

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 997 200 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
31.03.2004 Bulletin 2004/14

(51) Int Cl.7: **B05C 17/005**, B05B 7/08,
B05B 7/16

(21) Application number: **98120344.1**

(22) Date of filing: **28.10.1998**

(54) Dispenser for fluids having a threaded bore air manifold

Fluidaustragsvorrichtung mit einem Luftverteiler mit einer Gewindebohrung

Appareil de décharge de fluides muni d'un distributeur d'air à alésage taraudé

(84) Designated Contracting States:
DE FR GB IT

(43) Date of publication of application:
03.05.2000 Bulletin 2000/18

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

(72) Inventors:
• **Carson King D. Jr.**
Lilburn, Georgia 30247 (US)

• **Reifenberger, Mark G.**
Norcross, Georgia 30092 (US)
• **Harben, William A.**
Dacula, Georgia (US)

(74) Representative: **Eisenführ, Speiser & Partner**
Patentanwälte Rechtsanwälte
Postfach 10 60 78
28060 Bremen (DE)

(56) References cited:
EP-A- 0 541 960 **US-A- 4 601 040**
US-A- 5 076 469 **US-A- 5 375 766**

EP 0 997 200 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

Field of the Invention

[0001] The present invention generally relates to dispensing heated thermoplastic materials and impacting the material with heated air to create a specific discharge pattern. More particularly, the present invention relates to compact, hand-held intermittent dispensing guns of this type.

Background of the Invention

[0002] Apparatus for dispensing heated thermoplastic material, such as so-called hot melt adhesives, often involves the simultaneous application of pattern air to the discharged thermoplastic material. Pattern air may be used to swirl a bead of hot melt adhesive as it exits a discharge orifice. The swirled adhesive may then be applied in a desired path to a substrate to facilitate better adhesive dispersion and, therefore, better adhesion between that substrate and another surface. In dispensers of this type, it is usually necessary to heat the pattern air prior to its discharge. Without heating, the pattern air can have undesirable effects on the discharged adhesive or thermoplastic material. For example, the air could cool the hot melt adhesive and lessen its ability to adhere to the substrate surfaces and/or reduce the time available to adhere two substrates together.

[0003] Various dispensers are known for applying hot melt adhesive and simultaneously applying pattern air to the adhesive. For many applications, hand-held dispensing guns are convenient to control and manipulate, for example, a swirled bead of adhesive onto a substrate. These hand-held dispensing guns must be of a size which is easily manipulated and non-fatiguing to the user. On the other hand, the units must supply heated air closely adjacent to the adhesive discharge passage for heating the pattern air immediately prior to its discharge. Typically, the air is heated in a manifold located generally at the discharge end of the gun. A gun of this design is disclosed in US-A-5,076,469. This prior art gun uses a sintered metal insert through which the air is forced. The insert is heated by one or more heating devices and transfers the heat to the air which is flowing therethrough. As the residence time of the air in the manifold is highly important, other heated air manifolds typically have a series of serpentine-shaped air passages, as well as integrated electrical heaters and resistance temperature detectors (RTDs) for controlling the temperature of the manifold. Serpentine-shaped passages increase the residence time of air in the manifold while attempting to minimize the size of the manifold.

[0004] Despite advances in this area, there is a constant desire to both achieve higher, uniform temperatures and provide more compact dispensing guns. In the past, these have been competing factors and have required compromised design solutions. One particular

problem relates to the tendency of air temperatures to stratify in the passages of the manifold. That is, the air will be hotter at the outer surfaces of the passages than at the centers of the passages. While turns in a serpentine-shaped passage will provide some mixing of this stratified air, they do not adequately solve the problem. For at least these reasons, improvements in this technology are still desirable and ideally involve achieving higher uniform temperatures in a more compact heated air manifold.

Summary of the Invention

[0005] To facilitate improvements related to the problems mentioned above, the present invention according to claim 1 provides dispensing apparatus for dispensing heated thermoplastic material while impacting the material with heated pattern air. In general accordance with the invention, an air manifold is provided with air heating passages having air turbulating structure in the form of internal threads extending along at least a substantial portion of said air heating passages. The air turbulating structure induces turbulence in the air flowing through the air heating passage and thereby produces efficient, uniform heating. As mentioned above, in the development of the present invention it was found that the smooth walls of the passages promoted stratification of thermal layers in the passages. That is, the air was hotter adjacent to the wall than at the center of the passage. However, the significant turbulence created in the air flowing through the manifold of the invention prevents stratification and uniformly mixes the air as it flows through the air heating passages. Also, the turbulating structure provides greater surface area for effecting heat transfer and, effectively, acting dually as an air mixer and a heat exchanger. In this way, the air is heated in a shorter time period than in the past and higher, more uniform air temperatures may be provided by a more compact manifold at a given temperature. In accordance with the dependent claims, other components of the dispensing apparatus may typically include a dispensing gun body adapted for connection to a supply of heated thermoplastic material. The gun body can have a handle and trigger assembly for controlling the discharge of heated thermoplastic material and pattern air.

[0006] In accordance with claim 1, the turbulating structure disposed in the air heating passage of the manifold advantageously comprises internal threads. These may be easily formed within a series of serpentine-shaped, connected passages in the manifold by drilling and tapping these passages. The internal threads act as a long, continuous fin extending inwardly from the walls of the passage and can induce continuous turbulence from the inlet to the outlet of the manifold. The present invention therefore provides a more compact dispensing gun by providing a more compact heated air manifold. Specifically, the manifold improves heat transfer for a given volume of air passages, allows a

smaller manifold size for a given outlet temperature, yields a relatively constant temperature across varying flow rates of air, and achieves all of the above at minimal additional expense.

[0007] The invention according to claim 6 further encompasses methods of dispensing heated thermoplastic material, such as hot melt adhesive, in manners generally corresponding to the use of apparatus as described above. Generally, these methods comprise directing heated thermoplastic material through a discharge passage, heating pressurized air by directing the air through a series of heated passages having turbulent structure and discharging the thermoplastic material from the discharge passage while impacting the discharged thermoplastic material with air exiting the series of passages. As discussed above, the preferred turbulent structure is at least one set of internal threads extending along walls of the series of passages. The method and apparatus of this invention are especially useful in dispensing thermoplastic material, such as hot melt adhesive, in an intermittent fashion.

[0008] Additional objects, advantages and features of the invention will become more readily apparent upon review of the following detailed description of the illustrative embodiments, taken in conjunction with the accompanying drawings.

Brief Description of the Drawings

[0009]

Fig. 1 is a side elevational view showing a first embodiment of a dispensing gun partially broken away to illustrate a heated air manifold of this invention;

Fig. 2 is a cross sectional view of the nozzle portion of the gun shown in Fig. 1, including the heated air manifold thereof;

Fig. 3 is a cross sectional view taken along line 3-3 of Fig. 2;

Fig. 4 is a perspective view of the heated air manifold shown in Figs. 1-3;

Fig. 5 is a side elevational view showing a second embodiment of a dispensing gun in accordance with the invention;

Fig. 6 is a cross sectional view showing the series of passages within the heated air manifold of the gun illustrated in Fig. 5 and taken along line 6-6;

Fig. 7 is a perspective view of the heated air manifold shown in Figs. 5 and 6;

Fig. 8 is a graph plotting the exit air temperature versus air flow for both a smooth bore version and a

threaded bore version of a heated air manifold constructed in accordance with the first embodiment of this invention;

Fig. 9 is a graph plotting exit air temperature versus air flow in a manner similar to Fig. 8, but at a higher set point temperature; and

Fig. 10 is a graph plotting pressure drop versus air flow for the heated air manifold of the first embodiment.

