

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
25 July 2002 (25.07.2002)

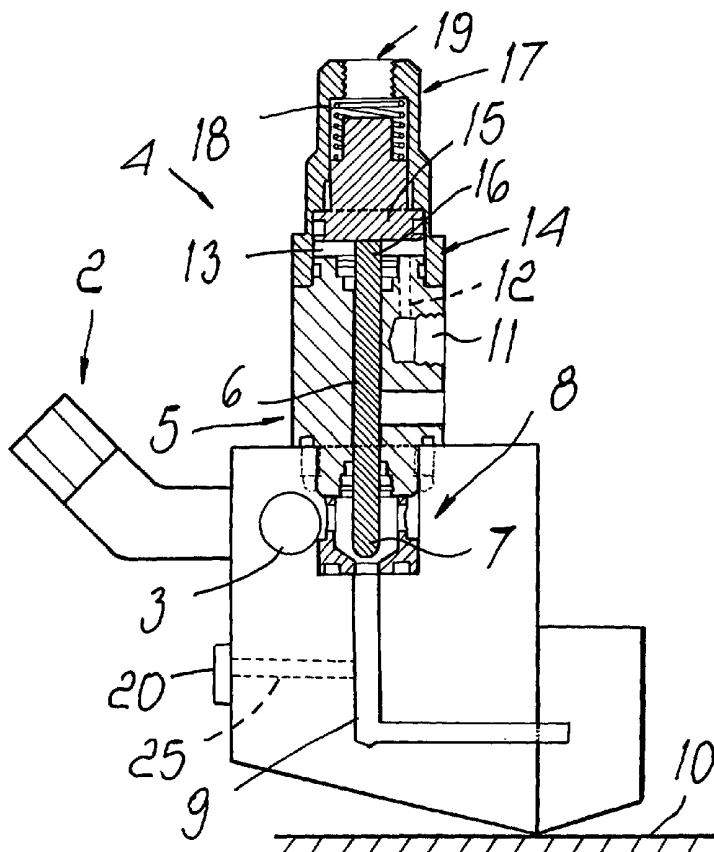
PCT

(10) International Publication Number  
**WO 02/057025 A2**

- (51) International Patent Classification<sup>7</sup>: **B05C**
- (21) International Application Number: PCT/EP02/00170
- (22) International Filing Date: 10 January 2002 (10.01.2002)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:  
TV2001A000008 17 January 2001 (17.01.2001) IT
- (71) Applicant (for all designated States except US): **H.I.P. S.R.L. HIGH INDUSTRIAL PERFORMANCES** [IT/IT]; via A. Volta, 1, I-31027 Spresiano (IT).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): **ARNABOLDI, Riccardo** [IT/IT]; Via Vegri, 4/A, I-31027 Spresiano (IT).
- (74) Agent: **MODIANO, Guido**; Modiano & Associati, Via Meravigli, 16, I-20123 Milano (IT).
- (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: SPREADING HEAD, PARTICULARLY FOR THERMOPLASTIC MATERIAL



(57) Abstract: A spreading head, particularly for spreading thermoplastic material on an intermediate component, which comprises a first duct (2) for feeding the adhesive to a valve (4) provided with a needle (5) that interferes with a cup (8) connected to a second duct (9) for spreading an adhesive. The valve comprises means (11) suitable to actuate and/or visualize the selective positioning of the needle, preferably in the open condition.

WO 02/057025 A2



**Published:**

— without international search report and to be republished upon receipt of that report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

## SPREADING HEAD, PARTICULARLY FOR THERMOPLASTIC MATERIAL

### Technical Field

The present invention relates to a spreading head, particularly for spreading thermoplastic material on an intermediate component.

### Background Art

Known spreading heads are currently used which are usually arranged transversely to the direction of movement of the intermediate component.

Such heads are usually composed of a laminar-flow assembly having a beak-shaped cross-section, an upper clamp block, and an underlying lower clamp block.

As an alternative, above the lower clamp block there can be a single device that acts as laminar-flow assembly and as upper clamp block.

The thermoplastic material (for example adhesives, including those known as "hot melt" or "reactive hot melt" adhesives) is first melted by means of a suitable continuous melting unit (tank) or a drum unloader and is then injected into the spreading head by means of gear pumps.

