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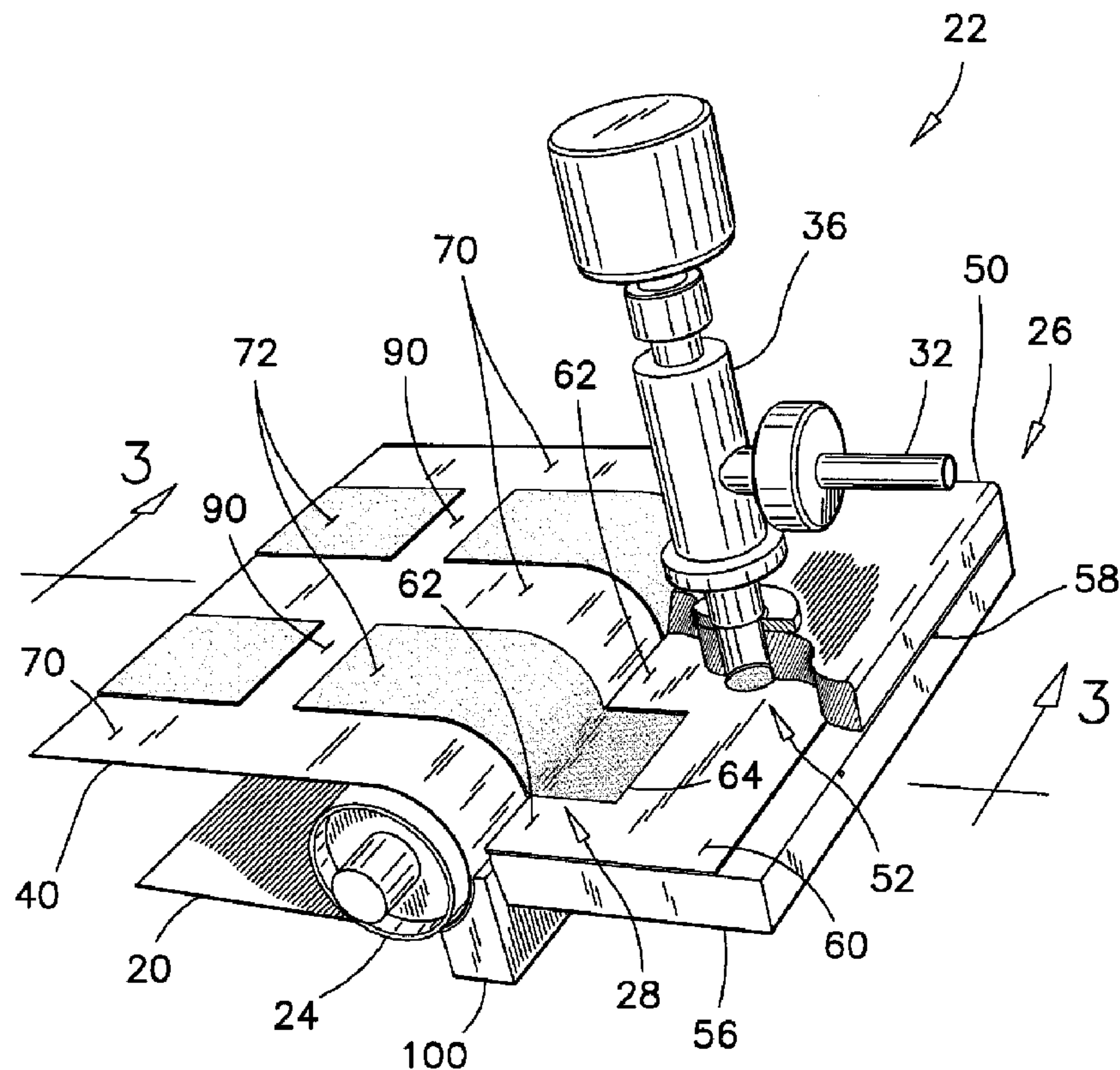
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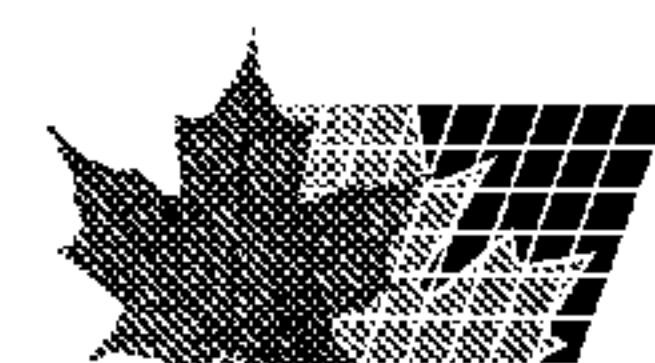
(54) Titre : PRESERVATION DES PROFILS DE SAVEUR DES ASSAISONNEMENTS PENDANT LA FABRICATION DE
FEUILLES D'ASSAISONNEMENT

(54) Title: PRESERVING SEASONING FLAVOUR PROFILES DURING THE MANUFACTURING OF FOOD-SEASONING
SHEETS



(57) Abrégé/Abstract:

A method and an installation are provided for preserving desired seasoning flavour profiles during the manufacturing of food-seasoning sheets. The method includes the steps of; laying a thin layer of adhesive on a base sheet; removing air from the



(57) **Abrégé(suite)/Abstract(continued):**

adhesive prior to the step of laying; reducing free moisture from the adhesive during the step of laying, and depositing food-seasoning ingredients onto the thin layer of adhesive. The installation for manufacturing food-seasoning sheets includes an adhesive dispenser having a reservoir and a delivery slot communicating with the reservoir for dispensing adhesive. The dispenser has a heating element mounted thereto for heating the adhesive. The adhesive is made under a partial vacuum and it is conveyed to the dispenser in a partial vacuum.