Detailed Description of the Preferred Embodiments

[0010] Fig. 1 illustrates one preferred embodiment of dispensing apparatus 10 constructed with features pertaining to the present invention. Various details of apparatus 10 have not been disclosed, as these are unnecessary to a full understanding of the present invention. Dispensing apparatus 10 takes the particular form of an intermittent hot melt adhesive dispensing gun, particularly of the type sold by Nordson Corporation of Westlake, Ohio under Model No. AD31. It will be appreciated that the invention may also apply to other applicators of heated thermoplastic material in which it is desirable to impact the dispersed material with hot air.

[0011] As shown in Fig. 1, apparatus 10 includes a gun body 12 having a nozzle portion 14 particularly suited for dispensing a swirled pattern of hot melt adhesive as will be understood from the description to follow. A heat shield 16 is mounted over nozzle portion 14. Hot melt adhesive is supplied through a conduit 18, while pressurized air is supplied through a conduit 20 for creating a pattern of adhesive, such as a swirled bead pattern. An electrical conduit 22 leads into a handle 24 having a trigger 26 with a conventional trigger lock 28. Trigger 26 may, for example, operate a microswitch which is connected to a solenoid (not shown) for controlling the on/off dispensing of adhesive from nozzle portion 14 in a typical manner. It will be appreciated that trigger 26 may instead operate various conventional air logic controls to similarly control the dispensing of adhesive from nozzle portion 14. Finally, in accordance with the invention, a heated air manifold 30 is provided and preferably directly connected to nozzle portion 14 for heating pattern air received from conduit 20 immediately prior to its use to swirl or otherwise impact the dispensed adhesive. As further shown in Fig. 1, electric leads 32, 34, 36 lead into manifold 30 and are respectively connected to electric heating elements and a resistance temperature detector (RTD) in a conventional manner. A fluid connector 38 connects air conduit 20 to manifold 30.

[0012] Now referring to Fig. 2, nozzle portion 14 includes a passage 50 which communicates with a main liquid passage (not shown) of gun body 12 and receives pressurized liquid, such as hot melt adhesive, from supply conduit 18 (Fig. 1). A valve 52 may be selectively moved between engaged and disengaged positions rel-

ative to a valve seat 54 to respectively prevent and allow pressurized liquid to flow into a liquid discharge passage 56. From here, the liquid flows through a liquid outlet 60a disposed in a disc 60 held against a nozzle body 62 by a retaining nut 64. Nozzle body 62 further includes

[0013] Now referring to Figs. 2-4, a serpentine-shaped air heating passage 70 traverses through air heating manifold 30. The manner of constructing passage 70 is not specifically shown in the figures as such machining is well known in the art. In particular, a series of passages are drilled into manifold 30 and various threaded plugs are used to create the serpentine-shaped passage 70 as generally shown in the drawings. Passage 70 preferably includes turbulating structure in the form of internal threads 70a extending along at least a substantial portion of air heating passage 70. These threads, for example, may be 6-32 threads or threads of other suitable size and pitch. Passage 70 extends from an inlet 71 defined by fluid connector 38 to an outlet defined by an annular recess 72 which communicates with a plurality of radial passages 74, 76, 78, 80 contained in nozzle body 62 as best shown in Figs. 2 and 3. Passages 74, 76, 78, 80 each respectively communicate with axial air passages 82, 84, 86, 88 extending lengthwise through nozzle body 62 and communicating with a series of air passages 60b as conventionally contained in disc 60 for creating a swirled pattern of adhesive upon impact with hot melt adhesive discharged from passage 60a.

[0014] As further shown in Fig. 3, a pair of electrical heating elements 90, 92 are inserted into bores drilled into air manifold 30 and disposed on either side of a similarly inserted resistance temperature detector (RTD) 94. Electrical heating elements 90, 92 are used in a conventional manner to heat the body of air manifold 30, which may be formed of aluminum, and the set point temperature of the body of manifold 30 may be controlled through conventional temperature controls connected with RTD 94.

[0015] Unlike conventional air heating manifolds used in adhesive dispensing apparatus, threads 70a disposed within air heating passage 70 will promote greater turbulence and, therefore, greater mixing and heating of air within passage 70 and more uniform temperature distribution. In addition, the threads also increase the amount of surface area through which heat may be transferred to the air moving through passage 70. The combined effects of these two general features of the invention ensure that, with each incremental increase in air flow rate, there is an incremental increase in turbulence. This incremental increase in turbulence causes an incremental increase in the effective heat transfer surface area which is available due to the addition of the threads. As a result, the rate at which heat is transferred

to the media is approximately the same as the rate at which the air flow increases. This results in uniform maintenance of the air temperature, and may allow the use of a more compact air manifold having a shorter air heating path.

[0016] Figs. 5-7 illustrate a second embodiment of the invention in the form of a dispensing apparatus 100 again preferably comprising a hand-held, intermittent hot melt adhesive gun. This embodiment of apparatus 100 consists of a modified model FP200 dispensing gun obtainable from Nordson Corporation of Westlake, Ohio. The basic modifications have been made in accordance with the invention as will be discussed in detail below. By way of describing the other conventional structure of apparatus 100, liquid manifold 102 connects with appropriate electric leads in a conduit 104 for supplying electric current to integrated heating elements and one or more RTDs (not shown). Manifold assembly 102 receives a supply of pressurized hot melt adhesive from a conduit 106 and this pressurized adhesive is supplied to an attached dispenser 108 which dispenses hot melt adhesive, for example, in a swirled pattern from a nozzle 110. Another conduit 111 delivers pressurized operating air to manifold 102. The operating air is delivered to dispenser 108 for moving a piston and thereby operating a valve stem (not shown) which controls the flow of adhesive from nozzle 110. Apparatus 100 further includes a gun body 112 having a handle 114 with a trigger 116 and conventional trigger lock 118 as described with respect to the first embodiment. Also as described with respect to the first embodiment, an electrical conduit 120 may be provided for connecting electric leads to various controls associated with trigger 116, such as a microswitch as described above with respect to the first embodiment. Again, air logic controls may be used as conventional substitute controls. Gun body 112 is mounted to liquid manifold 102 by suitable mounting structure 122.

[0017] As further shown in Fig. 5, an air heating manifold 130 is mounted to liquid manifold 102 by fasteners 132. As shown in Figs. 5 and 6, manifold 130 is connected with a cord set or electric conduit 134 for supplying electric current to electric heating elements 136, 138 and a resistance temperature detector (RTD) 140, as shown in Fig. 6.

[0018] Now referring to Figs. 6 and 7, air heating manifold 130 includes a serpentine-shaped passage 150 which includes internal threads 150a along at least a substantial portion thereof. Serpentine-shaped passage 150 extends from an inlet 152 connected with air supply conduit 146 (Fig. 5) to an outlet 154 connected with an air distributing portion 108a of dispenser 108. As shown in Fig. 6, the interface between air distributing portion 108a and manifold 130 may be sealed by an O-ring 158. In a conventional manner, pressurized pattern air may be introduced through conduit 146 upon actuation of trigger 116 through the use of appropriate controls. These controls would ensure that air is supplied to con-

duit 146 and, therefore, to passage 156 at the same time that adhesive or other heated thermoplastic material is supplied to conduit 106 and, therefore, dispenser 108. The air heating manifold 130 of this embodiment has each of the same objectives and advantages of the first embodiment as discussed above.

