

[54] **PNEUMATIC LABEL APPLICATION SYSTEM**

[72] Inventor: Anton Sauer, Baldwin Park, Calif.

[73] Assignee: Avery Products Corporation, Marino, Calif.

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[51] Int. Cl. B32b 31/04, B32b 31/10

[58] Field of Search 156/361, 384-388, 156/540-542; 99/251; 141/7

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Primary Examiner—Benjamin A. Borchelt

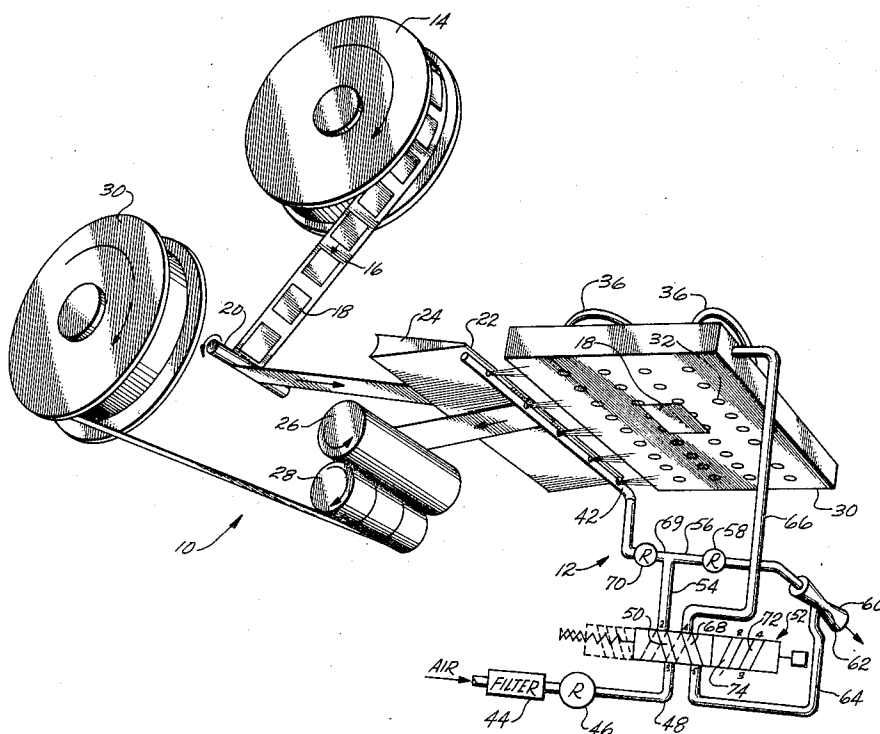
Assistant Examiner—James M. Hanley