ABSTRACT OF THE DISCLOSURE

A method and an installation are provided for preserving desired seasoning flavour profiles during the manufacturing of food-seasoning sheets. The method includes the steps of; laying a thin layer of adhesive on a base sheet; removing air from the adhesive prior to the step of laying; reducing free moisture from the adhesive during the step of laying, and depositing food-seasoning ingredients onto the thin layer of adhesive. The installation for manufacturing food-seasoning sheets includes an adhesive dispenser having a reservoir and a delivery slot communicating with the reservoir for dispensing adhesive. The dispenser has a heating element mounted thereto for heating the adhesive. The adhesive is made under a partial vacuum and it is conveyed to the dispenser in a partial vacuum.

**TITLE: PRESERVING SEASONING FLAVOUR PROFILES
DURING THE MANUFACTURING OF FOOD-SEASONING
SHEETS**

FIELD OF THE INVENTION

5

This invention pertains to the manufacturing of food-seasoning sheets, and more particularly, it pertains to the calibration of ingredients in food-seasoning sheets.

10 **BACKGROUND OF THE INVENTION**

Packaging material for curing or marinating fresh food during storage has been part of the art for some time. **US Patent 6,623,773** for example, issued to Mr. Hans J. Meier, one of the inventors of the instant application, has
15 been granted on September 23, 2003. This document explains the composition of food-seasoning sheet products.

Other known documents describing similar sheet materials include:

US Patent 5,705,214 issued to T. Ito et al., on January 6, 1998;
20 **CA Patent 2,007,522** issued to T. Ito, et al., on Mar. 14, 2000;
US publ. 2009/0274799 published by R. V. Lee et al., on Nov. 5, 2009.

Referring back to the Meier patent, US 6,623,773, which is incorporated herein by reference, it is explained therein that the calibration of seasoning
25 ingredients bonded to a food-seasoning sheet is closely depending on the amount of adhesive that has been applied to the sheet. We might add that the calibration of seasoning ingredients in a food-seasoning sheet is also closely depending on the condition of the adhesive when seasoning

ingredients are deposited over the sheet.

Spice products for example, are granular or powdery in nature and their adhesion to a food-seasoning sheet depends on the portion of each granule that sinks into the layer of adhesive. The thickness and surface tension of the adhesive layer are contributing factors in the ability to retain the spice product to a food-seasoning sheet. When the layer of adhesive is too shallow, the surface of the adhesive tends to dry up and to form a shell that does not retain powdery spice materials. A thicker layer of adhesive tends to remain more fluid and wet, and to completely encapsulate and /or dissolve spice particles. In some instances, a thicker layer of adhesive may hinder the release of the spice particles from the sheet and into the food to be marinated. Furthermore, the air and water content of the adhesive are contributing factors to cause more or less absorption of the seasoning ingredients into the adhesive and to modify the potency of these ingredients. Therefore, both the thickness of adhesive and the wetness of this adhesive are important factors to consider in the manufacturing a high quality food-seasoning sheets.

For example, it is well known that HVP's (hydrolyzed vegetable proteins) and sucrose are very moisture-sensitive elements that have the ability to extract moisture from a substrate. This makes these elements very difficult to work with without losing their effectiveness.

The type of adhesive that is used in these applications has a viscous structure. When such an adhesive is discharged from a slot die for example, it may have a foamy texture with air entrapped in it. When air is released from the adhesive, the final volume of adhesive remaining on the sheet is less than the amount calibrated through the slot die. Also, when air is

released from the surface of the adhesive, it promotes a faster drying of the surface. Consequently, the wetness of the adhesive applied to a food-seasoning sheet also depends on the air content in the adhesive exiting the slot die. Similarly, the free moisture present in the adhesive tends to dissolve the food-seasoning ingredients into the adhesive and/or into one
 5 another and to reduce the potency of the seasoning ingredients.

Because of these factors, basically, it has been difficult in the past to precisely calibrated the amount of adhesive delivered onto a food-seasoning sheet. Therefore, there exists a need for precisely controlling the amount of
 10 adhesive that is laid on a food-seasoning sheet and there also exists a need for controlling the amount of air and free moisture present in that adhesive.

SUMMARY OF THE INVENTION

15 In the present invention, there is provided an installation for dispensing adhesive onto a moving base sheet, wherein the amount of adhesive laid on a base sheet is precisely calibrated in a very thin layer. Air and free moisture are removed from the adhesive before the adhesive is dispensed onto the base sheet. The adhesive is in a more favourable state for receiving
 20 food-seasoning products thereon.

In a first aspect of the present invention, there is provided a method for preventing a dissolution of food-seasoning ingredients into the adhesive. This method comprises the steps of;

- 25
- laying a thin layer of adhesive on a base sheet;
 - removing air from the adhesive prior to the step of laying;
 - reducing free moisture from the adhesive during the step of laying, and
 - depositing food-seasoning ingredients onto the layer of adhesive.

The removing of air and free moisture from the adhesive has been devised primarily for obtaining a better dispensing of the adhesive on a base sheet. Because the adhesive that is used in the method according to the present invention has less air entrapped in it and contains less free moisture, this adhesive can be applied in very thin layers and can be applied with clean
5 edges and clean breaks.

In addition to making the adhesive easy to apply on a base sheet, i.e. clean edges and clean breaks, a new and unexpected advantage has been obtained. It is believed that because of the low water activity and the extremely thin
10 application of the adhesive, there is minimal (if any) dissolving of potentially soluble food-seasoning ingredients into the adhesive and/or into one another. The low water activity means that there is little free water available to dissolve anything. The thin application and the scarcity of air speed up the drying process to further reduce free moisture. As a result of
15 minimal dissolving, there is nothing to diminish, mask or alter the seasoning flavour profile selected. The flavour profiles desired are more easily obtained and preserved. The flavour profiles desired are more precisely duplicated from one order to the next.