The transverse distribution of the adhesive is performed by means of a closed duct affected by uniformly spaced valves (modules), which allow the adhesive to reach a second laminar-flow region through channels and optionally a third region.

Such channels convey the adhesive directly to the laminar-flow assembly, which is directly connected to the intermediate component.

As mentioned, the passage of the fluid adhesive is allowed by suitable valves, usually known as modules, which are mostly actuated by electric valves of the pneumatic or magnetic type.

The duct is closed downstream of each valve by means of a device of the needle type, which closes onto an appropriately provided cup.

The ducts are opened by lifting the needle from the closed position.

The main drawback of this known head is the fact that sometimes the

opening movement of the valve is not achieved; this can depend on various situations, including the fact that the injected hot-melt adhesives can be unstable and, if they remain at high temperature, can trigger charring (cracking) phenomena that block the valve.

5 Furthermore, if reactive hot-melts are used, the adhesive can polymerize in the head itself, consequently blocking the valve.

The opening movement of the valve might not be achieved also due to normal mechanical problems (hindered sliding movements) or due to wear or failure of sealing gaskets (O-rings) of the pneumatic circuit.

10 Clearly, the uncontrolled failure of a valve to open entails a severe damage for the application of the adhesive and entails, in the case of spreading heads of the known type, a reduction in the overall amount of adhesive applied to the substrate.

The effect in heads of the so-called "step" type (which comprise multiple  
15 regions for releasing the material in film form) is much more severe: such heads are choked transversely and each individual valve supplies a step without thereby any possibility to compensate for the adhesive that does not arrive from the unintentionally "closed" valve; the occurrence of this condition entails the uncontrolled production of rejects, since a band as wide  
20 as the step of adhesive will be missing on the strip being processed.

In addition to this, in many cases visual monitoring of the application is not possible owing to the small amount of adhesive that is applied: by way of example, the following application is cited:

- thickness of applied adhesive: 1.5 microns
- 25 -- characteristics of adhesive: transparent
- width of substrate: 3,600 mm
- speed of application: 400 m/min

In a correlated way, one can deduce that in the above cited application case the reject produced inadvertently might reach approximately 86,400  
30 square meters/hour.

Moreover, one should consider that the product on which the hot melt is spread is normally coupled immediately by calendering to another film (immediately in order to utilize the ability of the hot melt to act as a bonding agent when it is at high temperature).

5 This entails the following further remarks: first of all, it is very difficult to perform visual inspection after spreading, since the region is located 300-400 mm from the calendering point (a distance that is covered in 0.0525 s in the above cited operating conditions).

10 Furthermore, it is extremely difficult to perform inspection, since the region to be examined is normally protected by barriers according to EC standards; finally, the defect (lack of adhesive on a band) is difficult to detect on the coupled material, which is wound immediately in a roll.

15 Currently, it is known, as a control measure that is usually adopted, to perform a sample check of the production, analyzing a transverse strip taken from the composite during production.

It is noted that this operation can occur easily only on the end portions of the rolls obtained once they have been removed from the machine; otherwise, the removal of samples would entail an inevitable machine downtime (complete cutting of the strip being processed and subsequent splicing).

20 Besides, identifying a band of defective product says nothing regarding the starting point and end point of the defect: one should bear in mind that since one is speaking of coupled products it is quite difficult to identify the head and the tail of the reject.

25 Clearly, there is the risk of not identifying a reject despite the sample check.

#### Disclosure of the Invention

30 The aim of the present invention is therefore to solve the noted technical problems, eliminating the drawbacks of the cited known art and thus providing an invention that allows to obtain a head that allows to monitor the

actual open condition of the valves (modules).

Within this aim, an object of the present invention is to provide a spreading head in which it is possible to detect the position of the needle in the valve, preferably detecting that it is in the open position.

5 Another important object is to provide a spreading head in which it is possible to detect immediately any failure to apply adhesive on a band.

Another object is to provide a spreading head that is structurally simple and has low manufacturing costs.

10 This aim and these and other objects that will become better apparent hereinafter are achieved by a spreading head, particularly for spreading thermoplastic material on an intermediate component, comprising a first duct for feeding an adhesive to a valve provided with a needle that interferes with a cup connected to a second duct for spreading said adhesive, characterized in that said valve comprises means suitable to actuate and/or visualize a  
15 selective positioning of said needle.

Advantageously, such means actuate the positioning of the needle in the open condition.