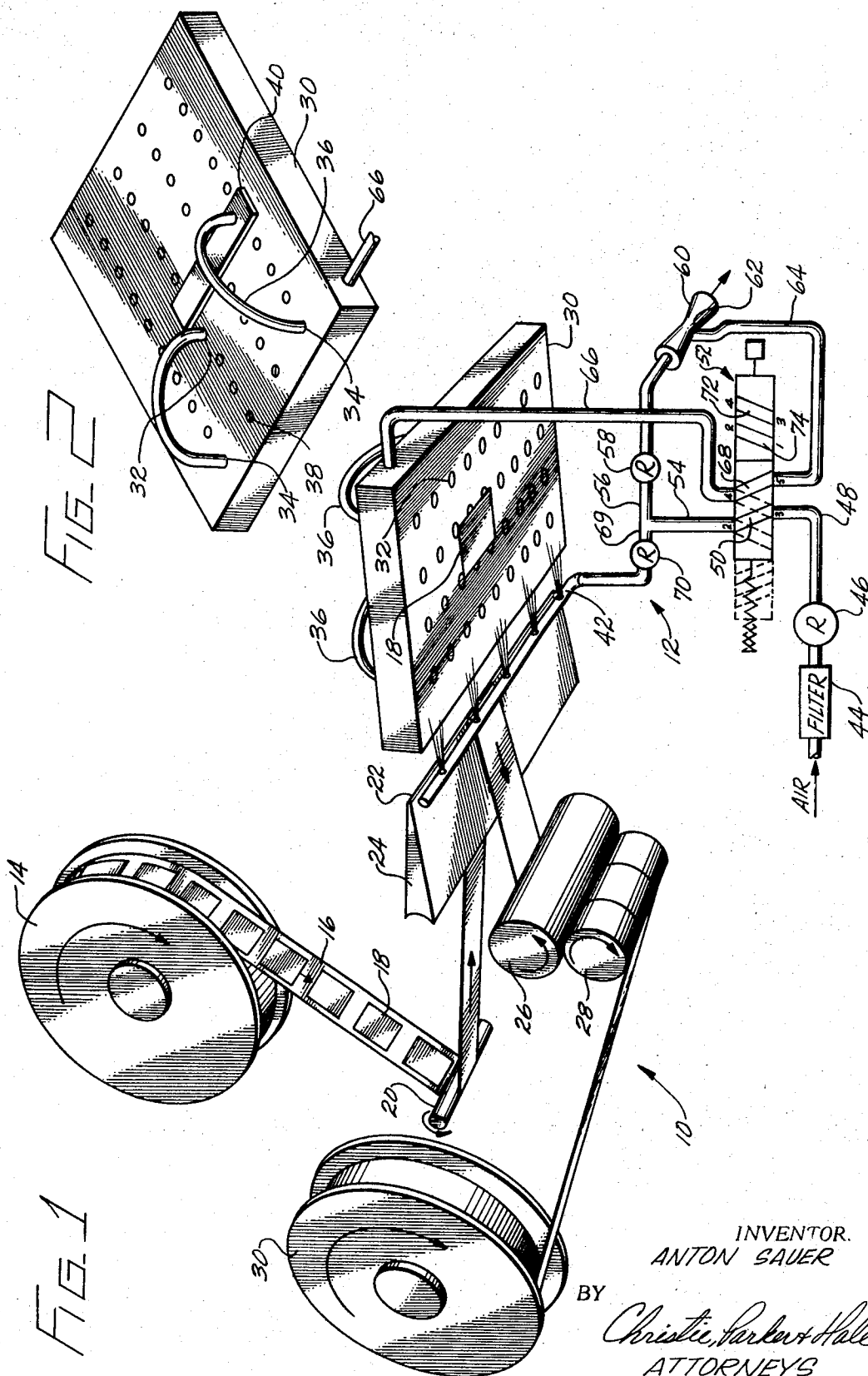
Attorney—Christie, Parker & Hale

[57] **ABSTRACT**

A venturi provided with a steady or intermittent high-pressure flow of a gaseous medium, such as air, creates a suction potential at a perforated surface to attract and register a pressure-sensitive label dispensed from a carrier web. The label is subsequently transferred onto a substrate by a reverse high-pressure flow of the gaseous medium through the perforated surface in the direction of the substrate.

