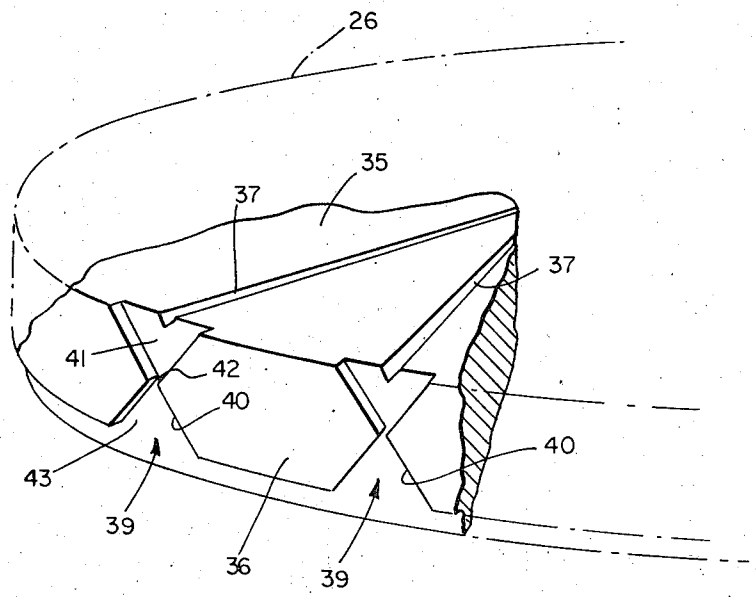


Fig. 4

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SYSTEM INCLUDING APPLICATOR FOR SPRAYING LIQUIDS

BACKGROUND OF THE INVENTION

This invention is concerned with a system that includes an applicator for spraying a liquid in a predetermined pattern.

In the commercial production of pies of the type in which a top crust is to be crimped to the edge of a bottom crust, it is essential to secure a good seal at the crimp in order to prevent the pie filling from leaking out during baking and in order to retain the flavor of the filling in the baked pie. Such seal is achieved by moistening the annular surface of the bottom crust prior to applying and crimping the top crust in place.

For small scale production, manually moistening the crust is usually relied upon; but this approach is unsatisfactory for high volume production for a number of reasons. First of all, the time and labor expense of such manual operation becomes prohibitive. Secondly, repetitive manual operations introduce a large probability of lack of uniformity from unit-to-unit and this introduces quality control problems complicating production and indirectly having an adverse effect on production economies.

The advantage is obvious of a system for automatically and uniformly moistening the annular surface of the bottom crust of a pie shell during volume production of pies. It is the primary object of the present invention, therefore, to provide such a system, and an applicator particularly suitable for use therein.

BRIEF DESCRIPTION OF THE INVENTION

In the system of the present invention, unbaked pie shells are conveyed past an applicator station where an applicator deposits an atomized spray of water on the upwardly facing annular surface of the bottom crust of a pie shell as it is conveyed past the station. The applicator is designed to produce an annular spray pattern that closely matches the annular surface on the crust to minimize dilution of the filling of the pie shell and to closely control the moisture applied to such surface in order to maximize the efficacy of the seal to be obtained when the top crust is crimped in place. To produce the annular spray pattern, the applicator has a housing on one surface of which is a circular peripheral flange defining a circular recess. Into this recess fits a circular spray disc with the top surface thereof abutting the one surface of the housing. A plurality of radially extending grooves is present in the top surface of the disc so that a pressurized mixture of air and water injected through a central aperture in the housing travels in the grooves to the periphery of the disc. A series of X-shaped recesses respectively connecting with the grooves are provided in the transverse peripheral edge of the disc abutting the peripheral flange on the housing. The shape of the recesses creates a nozzle-effect which causes the air-water mixture to be sprayed in droplets in an annular pattern that closely matches the annular surface of the bottom pie crust.

The pressurized mixture of air and water is created in a mixing chamber on the housing by selectively connecting the chamber to an air supply and a water supply. Such selective connection is achieved by solenoid operated valves whose operation is synchronized with the movement of the pie shells on the conveyor.

The more important features of this invention have thus been outlined rather broadly in order that the detailed description thereof that follows may be better understood, and in order that the contribution to the art may be better appreciated. There are, of course, additional features of the invention that will be described hereinafter and which will also form the subject of the claims appended hereto. Those skilled in the art will appreciate that the conception upon which this disclosure is based may readily be utilized as a basis for designing other structures for carrying out the several purposes of this invention. It is important, therefore, that the claims to be granted herein shall be of sufficient breadth to prevent the appropriation of this invention by those skilled in the art.