#### Brief description of the drawings

20 Further characteristics and advantages of the invention will become better apparent from the detailed description of a particular embodiment, illustrated only by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a side view of the spreading head according to the present invention;

25 Figure 2 is a partially sectional view, similar to Figure 1;

Figure 3 is a sectional view of the valve;

Figure 4 is a view, similar to Figure 3, of the valve;

Figure 5 is a view of the use of a capacitive sensor with the valve in the closed condition;

30 Figure 6 is a view of the embodiment of Figure 5, with the valve in the

open condition.

### Ways of carrying out the Invention

With reference to the figures, the reference numeral 1 designates a spreading head particularly for spreading thermoplastic material on intermediate components.

The head 1 is preferably arranged transversely to the flow of motion of intermediate components on which for example an adhesive is to be applied, and has a first duct 2 for feeding the adhesive at a hole 3 for the transverse distribution of the adhesive at one or more valves 4.

Each one of the valves 4 comprises a body 5, rigidly coupled to the head 1, which contains a needle 6 arranged axially thereto; the tip 7 of the needle is arranged inside the head 1 at a cup 8, which is connected to a second duct 9 for spreading adhesive at a suitable substrate 10.

At the valve 4 there are means suitable to actuate the selective positioning of the needle 6 in an open position, such means being constituted for example by a first air intake 11 obtained laterally from the body 5 and connected to a third duct 12, which is in turn connected to a chamber 13 provided between a rear end 14 of the body 5 directed away from the cup 8 and a disk 15 to which a rear end 16 of the needle 6 is axially coupled, the disk sliding at a cover 17, which is associated with the rear end 14 of the body 5.

The disk 15, and therefore the needle 6, can move axially with respect to the body 5 and the cover 17 in contrast with at least one elastically deformable element, such as a spring 18.

The free end of the cover 17 advantageously has a second intake 19, which is preferably suitable to be connected to an air supply, like the first intake 11.

This solution allows to move the needle 6, for example by pneumatic actuation: it is possible to inject air at the first intake 11, so as to force the uncoupling of the tip 7 of the needle 6 from the cup 8, thus connecting the

hole 3 to the second duct 9, so as to allow to spread the adhesive.

Any injection of air at the second intake 19 instead allows to achieve the movement of the needle 6 until it is arranged in the closed condition, in which its tip 7 closes the end of the second duct 9, so as to prevent the spreading of the adhesive.

As an alternative to the second intake 19, which can also be closed, the step for closing the needle 6 can be achieved by setting the spring 18 appropriately.

There is also a fifth intake 26, which is formed laterally to the body 5 at the chamber 13: at the fifth intake 26 it is possible to arrange an additional pressure sensor or a sensor for detecting the position of the disk 15 connected to the needle 6.

It is therefore again possible to control the position of the needle, as in the preceding cases.

It has thus been found that the invention has achieved the intended aim and objects, a head having been provided which allows to control the actual open condition of the valves, since it is possible to detect the position of the needle.

It is thus possible to detect immediately any failure to apply adhesive along a band.

The invention is of course susceptible of numerous modifications and variations, all of which are within the scope of the same inventive concept.

Thus, for example, at the first intake 11 it is possible to connect an appropriate pressure sensor 20, which is suitable to confirm the position of the disk 15 and therefore of the needle 6, for example in the open condition in which the tip 7 of the needle does not close the second duct 9.

As an alternative, as shown in Figure 4, laterally to the cover 17 there is a third air intake 21, and at the same time the second intake 19 is closed by means of a capacitive sensor 22, suitable to provide a signal indicating the correct placement of the disk 15 and therefore of the needle 6.

The capacitive sensor 22 can be of the ON/OFF type if one wishes to detect exclusively the correct opening of the needle 6, or of the proportional type if one wishes to check, by means of the same instrument, also the correct closure of the needle 6.

5 In this case also, the spring 18 might be omitted.

As an alternative to the use of a capacitive sensor, it is possible to use a sensor of the magnetic type.

It is also possible to use a sensor suitable to check the position assumed by the needle 6 inside the body 5, for example a suitable optical sensor,  
10 which can be arranged at a fourth intake 23 formed radially with respect to the body 5 and adapted to connect an outer lateral surface 24 thereof with the seat in which the needle 6 slides.

In this case, the correct closed or open position of the needle 6 can be detected once again.