[0019] Fig. 8 illustrates a graph plotting air temperature versus air flow in a fixture constructed generally in accordance with the invention and another fixture having a smooth bore. Specifically, the first fixture was a block of aluminum with a threaded bore extending along the length of the fixture in one direction and then turning and extending along the fixture in the opposite direction. The second fixture was the same, except that a smooth bore air passage was used instead of threaded passage. This graph illustrates that with a smooth bore air heating passage, the temperature falls off significantly as air flow increases. This particular graph illustrates an example wherein a set point temperature of the pressurized pattern air is desired to be 177,2 °C (351 °F). By contrast, the graph shows that the threaded bore of the present invention can maintain the air temperature at or very close to the desired set point temperature even at relatively high air flow rates.

[0020] Fig. 9 illustrates a similar graph of air temperature versus air flow for a smooth bore versus a threaded bore fixture as described above. In this illustration, the desired set point was 219,4 °C (427°F). Again, the graph illustrates that the threaded bore version of the fixture maintains the air temperature at or very close to the desired set point temperature even at higher flow rates, i.e., even when there is a relatively short residence time during which the air may be heated to the set point temperature within the manifold.

[0021] Finally, Fig. 10 illustrates a graph plotting pressure drop versus flow and again comparing a smooth bore fixture versus a threaded bore fixture as described above. This graph more specifically illustrates that the pressure drop experienced in the fixture is very similar in both the smooth bore and threaded bore versions at a set point temperature of 177,2 °C (351 °F). Thus, the turbulence may be created by the internal threads within the air heating passage without also creating significant increases in pressure drop across a relatively wide range of air flow rates.

Claims

1. Dispensing apparatus (10) for dispensing heated thermoplastic material and impacting the material with heated air, the apparatus comprising:

a dispensing gun body (12) adapted for connection to a supply of heated thermoplastic material and including a thermoplastic material discharge outlet (60a) and at least one air discharge passage (60b) for directing air at ther-

moplastic material exiting the thermoplastic material discharge outlet,

an air manifold (30) having an air heating passage (70) extending between an air inlet (71) and an air outlet (72) thereof, said air inlet being adapted for connection to a source of pressurized air and said air outlet communicating with the air discharge passage of said gun body,

at least one heating element (90;92) thermally coupled to said air manifold for heating air passing from said air inlet to said air outlet of said air heating passage, including air turbulating structure for inducing turbulence in the air flowing through said air heating passage and thereby promoting efficient, uniform heating of the air during dispensing operations.

characterized in that said turbulating structure includes internal threads (70a; 150a) in the air heating passage (70) of said manifold.

2. The dispensing apparatus of claim 1, wherein the air heating passage in said manifold (30) is serpentine-shaped and includes threads substantially along the entire length thereof.
3. The dispensing apparatus of claims 1 or 2 further comprising:

a handle (24) connected with the dispensing gun body (12) and having a trigger (26) for controlling the discharge of thermoplastic material and pattern air,
a dispensing valve (52) connected to said handle,
said valve adapted for connection to a supply of heated thermoplastic material and having a nozzle portion (14) including said thermoplastic material discharge outlet (60a) and said air discharge passage (60b) for directing said pattern air at thermoplastic material exiting the thermoplastic material discharge outlet, and
a valve control connected with the trigger and operative to allow and prevent movement of thermoplastic material from said thermoplastic material discharge outlet in response to movements of said trigger.

4. The dispensing apparatus of any of the above claims, wherein said turbulating structure further includes a heat exchanger.
5. The dispensing apparatus of any of the above claims, wherein the gun body further includes a nozzle portion (14) connected to said air manifold (30), said nozzle por-

tion including both said thermoplastic material discharge outlet and said air discharge passage.

6. A method of dispensing heated thermoplastic material and inducing a patterned discharge of said thermoplastic material using pressurized, heated air, the method comprising:
 - (a) directing heated thermoplastic material through a discharge passage (60a),
 - (b) heating and mixing the pressurized air in a heated manifold (30), said method being **characterized by**
 - (c) directing said air through a series of passages (70) having turbulating structure therein and being contained in said manifold, and said turbulating structure including internal threads (70a; 150a) extending along walls of the series of passages and
 - (d) discharging said thermoplastic material from said discharge passage while impacting the discharged thermoplastic material with air exiting said series of passages.
7. The method of claim 6, wherein the step of heating and mixing the pressurized air further includes directing the air through passages (70) having combined heat exchanging and turbulating structure.
8. The method of claim 6, wherein the step of discharging thermoplastic material further comprises intermittently discharging said thermoplastic material and correspondingly impacting the discharged thermoplastic material with air exiting said series of passages.

Patentansprüche

1. Ausgabevorrichtung (10) zum Ausgeben von heißem Thermoplastmaterial und Beaufschlagen des Materials mit Heißluft, wobei die Vorrichtung umfasst:

einen Ausgabepistolenkörper (12), der zum Anschluss an eine Zuführung des heißen Thermoplastmaterials angepasst ist und eine Thermoplastmaterialaustragsöffnung (60a) und mindestens einen Luftaustragskanal (60b) zum Leiten von Luft auf aus der Thermoplastmaterialaustragsöffnung austretendes Thermoplastmaterial umfasst,

einen Luftverteiler (30) mit einem Luftheizkanal (70), der sich zwischen einem Lufteinlass (71) und einem Luftauslass (72) desselben er-

streckt, wobei der Lufteinlass zum Anschluss an eine Druckluftquelle angepasst ist und der Luftauslass mit dem Luftaustragskanal des Pistolenkörpers in Verbindung steht, mindestens ein Heizelement (90; 92), das zum Erwärmen vom Lufteinlass zum Luftauslass des Luftheizkanals strömender Luft mit dem Luftverteiler thermisch verbunden ist, umfassend eine Luftverwirbelungskonstruktion zum Erzeugen einer Turbulenz in der durch den Luftheizkanal strömenden Luft, um dadurch während der Ausgabevorgänge eine wirksame, gleichmäßige Erwärmung der Luft zu unterstützen,

dadurch gekennzeichnet, dass die Luftverwirbelungskonstruktion im Luftheizkanal (70) des Verteilers Innengewinde (70a; 150a) besitzt.

2. Ausgabevorrichtung gemäß Anspruch 1, bei der der Luftheizkanal im Verteiler (30) serpentinenförmig ist und im wesentlichen über seine gesamte Länge Gewindegänge besitzt.
3. Ausgabevorrichtung gemäß den Ansprüchen 1 oder 2, außerdem umfassend:

einen Handgriff (24), der mit dem Ausgabepistolenkörper (12) verbunden ist und einen Auslöser (26) zum Regeln des Austrags des Thermoplastmaterials und Luftströmungsmusters besitzt,

ein an dem Handgriff angeschlossenes Ausgabeventil (52),

wobei das Ventil zum Anschluss an eine Zuführung des Thermoplastmaterials angepasst ist und ein Düsenteil (14) umfasst, das die Thermoplastmaterialaustragsöffnung (60a) und den Luftaustragskanal (60b) zum Leiten des Luftströmungsmusters auf aus der Thermoplastmaterialaustragsöffnung austretendes Thermoplastmaterial umfasst, und eine Ventilsteuerung, die mit dem Auslöser verbunden und betätigbar ist, um in Reaktion auf die Bewegungen des Auslösers die Bewegung von Thermoplastmaterial aus der Thermoplastaustragsöffnung zuzulassen und zu verhindern.

