(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 367 985 B1**

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **01.02.95** (51) Int. Cl.[6]: **B05B 7/16**, B05C 5/04

(21) Application number: **89118357.6**

(22) Date of filing: **04.10.89**

(54) **Nozzle attachment for an adhesive spray gun.**

(30) Priority: **07.11.88 US 268002**

(43) Date of publication of application:
16.05.90 Bulletin 90/20

(45) Publication of the grant of the patent:
01.02.95 Bulletin 95/05

(84) Designated Contracting States:
BE DE ES FR GB IT NL SE

(56) References cited:
EP-A- 0 222 379
EP-A- 0 333 902
WO-A-81/01670
DE-A- 2 553 664
GB-A- 1 587 898
US-A- 3 152 923
US-A- 4 185 981

(73) Proprietor: **NORDSON CORPORATION**
28601 Clemens Road
Westlake, OH 44145 (US)

(72) Inventor: **Scholl, Charles H.**
3699 Hermitage Drive
Duluth
Georgia 30136 (US)

(74) Representative: **Eisenführ, Speiser & Partner**
Martinistrasse 24
D-28195 Bremen (DE)

EP 0 367 985 B1

Description

This invention relates to a nozzle attachement for use in an apparatus for dispensing adhesive according to the preamble of claim 1 and an apparatus for spraying hot melt adhesive according to the preamble of claim 4.

Background of the Invention

Hot melt thermoplastic adhesives have been widely used in industry for adhering many types of products, and are particularly useful in applications where quick setting time is advantageous. One application for hot melt adhesive which has been of considerable interest in recent years is the bonding of non-woven fibrous material to a polyurethane substrate in articles such as disposable diapers, incontinence pads and similar articles.

One aspect of forming an appropriate bond between the non-woven layer and polyurethane substrate of a disposable diaper, for example, is to avoid loss of adhesive in the valleys or gaps formed in the irregular surface of the chopped fibrous or fluff-type material which forms the non-woven layer. If the adhesive is discharged onto the non-woven layer in droplet form, for example, a portion of the droplets can fall between the gaps in the surface of the fibrous, non-woven material. As a result, additional quantities of adhesive are required to obtain the desired bond strength between the polyurethane substrate and non-woven material.

This problem has been overcome in the prior art by forming hot melt thermoplastic adhesives in elongated, thin beads or fibers which are deposited atop the non-woven material and span the gaps in its irregular surface. Elongated beads or fibers of adhesive have been produced in prior art spray devices which include a nozzle formed with an adhesive discharge opening and one or more air jet orifices through which a jet of air is ejected. A bead of adhesive is ejected from the adhesive discharge opening in the nozzle which is then impinged by the air jets to attenuate or stretch the adhesive bead forming a thin fiber for deposition onto the substrate. Examples of spray devices of this type are disclosed in U.S. Patent Nos. 2,626,424 to Hawthorne, Jr.; 3,152,923 to Marshall et al; and, 4,185,981 to Ohsato et al.

In EP-A1-0 333 902 an apparatus is disclosed in which elongated adhesive fibers are formed in a spiral spray pattern by means of a rotary nozzle. Such design is relatively expensive to manufacture and difficult to operate.

From GB-A-1 587 898 it was known to atomize liquid products using a spray gun and jets of compressed air impinging against a jet of paint or other liquid. From this reference a person of ordinary skill learns of the pressures of the air used to atomize the liquid and of possible orientations of bores used to direct the compressed air towards the to be atomized fan of liquid material.

In applications such as the formation of disposable diapers, it is important to carefully control the spray pattern of adhesive fibers deposited onto the non-woven substrate in order to obtain the desired bond strength between the non-woven layer and polyurethane substrate using as little adhesive as possible. Improved control of the spray pattern of adhesive fibers has been obtained in prior art spray devices of the type described above by impacting the adhesive bead discharged from the nozzle with air jets directed substantially tangent to the adhesive bead. The tangentially applied air jets control the motion of the elongated fibers of adhesive formed from the adhesive bead ejected from the adhesive discharge opening in the gun nozzle, and confine the elongated fibers in a relatively tight, or compact, spiral pattern for application onto the substrate. Structure which produces a spiral spray pattern of adhesive fibers for deposition onto a substrate is disclosed, for example, in the '424 Hawthorne, Jr. patent and the '981 Ohsato et al patent mentioned above.

In order to produce a compact spiral spray pattern of adhesive fibers in the spray devices described above, it is important to ensure that the air jets are directed tangentially relative to the bead of adhesive ejected from the nozzle of the spray device. This requires accurate placement of the bores or passageways through which pressurized air is ejected from the nozzle or gun body of the spray device, which are typically on the order of about 0.38 to 0.51 mm (0.015 to 0.020 inches) in diameter. The boring or drilling of passageways having such a small diameter at the appropriate angles in the nozzle and/or gun body of prior art spray devices is a relatively expensive and difficult machining operation.

Many problems which prior art adhesive fiber spray systems have been overcome by the nozzle attachment disclosed in AU-B-15045/88 and entitled "Adhesive Spray Gun and Nozzle Attachment" which is assigned to the same assignee as this invention. The nozzle attachment of that invention is adapted to mount to the nozzle of a standard adhesive spray gun which is formed with an adhesive discharge opening connected to an adhesive passageway in the gun body and an air discharge opening connected to an air passageway in the gun body. The nozzle attachment is a one-piece annular plate formed with a boss extending outwardly from a first surface of the plate and a nozzle tip extending outwardly from a second surface of the plate. A throughbore is formed between the boss and nozzle tip which communicates with

the adhesive discharge opening in the nozzle of the gun body when the plate is mounted to the nozzle. Heated hot melt adhesive is transmitted through the adhesive passageway in the gun body, out its adhesive discharge opening and then into the throughbore in the plate. The adhesive is ejected as a bead through the nozzle tip toward a substrate.

The annular plate is formed with a V-shaped notch or groove which extends from its first surface having the boss toward the second surface formed with the nozzle tip. The V-shaped groove is provided to assist in drilling air jet bores in the plate through which jets of pressurized air are directed at an angle of about 30° and tangent to the adhesive bead ejected from the nozzle tip. The annular V-shaped groove is formed with two sidewalls, one of which is disposed substantially perpendicularly to the longitudinal axis of each of the air jet bores. This construction permits the drill bit to contact the plate at the surface of one of the sidewalls in the V-shaped groove which is substantially perpendicular to the axis of movement of the drill bit, i.e., at an angle of abut 30° to the first and second surfaces of the plate. As a result, sliding of the drill bit relative to the plate is minimized during the drilling or boring operation which helps locate the air jets bores at the desired angle in the plate.

While the nozzle attachment disclosed in AU-B-15045/88 solves many of the problems of prior art devices designed to spray adhesive fibers, some deficiencies have been discovered in certain applications. It has been found that the formation of a groove in the relatively thin nozzle attachment or plate can result in deflection of the nozzle attachment during operation. This deflection can form a leakage path at the interface between the nozzle attachment and nozzle of the spray gun. In some instances, it has been found that hot melt adhesive entering the nozzle attachment has flowed along this leakage path and been deposited in the V-shaped groove where the air flows into the air jet bores. This can clog the air jet bores and restrict the flow of air necessary to attenuate or stretch the adhesive bead to form adhesive fibers.