15 As an alternative, it is possible to install at the fourth intake 23 an electric position sensor, which can also be positioned, for example, at the second intake 19.

It is also possible to use a suitable pressure sensor located on the air circuit upstream of the first intake 11, the pressure sensor being suitable to  
20 confirm that the pressure that corresponds to a correct opening of the valve, and therefore to the lifting of the needle 7 with respect to the second duct 9, has been reached.

It is also possible to use a pressure sensor in the adhesive circuit located downstream of the valve 4 and therefore at the second duct 9; such duct can  
25 in fact be connected, by means of a suitable fourth duct 25, to the outside of the head 1; the fourth duct 25 is connected to a suitable pressure sensor 20 for hot-melt, which reports the correct opening of the valve because the pressure of the adhesive circuit downstream of said sensor has been reached.

Figures 5 and 6 illustrate the use of a capacitive sensor 22 in combination  
30 with the third intake 21 for the inflow of, for example, air, so as to allow the

axial closure movement of the needle 6.

In Figures 5 and 6, the cover 17 is elongated in order to allow to accommodate the capacitive sensor 22, which has a suitable axial length.

The capacitive sensor 22 can be used to check both the closed state and  
5 the open state (of the end of the second duct 9) of the needle 6; in the first  
case, the capacitive sensor 22 can therefore check the closure movement of  
the needle 6; advantageously, there is a suitable amplifier for the signal that  
arrives from the capacitor sensor 22 and there is a visual indicator 27, which  
comprises two LEDs 28a and 28b suitable, for example, to visually indicate  
10 the state of the position of the needle 6 and therefore the closure or not of the  
end of the second duct 9.

The materials used, as well as the dimensions of the individual  
components of the invention, may of course be more pertinent according to  
specific requirements.

15 The disclosures in Italian Patent Application No. TV2001A000008 from  
which this application claims priority are incorporated herein by reference.

CLAIMS

1. A spreading head, particularly for spreading thermoplastic material on an intermediate component, comprising a first duct for feeding an adhesive to a at least one valve provided with a needle that interferes with a cup  
5 connected to a second duct for spreading said adhesive, characterized in that said valve comprises means suitable to actuate and/or visualize the selective positioning of said needle.

2. The head according to claim 1, characterized in that said means actuate the positioning of said needle in the open condition.

10 3. The head according to claim 1, characterized in that a hole is provided, connected to said first duct, for the transverse distribution of said adhesive at said at least one valve which comprise a body, rigidly coupled to said head, which contains a needle arranged axially thereto, whose tip is arranged inside said head at a cup connected to a second duct for spreading the  
15 adhesive at a suitable substrate, each one of said one or more valves being provided with said means suitable to actuate and/or visualize the selective positioning of said needle at least in the open position, said means being constituted by a first air intake, which is formed laterally to said body and is connected to a third duct, which in turn is connected to a chamber which is  
20 formed between the rear end of said body that is directed away from said cup and a disk to which the rear end of said needle is axially coupled, said disk sliding at a cover that is associated with the rear end of said body.

4. The head according to claim 3, characterized in that said disk, and therefore said needle, can move axially with respect to said body and said  
25 cover in contrast with at least one elastically deformable element, such as a spring.

5. The head according to claim 3, characterized in that the free end of said cover has a second intake, which is suitable to be connected to an air supply, like said first intake, in order to allow to impart an axial movement  
30 to said needle by pneumatic actuation.

6. The head according to claim 3, characterized in that an injection of air at said first intake forces the uncoupling of said tip of said needle from said cup, thus connecting said hole to said second duct so as to allow to spread the adhesive.

5 7. The head according to claim 5, characterized in that the injection of air at said second intake allows to force the axial movement of said needle until it is arranged in the closed condition, in which its tip closes the end of said second duct so as to prevent adhesive spreading.

10 8. The head according to one or more of the preceding claims, characterized in that said spring is set to allow the closure of said needle on said cup once the injection of air at said second intake has ended.

15 9. The head according to one or more of the preceding claims, characterized in that a pressure sensor is connected at said first intake and is suitable to confirm the position of said disk and of said needle 6 in the open condition in which said tip does not close said second duct.

20 10. The head according to one or more of the preceding claims, characterized in that laterally to said cover there is a third air intake and simultaneously said second intake is closed by means of a capacitive or magnetic or optical sensor, suitable to provide a signal indicating the correct or intended position of said disk and therefore of said needle.