BRIEF DESCRIPTION OF VIEWS OF THE DRAWING

For a more complete understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings wherein:

FIG. 1 is a schematic illustration of the system of the present invention showing the applicator station.

FIG. 2 is a sectional view of the bottom crust of a pie shell showing the application of a spray to the annular surface on the crust.

FIG. 3 is a sectional view taken along the line 3—3 in FIG. 1 showing the applicator.

FIG. 4 is a fragment of the edge of the spray disc used in the applicator.

DETAILED DESCRIPTION

Referring to FIG. 1, reference numeral 10 designates a portion of a pie processing system into which the present invention is incorporated. System 10 includes conveyor means 11 by which unbaked pie shells 12 are conveyed past applicator station 13. Conveyor means 11 is shown schematically as a conveyor belt 14 carrying spacers 15 which accurately locate shells 12 at predetermined intervals on the belt which is driven by an intermittent drive mechanism shown schematically by reference number 16. Not shown in the drawing, but present in an actual system, are the stations upstream of the applicator station at which bottom crusts 17 are placed in metallic pie plates 18, and the filling 19 is added. Likewise, FIG. 1 does not show the stations downstream of the applicator station at which the top crust is placed on shells 12 and then peripherally crimped. The operation of drive mechanism 16 is synchronized with the tasks performed at the various stations so that shells 12 move intermittently from station-to-station, pausing long enough at each station for the required operation to take place.

Metallic pie plate 18, as shown best in FIG. 2, typically has frustro-conical side walls 30 terminating in an outwardly extending flat flange 21. Bottom crust 17 lies within plate 18 and terminates in lip 22 that rests on flange 21 and defines an annular upwardly facing surface 23 which eventually receives and is crimped to a top crust (not shown) at a station downstream from station 13. It is surface 23 that is to be uniformly moistened in order to establish an effective seal between the top and bottom crusts.

Applicator **24**, located at station **13**, is designed to deposit an atomized spray of water on annular surface **23** without significantly diluting filling **19**. To achieve this end, applicator **24** comprises housing **25**, spray disc **26** and mixing means **27**. As shown in FIG. **3**, housing **25** is essentially disc-shaped having on its bottom surface **28** a circular peripheral flange **29** defining a circular recess **30**. Central aperture **31** in housing **25** connects the top surface **32** to the bottom surface **28**. The housing is positioned properly relative to conveyor means **11** by reason of support bar **33** welded or otherwise fastened to the housing and attached to the chassis, designated by reference numeral **34**, which forms the structural support for the elements of the system.

Spray disc **26** has a circular shape corresponding to recess **30** and fits therein, as seen in FIG. **3**, with top surface **35** on disc **26** abutting bottom surface **28** of housing **25**, and the transverse peripheral edge **36** of the disc fitting snugly against the inside of flange **29** defining recess **30**. Threaded fasteners **45** hold disc **26** attached to housing **25**. As shown clearest in FIG. **4**, top surface **35** of the disc is provided with a plurality of uniformly displaced diametral grooves **37**. In one form of the invention, thirty such grooves are provided displaced about 12° from each other. As seen in FIG. **3**, these grooves extend from a central region **38** on the disc adjacent central aperture **31** in housing **25** to the peripheral edge of the disc. Nozzle means **39** in the peripheral edge **36** of the disc are adjacent to and connect with respective ones of the grooves **37**. The nozzle means **39** are established by X-shaped transverse slots **40** cut into edge **36** as shown in FIG. **4**. As a consequence of this arrangement, pressurized fluid, in the form of an air/water mixture injected into central aperture **31** travels radially in the grooves **37** (which are closed by reason of the abutment of surface **35** with surface **28**), and exits into enlarged top chambers **41** defined by slots **40**. Each of chambers **41** is closed by flange **29** and opens only at narrow restriction **42** into enlarged lower chamber **43**. Chambers **41**, **43** and restriction **42** function as a Venturi-tube causing the water in the mixture entering chamber **41** to be broken up into fine droplets and sprayed downwardly in a narrow annular pattern **44** closely matching the shape and size of disc **26**. The width of the annular pattern as shown in FIG. **3** is a function of the depth of slots **40**.

To properly time the injection of a pulse of pressurized fluid into central aperture **31** so that spray pattern **44** impinges upon surface **23**, the arrival of a shell at station **13** directly below applicator **24** is sensed by normally-open switch **46** which is closed by spacer **15**. Switch **46** is electrically connected to control circuit **47**. The closing of switch **46** initiates a cycle in control circuit **47** which causes mixing means **27** to inject the required pulse of pressurized fluid into aperture **31**.