4. Ausgabevorrichtung gemäß einem der obigen Ansprüche, bei der die Luftverwirbelungskonstruktion außerdem einen Wärmeaustauscher umfasst.
5. Ausgabevorrichtung gemäß einem der obigen Ansprüche, bei der der Pistolenkörper außerdem ein an den Luftverteiler (30) angeschlossenes Düsenteil (14) umfasst, wobei das Düsenteil sowohl die Thermoplastmaterialaustragsöffnung als auch den Luftaustragskanal (60b) umfasst.

6. Verfahren zum Ausgeben von heißem Thermoplastmaterial und Erzeugen eines Thermoplastaustagsmusters unter Anwendung von heißer Druckluft, wobei das Verfahren umfasst:
- (a) Leiten von heißem Thermoplastmaterial durch einen Austragskanal (60a),
 - (b) Erwärmen und Mischen der Druckluft in einem geheizten Verteiler (30), wobei das Verfahren **gekennzeichnet ist durch**
 - (c) Leiten der Luft **durch** eine Reihe von Kanälen (70), die eine Luftverwirbelungskonstruktion besitzen und im Verteiler aufgenommen sind, und wobei die Luftverwirbelungskonstruktion Innengewinde (70a; 150a) besitzt, das sich an den Wänden der Reihe von Kanälen entlang erstreckt, und
 - (d) Austragen des Thermoplastmaterials aus dem Austragskanal während des Beaufschlagens des ausgetragenen Thermoplastmaterials mit aus der Reihe von Kanälen austretender Luft.
7. Verfahren gemäß Anspruch 6, bei dem der Schritt des Erwärmens und Mischens der Druckluft außerdem des Leiten der Luft durch Kanäle (79) umfasst, die eine kombinierte Wärmeaustauscher- und Verwirbelungskonstruktion besitzen.
8. Verfahren gemäß Anspruch 6, bei dem der Schritt des Austragens von Thermoplastmaterial außerdem das intermittierende Austragen des Thermoplastmaterials und entsprechendes Beaufschlagen des ausgetragenen Thermoplastmaterials mit aus der Reihe von Kanälen austretender Luft umfasst.

Revendications

1. Dispositif distributeur (10) destiné à distribuer un matériau thermoplastique chauffé et à soumettre le matériau à un impact avec de l'air chauffé, le dispositif comprenant:
- un corps de pistolet distributeur (12) destiné à être connecté à une alimentation de matériau thermoplastique chauffé et englobant un orifice de sortie du matériau thermoplastique (60a) et au moins un passage de décharge de l'air (60b) pour diriger l'air sur le matériau thermoplastique sortant de l'orifice de sortie du matériau thermoplastique,
 - un collecteur d'air (30) comportant un passage de chauffage de l'air (70) s'étendant entre un orifice d'entrée de l'air (71) et un orifice de sortie de l'air (72), ledit orifice d'entrée de l'air étant

destiné à être connecté à une source d'air sous pression et ledit orifice de sortie communiquant avec le passage de décharge de l'air dudit corps du pistolet,

au moins un élément de chauffage (90; 92) accouplé thermiquement audit collecteur d'air pour chauffer l'air s'écoulant dudit orifice d'entrée de l'air vers ledit orifice de sortie de l'air dudit passage de chauffage de l'air, englobant une structure à turbulence de l'air pour entraîner une turbulence dans l'air s'écoulant à travers ledit passage de chauffage de l'air et assurer ainsi un chauffage uniforme et efficace de l'air au cours des opérations de distribution,

caractérisé en ce que ladite structure à turbulence englobe des filetages internes (70a; 150a) dans le passage de chauffage de l'air (70) dudit collecteur.

2. Dispositif distributeur selon la revendication 1, dans lequel le passage de chauffage de l'air dans ledit collecteur (30) a une forme en serpent et englobe des filetages pratiquement le long de l'ensemble de sa longueur.
3. Dispositif distributeur selon les revendications 1 ou 2, comprenant en outre:

une poignée (24) connectée au corps du pistolet distributeur (12) et comportant une gâchette (26) pour contrôler la décharge du matériau thermoplastique et de l'air conditionné, une soupape de distribution (52) connectée à ladite poignée,

ladite soupape étant destinée à être connectée à une alimentation de matériau thermoplastique chauffé et comportant une partie de buse (14) englobant ledit orifice de sortie du matériau thermoplastique (60a) et ledit passage de décharge de l'air (60b) pour diriger ledit air conditionné vers le matériau thermoplastique sortant à travers l'orifice de décharge du matériau thermoplastique, et une commande de soupape connectée à la gâchette et destinée à permettre et à empêcher un déplacement du matériau thermoplastique à partir dudit orifice de décharge du matériau thermoplastique en réponse à des déplacements de ladite gâchette.

4. Dispositif distributeur selon l'une quelconque des revendications précédentes, dans lequel ladite structure à turbulence englobe en outre un échangeur de chaleur.
5. Dispositif de distribution selon l'une quelconque des revendications précédentes, dans lequel le corps du pistolet englobe en outre une partie de buse (14)

connectée audit collecteur d'air (30), ladite partie de buse englobant ledit orifice de décharge du matériau thermoplastique et ledit passage de décharge de l'air.

5

6. Procédé de distribution d'un matériau thermoplastique chauffé, englobant une décharge configurée dudit matériau thermoplastique, par l'intermédiaire d'air chauffé sous pression, le procédé comprenant les étapes ci-dessous:

10

(a) guidage du matériau thermoplastique chauffé à travers un passage de décharge (60a),

(b) chauffage et mélange de l'air sous pression dans un collecteur chauffé (30),

15

ledit procédé étant **caractérisé** par les étapes ci-dessous:

(c) guidage dudit air à travers une série de passages (70) comportant une structure à turbulence et contenue dans ledit distributeur, ladite structure à turbulence englobant des filetages internes (70a, 150a) s'étendant le long des parois de la série de passages, et

20

(d) décharge dudit matériau thermoplastique à partir dudit passage de décharge tout en soumettant le matériau thermoplastique déchargé à un impact avec l'air sortant de ladite série de passages.

25

30

7. Procédé selon la revendication 6, dans lequel l'étape de chauffage et de mélange de l'air sous pression englobe en outre l'étape de guidage de l'air à travers des passages (70) comportant une structure combinée à échange de chaleur et à turbulence.

35

8. Procédé selon la revendication 6, dans lequel l'étape de décharge du matériau thermoplastique comprend en outre l'étape de décharge intermittente dudit matériau thermoplastique et d'exposition correspondante du matériau thermoplastique déchargé à un impact avec l'air sortant de ladite série de passages.