20 In another aspect of the present invention, there is provided an installation for manufacturing food-seasoning sheets having a layer of adhesive laid onto on a base sheet and food-seasoning ingredients bonded to the layer of adhesive. This installation includes a first reservoir for making liquid adhesive therein. The installation also has a liquid adhesive dispenser
25 having a slot die and a second reservoir in the slot die for receiving the liquid adhesive from the first reservoir; and a delivery slot in the slot die communicating with the second reservoir for dispensing the liquid adhesive onto the base sheet. There is also provided a pump and a piping system for

pumping the liquid adhesive from the first reservoir to the second reservoir in an air free environment. A spice dispenser is included for dispensing spice product over the liquid adhesive on the base sheet. In this installation, the first reservoir has a mixer and a vacuum pump connected to it for generating a partial vacuum in the first reservoir when the first reservoir
5 contains the liquid adhesive, and for removing air from the liquid adhesive prior to delivering the liquid adhesive to the second reservoir. As a result, the liquid adhesive laid on the base sheet has less air entrapped in it such that it is more easily applied in a very thin layer.

10 In yet another aspect of the installation according to the present invention, there is provided a heating element mounted in or to the slot die for heating the adhesive as it is dispensed onto the base sheet. The heating of the adhesive promotes the evaporation of free moisture from the adhesive and the release of air entrapped in the adhesive. The adhesive is easily applied
15 in thin layers with clean edges and breaks.

In yet a further aspect of the installation according to the present invention, there is provided a vacuum box mounted under the delivery slot of the slot die for removing air from the base sheet and from the adhesive when the
20 adhesive is laid on the base sheet.

In yet another aspect of the installation according to the present invention, there is provided a system for winding the base sheet after spice products have been dispensed on it, and a monitoring and control system for setting
25 and controlling a tension in the base sheet during a winding of the base sheet, for preventing damage to the food-seasoning sheets during storage and transport to a client.

In yet a further aspect of the installation according to the present invention, a template is mounted in the slot die. The template has a dado edge extending in the delivery slot for locally obstructing a flow of adhesive through the delivery slot and for creating margins free of adhesive on the base sheet.

5

This brief summary has been provided so that the nature of the invention may be understood quickly. A more complete understanding of the invention can be obtained by reference to the following detailed description of the preferred embodiment thereof in connection with the attached drawings.

10

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention is illustrated in the accompanying drawings, in which like numerals denote like parts throughout the several views, and in which:

15

FIG. 1 is a schematic representation of an adhesive dispenser and a spice dispenser in an installation for manufacturing food-seasoning sheets;

20

FIG. 2 is a cutaway perspective view of the slot die in the adhesive dispenser;

FIG. 3 is a cross-section view of the slot die as seen substantially along **lines 3-3** in **FIG. 2**;

25

FIG. 4 is a cutaway view of a reservoir for making adhesive to be delivered to the adhesive dispenser of **FIGS. 2** and **3**;

FIG. 5 is a block diagram of the operation and control equipment included in the installation for manufacturing food-seasoning sheets.

DESCRIPTION OF THE PREFERRED EMBODIMENT

5 Referring firstly to **FIG. 1**, the manufacturing of a food-seasoning sheets in the installation according to the preferred embodiment will be explained in a general manner. As a base, a film **20** of plastic material is supplied to the adhesive dispenser **22** from a roll of film for example (not shown). The film **20** can be made of polyethylene for example or other sheet material, but
10 this is not the focus of the present invention.

The film **20** is wrapped over a slot die mandrel **24** which is mounted close to a slot die **26**. The slot die **26** has a delivery slot **28** facing the slot die mandrel **24**. The film **20** passes in a small gap **30** between the delivery slot
15 **28** of the slot die **26** and the slot die mandrel **24**.

Adhesive is delivered under pressure from a reservoir (described later) to the slot die **26**, via the inlet tubing **32**. The inlet tubing **32** has a connection to a piping system represented by a dash line **34**. The adhesive is pumped
20 through the body of a pull-back valve **36** and into the slot die **26**. The operation of the pull-back valve **36** and the slot die **26** will also be described later.

The adhesive-covered sheet **40** is then passed under a spice dispenser **42**
25 where a calibrated amount of spice product is delivered on the top of the sheet. The spice product is delivered over the wet adhesive, to bond to the adhesive. The spice dispenser **42** is located at a minimum distance from the adhesive dispenser **22** to minimize the drying of the adhesive prior to

dispensing the spice product on the sheet **40**. The spice-covered sheet is then allowed to dry on the run to a winder (not shown), where it is wound on a storage roll.

Although the words “spice” and “spice product” are used herein, these words are used for convenience only and should not be limiting in the interpretation of the present invention. The spice dispenser **42** may be used to deliver granular food products, salt, pepper, sugar, chocolate, nuts, fruits, spices, preservatives, seasoning formulations, anti-microbial compositions, medicinal products or any combination of these substances, or any product of that nature.

The operation of the spice dispenser **42** is not described in detail herein because it is not the focus of the present invention. In the preferred installation, the calibration of the amount of spice product delivered per unit of surface of film **40** over time is done by weight and this is controlled by computer and load cells **44** mounted under the base of the spice dispenser **42**, and a speed sensor (described later) reading the speed of the slot die mandrel **24** on the adhesive dispenser **22** for example.