Mixing means **27** comprises mixing chamber **48**, air supply **49**, water supply **50**, and the associated circuitry for controlling these supplies. Chamber **48** is preferably non-metallic and is cylindrical in shape being positioned above aperture **31** on surface **32** of housing **25**. Boss **51** on bar **33** serves to mount chamber **48** and effect its seal with surface **32** of the housing in a region surrounding aperture **31**. Pipe **52** attached at one end to air inlet port **53** in chamber **48** is attached at its other end to the outlet of solenoid valve **54**. The inlet to valve **54** is attached to a filtered and regulated air supply. Pipe **55** attached at one end to water inlet port **56** in chamber **48** is connected by way of stop-cock **57** to the outlet of solenoid valve **58**. The inlet to valve **58** is attached to water supply **50**. Each of valves **54** and **58** is simultaneously opened for a predetermined period of time by control circuit **47** after switch **46** is closed, thus furnishing a predetermined quantity of air and water to chamber **48** each time a pie shell is properly located relative to the applicator.

Summarizing, system **10** is effective to generate an annular spray pattern which is deposited on the annular surface of a pie shell on which a top crust is to be crimped. While the applicator is shown as a part of such system and is disclosed as spraying a mixture of air and water in an annular pattern, it is obvious that other patterns could be achieved, since the spray pattern is determined by the size and shape of the spray disc and housing. The applicator can be used to deposit liquids other than water, such as, for example, paint or glue. Furthermore, the nozzle-means disclosed herein is easily and inexpensively manufactured because a straightforward edge-milling operation can be employed. The spray disc is thus simple in design and inexpensive to fabricate, regardless of the complexity of the shape of the spray pattern. The cross-sectional dimension of the pattern is established by the depth of the X-shaped notches, so that this easily variable parameter is available for achieving whatever dimension a particular application calls for.

What is claimed is:

1. A processing system comprising:

a. conveyor means for conveying the bottom crusts of unbaked pie shells past an applicator station;

b. each of said crusts having at its periphery an annular upwardly facing surface adapted to engage and be crimped to a top crust at a station downstream of said applicator station;

c. an applicator at said applicator station;

d. means for causing said applicator to automatically deposit an atomized spray of water on said surface in synchronism with movement of said conveyor past said applicator station.

2. A system according to claim **1** wherein said applicator is constructed and arranged to deposit said spray in an annular pattern that matches said surface.

3. An applicator for depositing fluid in a predetermined pattern comprising:

a. a housing having on one surface a peripheral flange of the shape of said predetermined pattern defining a recess in said one surface, and having a central aperture connecting said one surface to the opposite surface;

b. a spray disc having a shape corresponding to said recess and fitting therein with one surface in abutment with said one surface on said housing;

c. a plurality of groove means between said one surface of said disc and said one surface of said housing extending from a region adjacent to said central aperture in said housing to the peripheral edge of said disc which abuts said flange;

d. a plurality of nozzle means between said peripheral edge of said disc and said flange, each of said nozzle means connecting with respective ones of said groove means whereby pressurized

fluid injected into said central aperture travels in said groove means and exits in a spray through said nozzle means in a pattern that matches the shape of the peripheral edge of said disc.

4. The applicator of claim 3 wherein said groove means are in the form of grooves in said one surface of said disc, and wherein said nozzle means are in the peripheral edge of said disc.

5. The applicator of claim 4 wherein said recess in said housing is circular and said spray pattern is annular.

6. The applicator of claim 5 wherein said nozzle means is in the form of transverse slots in said peripheral edges of said disc.

7. The applicator of claim 6 wherein said transverse slots are X-shaped to form a restriction that acts as a nozzle.

8. The applicator of claim 7 wherein a fluid mixing chamber is mounted on said opposite surface of said housing and is connected to said central aperture.

9. The applicator of claim 8 wherein said mixing chamber is connected to an air supply and a liquid supply.

10. The applicator of claim 8 including selectively operable control valves respectively connecting air and liquid supplies to said mixing chamber for selectively controlling the spray.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,685,744 Dated August 22, 1972

Inventor(s) William F. Ludy, Jr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On title page, [22], after "Filed:" change --Jan. 18, 1971-- to --March 18, 1971--.

Signed and sealed this 9th day of January 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

USCOMM-DC 60376-P69
* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334