12 Claims, 5 Drawing Figures





INVENTOR.
ANTON SAUER

BY

Christie, Parker & Hale
ATTORNEYS

FIG. 3

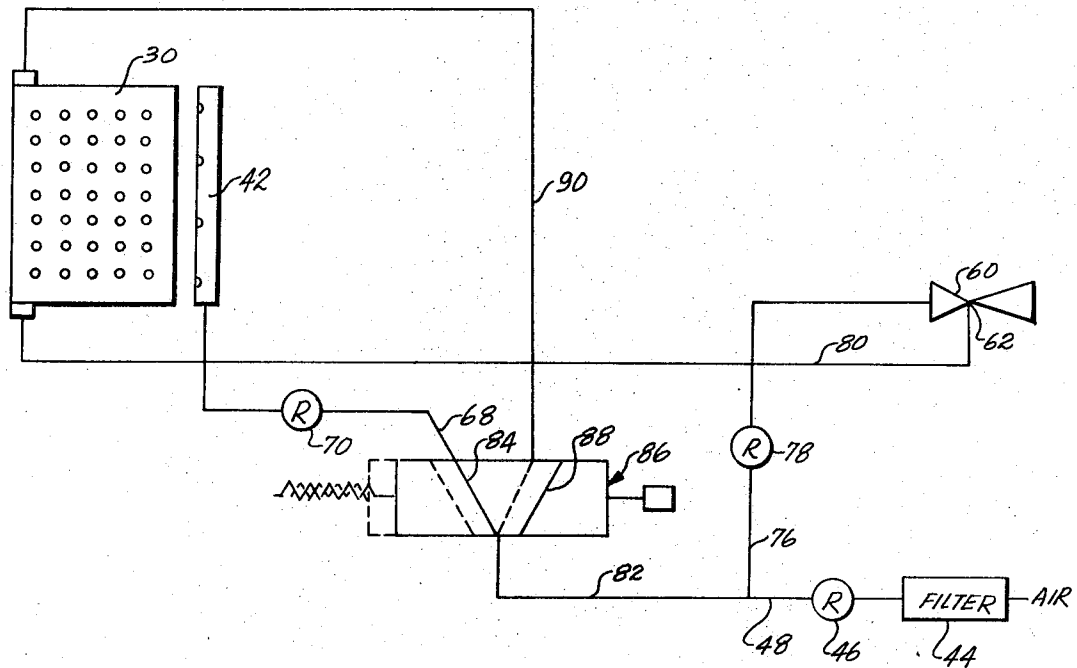


FIG. 4

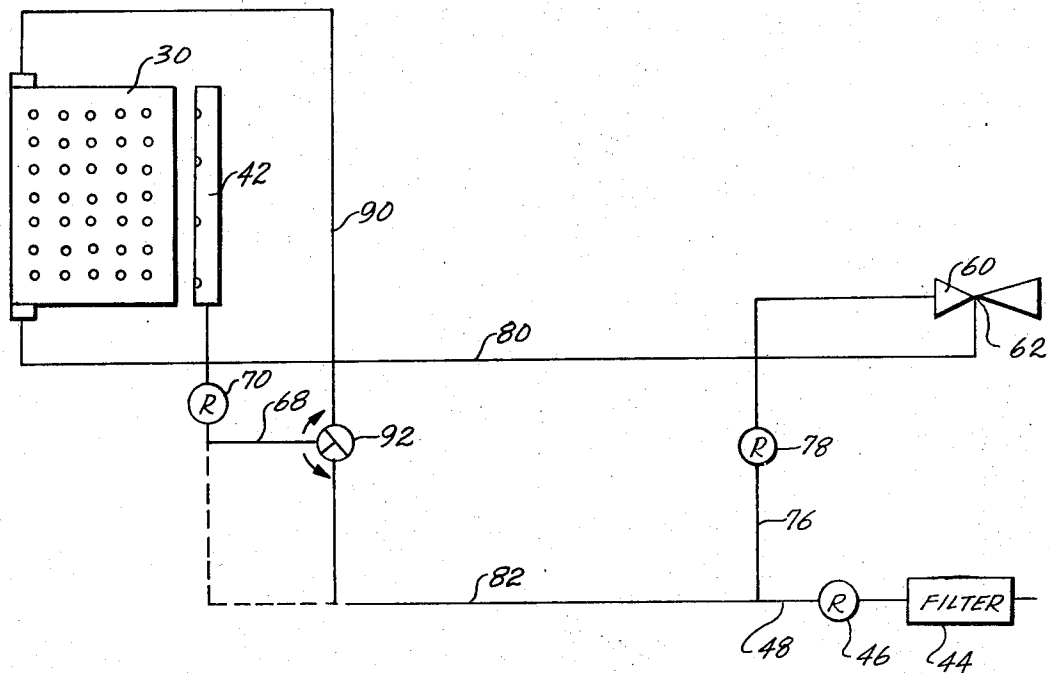
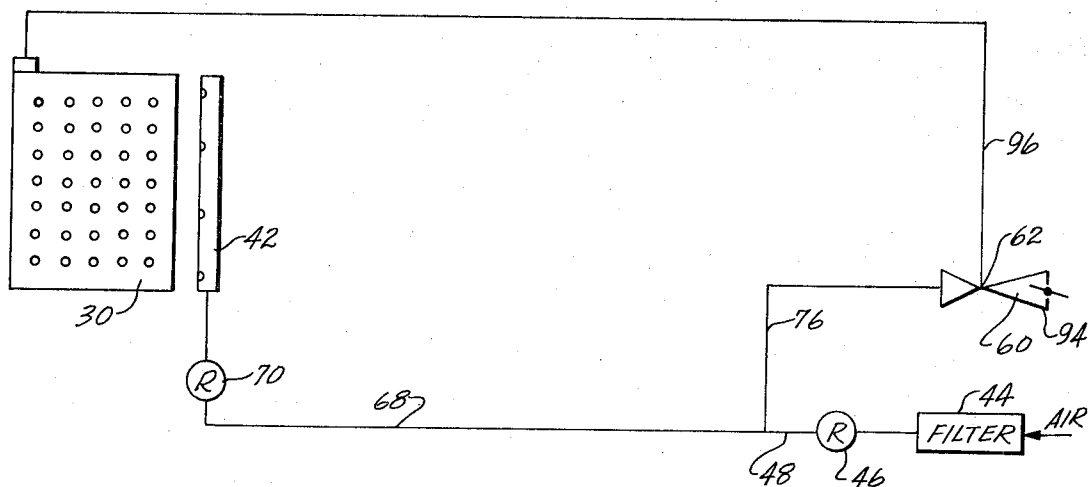