11. The head according to claim 10, characterized in that said capacitive sensor is of the ON/OFF type or of the proportional type.

25 12. The head according to claim 10, characterized in that said optical sensor can be positioned at a fourth intake, formed radially to said body, which connects the outer lateral surface of said body to the seat in which said needle slides.

13. The head according to claim 12, characterized in that an electric position sensor is installed at said second or fourth intakes.

30 14. The head according to one or more of the preceding claims, characterized in that it comprises a pressure sensor arranged on the air circuit

upstream of said first intake, said pressure sensor being suitable to confirm that the pressure that corresponds to a correct opening of the valve, and therefore to the lifting of said needle with respect to said second duct, has been reached.

5 15. The head according to one or more of the preceding claims, characterized in that it comprises a pressure sensor in the circuit of the adhesive arranged downstream of said valve and therefore at said second duct, which is connected, by means of a fourth duct, to the outside of said head, said fourth duct being connected to a pressure sensor for hot-melt,  
10 which reports the correct opening of said valve because the pressure of the adhesive circuit downstream of said pressure sensor has been reached.

16. The head according to one or more of the preceding claims, characterized in that it comprises a fifth intake, which is formed laterally to said body at said chamber, an additional pressure sensor or a sensor for  
15 detecting the position of said disk or needle being arrangeable at said fifth intake.

17. The head according to claims 1, 10 and 11, characterized in that said cover has a seat for a capacitive sensor and a third lateral intake for the inflow of preferably air, in order to allow the axial closing movement of said  
20 needle, said capacitive sensor being wired to a suitable signal amplifier, to a capacitive sensor and to a visual indicator that comprises a pair of LEDs suitable to visually indicate the state the position of said needle and therefore the closure or not of said end of said second duct.