Referring now to **FIGS. 2** and **3**, the structure and operation of the adhesive dispenser **22** will be described. In **FIG. 2**, the slot die **26** is shown with its top half **50** in a cutaway view. The pull-back valve **36** is connected to an opening **52** in the top half **50**. This opening **52** communicates with a reservoir **54** in the bottom half **56** of the slot die **26**. The reservoir **54** can be seen in the cross-section view of the slot die **26** in **FIG. 3**. The reservoir **54** communicates with the delivery slot **28**.

The reservoir **54** further has two vent holes **58** along a top portion thereof to evacuate air entrapped in it. The vent holes **58** have a dimension to allow air to escape out, but to restrict the flow of adhesive there through.

5 A flat template **60** is mounted between the top and bottom halves **50, 56** of the slot die **26** and over the reservoir **54**. The thickness of the template **60** is a same thickness as the gap of the delivery slot **28** in the slot die **26**. The template **60** has a dado edge with fingers **62** and recesses **64**. The fingers **62** block portions of the slot **28** of the die while the recesses **64** allow adhesive to flow though other portions of the slot **28** of the die. The local
10 blocking of the slot **28** of the slot die **26** at the fingers **62** causes the formation of clean margins **70** along the adhesive-covered sheet **40** so as to define strips **72** of adhesive on the adhesive-covered sheet **40**, and margins **70** free of adhesive.

15 The operation of the pull-back valve **36** creates a partial vacuum in the reservoir **54** and pulls back the adhesive upward in the conduit **52**. The pull-back valve **36** comprises a spool **80** that is movable in a valve body **82**, under the action of a pneumatic actuator **84**. The details of the spool **80**, the valve body **82** and the actuator **84** are not provided herein because these
20 details are not the focus of the present invention and are known to those skilled in the art. The valve **36** is basically a two-way valve.

The operation of the pull-back valve **36** causes interruptions in the flow of adhesive through the slot **28** of the slot die **26**. The operation of the pull-
25 back valve **36** creates interruptions in the delivery of adhesive to the adhesive-covered sheet **40** when the sheet **20** is moving in front of the delivery slot **28**, thereby causing breaks **90** in the strips of adhesive **72**.

The slot die **26** is separable in two halves **50**, **56** and the template **60** is removably mounted between both halves. Different templates **60** may be used with different dado edges to define more or less margins **70** and margin widths. The operation of the pull-back valve **36** may be controlled by a timer and a programmable controller or other computer to vary the
 5 frequency and length of the breaks **90**.

These clean margins **70** and breaks **90** free of adhesive are useful for manufacturing foldable food-seasoning sheet products such as envelopes and bags for examples. The clean margins and breaks provide clean
 10 surfaces that can be bonded to each other using heat-sealing equipment for example.

The stroke length of the spool **80** of the pull-back valve **36** is selected so that air does not get into the reservoir **54**. The stroke length is selected to
 15 break the flow of adhesive through the slot **28** of the die **26**, without introducing air in the slot **28**.

The movement of the valve spool **80** of the pull-back valve **36** and of the resulting movement of the adhesive inside the reservoir **54** associated with
 20 the partial vacuum that is created inside the reservoir **54** causes a certain amount of air to be released from the adhesive inside the reservoir **54** and to be evacuated through the vent holes **58**.

A heating element **92** and a thermocouple **94** are mounted in or to the slot
 25 die **26**. The exact location of the heating element and the thermocouple can vary from the illustration in **FIG. 3**, according to the choice of the designer. This heating element **92** and thermocouple **94** are used to control the temperature of the adhesive exiting the slot die **26**. It has been found that a

controlled heating of the adhesive prior to delivery through the slot die **26** improve trailing edge quality and uniformity in the adhesive layer. It also has been found that a heating of the adhesive helps to release air entrapped in the adhesive and from the reservoir **54**. It has further been found that the heating of the adhesive helps to reduce free moisture in the adhesive being
5 delivered onto the film **20**. Reduced amounts of air and free moisture in the adhesive have been found to yield a better quality food-seasoning sheets with less dissolving of the food-seasoning ingredients.

A vacuum box **100** is also provided immediately under the gap **30** and the
10 delivery slot **28**. The vacuum box **100** is open at the top as can be seen in **FIG. 3**, with an opening facing the surface of the slot die mandrel **24** immediately below the delivery slot **28**. A partial vacuum is applied into the box **100** and an air flow is drawn therein from the surface of the slot die mandrel **24**, to remove air from the surface of film **20** immediately before
15 adhesive is deposited to the film **20**. As may be appreciated, the vacuum box also has the ability to remove air from the lower laminae of adhesive exiting the slot **28** of the die.

The removal of air from the film **20** and from the lower laminae of adhesive
20 ensures that less air is be trapped under and into the adhesive. As may be appreciated, this removal of air reduces the amount of air permeating through the layer of adhesive on the adhesive-covered sheet **40**.

Referring now to **FIG. 4**, there is illustrated therein a reservoir **110** for
25 making and mixing a batch of adhesive, for use in the slot die **26**. The adhesive is pumped from the reservoir **110** though the piping system **34** shown in **FIG. 1**. The reservoir **110** is of a type that can be hermetically sealed. The reservoir **110** has a mixer **112** mounted therein. The reservoir

110 also has a tubing **114** connected to a top part thereof at connection **116** for example. The tubing **114** is connected to a vacuum pump **118**.

In use, a batch of adhesive is prepared and mixed under at least a partial vacuum so that a minimum amount of air is entrapped in the adhesive. The adhesive is transferred to the slot die **26** and enters the slot die **26** under pressure from a pump **120** and tubing **34**. Both the pump **120** and tubing **34** are hermetically sealed as it is customary with equipment of that nature. The adhesive being pumped is not exposed to air between the reservoir **110** and the slot die **26**.