40

45

50

55

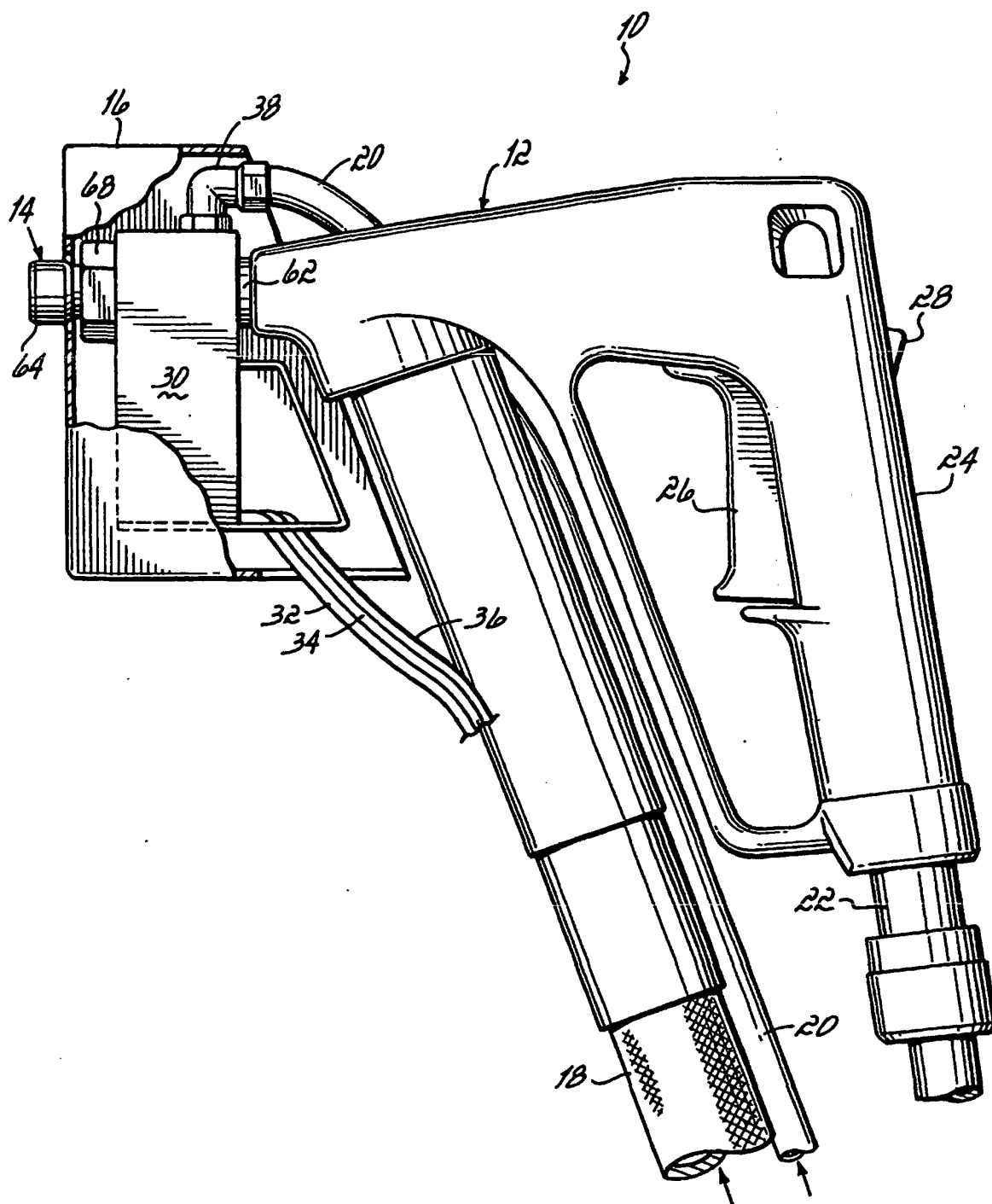
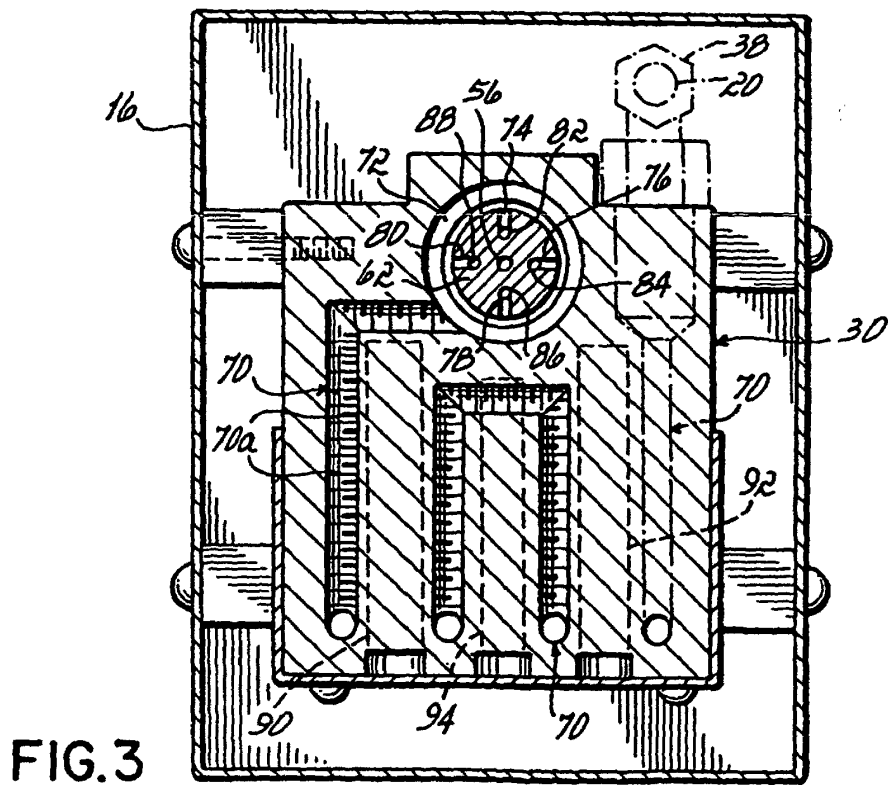
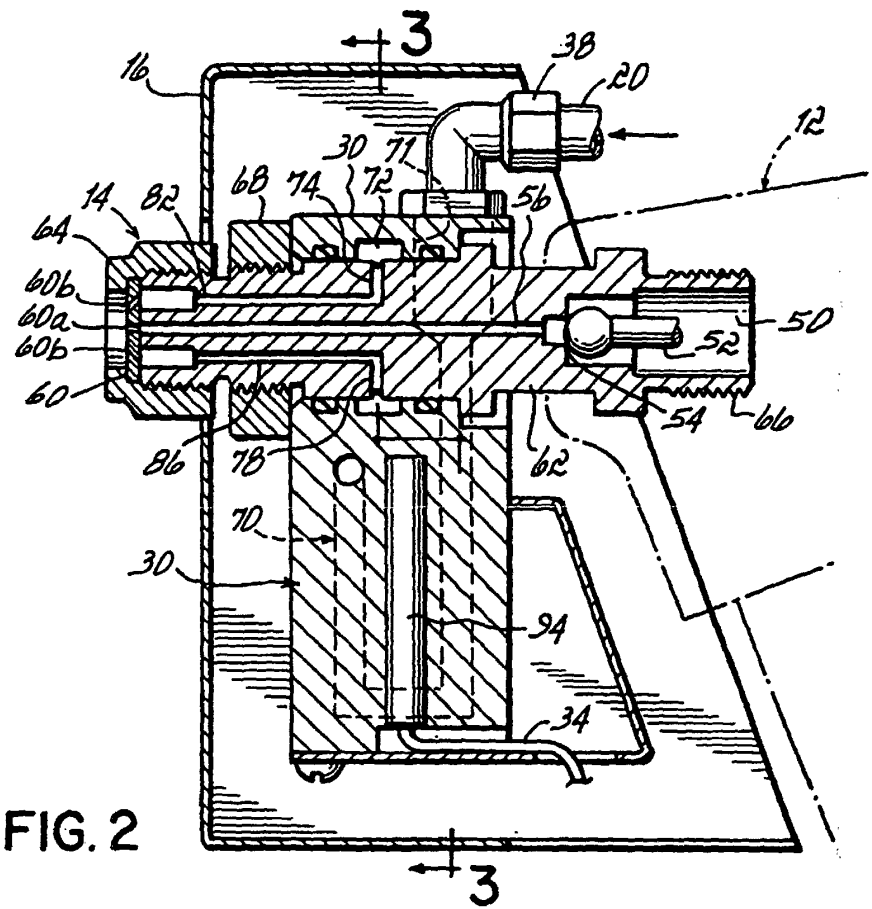