Another potential problem with the nozzle attachment of AU-B-15045/88 is that the air jet bores are drilled in the plate or nozzle attachment from the inner side or surface with contacts the nozzle toward the outer side of surface formed with the nozzle tip. Because the air jet bores are so small in diameter, i.e. 0.38 to 0.51 mm (0.015 to 0.020 inches), it is possible for the drill bit to drift or move off line in the course of passing through the nozzle attachment from its inner side to the outer side. As a result, the discharge outlet of the air jet bores at the outer side of the nozzle attachment might be slightly out of position and this can affect the efficiency of the nozzle attachment in forming adhesive fibers because the air jets may not impact the adhesive bead precisely tangentially thereto.

The nozzle tip of the nozzle attachment disclosed in AU-B-15045/88 protrudes from the outer surface thereof when mounted to the nozzle of the gun body, and extends outwardly from a mounting nut which secures the nozzle attachment to the nozzle of the spray gun. A cavity or space is thus formed between the nozzle tip and such mounting nut. When the spray gun is operated intermittently, it has been found that cut-off drool, i.e., adhesive remaining after the gun is shut off, can collect in the space or cavity between the nozzle tip and mounting nut. This cut-off drool might collect and partially block the discharge outlet of the air jet bores formed in the nozzle attachment, thus affecting the performance or the nozzle attachment in forming adhesive fibers. Additionally, the protruding nozzle tip is exposed and can be damaged if it contacts the target substrate or other object during operation of the spray gun.

Summary of the Invention

It is therefore among the objectives of this invention to provide a nozzle attachment for use in a spray gun for spraying hot melt adhesive in elongated beads or fibers onto a substrate which is relatively inexpensive to manufacture, which provides accurately located air jets to attenuate or stretch an adhesive bead to form adhesive fibers, which avoids leakage of adhesive from the spray gun, which is rugged in construction, which resists clogging with adhesive and which is readily installed on a standard spray gun to convert the spray gun to one capable of spraying hot melt adhesive in fiber form.

These objectives are accomplished in a nozzle attachment for a hot melt adhesive spray device having the features of claims 1 and 4, respectively This includes a gun body and a nozzle having an adhesive passageway and an air passageway. The nozzle attachment is a one-piece annular plate which is mounted by a cap or nut to the nozzle of the gun body. The nozzle attachment or plate is formed with a throughbore adapted to connect to the adhesive passageway in the nozzle, and a plurality of spaced air jet bores are formed in the plate which communicate with the air passageway in the nozzle. An adhesive bead is ejected from the throughbore in the plate which is impacted by air jets from the spaced air jet bores. The air jets are directed tangentially to the bead to both stretch the bead forming hot melt adhesive fibers, and to impart a spiral motion to the adhesive fibers so that they are deposited in a controlled spray pattern

upon a substrate.

The one-piece annular plate is formed with a boss extending outwardly from a first, inner surface of the plate, and a nozzle tip extending inwardly from a second, outer surface of the plate toward its inner surface. A throughbore is formed between the boss and nozzle tip which communicates with the adhesive passageway in the nozzle when the plate is mounted thereto. Heated hot melt adhesive is transmitted through the nozzle and then into the throughbore in the plate from which it is ejected through a discharge outlet of the nozzle tip toward a substrate.

The annular plate of this invention is relatively thick from its inner surface to its outer surface in order to resist deflection with respect to the nozzle during operation of the spray gun. The inner surface of the plate is flat or planar except for the boss which extends outwardly therefrom. This inner surface forms an effective metal-to-metal seal with the mating surface of the nozzle of the spray gun when the plate is mounted thereto. As a result, adhesive transmitted from the nozzle into the throughbore of the plate is prevented from leaking at the interface therebetween.

The annular plate forming the nozzle attachment of this invention is formed with an annular, V-shaped notch or groove which extends inwardly from the outer surface of the plate toward its inner surface. This V-shaped groove is provided to assist in the drilling operation of the air jet bores through which jets of pressurized air are directed from the air passageway in the nozzle, through the plate and then into contact with the adhesive bead ejected from the discharge outlet of the nozzle tip.

In the presently preferred embodiment, each of the spaced air jet bores is drilled at an angle of approximately 30° with respect to the longitudinal axis of the throughbore in the plate from which the adhesive bead is ejected. In order to assist in drilling the air jet bores at this angle, the V-shaped notch or groove at the outer surface of the nozzle attachment forms two sidewalls. One of the sidewalls is oriented substantially perpendicularly to the longitudinal axis of each of the air jet bores. The other sidewall forms the outer surface of the nozzle tip such that the discharge outlet of the nozzle tip is substantially coplanar with the outer surface of the plate. The sidewall of the V-shaped groove oriented perpendicularly to the longitudinal axis of the air jet bores permits the drill bit to contact the plate at a surface which is substantially perpendicular to the axis of movement of the drill bit even though the drill bit is moved at a 30° angle with respect to the outer surface of the plate.

The air jet bores formed in the nozzle attachment of this invention are drilled by movement of a drill bit from the outer surface of the nozzle attachment where the V-shaped groove is formed, toward the inner surface of the nozzle attachment which contacts the nozzle. As mentioned above, it is important that the outlet of the air jet bores be precisely located so that the air jets discharged therefrom tangentially impact the adhesive bead discharged from the nozzle tip of the nozzle attachment. Because the drilling operation begins at the outer surface of the nozzle attachment, the location of the outlet of the air jet bores at such outer surface can be precisely controlled. Any drift of the drill bit in moving through the nozzle attachment or plate has no effect on the location of the outlet of the air jet bores at the outer surface of the plate. This had sometimes presented a problem in the machining of the nozzle attachment disclosed in AU-B-15045/88 wherein the drilling operation proceeded from the inner surface of the plate toward the outer surface.

In a presently preferred embodiment, the spaced air jet bores are also formed in the plate at an angle relative to the outer periphery of the throughbore and the adhesive bead ejected therefrom. The longitudinal axis of each air jet bore is oriented at an angle of approximately 10° with respect to a vertical plane which passes through the longitudinal axis of the throughbore in the plate and the center of such air jet bore at the V-shaped groove in the plate. As a result, the jets of pressurized air ejected from the spaced air jet bores impact the adhesive bead discharged from the nozzle tip of the plate at its outer periphery so as to impart a rotational movement to the bead. The adhesive bead is attenuated or stretched into elongated fibers upon impact with the air jets, and these fibers are then rotated by the air jets in a spiral motion to control the width of the spray pattern applied to the substrate.

In the presently preferred embodiment, an annular recess is formed in the nozzle attachment or plate which extends inwardly at the peripheral edge of the plate from its outer surface toward the inner surface. This annular recess forms a seat which receives the mounting nut or cap which mounts the nozzle attachment to the nozzle of the spray gun. Preferably, the outer surface of the nozzle attachment and the discharge outlet of the nozzle tip are coplanar with the mounting cap or nut when the nozzle attachment is mounted to the spray gun nozzle.

This construction has two advantages. First, there is no space or cavity formed between the mounting nut and nozzle tip in which cut-off drool or strands of adhesive could collect to block the air jet bores. This had been a problem in the aforementioned patent application Serial No. 07/041,712 wherein a gap was formed between the nozzle tip and mounting nut. Secondly, the mounting nut, the

outer surface of the nozzle attachment and the discharge outlet of the nozzle tip are all coplanar. This prevents the nozzle tip from contacting the substrate or another object during separation of the spray gun where it could be damaged.