Referring now to **FIG. 5**, there is illustrated therein a block diagram of the equipment included in the preferred installation for manufacturing food-seasoning sheets. The installation is controlled by a programmable logic controller (PLC) **130** with motion controllers. A touch-screen input device **132** is used to enter settings for different food-seasoning profiles.

Servo drives **134**, encoders **136** and feedback loops **138** are used for controlling the speed of each function driver.

Referring to individual function drivers, the adhesive delivery pump **120** is connected to the adhesive reservoir **110**. The reservoir **110** as shown in **FIG. 5** is a same reservoir as the mixing reservoir shown in **FIG. 4**. However, in some installations, two reservoirs may be used; one for batch mixing the adhesive and one for delivering the adhesive to the slot die **26** in a continuous mode.

The adhesive delivery pump **120** is a volume-controllable pump and its delivery volume is controlled in relation to film speed measured at slot die

mandrel **24**, in a control feedback loop **140**. The adhesive delivery pump **120** is programmable to set precise coat weight or thickness.

The delivery of spice product from the spice hopper **42** to the web is also controlled in relation with the speed of the slot die mandrel **24**, by means of
5 a feedback loop **142** between the spice delivery mandrel **150** and the slot die mandrel **24**.

The spice application is based on a loss-of-weight feeding system, including load cells **44** under the spice hopper **42**, and a first summing module **152**
10 reading the load cells **44**. The speed of the servo motor **150** on the spice mandrel **150'** is controlled by weight loss over film speed and recipe request. The location of the spice mandrel **150'** can be seen in **FIG. 1**.

The film speed and film tension are controlled through a feedback loop **154**
15 between a web-unwind roll **156** and a web rewind roll **158**. Each of the film unwind roll **156** and film rewind roll **158** is driven by a gear box **160** and a servo motor **162**.

The film speed and film tension are also controlled by measurement of the
20 radial strain on a tension roll **164**. The tension roll **164** can also be seen in **FIG. 1**. A pair of load cells **44'** are installed on the tension roll **164** to measure film tension. The signals from these load cells **44'** are integrated in a second summing module **166**, and are used to adjust speed and torque of both the film unwind roll **156** and film rewind roll **158**. Torque is recipe-
25 dependent and is controlled especially for preventing product damage on roll-up of the coated film **40**.

The installation according to the preferred embodiment for manufacturing food-seasoning sheets has the ability to precisely control the thickness of the adhesive layer and the volume of food-seasoning ingredients deposited on the film surface. The preferred installation also has the ability to control film tension at roll-up. Further, the preferred installation has the ability to
5 control free moisture and air content in the adhesive. As a result, a better calibration of the food-seasoning ingredients is obtained.

The preferred installation has limited absorption of the food-seasoning elements into the adhesive or vice-versa, or into one another. The food-
10 seasoning elements keep their maximum potency.

As to other manner of usage and operation of the manufacturing of food-seasoning sheets, the same should be apparent from the above description and accompanying drawings, and accordingly, further discussion relative to
15 these aspects is deemed unnecessary.

20

25

CLAIMS

What is claimed is;

1. In a manufacturing of a food-seasoning sheet comprising a base sheet, a layer of adhesive laid on said base sheet and food-seasoning ingredients bonded to said layer of adhesive, the method of preventing a dissolution of said food-seasoning ingredients into said adhesive, comprising the steps of:
laying a thin layer of adhesive on said base sheet;
removing air from said adhesive prior to said step of laying;
reducing free moisture from said adhesive during said step of laying,
and
depositing food-seasoning ingredients onto said layer of adhesive.
2. The method as claimed in **claim 1**, wherein said step of removing air from said adhesive comprises the steps of:
removing air from said adhesive during a making of said adhesive in
a first location, and
pumping said adhesive to an adhesive dispenser in an air free environment to a second location different from said first location.
3. The method as claimed in **claim 1**, wherein said step of reducing free moisture from said adhesive includes a heating of said adhesive.
4. The method as claimed in **claim 1**, wherein said step of laying comprises the step of controlling a volume of said adhesive

according to a speed of said base sheet when said adhesive is delivered to said base sheet.

5. The method as claimed in **claim 2**, wherein said second location is a slot die and further comprising the step of removing air from said adhesive at said slot die.
6. The method as claimed in **claim 5**, further comprising the step of heating said slot die.
7. The method as claimed in **claim 5**, further comprising the step of removing air from said adhesive and from said base sheet when said adhesive is delivered to said base sheet.
8. The method as claimed in **claim 5**, further including the step of periodically creating a partial vacuum in said slot die.
9. An adhesive dispenser for dispensing adhesive onto a moving base sheet, comprising;
a slot die;
a reservoir formed in said slot die for receiving liquid adhesive therein under pressure;
a delivery slot in said slot die communicating with said reservoir for dispensing said adhesive there through;
a valve mounted thereto for periodically creating a partial vacuum in said reservoir.
10. The adhesive dispenser as claimed in **claim 9**, wherein said valve is mounted to said slot die.

11. The adhesive dispenser as claimed in **claim 9**, wherein said valve has a valve body and a valve spool movable in said valve body; and said valve spool has a stroke length which is selected to prevent air from entering into said reservoir through said slot die when said valve spool is moved.
12. The adhesive dispenser as claimed in **claim 9**, further comprising a vacuum box mounted adjacent said delivery slot for removing air from said base sheet prior to dispensing said liquid adhesive to said base sheet.
13. The adhesive dispenser as claimed in **claim 11**, wherein said stroke length is also selected for withdrawing said liquid adhesive from said delivery slot and for creating a break in a delivery of said adhesive through said slot when said valve spool is moved.
14. The adhesive dispenser as claimed in **claim 11**, wherein said valve comprises a pneumatic actuator and said valve spool is operable by said pneumatic actuator.
15. The adhesive dispenser as claimed in **claim 9**, wherein said slot die has a template mounted therein and said template has a dado edge extending in said delivery slot for locally obstructing a flow of adhesive through said delivery slot.
16. The adhesive dispenser as claimed in **claim 15**, wherein said template is removably mounted in said slot die.