FIG. 5



PNEUMATIC LABEL APPLICATION SYSTEM

BACKGROUND OF THE INVENTION

The present invention relates to the pneumatic vacuum register of a pressure-sensitive label onto a perforated surface from which the label is subsequently transferred onto a substrate by an opposed flow of a gaseous medium through the perforated surface.

The advent of the pressure-sensitive label represented a new era in labeling procedures. A pressure-sensitive label can be easily released from a carrier web and registered on an applicator without the slow and rather cumbersome systems previously required for activating an adhesive on a label.

As this improvement provided higher available label application rates, efforts were made to minimize the amount of mechanical motion required to register a released label and transfer it onto a substrate to be labeled.

Systems which combine vacuum action register and a positive air jet transfer of a label have been proposed. In one, a constant suction is made available at a perforated grid to which a dispensed label is registered. Upon receipt of the label an opposed flow of air is applied to overcome the applied vacuum. This causes the label to leave the surface of the grid and transfer to the substrate.

Another provides an alternate vacuum and positive airflow mechanisms. A vacuum is first applied to attract the dispensed label. The vacuum is then terminated and supplanted by a reverse positive airflow to force the label to the substrate on which the label is to be applied.

While both systems are functional, they employ fairly cumbersome mechanical mechanisms including motor driven fans for creating suction and providing positive pressure air jets. These mechanical systems have slow response times and are subject to frequent breakdowns and in many instances are the slowest link in the chain of actions which must occur in dispensing a label.

SUMMARY OF THE INVENTION

It has now been found that a dispensed pressure-sensitive label can be more accurately and rapidly registered onto a perforated surface by applying a suction potential to at least one of the perforations of a magnitude sufficient to attract and hold the label, the suction being generated by the positive high-pressure flow of a gaseous medium through a gas flow conduit containing an inlet orifice and a suction orifice in open connecting communication with at least one of the perforations of the perforated surface. The registered label is held on the surface of the grid by a differential vacuum force for subsequent transfer to a substrate. Label transfer to a substrate is accomplished by superseding the vacuum force with an opposed flow of a high-pressure gaseous medium through at least one of the perforations in contact with the label.