The nozzle attachment or plate of this invention provides an economical means to convert a standard spray gun into one in which hot melt adhesive may be discharged in elongated strands or fibers for applications such as bonding the non-woven and polyurethane layers of disposable diapers or other hygienic articles. The construction of the nozzle attachment or plate prevents leakage of adhesive at its interface with the nozzle, facilitates the accurate drilling of air jet bores so that the adhesive bead discharged from the spray device is consistently formed into elongated fibers and resists clogging from build-up of cut-off drool. The nozzle attachment or plate is easily removed from the spray gun and replaced with another nozzle attachment of different size to accommodate different applications and/or different spray guns.

Detailed Description of the Drawings

The structure, operation and advantages of the presently preferred embodiment of this invention will become further apparent upon consideration of the following description, taken in conjunction with the accompanying drawings, wherein:

Fig. 1 is a cross sectional view of a spray gun incorporating the nozzle attachment herein with a schematic view of a manifold mounted to the spray gun;

Fig. 2 is an enlarged cross sectional view of the nozzle attachment herein showing an adhesive bead impacted by air jet streams; and

Fig. 3 is a top plan view of the nozzle attachment shown in Fig. 2.

Detailed Description of the Invention

Referring now to Fig. 1, an adhesive spray device 10 is illustrated comprising a gun body 12 having a nozzle 14 connected at one end, and an adhesive manifold 16 and air manifold 17 mounted to the gun body 12. The air manifold 17 is mounted to the adhesive manifold 16 by two or more screws 19, each of which extend through a spacer 21 extending between the manifolds 16, 17. The nozzle 14 supports a nozzle attachment 18 from which a bead of heated hot melt adhesive is discharged and formed into a thin, elongated bead or fiber which is rotated in a compact spiral spray pattern onto a substrate, as discussed in detail below. The structure of the gun body 12 and manifolds 16, 17 are substantially identical to the Model H200 spray gun manufactured and sold by the assignee of this invention, Nordson Corporation of Amherst, Ohio. These elements form no part of the invention per se and are thus discussed only briefly herein.

As shown in Fig. 1, the upper portion of gun body 12 is formed with an air cavity 20 which receives the upper end of a plunger 22 mounted to a seal 24. The seal 24 is slidable within the air cavity 20 and provides an airtight seal along its walls. A collar 26 is mounted to the upper end of gun body 12, such as by bolts 28, which is formed with a throughbore defining an inner, threaded wall 30. The collar 26 receives a plug 32 having external threads which mate with the threaded wall 30 of the collar 26. The plug 32 is hollow and a spring 34 is mounted in its interior which extends between the top end of the plunger 22 and the head 36 of plug 32 having a screw slot 38. A lock nut 40 is threaded onto the plug 32 into engagement with the top edge of the collar 26.

The plug 32 is rotatable with respect to the collar 26 to vary the force applied by the spring 34 against the top edge of plunger 22. In order to rotate the plug 32, the lock nut 40 is first rotated to disengage the collar 26 after which a screwdriver is inserted into the screw slot 38 in the head 36 of plug 32 and rotated to move the plug 32, and in turn increase or decrease the compression force of spring 34 within the collar 26.

The plunger 22 is sealed at the base of the air cavity 20 by a seal 42 which permits axial movement of the plunger 22 therealong. The plunger 22 extends downwardly through the gun body 12 from the air cavity 20 through a stepped bore 44 which leads into an adhesive cavity 46 having a seal 48 at its upper end and a plunger mount 50 at its lower end. A spring 51 carried around the plunger 22 is disposed within the adhesive cavity 46 and extends between the seal 48 and plunger mount 50 to hold the seal 48 in place. This seal 48 and seal 42 aid in guiding the axial movement of plunger 22 within the gun body 12.

The upper end of the nozzle 14 extends into the adhesive cavity 46 and is sealed thereto by an O-ring 52. The nozzle 14 is fixed to the gun body 12 by screws 54. The plunger 22 extends downwardly from the adhesive cavity 46 and plunger mount 50 into an adhesive passageway 56 formed in the nozzle 14 which terminates at an adhesive discharge opening 57. Immediately upstream from the adhesive discharge opening 57, the adhesive passageway 56 is formed with a conical-shaped seat 58 which mates with the terminal end 59 of the plunger 22. As discussed below, movement of the plunger 22 relative to the seat 58 controls the flow of heated hot melt adhesive ejected from adhesive passageway 56 through its adhesive discharge opening 57.

The nozzle 14 is also formed with a reduced diameter portion having external threads 60 which mate with internal threads formed in a cap 62. As described below, the cap 62 mounts the nozzle attachment 18 to the base of nozzle 14 in communication with the discharge opening 57 of adhesive passageway 56.

The gun body 12 is mounted to the adhesive manifold 16 by mounting bolts 64. In turn, the adhesive manifold 16 is supported on a bar 66 by a mounting block 68 connected to the adhesive manifold 16 with screws 70. As illustrated at the top of Fig. 1, the mounting block 68 is formed with a slot 72 forming two half sections 73, 75 which receive the bar 66 therebetween. A bolt 74 spans the half sections 73, 75 of the mounting block formed by the slot 72 and tightens them down against the bar 66 to secure the mounting block 68 thereto.

The adhesive manifold 16 is formed with a junction box 76 which receives an electric cable 78 to supply power to a heater 80 and an resistance temperature detector 82. The heater 80 maintains the hot melt adhesive in a molten state when it is introduced into the adhesive manifold 16 through an adhesive inlet line 84 from a source of hot melt adhesive (not shown). The adhesive inlet line 84 communicates through a connector line 86 formed in the gun body 12 with the adhesive cavity 46. An O-ring 85 is provided between the gun body 12 and adhesive manifold 16 at the junction of the adhesive inlet line 84 and connector line 86 to form a seal therebetween. Operating air for the plunger 22 is supplied through an inlet line 88 formed in the adhesive manifold 16 which is joined by a connector line 90 to the air cavity 20. The gun body 12 and manifold are sealed thereat by an O-ring 89.

The air manifold 17 is formed with an air inlet line 92 connected to an air delivery passageway 94 formed in the nozzle 14 which terminates in an annular chamber 95 at the base of the nozzle 14. O-ring seal 96 forms a fluid-tight seal between the nozzle 14 and air manifold 17 at the intersection of air inlet line 92 and air delivery passageway 94.

Referring now to the bottom of Fig. 1 and to Figs. 2 and 3, the nozzle attachment 18 of this invention is shown in detail. The nozzle attachment 18 is an annular plate having one side formed with a first or inner surface 102 and an opposite side formed with a second or outer surface 104 spaced from the inner surface 102. For purposes of the present description, the term "inner" refers to a direction toward the nozzle 14, and the term "outer" refers to a direction away from the nozzle 14 with the nozzle attachment 18 mounted to the nozzle 14 as shown in Fig. 1.

A boss 106 extends outwardly from the inner surface 102, and a nozzle tip 108 extends inwardly from the outer surface 104 in alignment with the boss 106. A throughbore 110 is drilled in the nozzle attachment 18 between the boss 106 and the nozzle tip 108 forming a discharge outlet 109 in the nozzle tip 108 which is coplanar with the outer surface 104 of nozzle attachment 18. The throughbore 110 has a diameter in the range of about 0.25 to 1.02 mm (0.010 to 0.040 inches), and preferably in the range of about 0.44 to 0.47 mm (0.0175 to 0.0185 inches).