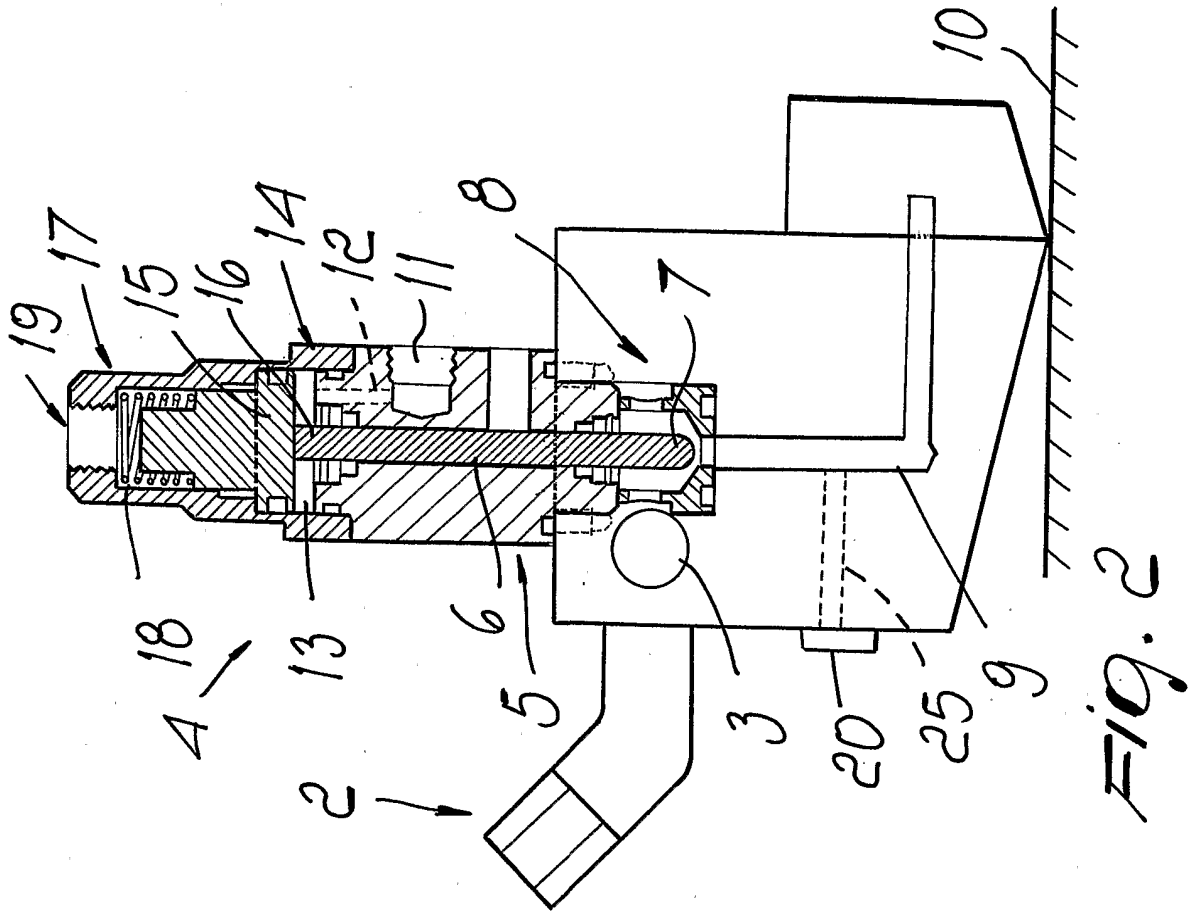


FIG. 2

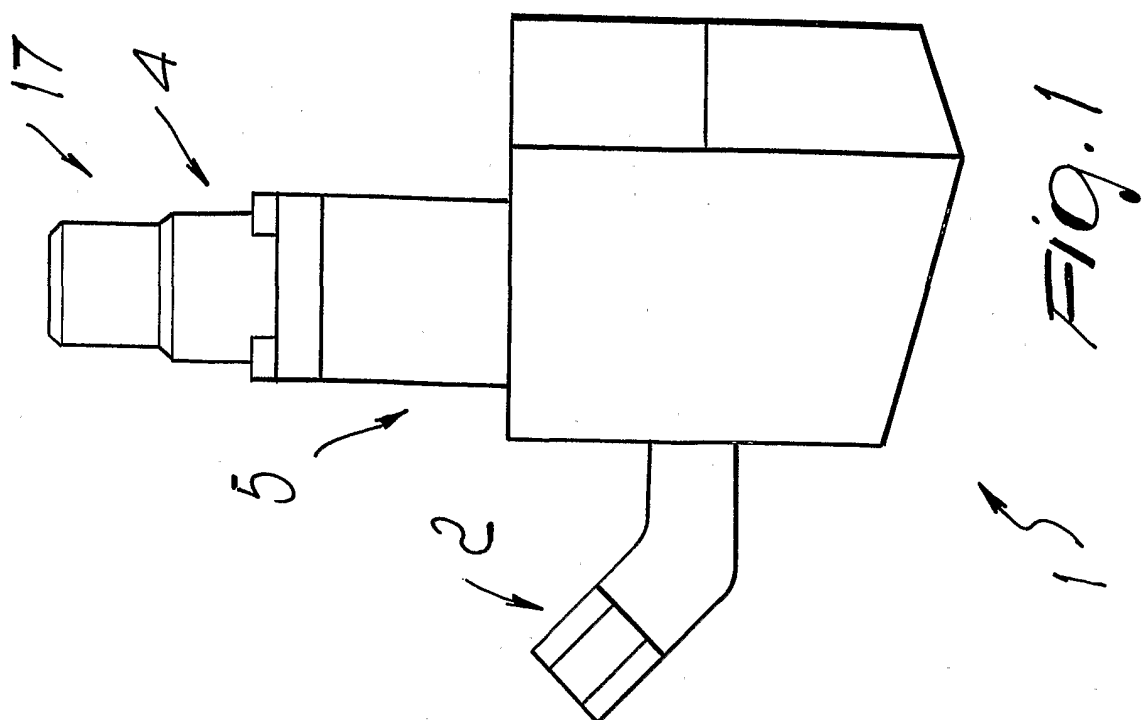