This may be conveniently accomplished with a minimum of mechanical action using pneumatic system in which the positive flow of high-pressure gaseous medium is initially provided to a venturi to generate the suction potential required to register the label onto the perforated surface. To transfer the label, the flow of the gaseous medium is switched to flow directly through the perforated surface to supplant the vacuum and thereby drive the registered label from the perforated surface to the substrate to which the label is to be transferred.

Alternatively, part of a source of a high-pressure gaseous medium may be intermittently applied to the grid to transfer a registered label onto a substrate while maintaining a constant vacuum potential for the grid by a continuous flow of part of the available high-pressure gaseous medium through the venturi.

Label register onto the perforated surface may also be assisted by providing as part of the applicator system a perforated projection tube positioned below the plane at which the label is dispensed. The flow of a gaseous medium through the projection tube provides lift to the dispensed label and

materially aids in cancelling local variations in surrounding air conditions to maximize accuracy in label register.

DRAWINGS

FIG. 1 is a perspective representation of a label applicator system which employs alternate venturi created suction label register and positive air flow label transfer.

FIG. 2 is an illustration of the upper portion of the perforated surface of FIG. 1 illustrating the manifold system and conduits utilized in registering and transferring a label.

FIG. 3 is a schematic representation of an alternate pneumatic system for continuously providing a vacuum potential for the perforated surface while intermittently applying a positive flow of a gaseous medium to release a registered label from perforated surface for transfer to a substrate.

FIG. 4 is a schematic representation of another pneumatic system for maintaining a constant vacuum potential and an essentially constant positive pressure label register assist in conjunction with the intermittent application of a positive high-pressure flow of a gaseous medium to cause a registered label to transfer onto a substrate.

FIG. 5 is a schematic representation of another pneumatic system for employing vacuum register and positive airflow transfer of a label.

DESCRIPTION

According to the invention, there is provided a label applicator system employing a vacuum label register

With reference now to FIG. 1, a composite labeling system employing the pneumatic vacuum applicator of this invention comprises, generally, a label-dispensing system 10 and the pneumatic vacuum label applicator 12.

The nature of the label-dispensing system 10 is not narrowly critical, but should preferably provide a means to dispense a pressure-sensitive label and the like from a release coated carrier web with a minimum of mechanical actions. A convenient system employs a dispensing reel 14 which serves as the reservoir for release coated carrier web 16 having applied thereto labels 18 which will readily release from its surface. To dispense a label, the web 16 is typically drawn past idler roll 20 over the relatively sharp edge 22 of dispensing blade 24 by means of drive roll 26 operating in cooperation with pinch roll 28. The web from which the labels have been released is generally accumulated on takeup reel 30.

The fluid label applicator 12 employed, in accordance with the practice of this invention, consists of a perforated surface 30 having a plurality of perforations 32 which commonly and/or separately serve as suction ports to register label 18 onto the perforated surface and airflow passages for projecting the registered label 18 from the perforated grid onto the substrate to which the label is to be transferred.

The number of available perforations activated for attracting a dispensed label is not narrowly critical and will generally vary depending on the label stock. Accordingly, the surface provided is dimensioned to accommodate wide variety of label sizes and has available sufficient perforations 32 to allow tailoring of the grid to meet the variables associated with any given label to be registered and transferred onto a substrate.

The manner of activating the perforations for label register may be more particularly illustrated with reference to FIG. 2. The perforated surface is provided with at least one manifold having a multiplicity of ports 34 where a suction and/or airflow may be, as desired, applied to the perforations 32 employed for registering and transferring a given label stock. The utilized perforations 32 are serviced from manifold ports 34 through conduits 36. The manifold ports which are not in use are plugged, typically, with capscrews 38. While one manifold may be conveniently used to provide both vacuum and airflow functions through common conduits 36 and perforations 32, it is equally convenient to employ a dual manifold, one manifold for applying a suction potential and a second manifold for positive high-pressure gas flow through separate conduits and

perforations. One manifold port 34 and conduit 36 may also service a number of perforations 32 using a suitable duct 40.