FIG. 1



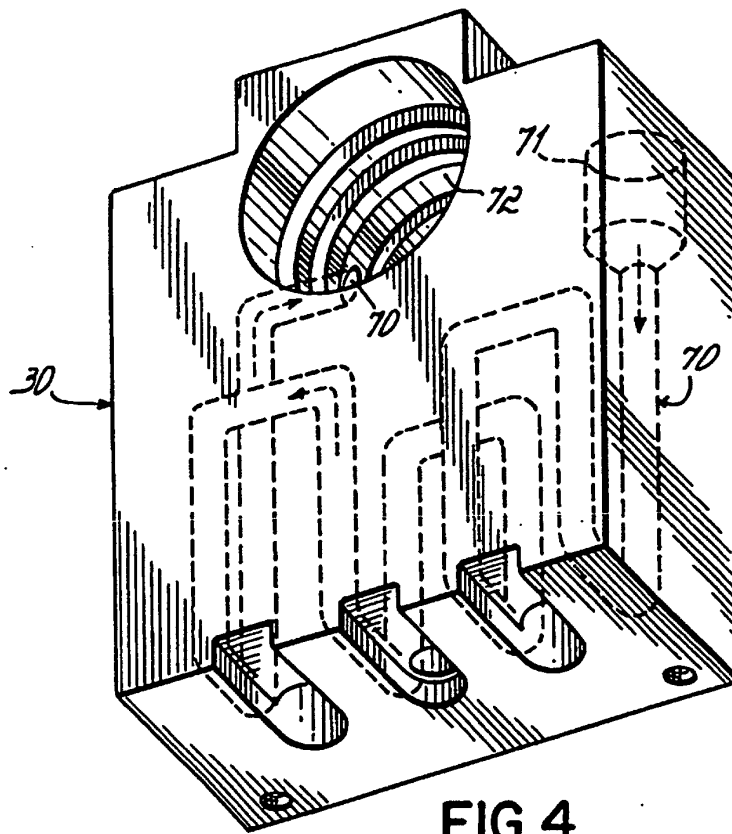


FIG. 4

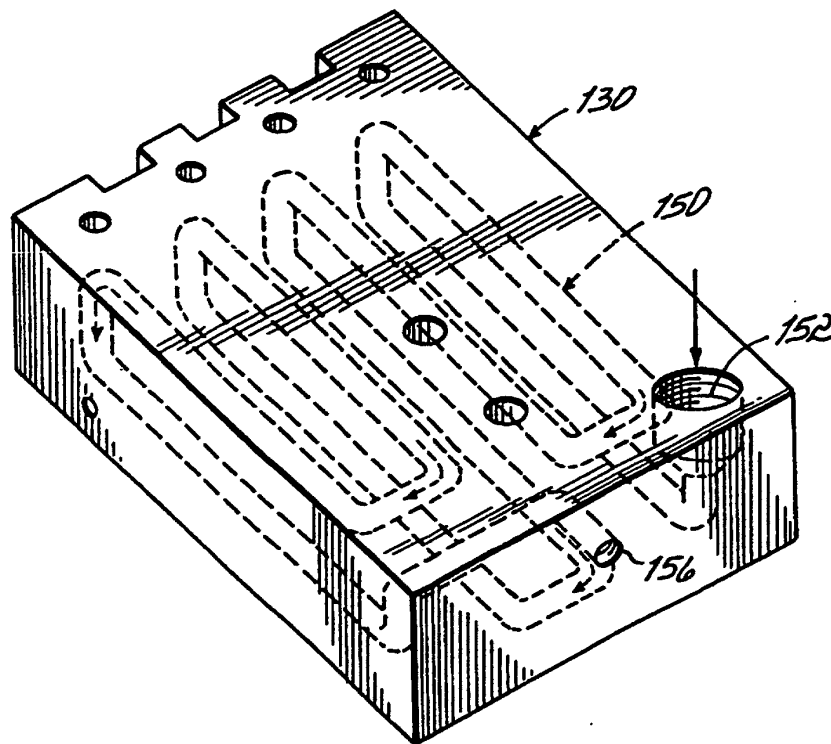
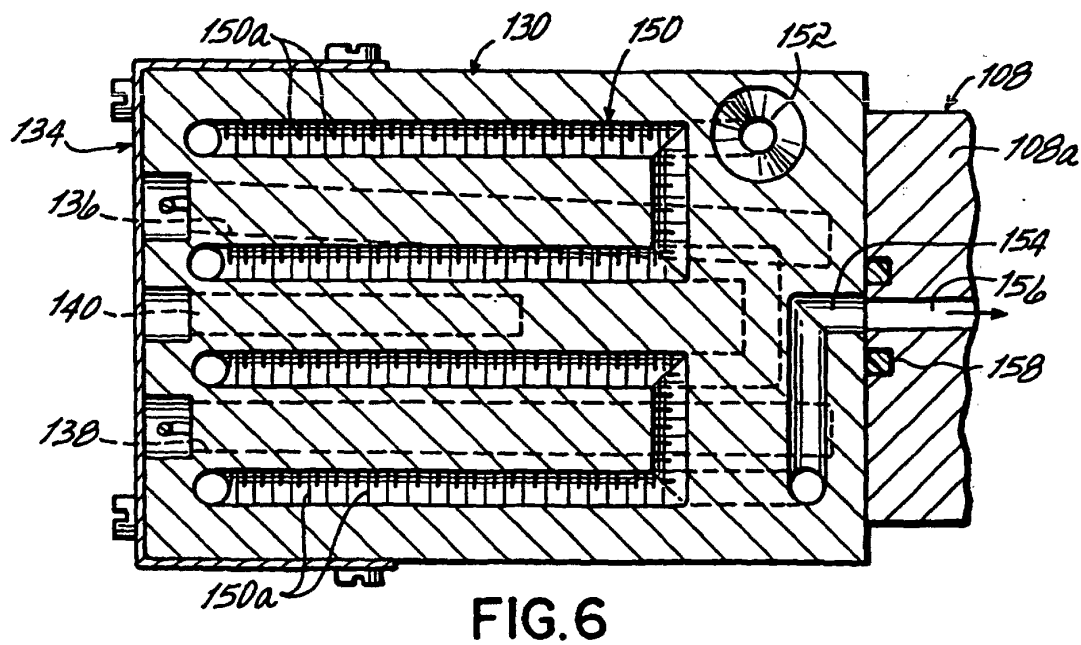
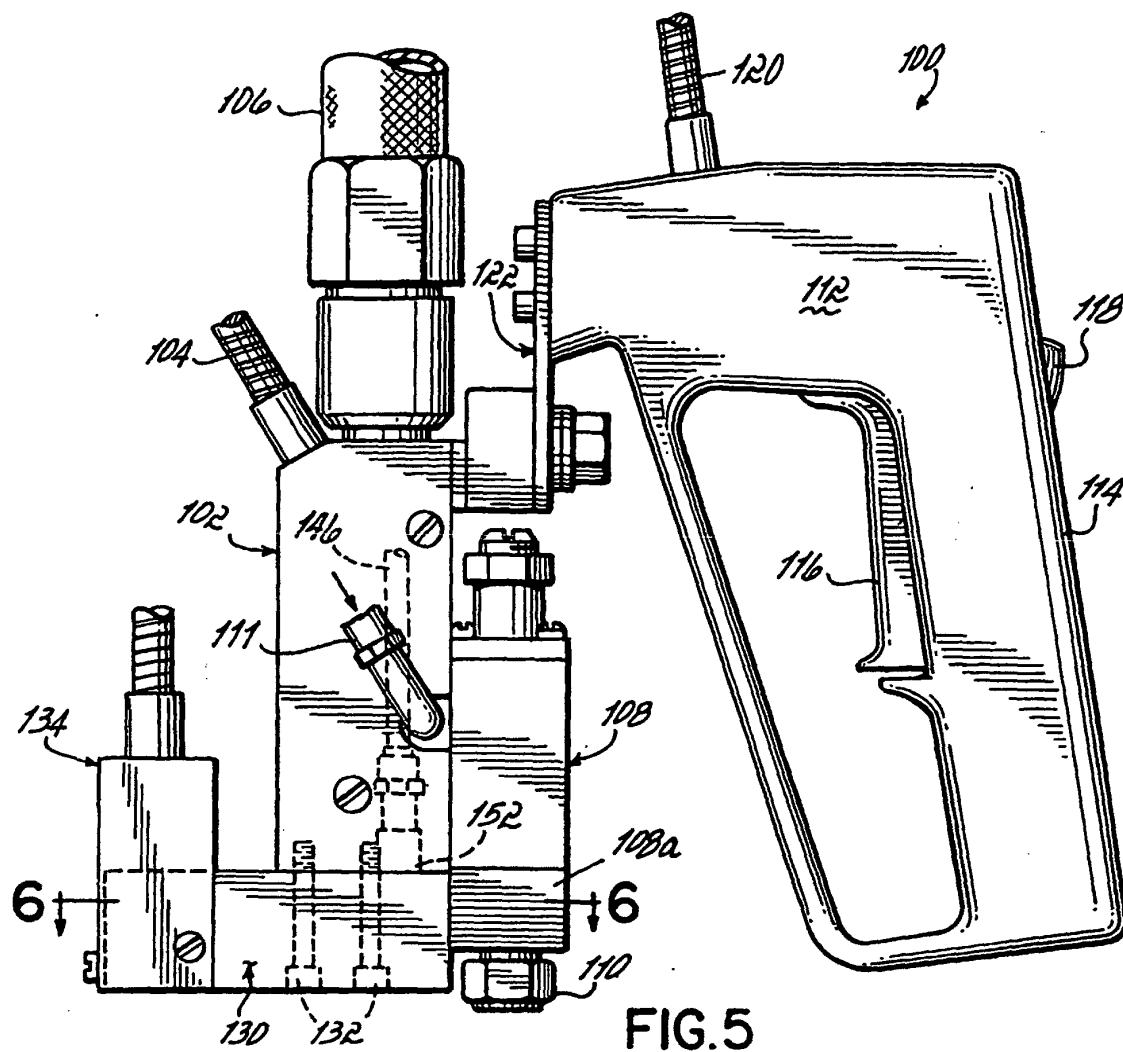