17. The adhesive dispenser as claimed in **claim 9**, further including a heating element in said slot die.
18. An installation for manufacturing food-seasoning sheets having a layer of adhesive laid onto on a base sheet, comprising;
a first reservoir for making liquid adhesive therein;
a liquid adhesive dispenser having a slot die and a second reservoir in said slot die for receiving said liquid adhesive from said first reservoir and a delivery slot in said slot die communicating with said second reservoir for dispensing said liquid adhesive onto said base sheet;
a pump and piping system for pumping said liquid adhesive from said first reservoir to said second reservoir in an air free environment;
a spice dispenser for dispensing spice product over said liquid adhesive over said base sheet;
said first reservoir having a mixer mounted therein and a vacuum pump connected thereto for generating a partial vacuum in said first reservoir when said first reservoir contains said liquid adhesive, and for removing air from said liquid adhesive prior to delivering said liquid adhesive to said second reservoir.
19. The installation as claimed in **claim 18**, further including a monitoring and control system for setting and controlling a thickness of said layer of adhesive.
20. The installation as claimed in **claim 18**, further including a system for winding said base sheet after spice product has been dispensed on

said base sheet, and a monitoring and control system for setting and controlling a tension in said base sheet during a winding of said base sheet.

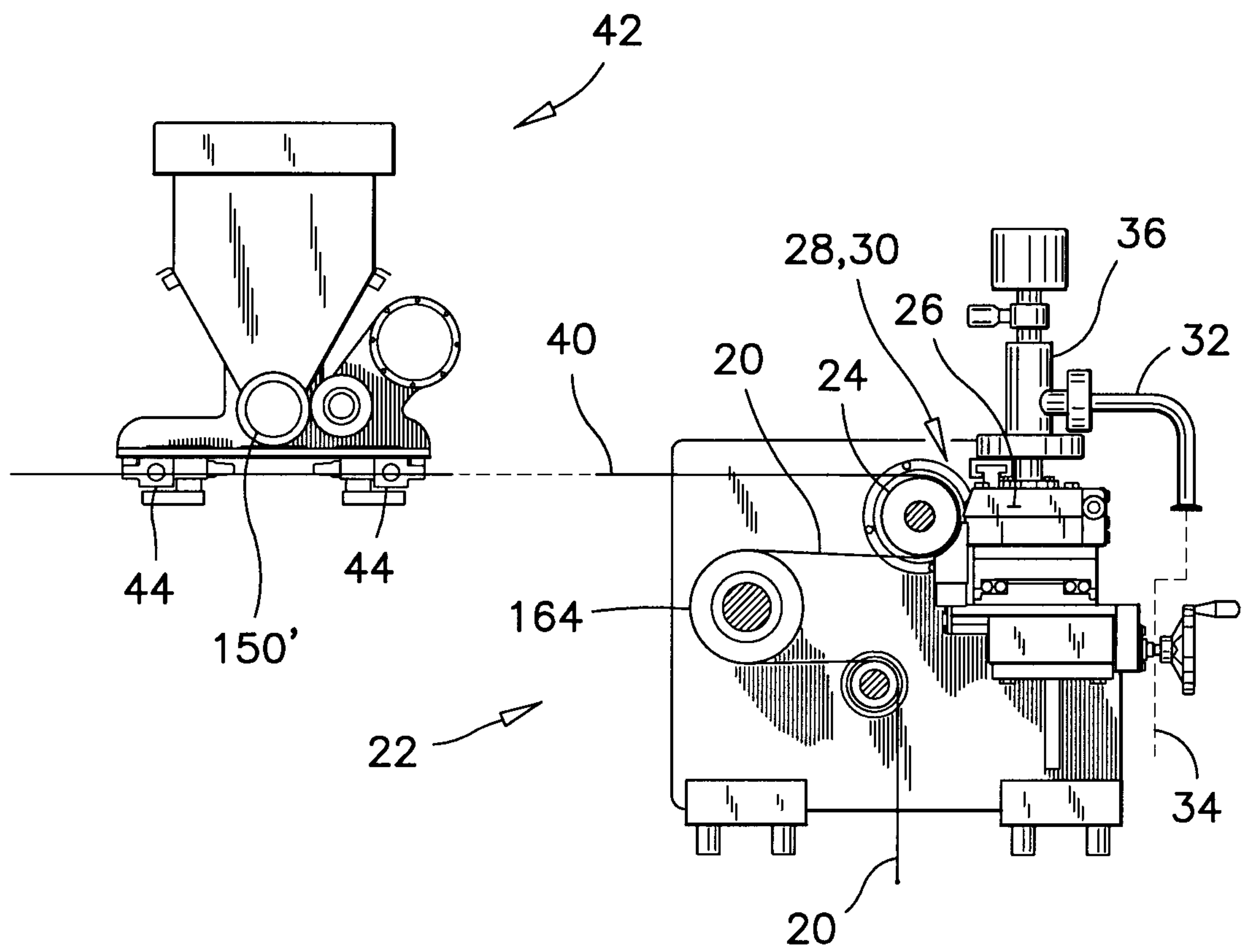


FIG. 1

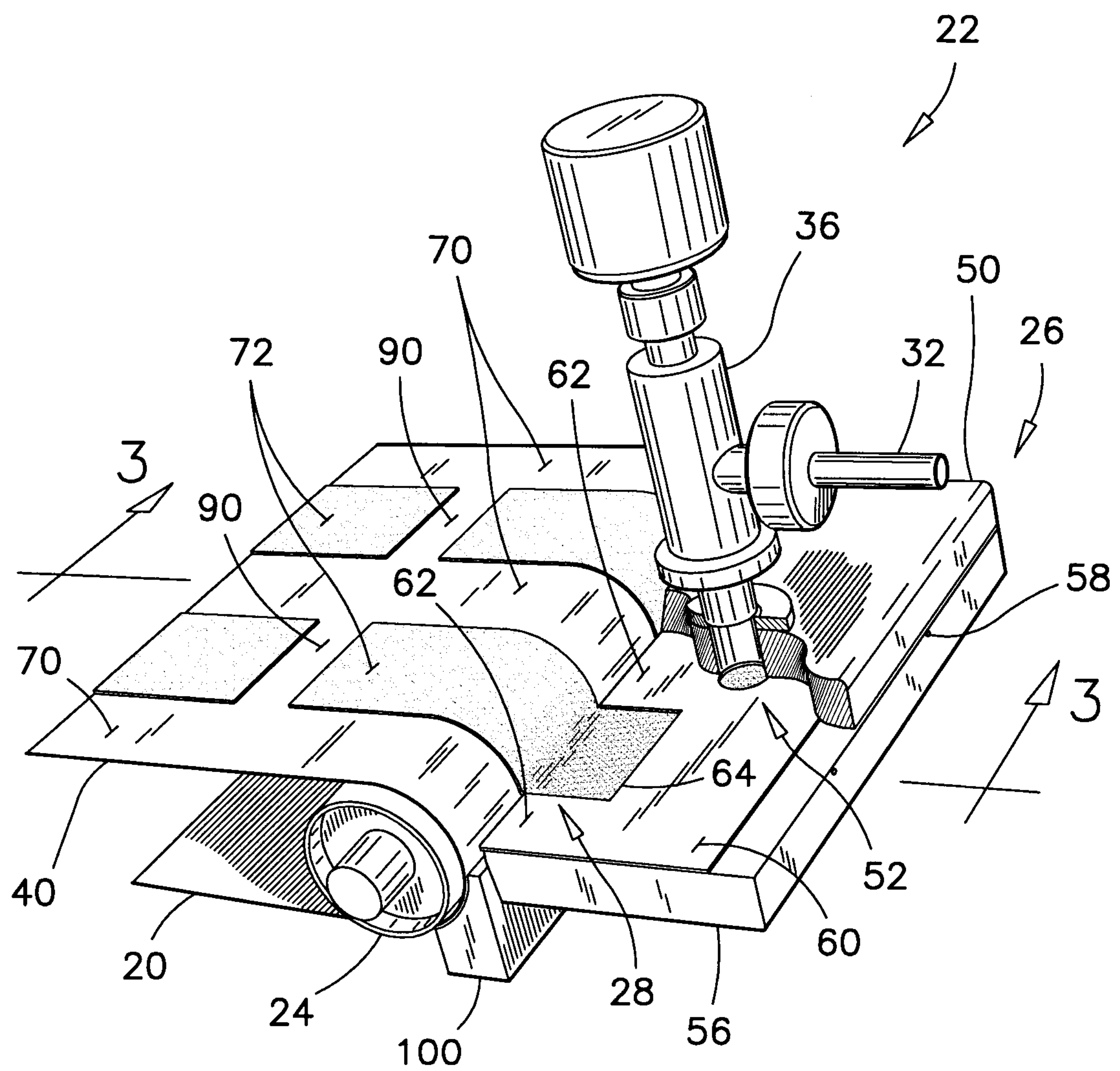


FIG. 2

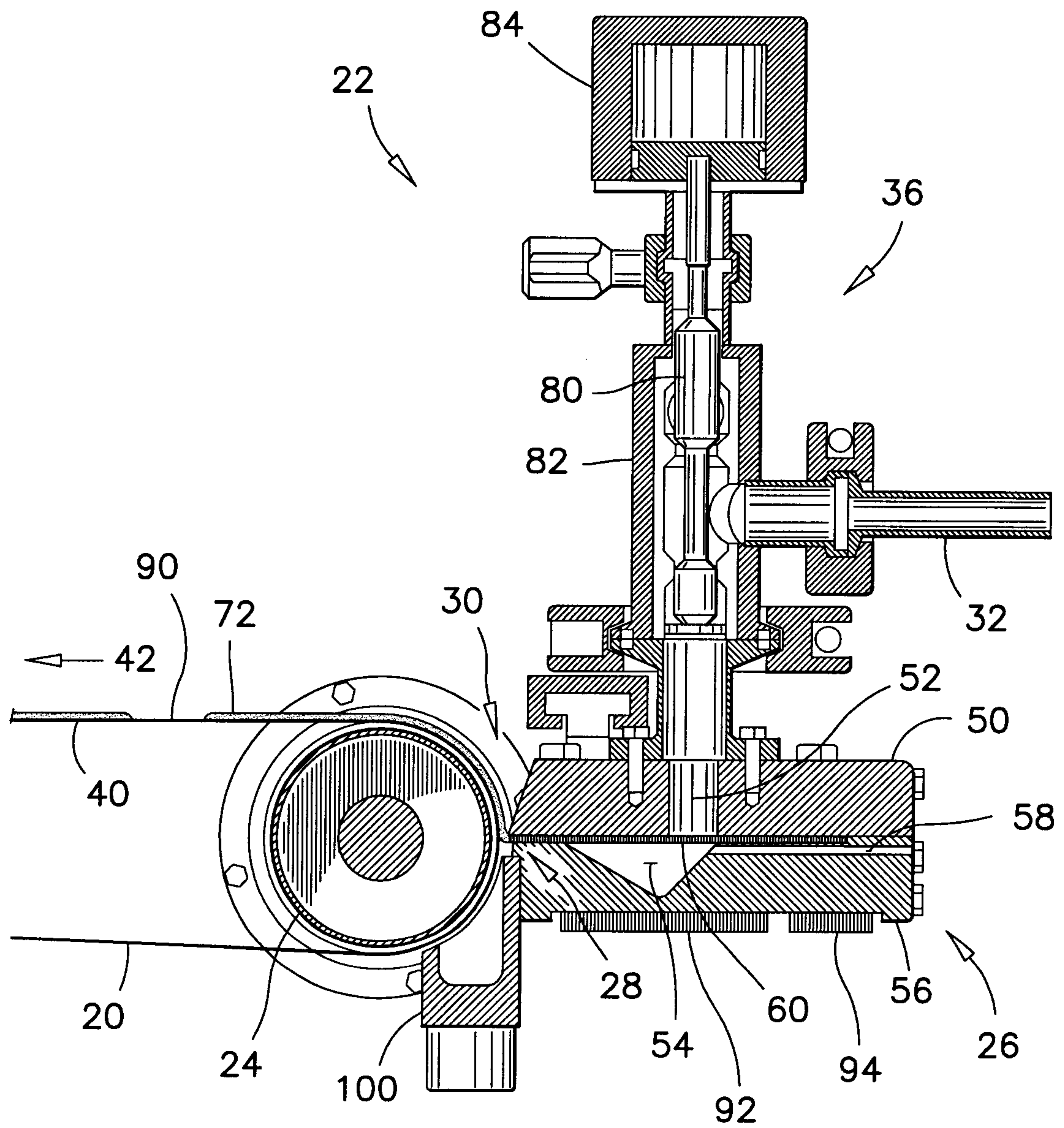


FIG. 3

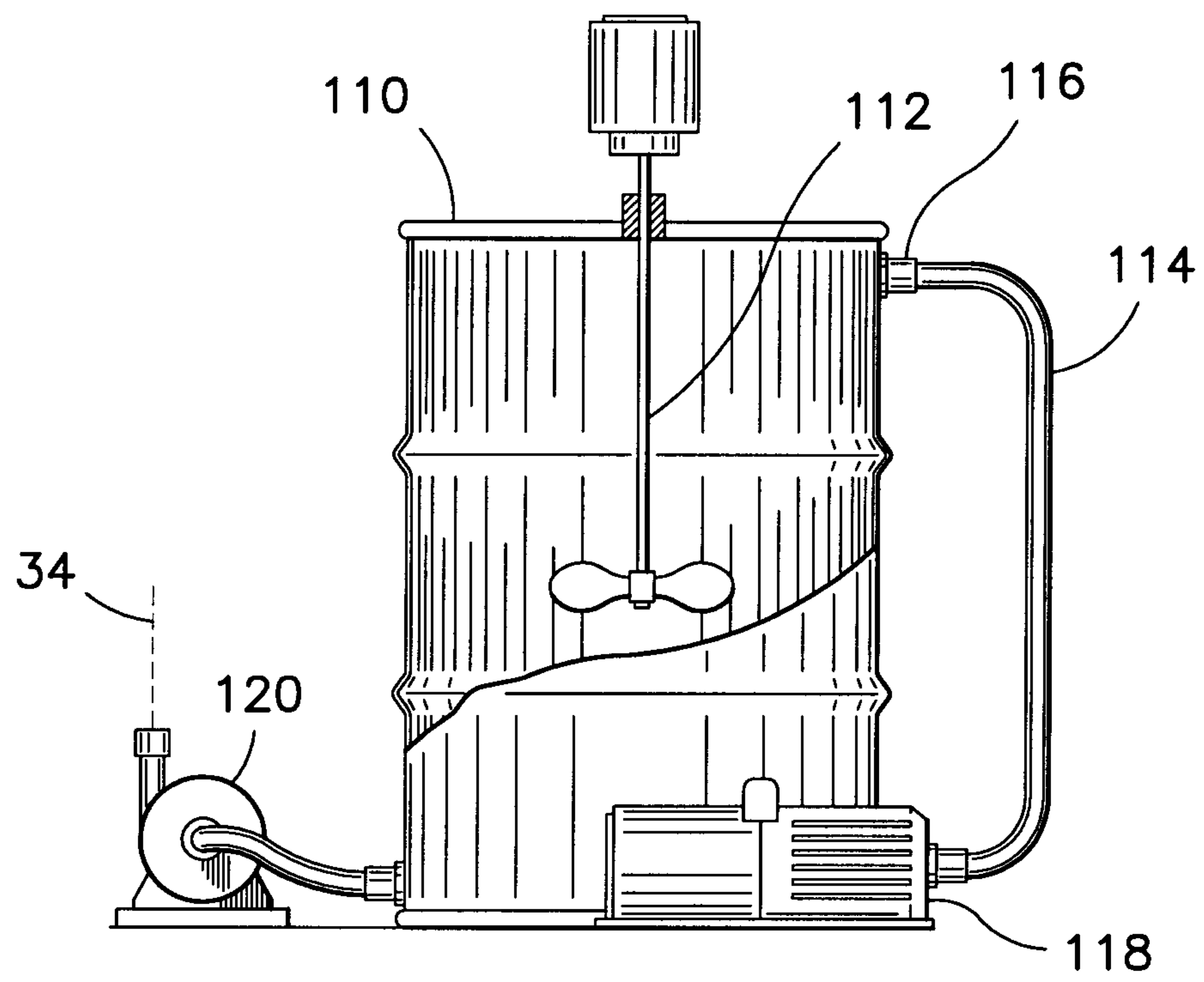


FIG. 4