Returning now to FIG. 1, when the label is light or fairly flexible, or where spurious air currents exist at the labeling site, the labeling system may also be provided with a projection tube 42 positioned below the label dispense plant which is suitably perforated to provide a positive flow of a gaseous medium at least during label register. Projection tube 42 provides some lift to a dispensed label and aids in cancelling out spurious air currents which can hinder accurate label register. Projection tube 42, however, may be conveniently eliminated where the labels are fairly rigid or where the label dispensing mechanism under operating conditions, provides a constant pitch attitude to the dispensed label for accurate register on perforated surface 30.

As indicated, however, projection tube 42 does provide a most convenient assist to overcoming or cancelling variations in the labeling environment such as airflow patterns adjacent to the labeling operation as well as changes in ambient conditions.

Once label 18 is dispensed from the carrier web it is, with or without use of projection tube 42, attracted to the surface 30 by means of an available suction potential at one or more perforations 32 and held in place by means of a vacuum generated when the activated ports are sealed by the registered label.

The suction provided for registering a label 18 onto the surface of perforated surface 30 is generated by providing a high-pressure flow of a gaseous medium, usually air, through a gas flow defining conduit; such as a venturi, which contains a gas inlet orifice and a suction orifice. The suction orifice is in connecting communication with manifold perforated surface 30 and provides suction potential for selected perforations 32 through conduits 36 when there exists a high-pressure flow of the gaseous medium to the conduit.

The pressure of the gaseous medium supplied to the gas flow defining conduit is not narrowly critical but at least sufficient to provide by flow through the gas flow defining conduit a suction potential sufficient to attract and hold a label on the perforated surface. The gaseous medium may be conveniently supplied from a cylinder, an on site compressor or any other source capable of providing the gaseous medium at the desired pressure.

While the suction or vacuum potential for label register may be generated by a variety of fluid logic circuits, a convenient system is illustrated in FIG. 1. With reference thereto, a high-pressure gaseous source, such as air, is generally filtered by filter 44 and provided with a constant supply pressure by regulator 46. The gaseous media flows through conduit 48, port 50 of control valve 52 (when the valve is in the 2-3 position), conduit 54, conduit 56, optionally through regulator 58, and to the orifice of venturi 60 and across a suction orifice at the throat 62 of venturi 60, creating thereby a vacuum potential. The vacuum potential made available by the flow of a gaseous media is provided to the manifold of perforated surface 30 by conduits 64 and 66 operating in conjunction with port 68 of control valve 52 when port 68 is in the 4-5 position.

When projection tube 42 is employed a flow of the supplied gaseous medium is provided thereto by conduit 69 the flow being regulated, when desired, by regulator 70 or in the alternative, by a suitable valve (not shown).

When the label is to be transferred to a substrate, a suitable mechanism (not shown) actuates control valve 52 to position port 72 to connect conduits 48 and 66 by adopting the 3-4 position and to vent conduits 48 and 66 by adopting the 3-4 position and to vent conduit 54 through open port 74 when in the 1-2 position. By this action the flow of the high-pressure gaseous medium diverted directly to the manifold of perforated surface 30 where in cooperation with conduits 36 and ports 32 the registered label is blown from the surface of the perforated surface and transferred to the substrate (not shown).

When the next label function is called for, a suitable activator means (not shown) returns control valve 52 to its normal position to generate the suction potential required to register a freshly supplied label 18.

Although control valve 52 has been shown as a solenoid valve in which functional fluid flow is controlled by lateral movement of the valve, any other ported valve means may be conveniently used. For instance, a rotating valve may also be used and in this respect, need only rotate a few degrees to provide proper alignment of ports to suitably connect the conduits for alternate vacuum or positive airflow functions.

As an alternate to the basic label applicator system of this invention in which the vacuum is supplanted by a positive pressure gas flow to perforated surface 30 for transferring a label, there may be provided a system in which a constant vacuum potential is made available for label register and intermittent injection of a positive flow of a gaseous medium to perforated surface 30 are used to transfer a label to a substrate.