An annular, V-shaped groove 112 is formed in the nozzle attachment 18 which extends inwardly from its outer surface 104 toward the inner surface 102. The annular groove 112 defines a pair of sidewalls 114, 116 which are substantially perpendicular to one another and intersect. In a presently preferred embodiment, the sidewall 116 is formed at approximately a 30° angle with respect to the planar outer surface 104 of the nozzle attachment 18, and the sidewall 114 forms the outer surface of the nozzle tip 108. As best shown in Figs. 2 and 3, six air jet bores 118 are formed in the nozzle attachment between the annular groove 112 and the inner surface 102, preferably at an angle of approximately 30° with respect to the longitudinal axis of the throughbore 110. The diameter of the air jet bores 118 is in the range of about 0.25 to 1.02 mm (0.010 to 0.040 inches), and preferably in the range of about 0.43 to 0.48 mm (0.017 to 0.019 inches).

The annular groove 112 facilitates accurate drilling of the air jet bores 118 so that they are formed at the desired angle relative to throughbore 110 and are precisely located at the desired position along the sidewall 116 of groove 112. By forming the sidewall 116 at a 30° angle relative to the upper surface 102 of nozzle attachment 18, a drill bit (not shown) can enter the annular groove 112 in the nozzle attachment 18 at a 30° angle relative to its outer surface 104, but contact the sidewall 116 formed by the annular groove 112 at a 90° angle. As a result, the drilling operation is performed with minimal slippage between the drill bit and nozzle attachment 18. This allows the outlet 119 of the air jet bores 118 to be precisely positioned at the sidewall 116 and oriented at the appropriate angles relative to throughbore 110. In the event of any drift of the drill bit as it moves through the nozzle attachment 18 to the inner surface 102, the inlet 121 of the air jet bores 118 may be slightly out of position but would nevertheless intersect the annular chamber 95 formed in nozzle 14.

As shown in Fig. 3, the longitudinal axis of each of the air jet bores 118 is angled approximately 10° with respect to a vertical plane passing

through the longitudinal axis of the throughbore 110 and the center of each such bore 118 at the annular groove 112. For example, the longitudinal axis 122 of air jet bore 118a is angled approximately 10° relative to a vertical plane passing through the longitudinal axis 124 of throughbore 110 and the center point 126 of bore 118a at the annular groove 112 in nozzle attachment 18. As a result, the jet of pressurized air 128 ejected from air jet bore 118a is directed substantially tangent to the outer periphery of the throughbore 110 and the adhesive bead 130 ejected therefrom, as described below.

Referred now to Figs. 1 and 2, the cap 62 is formed with an annular seat 132 which mates with an annular recess 134 formed in the peripheral edge of nozzle attachment 18 which extends inwardly from its outer surface 104. The cap 62 is threaded onto the lowermost end of the nozzle 14 so that the boss 106 on the inner surface 102 of nozzle attachment 18 extends within a seat 136 formed in the base of nozzle 14 at the adhesive discharge opening 57 of adhesive passageway 56. With the nozzle attachment 18 in this position, the inlet of each of the air jet bores 118 communicates with the annular air chamber 95 formed in the base of the nozzle 14 at the end of the air delivery passageway 94. No O-rings or other seals are required between the inner surface 102 of the nozzle attachment 18 and the nozzle 14 in order to create a fluid-tight seal therebetween and between the boss 106 and adhesive discharge opening 57. The nozzle attachment 18 is easily removed and replaced by another attachment of different size by rotating the cap 62 out of engagement with the nozzle 14.

The operation of the spray device 10 of this invention is as follows. Heated hot melt adhesive is introduced into the adhesive cavity 46 of the gun body 12 through the adhesive inlet line 84. Adhesive flows from the adhesive cavity 46 into the nozzle 14 through the adhesive passageway 56. With the terminal end 59 of the plunger 22 in engagement with the seat 58 formed at the end of the adhesive passageway 56, as illustrated in Fig. 1, the adhesive is not permitted to flow through the adhesive discharge opening 57 of the adhesive passageway 56 to the throughbore 110. In order to retract the plunger 22 and permit the flow of adhesive into the discharge opening 57, operating air is introduced through the operating air line 88 into the air cavity 20 in the gun body 12. This pressurized air acts against the seal 42 connected to the plunger 22 which forces the plunger 22 upwardly so that its terminal end 59 disengages the seat 58 at the lower end of the adhesive passageway 56. The plunger 22 is returned to its closed position by discontinuing the flow of air to the air cavity 20 allowing the return spring 34 to move the plunger 22 back into a seated position.

The flow of hot melt adhesive through the adhesive discharge opening 57 of adhesive passageway 56 is transmitted into the throughbore 110 of nozzle attachment 18 from which it is discharged through the discharge outlet 109 of nozzle tip 108 to form the adhesive bead 130. At the same time the adhesive bead 130 is formed and ejected from the nozzle attachment 18, pressurized air is directed through the air inlet line 92, air delivery passageway 94 and air chamber 95 to the air jet bores 118 formed in the nozzle attachment 18.

As best shown in Fig. 2, the air jet bores 118 are angled relative to the longitudinal axis of the throughbore 110 so that the jets of air 128 flowing therethrough impact the adhesive bead 130 substantially tangent to its outer periphery at a point spaced below the nozzle tip 108. The air ejected from the air jet bores 118 performs two functions. First, the jets of air 128 attenuate or stretch the adhesive bead 130 forming elongated strands or fibers of hot melt adhesive for deposit onto a substrate. Additionally, since the air jet bores 118 are oriented to direct jets of air 128 tangent to the outer periphery of the adhesive bead 130, the adhesive bead 130 and adhesive fibers formed therefrom are rotated in a compact spiral path toward a substrate. As a result, a controlled pattern of adhesive having a desired width is obtained on the substrate.

While the invention has been described with reference to a preferred embodiment, it will be understood by those skilled in the air that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope of the claims. Therefore, it is intended that the invention not be limited to the particular embodiment disclosed as the best mode contemplated for carrying out this invention, but that the invention will include all embodiments falling within the scope of the appended claims.

Claims

1. A nozzle attachment for use in an apparatus for dispensing adhesive which includes a gun body (12) having a nozzle (14) formed with an adhesive passageway (56) for conveying adhesive and an air delivery passageway (94) for conveying pressurized air, said nozzle attachment comprising:
a plate (18) formed with a first surface (102) on one side of said plate, and a second surface (104) on an opposite side of said plate;
said plate (18) being formed with a throughbore (110) extending between said first surface (102) and a discharge outlet (109) of a nozzle

tip (108), said plate (18) being adapted to mount to said nozzle (14) of said gun body (12) so that said throughbore (110) communicates with said adhesive passageway (56) in said nozzle (14) for receiving adhesive, the adhesive being transmitted through said throughbore (110) and being ejected from said discharge outlet (109) in said nozzle tip (108) to form an adhesive bead (130);
said plate (18) being adapted to mount to said nozzle (14) so that said each of a plurality of air jet bores (118) provided in said plate communicates with said air delivery passageway (94) in said nozzle (14) for transmitting air therethrough, and
said air jet bores (118) being formed at an angle with respect to said throughbore (110) in said plate (18) to direct pressurized air flowing therethrough substantially tangent to the outer periphery of said adhesive bead ejected from said adhesive discharge outlet (109) of said nozzle tip (108) to form said adhesive bead (130) in an elongated adhesive fiber and to impart a twisting motion to said elongated adhesive fiber for deposition in a spiral spray pattern on a substrate,
said attachment being characterized in that
said nozzle tip (108) is formed in said plate which extends inwardly from said second surface toward said first surface, said nozzle tip (108) having an outer surface and a discharge outlet (109) located in substantially the same plane as said second surface (104) of said plate (18);
said plate (18) is formed with an annular groove (112) extending inwardly from said second surface (104) toward said first surface (102), said annular groove (112) having a first portion (114) which forms said outer surface of said nozzle tip (108) and a second portion (116) which slopes relative to said throughbore (110) in said plate (18);
said air jet bores (118) extending from said annular groove (112) through said plate (18); and
said air jet bores (118) each having a longitudinal axis extending substantially perpendicular to said second portion (116) of said annular groove (112).

2. The nozzle attachment of claim 1 in which said air jet bores (118) in said annular plate (18) are formed at an angle of about 30° relative to the longitudinal axis of said throughbore (110) in said plate (18).

3. The nozzle attachment of claim 1 in which the longitudinal axis of each said air jet bores (118) forms an angle of approximately 10° relative to a vertical plane passing through the longitudinal axis of said throughbore (110), the pressurized air (128) ejected from said air jet bores (118) thereby being directed substantially tangent to the outer periphery of said adhesive bead (130) ejected from said discharge outlet (109) in said nozzle tip (108).

4. Apparatus for spraying hot melt adhesive comprising:
a gun body (12) having a nozzle (14) formed with an adhesive passageway (56) communicating with a source of adhesive and an air passageway (94) communicating with a source of pressurized air;
a plate (18) formed with a boss (106) extending outwardly from a first surface (102) of said plate, said plate being formed with a nozzle tip (108) and being provided with a throughbore (110) extending between said boss and the discharge outlet of said nozzle tip;
said plate (18) further being formed with a plurality of air jet bores (118) extending at an angle relative to the longitudinal axis of said throughbore (110) in said plate;
cap means (62) for mounting said plate to said nozzle (14) of said gun body (12) so that said throughbore (110) formed between said boss and said discharge outlet in said nozzle tip communicates with said adhesive passageway (56) in said nozzle and so that said air jet bores communicate with said air passageway (94) in said nozzle, said throughbore receiving adhesive from said adhesive passageway and ejecting the adhesive from said discharge outlet in said nozzle tip to form an adhesive bead (130), said air jet bores receiving pressurized air from said air passageway in said nozzle and directing the pressurized air substantially tangent to the outer periphery of said adhesive bead to form an elongated adhesive fiber and to impart a twisting motion to said elongated adhesive fiber to form a spiral spray pattern of the elongated adhesive fiber for deposition on a substrate,
said apparatus being characterized in that
a nozzle tip (108) extends inwardly from a second surface (104) of said plate toward said first surface, said nozzle tip having an outer surface and a discharge outlet (109) located in substantially the same plane as said second surface of said plate;
said plate (18) being formed with an annular groove (112) extending inwardly from said second surface (104) toward said first surface (102), said annular groove having a first portion (114) which forms said outer surface of said

nozzle tip and a second portion (116) which slopes relative to said throughbore (110) in said plate; and

said plate (18) being formed with a plurality of air jet bores (118) extending from said annular groove (112) through said plate, said air jet bores each having a longitudinal axis (122) extending substantially perpendicular to said second portion of said annular groove.

5. The apparatus of claims 4 in which said nozzle (14) of said gun body (12) is formed with a seat (136) which receives said boss (106) of said plate forming a fluid-tight seal therebetween.

6. The apparatus of claim 4 in which said plate (18) is annular and has a peripheral edge formed with a recess (134) which extends from said second surface (104) toward said first surface (102) of said plate (18).

7. The apparatus of claim 6 in which a portion of said nozzle (14) of said gun body (12) is formed with external threads (60), said cap means (62) comprising a cylindrical-shaped member formed with a throughbore defining an inner wall having threads adapted to mate with said external threads (60) of said nozzle (14), said cylindrical-shaped member being formed with an annular seat which mates with said recess formed in said annular plate to support said plate (18), said cylindrical-shaped member being threaded onto said nozzle (14) to place said throughbore (110) of said plate (18) in communication with said adhesive passageway (56) in said nozzle (14).

8. The apparatus of claim 4 in which said plate (18) is formed with a second annular groove extending inwardly from said first surface (102) toward said second surface (104) and intersecting one end of each of said air jet bores (118).

Patentansprüche

1. Düsenvorsatz zur Anwendung in einer Vorrichtung zum Verteilen von Kleber, die ein Pistolengehäuse (12) umfaßt mit einer Düse (14), die mit einem Kleberkanal (56) zum Befördern von Kleber und einem Luftverteilerkanal (94) zum Befördern von Druckluft ausgebildet ist, wobei der Düsenvorsatz umfaßt:

eine Platte (18), die mit einer ersten Fläche (102) auf einer Seite der Platte und einer zweiten Fläche (104) auf einer gegenüberliegenden Seite der Platte ausgebildet ist;

wobei die Platte (18) mit einer Durchbohrung (110) ausgebildet ist, die sich zwischen der ersten Fläche (102) und einer Austragsöffnung (109) eines Düsenmundstückes (108) erstreckt, die Platte (18) angepaßt ist, um so an der Düse (14) des Pistolengehäuses (12) befestigt zu werden, daß die Durchbohrung (110) mit dem Kleberkanal (56) in der Düse (14) zum Empfangen von Kleber in Verbindung steht, der Kleber durch die Durchbohrung (110) geführt und aus der Austragsöffnung (109) in dem Düsenmundstück (108) ausgestoßen wird, um einen Klebertropfen (130) zu bilden;

die Platte (18) angepaßt ist, um so an der Düse (14) befestigt zu werden, daß jede einer Vielzahl von in der Platte vorgesehenen Luftstrahlbohrungen (118) mit dem Luftverteilerkanal (94) in der Düse (14) zum übertragen von Luft dadurch in Verbindung steht, und die Luftstrahlbohrungen (118) in einem Winkel in bezug auf die Durchbohrung (110) in der Platte (18) ausgebildet sind, um dadurch strömende Druckluft im wesentlichen tangential zum äußeren Rand des von der Kleberaustragsöffnung (109) des Düsenmundstückes (108) ausgestoßenen Klebertropfens (130) zu richten, um den Klebertropfen (130) in eine längliche Klebfaser zu formen und der länglichen Klebfaser für die Auflage in einem Spiralsprühmuster auf eine Unterlage eine Verdrehungsbewegung zu geben, wobei der Vorsatz dadurch gekennzeichnet ist, daß

sich das in der Platte ausgebildete Düsenmundstück (108) von der zweiten Fläche zur ersten Fläche nach innen erstreckt, wobei das Düsenmundstück (108) eine äußere Fläche und eine Austragsöffnung (109) besitzt, die im wesentlichen in derselben Ebene wie die zweite Fläche (104) der Platte (18) gelegen sind;

die Platte (18) mit einer Ringnut (112) ausgebildet ist, die sich von der zweiten Fläche (104) zur ersten Fläche (102) nach innen erstreckt, wobei die Ringnut (112) ein erstes, die äußere Fläche des Düsenmundstückes (108) bildendes Teil (114) und ein zweites Teil (116) besitzt, das sich in bezug auf die Durchbohrung (110) in der Platte (18) neigt;

die Luftstrahlbohrungen (118) sich von der Ringnut (112) durch die Platte (18) erstrecken; und

die Luftstrahlbohrungen (118) jeweils eine Längsachse besitzen, die sich im wesentlichen senkrecht zu dem zweiten Teil (116) der Ringnut (112) erstreckt.

2. Düsenvorsatz nach Anspruch 1, bei dem die Luftstrahlbohrungen (118) in der Ringplatte (18) in einem Winkel von ungefähr 30° in

bezug auf die Längsachse der Durchbohrung (110) in der Platte (18) ausgebildet sind.

3. Düsenvorsatz nach Anspruch 1, bei dem die Längsachse jeder der Luftstrahlbohrungen (118) einen Winkel von ungefähr 10° in bezug auf eine durch die Längsachse der Durchbohrung (110) verlaufende vertikale Ebene bildet, wobei die von den Luftstrahlbohrungen (118) ausgestoßene Druckluft (128) dadurch im wesentlichen tangential auf den äußeren Rand des von der Austragsöffnung (109) in dem Düsenmundstück (108) ausgestoßenen Klebertropfens (130) gerichtet wird.

4. Vorrichtung zum Sprühen von Schmelzkleber einschließlich:
eines Pistolengehäuses (12) mit einer Düse (14), die mit einem mit einer Kleberquelle in Verbindung stehenden Kleberkanal (56) und einem mit einer Druckluftquelle in Verbindung stehenden Luftkanal (94) ausgebildet ist;
einer Platte (18), die mit einer sich von einer ersten Fläche (102) der Platte nach außen erstreckenden Nabe (106) ausgebildet ist, wobei die Platte mit einem Düsenmundstück (108) ausgebildet und mit einer sich zwischen der Habe und der Austragsöffnung des Düsenmundstückes erstreckenden Durchbohrung (110) versehen ist;
wobei die Platte (18) außerdem mit einer Vielzahl von Luftstrahlbohrungen (118) ausgebildet ist, die sich in einem Winkel in bezug auf die Längsachse der Durchbohrung (110) in der Platte erstrecken;
eines Kappenmittels (62) zum Befestigen der Platte an der Düse (14) des Pistolengehäuses (12), so daß die zwischen der Nabe und der Austragsöffnung in dem Düsenmundstück ausgebildete Durchbohrung (110) mit dem Kleberkanal (56) in der Düse in Verbindung steht und die Luftstrahlbohrungen mit dem Luftkanal (94) in der Düse in Verbindung stehen, wobei die Durchbohrung von dem Kleberkanal Kleber erhält und den Kleber aus der Austragsöffnung in dem Düsenmundstück ausstößt, um einen Klebertropfen (130) zu bilden, und die Luftstrahlbohrungen von dem Luftkanal in der Düse Druckluft erhalten und die Druckluft im wesentlichen tangential zu dem äußeren Rand des Klebertropfens richten, um eine längliche Klebfaser zu bilden und der länglichen Klebfaser eine Verdrehungsbewegung zu geben, um aus der länglichen Klebfaser zum Auftragen auf eine Unterlage eine Spiralsprühform zu bilden;
wobei die Vorrichtung dadurch gekennzeichnet ist, daß sich ein Düsenmundstück (108) von einer zweiten Fläche (104) der Platte zu der ersten Fläche nach innen erstreckt, wobei das Düsenmundstück eine äußere Fläche und eine Austragsöffnung (109) besitzt, die im wesentlichen in derselben Ebene wie die zweite Fläche der Platte liegen;
die Platte (18) mit einer Ringnut (112) ausgebildet ist, die sich von der zweiten Fläche (104) zur ersten Fläche (102) nach innen erstreckt, wobei die Ringnut ein erstes, die äußere Fläche des Düsenmundstückes bildendes Teil (114) und ein zweites Teil (116) besitzt, das sich in bezug auf die Durchbohrung (110) in der Platte neigt; und
die Platte (18) mit einer Vielzahl von Luftstrahlbohrungen (118) ausgebildet ist, die sich von der Ringnut (112) durch die Platte erstrecken, wobei die Luftstrahlbohrungen jeweils eine Längsachse (122) haben, die sich im wesentlichen senkrecht zu dem zweiten Teil der Ringnut erstreckt.

5. Vorrichtung nach Anspruch 4, bei der die Düse (14) des Pistolengehäuses (12) mit einer Aufnahme (136) ausgebildet ist, die die Nabe (106) der Platte unter Bildung einer fluiddurchlässigen Dichtung zwischen ihnen aufnimmt.

6. Vorrichtung nach Anspruch 4, bei der die Platte (18) ringförmig ist und eine äußere Kante besitzt, die mit einer Aussparung (134) ausgebildet ist, die sich von der zweiten Fläche (104) zu der ersten Fläche (102) der Platte (18) erstreckt.

7. Vorrichtung nach Anspruch 6, bei der ein Teil der Düse (14) des Pistolengehäuses (12) mit Außengewinde (60) ausgebildet ist, wobei das Kappenmittel (62) ein zylinderförmiges Teil umfaßt, das mit einer Durchbohrung ausgebildet ist, die eine innere Wand abgrenzt, die mit einem Gewinde versehen ist, das angepaßt ist, um mit dem Außengewinde (60) der Düse (14) ineinanderzugreifen, das zylinderförmige Teil mit einem ringförmigen Sitz ausgebildet ist, der mit der in der Ringplatte ausgebildeten Aussparung ineinandergreift, um die Platte (18) zu tragen, das zylinderförmige Teil auf die Düse (14) geschraubt ist, um die Durchbohrung (110) der Platte (18) mit dem Kleberkanal (56) in der Düse (14) zu verbinden.

8. Vorrichtung nach Anspruch 4, bei der die Platte (18) mit einer zweiten Ringnut ausgebildet ist, die sich von der ersten Fläche (102) zur zweiten Fläche (104) nach innen erstreckt und

ein Ende jeder der Luftstrahldüsen (118) schneidet.

Revendications

1. Adaptateur de tuyère destiné à être utilisé dans un appareil de distribution d'adhésif qui comporte un pistolet (12) possédant une tuyère (14) formée avec un passage d'adhésif (56) permettant de transmettre un adhésif et un passage de conduite d'air (94) permettant de transmettre de l'air pressurisé, ledit adaptateur de tuyère comprenant :
une plaque (18) formée avec une première surface (102) sur un côté de ladite plaque, et une seconde surface (104) sur un côté opposé de ladite plaque ;
ladite plaque (18) comportant un alésage traversant (110) s'étendant entre ladite première surface (102) et un orifice de déchargement (109) d'une extrémité de tuyère (108), ladite plaque (18) étant adaptée pour être montée sur ladite tuyère (14) dudit pistolet (12) de façon que ledit alésage traversant (110) communique avec ledit passage d'adhésif (56) dans ladite tuyère (14) pour recevoir l'adhésif, l'adhésif étant transmis à travers ledit alésage traversant (110) et étant éjecté dudit orifice de déchargement (109) de l'extrémité de tuyère (108) pour former un filet d'adhésif (130) ;
ladite plaque (18) étant adaptée pour être montée sur ladite tuyère (14) de façon que chacun des alésages de jet d'air (118) d'une pluralité réalisés dans ladite plaque communique avec ledit passage de conduite d'air (94) de la tuyère (14), afin de permettre la transmission de l'air à travers celui-ci, et
lesdits alésages de jet d'air (118) étant réalisés avec un angle par rapport audit alésage traversant (110) de ladite plaque (18) afin de diriger l'air pressurisé s'écoulant à travers ceux-ci substantiellement selon la tangente à la périphérie externe dudit filet d'adhésif éjecté de l'orifice de déchargement d'adhésif (109) de l'extrémité de tuyère (108), de façon à réaliser ledit filet d'adhésif (130) sous la forme d'une fibre allongée d'adhésif et imprimer un mouvement de torsion à ladite fibre allongée d'adhésif permettant un dépôt selon un modèle de diffusion en spirale sur un substrat, ledit adaptateur étant caractérisé en ce que ladite extrémité de tuyère (108) est formée dans ladite plaque qui s'étend vers l'intérieur à partir de ladite seconde surface en direction de ladite première surface, ladite extrémité de tuyère (108) possédant une surface externe et un orifice de déchargement (109) placé substantiellement dans le même plan que ladite seconde surface (104) de ladite plaque (18) ;
ladite plaque (18) est formée avec une rainure annulaire (112) s'étendant vers l'intérieur à partir de ladite seconde surface (104) en direction de ladite première surface (102), ladite rainure annulaire (112) possédant une première portion (114) qui forme ladite surface externe de l'extrémité de tuyère (108) et une seconde portion (116) qui est inclinée par rapport audit alésage traversant (110) de ladite plaque (18) ;
lesdits alésages de jet d'air (118) s'étendant à partir de ladite rainure annulaire (112) à travers ladite plaque (18) ; et
lesdits alésages de jet d'air (118) possédant chacun un axe longitudinal s'étendant substantiellement perpendiculairement à ladite seconde portion (116) de la rainure annulaire (112).

2. Adaptateur de tuyère selon la revendication 1 dans lequel lesdits alésages de jet d'air (118) de ladite plaque annulaire (18) forment un angle d'environ 30° par rapport à l'axe longitudinal dudit alésage traversant (110) de ladite plaque (18).

3. Adaptateur de tuyère selon la revendication 1 dans lequel l'axe longitudinal de chacun desdits alésages de jet d'air (118) forme un angle d'environ 10° par rapport à un plan vertical passant par l'axe longitudinal dudit alésage traversant (110), l'air pressurisé (128) éjecté desdits alésages de jet d'air (118) étant ainsi dirigé substantiellement selon la tangente à la périphérie externe dudit filet d'adhésif (130) éjecté de l'orifice de déchargement (109) de l'extrémité de tuyère (108).

4. Appareil de distribution d'adhésif à fusion comprenant : un pistolet (12) possédant une tuyère (14) formée avec un passage d'adhésif (56) communiquant avec une source d'adhésif et un passage d'air (94) communiquant avec une source d'air pressurisé ;
une plaque (18) comportant une protubérance (106) s'étendant vers l'extérieur à partir d'une première surface (102) de ladite plaque, ladite plaque étant réalisée avec une extrémité de tuyère (108) et comportant un alésage traversant (110) s'étendant entre ladite protubérance et ledit orifice de déchargement de ladite extrémité de tuyère ;
ladite plaque (18) comportant également une pluralité d'alésages de jet d'air (18) s'étendant selon un angle par rapport à l'axe longitudinal dudit alésage traversant (110) de ladite plaque ;
des moyens de coiffage (62) permettant de

monter ladite plaque sur ladite tuyère (14) du pistolet (12) de façon que ledit alésage traversant (110) réalisé entre ladite protubérance et ledit orifice de déchargement de l'extrémité de tuyère communique avec ledit passage d'adhésif (56) de ladite tuyère et de façon que lesdits alésages de jet d'air communiquent avec ledit passage d'air (94) de ladite tuyère, ledit alésage traversant recevant l'adhésif provenant du passage d'adhésif et éjectant l'adhésif à partir dudit orifice de déchargement de l'extrémité de tuyère pour former un filet adhésif (130), lesdits alésages de jet d'air recevant de l'air pressurisé provenant du passage d'air de la tuyère et dirigeant l'air pressurisé substantiellement selon la tangente à la périphérie externe dudit filet adhésif afin de former une fibre allongée d'adhésif et imprimer un mouvement de torsion à ladite fibre allongée d' adhésif permettant un dépôt selon un modèle de diffusion en spirale sur un substrat,
ledit appareil étant caractérisé en ce qu'une extrémité de tuyère (108) s'étend vers l'intérieur à partir d'une seconde surface (104) de ladite plaque en direction de ladite première surface, ladite extrémité de tuyère possédant une surface externe et un orifice de déchargement (109) placé substantiellement dans le même plan que ladite seconde surface de ladite plaque ;
ladite plaque (18) étant formée avec une rainure annulaire (112) s'étendant vers l'intérieur à partir de ladite seconde surface (104) en direction de ladite première surface (102), ladite rainure annulaire (112) possédant une première portion (114) qui forme ladite surface externe de l'extrémité de tuyère (108) et une seconde portion (116) qui est inclinée par rapport audit alésage traversant (110) de ladite plaque (18) ; et
ladite plaque (18) étant réalisée avec une pluralité d'alésages de jet d'air (118) s'étendant à partir de ladite rainure annulaire (112) à travers ladite plaque, lesdits alésages de jet d'air possédant chacun un axe longitudinal (122) s'étendant substantiellement perpendiculairement à ladite seconde portion de ladite rainure annulaire.

5. Appareil de la revendication 4 dans lequel ladite tuyère (14) du pistolet (12) est réalisée avec un logement (136) qui reçoit ladite protubérance (106) de la plaque formant un joint étanche entre ceux-ci.

6. Appareil de la revendication 4 dans lequel ladite plaque (18) est annulaire et possède un rebord périphérique réalisé avec un évidement (134) qui s'étend à partir de ladite seconde surface (104) en direction de ladite première surface (102) de ladite plaque (18).

7. Appareil de la revendication 6 dans lequel une portion de ladite tuyère (14) dudit pistolet (12) est réalisée avec des filets externes (60), lesdits moyens de coiffage comprenant un élément en forme de cylindre réalisé avec un alésage traversant définissant une paroi interne possédant des filets adaptés pour correspondre auxdits filets externes (60) de la tuyère (14), ledit élément en forme de cylindre étant réalisé avec un logement annulaire qui s'emboîte avec ledit évidement réalisé dans ladite plaque annulaire afin de maintenir ladite plaque (18), ledit élément en forme de cylindre étant vissé sur la tuyère (14) pour placer ledit alésage traversant (110) de ladite plaque en communication avec ledit passage d'adhésif (56) de la tuyère (14).

8. Appareil de la revendication 4 dans lequel ladite plaque (18) est réalisée avec une seconde rainure annulaire s'étendant vers l'intérieur à partir de ladite première surface (102) en direction de ladite seconde surface (104) et étant sécante à une extrémité de chacun desdits alésages de jet d'air (118).

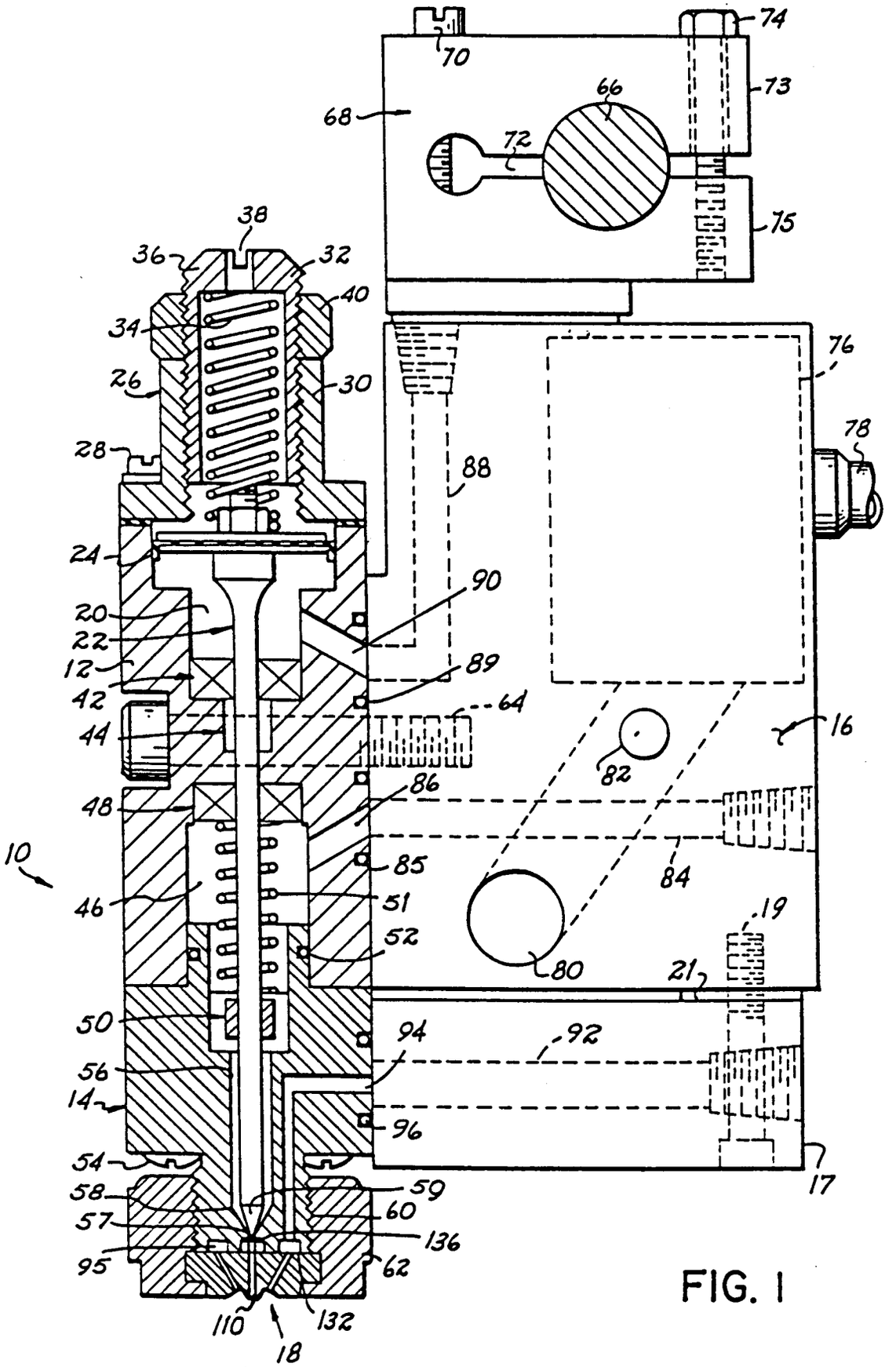
74
70
73
66
68
72
75
38
36
32
40
34
26
30
76
78
28
88
24
90
20
22
12
89
42
64
16
44
82
86
48
10
85
84
46
51
19
52
80
21
50
94
92
56
14
96
54
17
58
59
57
60
136
95
62
110
132
18

FIG. 1

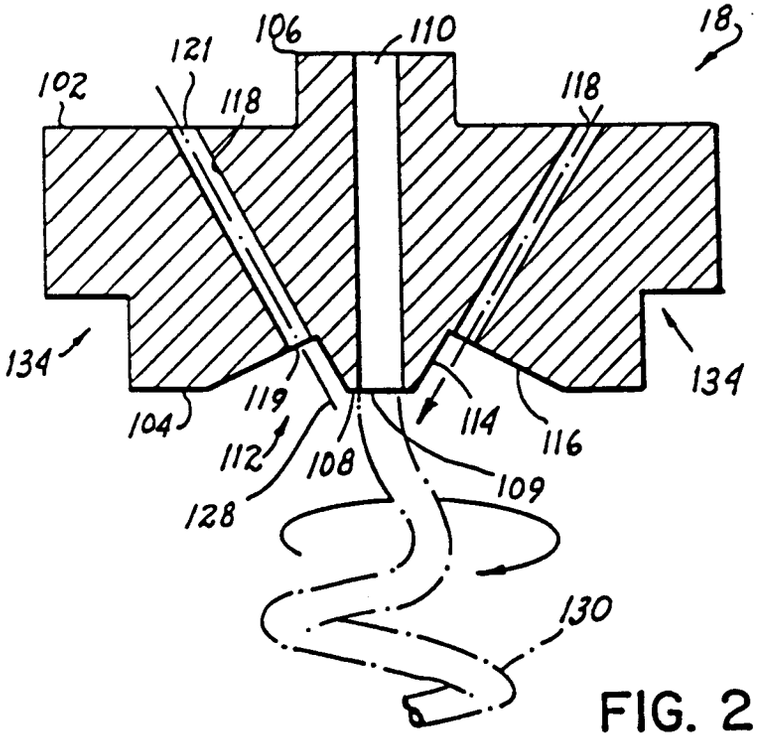
18
106
110
121
102
118
118
134
134
104
119
112
108
114
116
109
128
130

FIG. 2

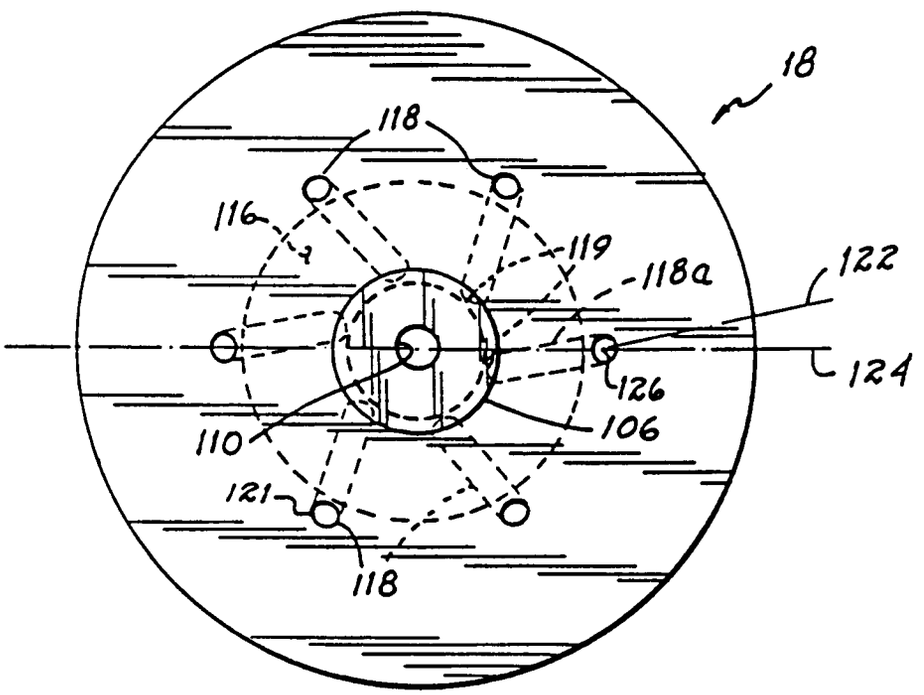
18
118
116
119
118a
122
124
126
110
106
121
118

FIG. 3