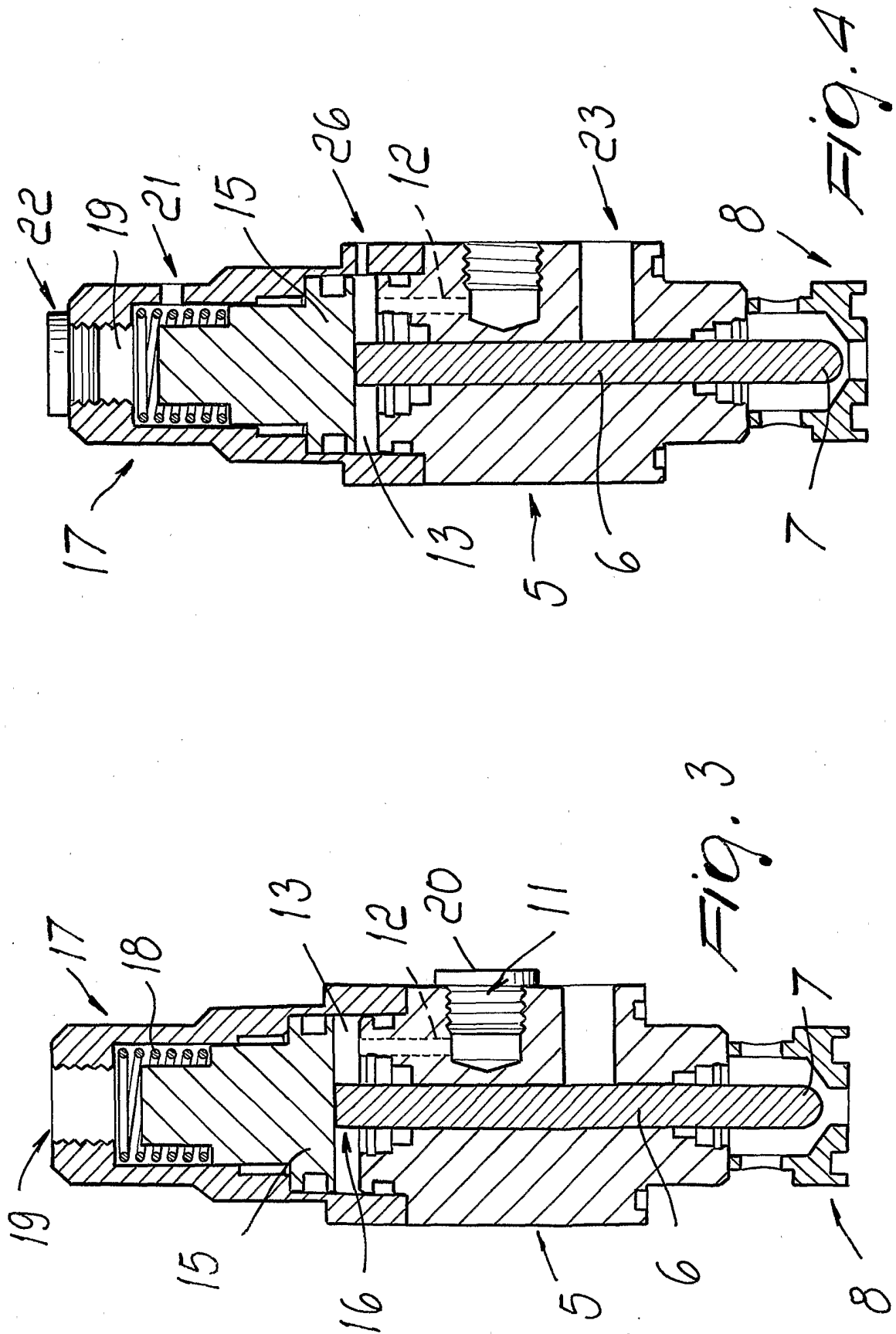
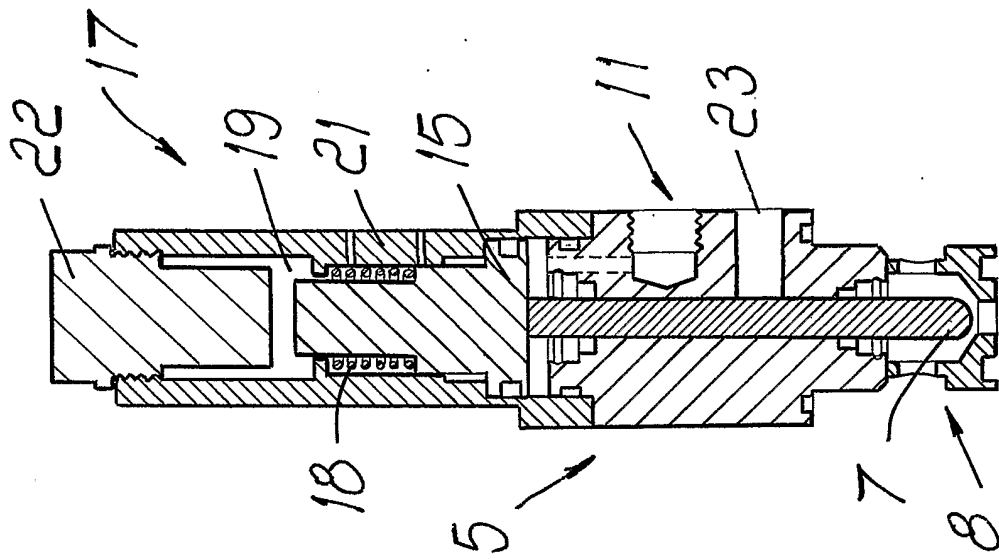
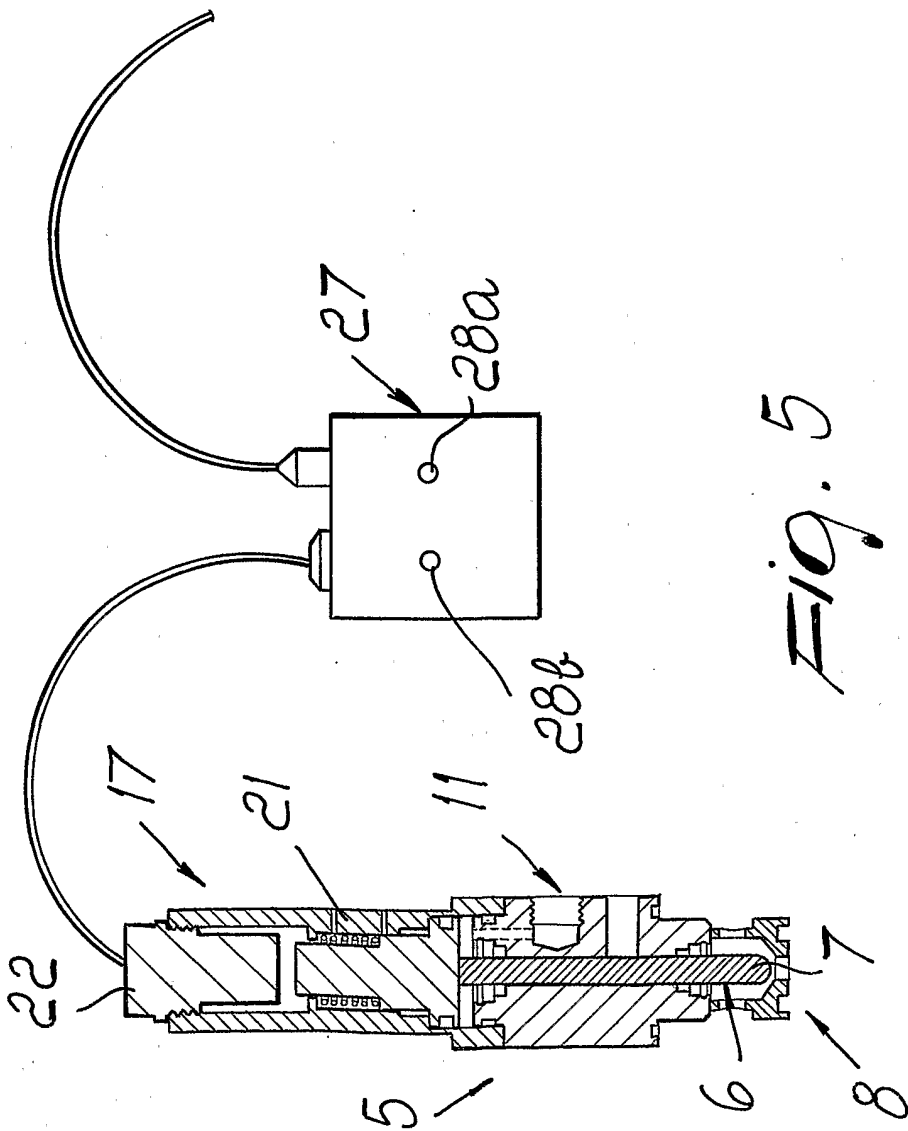


FIG. 1





*Fig. 6*



*Fig. 5*