Suitable systems for maintaining a continuous vacuum potential are illustrated in FIGS. 3 and 4. With reference now to FIG. 3, the filtered regulated high-pressure gaseous medium continuously flow through conduit 76 to venturi 60 as modulated where desired by regulator 78 or a suitable valve (not shown). Conduit 80 connects the manifold of perforated surface 30 to the throat 62 of venturi 60. As a continuous flow of the gaseous medium is maintained through venturi 60 there is provided at throat 62 a continuous vacuum potential for perforated surface 30. When projection tube 42 is employed in the system, a portion of the supply of gaseous medium is provided through a combined cooperation of conduits 82 and 68 as connected by port 84 of solenoid valve 86. When transfer of a label is called for, valve 86 is actuated to move port 88 to align conduit 90, which communicates with the manifold of perforated surface 30, with conduit 82. This action provides positive flow of air to transfer the label and discontinues the flow of air to projection tube 42, without interrupting the vacuum potential available as provided by the constant flow of a gaseous medium through venturi 60.

FIG. 4 illustrates a similar system in which airflow to projection tube 42 is essentially maintained in continuous operation. Again, a vacuum potential is continuously maintained in the manner described for FIG. 3. There is, however, provided a T-valve 92 which alternately, by the position of the T, provides a flow of the gaseous medium to projection tube 42 alone or to projection tube 42 and the manifold of perforated surface 30. The only interruption in the flow of air to perforated tube 42 occurs during rotation of valve 92. Valve 92, in the alternative, can be provided as a single port rotational or solenoid valve and flow to perforated tube 42 continuously maintained by bypassing valve 92 as illustrated by the dashed lines. Valve 92 would then serve only to supply the indexing gaseous medium to the manifold of perforated surface 30 when label indexing is called for.

FIG. 5 may be used to illustrate another pneumatic system for providing alternate vacuum potential or air flow at surface of perforated surface 30. In this arrangement the suction orifice serves a dual function of alternately providing suction potential at the perforations and a positive flow of the high-pressure gaseous medium to the perforations. The regulated supply of filtered gaseous medium, typically air, is provided by conduits 48 and 68, as regulated by regulator 70, to projection tube 42 and by conduits 48 and 76 to venturi 60. Venturi 60 is provided with a suitable valve 94, such as the butterfly valve shown, which is maintained in either an open or closed condition. When open, the gaseous medium flows through venturi 60 and valve 94 creating a vacuum at throat 62, the vacuum being applied to the perforated surface 30 by conduit 96 to register a label. When transfer of a label is called for, valve 94 is closed and the flow of the high-pressure gaseous medium diverted through the suction orifice in throat 62 of venturi 60 and to activated area of perforated surface 30 through conduit 96.

The label applicator mechanisms of this invention may be operated by any suitable control mechanism governed by some sensing device which senses either the availability of the label for dispensing the proper positioning of a substrate for label indexing or both.

While air is a suitable gaseous medium for operating the pneumatic label applicator system of this invention there may be other inner gaseous medium used such as nitrogen, carbon dioxide and the like.

As the label applicator system of this invention are based on pneumatic driving forces, label functions can be carried out with a minimum of mechanical motions. As a consequence, it has been found that labeling rate can be appreciably increased and down time due to mechanical malfunctions virtually eliminated. In addition, the size of equipment required to carry out the labeling operation is significantly reduced and the system highly compact.

What is claimed is:

1. A pneumatic pressure-sensitive label applicator system which comprises:

- a. a perforated surface having a plurality of open perforations and adapted to be disposed in label receiving relation to a dispensing means for pressure sensitive labels;
- b. a source of a high-pressure gaseous medium;
- c. a gas flow conduit including an inlet orifice and a suction orifice which cooperate to provide a suction sufficient to register the nonadhesive surface of a dispensed pressure sensitive label on said perforated surface by the flow of the high-pressure gaseous medium through the inlet orifice;
- d. means providing flow communication between the suction orifice and said perforations, said means selectively connecting perforations disposed above a registered label without being connected to perforations disposed outside the area of the label;
- e. means to interconnect the source of high-pressure gaseous medium with the orifice inlet; and
- f. control means operable to interconnect the source of high-pressure gaseous medium with perforations disposed above a registered label.