FIG. 7



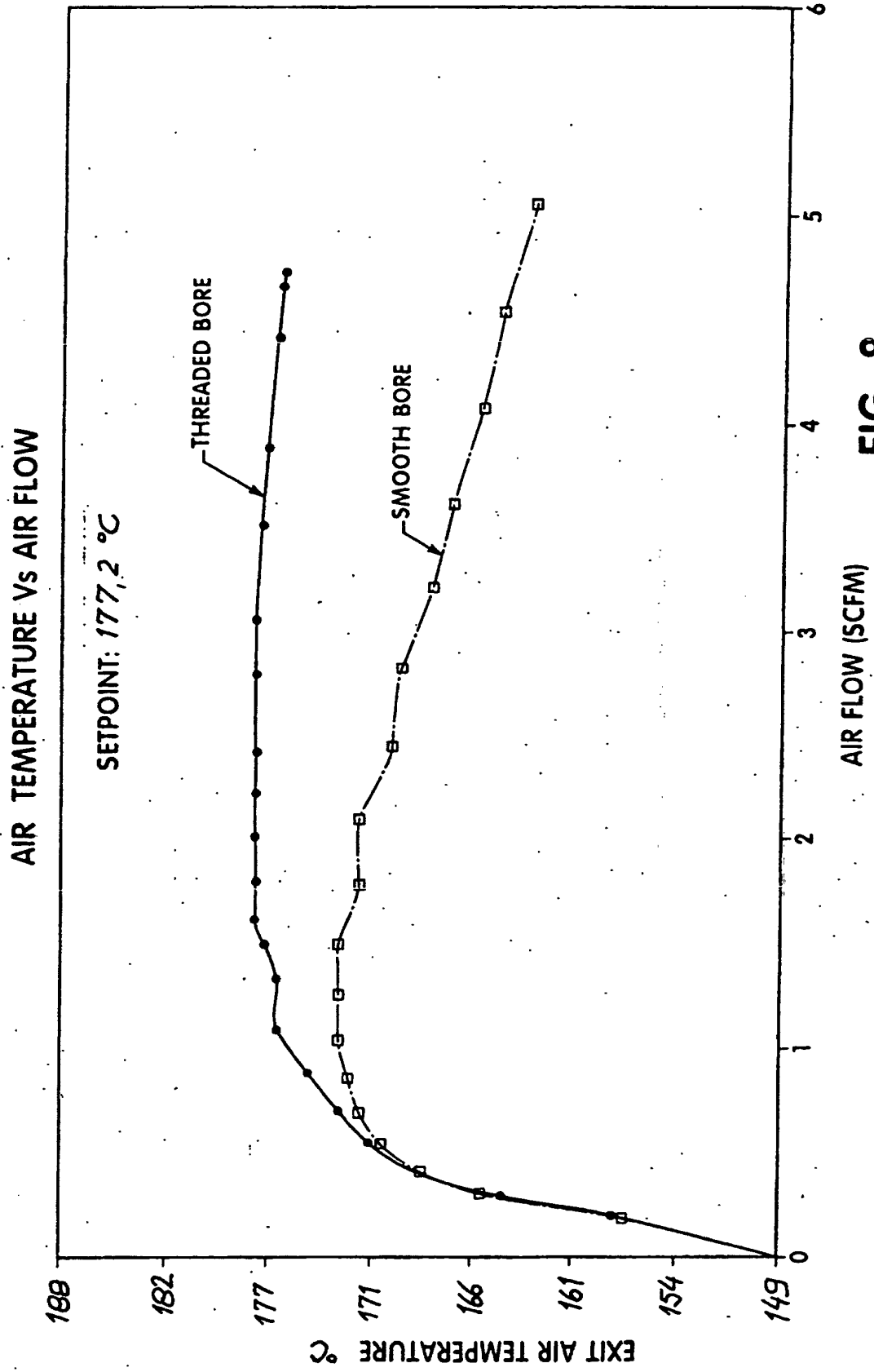


FIG. 8

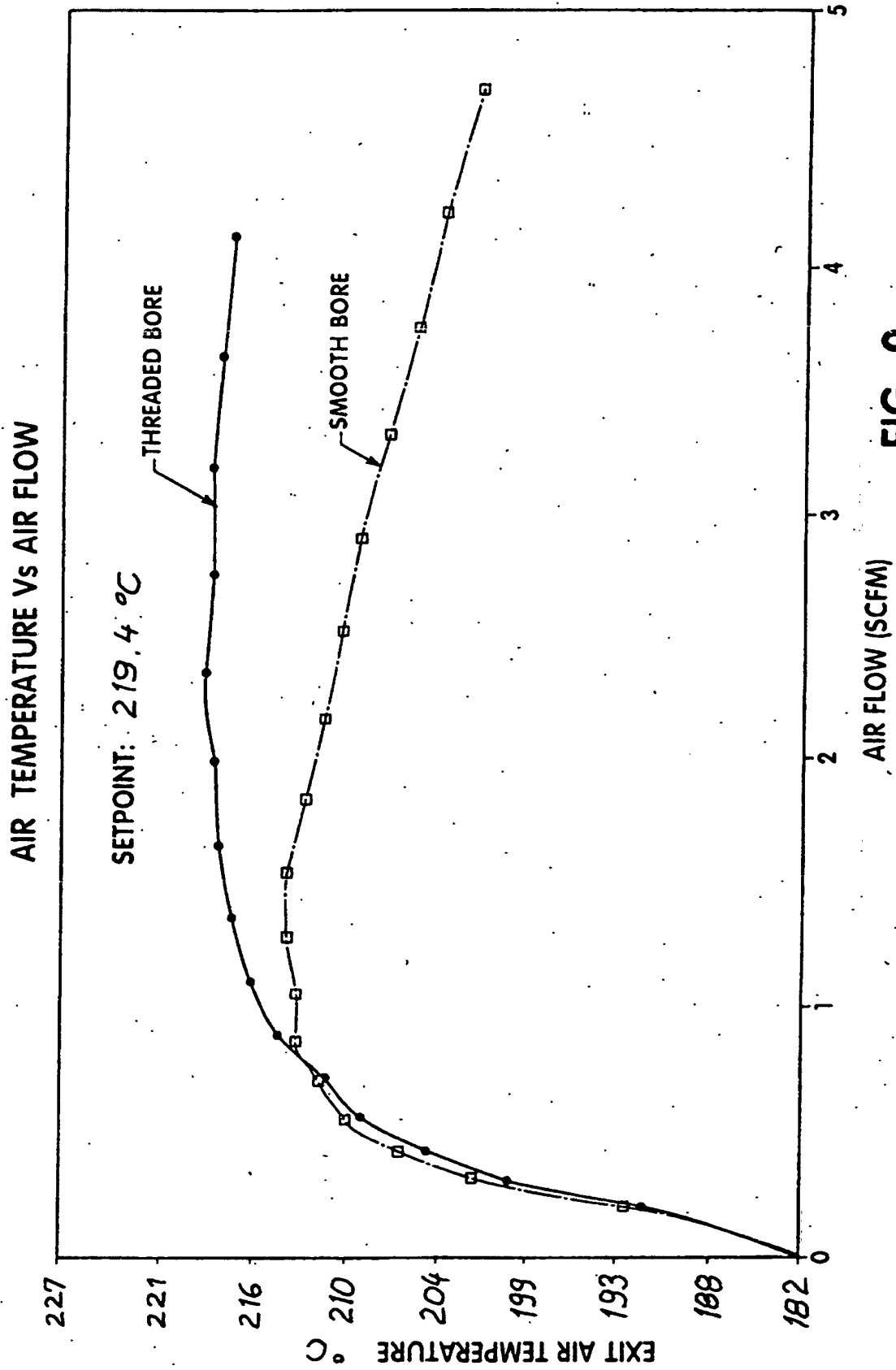


FIG. 9

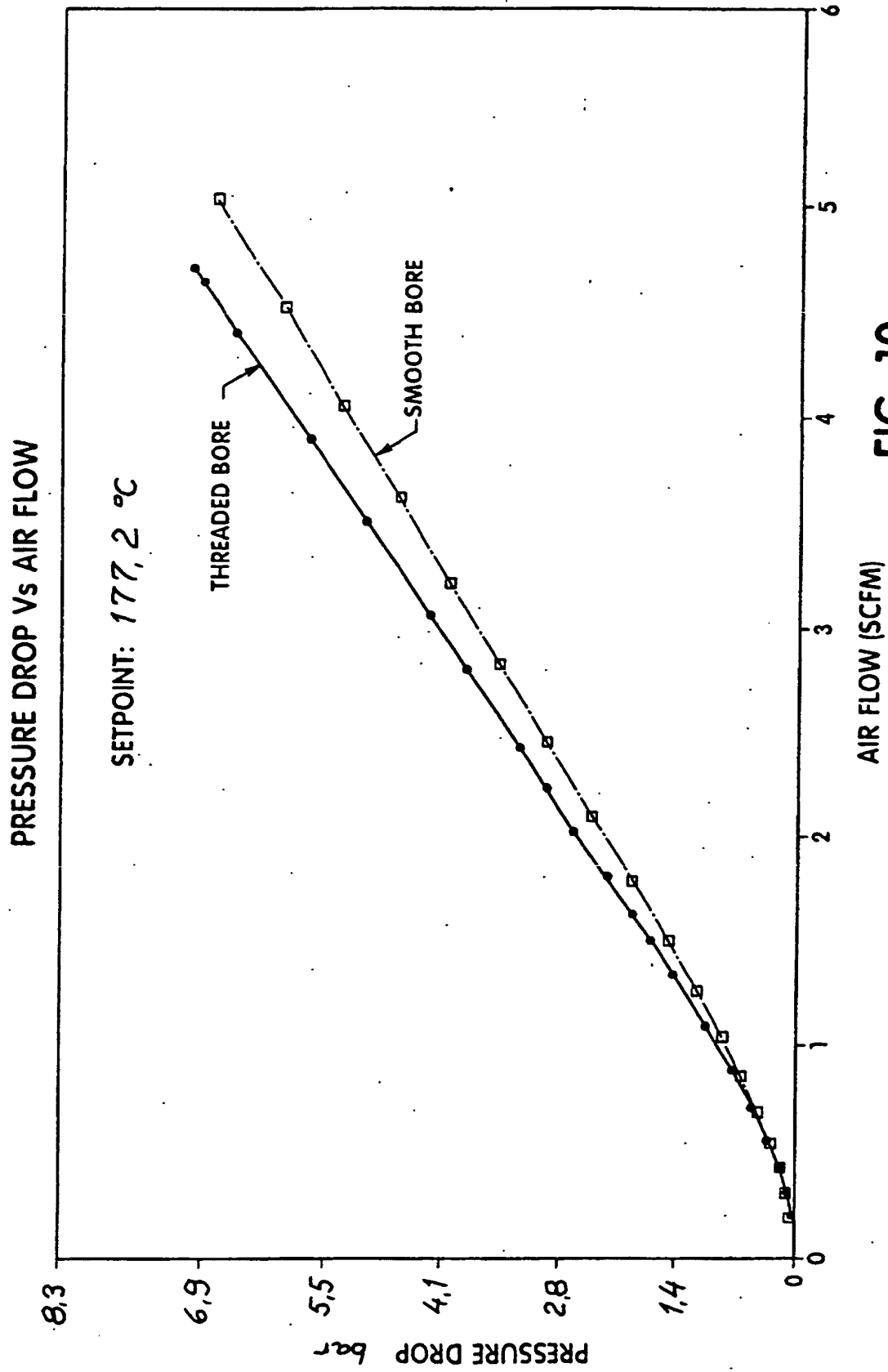


FIG. 10