2. A pneumatic pressure-sensitive label applicator system as claimed in claim 1 in which the gas flow conduit is a venturi.

3. A pneumatic pressure-sensitive label applicator system as claimed in claim 1 in which the control means terminates the flow of the high-pressure gaseous medium to the inlet orifice of said gas flow conduit when operated to interconnect the source of the high-pressure gaseous medium with perforations disposed above a registered label.

4. A pneumatic pressure-sensitive label applicator system as claimed in claim 2 in which the control means terminates the flow of the high-pressure gaseous medium to the inlet orifice of said gas flow conduit when operated to interconnect the source of the high-pressure gaseous medium with perforations disposed above a registered label.

5. A pneumatic pressure-sensitive label applicator as 55

claimed in claim 1 in combination with projection means adapted to project a dispensed label upwardly towards said perforated surface by the flow of the high-pressure gaseous medium therethrough.

6. A pneumatic pressure-sensitive label applicator system as claimed in claim 5 in which the projection means is a perforated tube adapted to be positioned below a plane at which a label is dispensed and provide a flow of the high-pressure gaseous medium in the direction of said perforated surface.

7. A pneumatic pressure-sensitive label applicator as claimed in claim 3 in combination with projection means adapted to project a dispensed label upwardly towards said perforated surface by the flow of the high-pressure gaseous medium therethrough.

8. A pneumatic pressure-sensitive label applicator system as claimed in claim 7 in which the projection means is a perforated tube adapted to be positioned below a plane at which a label is dispensed and provide a flow of the high-pressure gaseous medium in the direction of said perforated surface.

9. A pneumatic pressure-sensitive label applicator system which comprises:

- a. a perforated surface having a plurality of open perforations and adapted to be disposed in label receiving relation to a dispensing means for pressure-sensitive labels;
- b. a source of a high-pressure gaseous medium;
- c. a gas flow conduit having an inlet orifice connected to the source of the high-pressure gaseous medium; an outlet opposed to said inlet orifice and a suction orifice, said gas flow conduit providing a suction sufficient to register the nonadhesive surface of a dispensed pressure-sensitive label on said perforated surface by the flow of the high-pressure gaseous medium through the inlet orifice and outlet;
- d. means providing flow communication between the suction orifice and said perforations, said means selectively connecting perforations disposed above a registered label without being connected to perforations disposed outside the area of the label; and
- e. control means to intermittently block the outlet of said gas flow conduit to divert a flow of a high-pressure gaseous medium through said suction orifice and perforations disposed above a registered label.

10. A pneumatic pressure-sensitive label applicator system as claimed in claim 9 in which the gas flow conduit is a venturi.

11. A pneumatic pressure-sensitive label applicator as claimed in claim 9 in combination with projection means adapted to project a dispensed label upwardly towards said perforated surface by the flow of the high-pressure gaseous medium therethrough.

12. A pneumatic pressure-sensitive label applicator system as claimed in claim 11 in which the projection means is a perforated tube adapted to be positioned below a plane at which a label is dispensed and provide a flow of the high-pressure gaseous medium in the direction of said perforated surface.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,645,832 Dated Feb. 29, 1972

Inventor(s) Anton Sauer

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

In Col. 2 at line 30 insert --in which the vacuum is created by a positive flow of a high pressure gaseous medium through a conduit containing an inlet orifice and a suction orifice to create a suction potential at the perforations of a perforated surface to attract and register a dispensed pressure sensitive label. The label is subsequently transferred onto a substrate by the reverse positive pressure flow of the gaseous medium through the perforated surface.--

Signed and sealed this 12th day of September 1972.

(SEAL)

Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents