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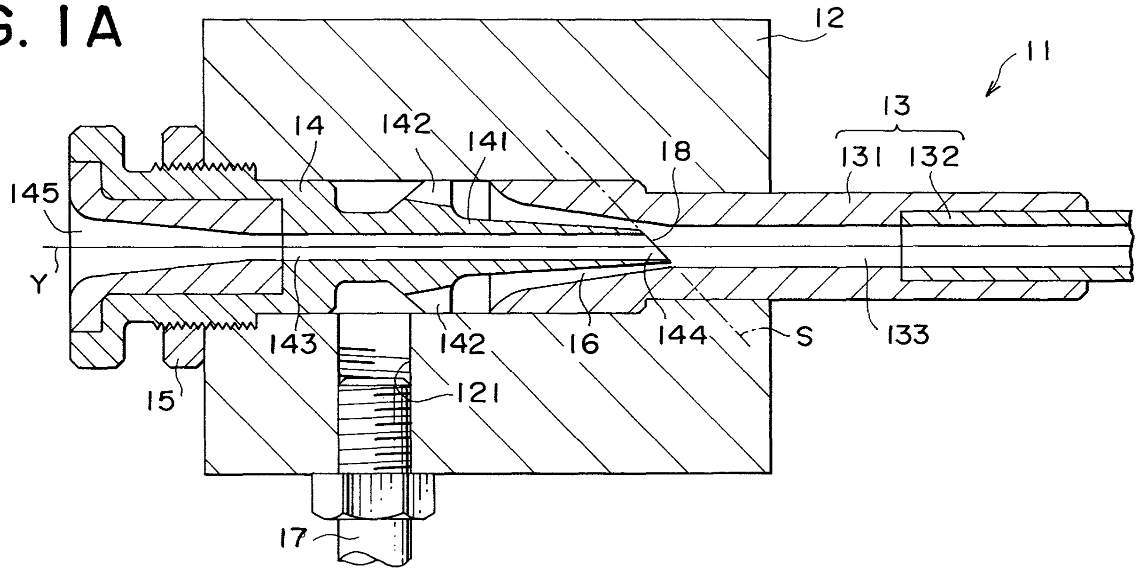
(54) **Weft conveying nozzle in an air jet loom**

(57) A deflective inflow portion 18 is formed at the forward end of a flow passage forming portion 141 of a thread guide 14. The deflective inflow portion 18 is formed by cutting the forward end portion of the flow passage forming portion 141 along a plane S obliquely intersecting the center axis line L of a weft passage 143. When forming the deflective inflow portion S by cutting along the plane S, the cutting is effected from the outlet 144 of the weft passage 143 toward the inlet 145 of the weft passage 143. The deflective inflow portion 18 is entirely surrounded by an air flow passage 16.

FIG. 1A



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a weft conveying nozzle in an air jet loom.

2. Description of the Related Art

[0002] In an air jet loom, a weft is stored for length measurement in a weft length measurement storage device, and the stored weft is drawn out from the weft length measurement storage device by the air jet action of a weft inserting main nozzle before effecting weft insertion. To attain an increase in speed, which is an advantage of an air jet loom, it is necessary to increase the speed at which weft insertion is performed. To achieve this, it is necessary to draw out the weft from the weft length measurement storage device within a limited period of time.

[0003] In the threading nozzle disclosed in Japanese Paten Application Laid-Open No. Hei 9-21035, a plurality of cutouts are provided at the forward end of a thread guide to avoid rapid expansion of an air flow in a pipe in which the air flow is mixed with a weft. The purpose of avoiding rapid expansion of the air flow in the mixing pipe is to prevent generation of a turbulent flow. Preventing generation of the turbulent flow contributes to increasing weft inserting speed.

[0004] In an ordinary nozzle with no such cutouts, the flow velocity of the air directly in front of the outlet of the thread guide is minimum in the vicinity of an extension of a center axis line of the weft passage in the thread guide. The weft flies in the vicinity of the extension of the center axis line of the weft passage. That is, the high velocity portion of the air flow directly in front of the outlet of the thread guide is not effectively utilized in the flying of the weft.

[0005] The plurality of cutouts in the threading nozzle disclosed in Japanese Patent Application Laid-Open No. Hei 9-21035 are arranged circumferentially and in bilateral symmetry. Thus, the air flowing into the weft passage in the thread guide from the cutouts is bilaterally symmetrical. Similarly in the case of the ordinary nozzle described above, the bilateral symmetry of the air flow entering from the cutouts into the weft passage makes the portion in the vicinity of the extension of the center axis line of the weft passage in the thread guide a minimum velocity air flow portion. Thus, also in the threading nozzle disclosed in Japanese Patent Application Laid-Open No. Hei 9-21035, a substantial increase in the weft inserting speed is not to be expected.

SUMMARY OF THE INVENTION

[0006] It is an object of the present invention to provide a weft conveying nozzle advantageous in increasing the weft inserting speed.

[0007] To attain the above-mentioned object, according to the present invention, there is provided a weft conveying nozzle including a weft passage into which a weft is introduced and guided, and an air flow passage causing air to flow toward the weft passage along an outer peripheral surface of a thread guide, which forms the weft passage, the air flow passage being extended to a weft route in front of the weft passage to overlap the same, in which the weft passage in the thread guide has a circular sectional configuration, and in which a unitary deflective inflow portion for making an area of the outlet of the weft passage in the thread guide larger than the area of the circular cross-section of the weft passage is formed by cutting the weft passage away from the outlet side toward the weft passage inlet side.

[0008] The existence of the deflective inflow portion shifts, directly in front of the outlet of the thread guide, the minimum velocity portion of the air flow from the vicinity of an extension of a center axis line of the weft passage. That is, directly in front of the outlet of the thread guide, the high velocity portion of the air flow enters the vicinity of the extension of the center axis line of the weft passage, and the high velocity portion of the air flow directly in front of the outlet of the thread guide is effectively utilized in the flying of the weft.

[0009] The diameter of the weft passage in the thread guide for passing the weft is very small. Thus, to form a number of deflective inflow portions at the forward end of the thread guide by cutting, a very sophisticated machining technique is required. The formation of a unitary deflective inflow portion by cutting can be effected relatively easily.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] In the accompanying drawings:

Figs. 1A through 1C show a first embodiment of the present invention, in which Fig. 1A is a side sectional view, Fig. 1B is an enlarged main portion sectional view, and Fig. 1C is an enlarged main portion perspective view;

Fig. 2 is an enlarged main portion side sectional view for illustrating flow velocity distribution of the present invention;

Fig. 3 is an enlarged main portion side sectional view showing a second embodiment of the present invention;

Fig. 4 is an enlarged main portion side sectional view showing a third embodiment of the present invention;

Fig. 5 is an enlarged main portion side sectional view showing a fourth embodiment of the present invention; and

Fig. 6 is an enlarged main portion side sectional view for illustrating flow velocity distribution in the prior art.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] The first embodiment of the present invention will now be described with reference to Figs. 1, 2, and 6.

[0012] As shown in Fig. 1A, a weft conveying nozzle 11 is composed of a cylindrical nozzle body 12, an accelerating tube 13 fitted into the nozzle body 12, a cylindrical thread guide 14 threadely engaged with the nozzle body 12, and a lock nut 15 for fastening the thread guide 14 to the nozzle body 12.

[0013] The forward end portion of the thread guide 14 is formed as a conical flow passage forming portion 141, and, in the middle of the flow passage forming portion 141, a plurality of positioning fins 142 are arranged circumferentially. The tips of the positioning fins 142 are in contact with the inner peripheral surface of the nozzle body 12. The accelerating tube 13 is composed of a base tube 131 fitted into the nozzle body 12 and a thin tube 132 fitted into the base tube 131. The forward end portion of the flow passage forming portion 141 of the thread guide 14 enters in the base tube 131. An annular air flow passage 16 is formed between the outer peripheral surface of the forward end portion of the flow passage forming portion 141 of the thread guide 14 and the tapered inner peripheral surface of the base tube 131.

[0014] A connection port 121 is formed in the nozzle body 12 so as to communicate with the interior of the nozzle body 12, and an air supply pipe 17 is connected to the connection port 121. The air supplied from the air supply pipe 17 flows through the air flow passage 16, the base tube 131, and the thin tube 132. A weft Y is passed through a weft passage 143 of the thread guide 14 and a traction passage 133 in the accelerating tube 13.

[0015] As shown in Figs. 1B and 1C, a deflective inflow portion 18 is formed at the forward end of the flow passage forming portion 141 of the thread guide 14. The deflective inflow portion 18 is formed by cutting the forward end portion of the flow passage forming portion 141 along a plane S that is oblique with respect to the center axis line L of the weft passage 143. The deflective inflow portion 18 is arranged in the plane S that is a unitary surface. The deflective inflow portion 18 formed by cutting along the plane S is cut from the outlet 144 of the weft passage 143 toward the inlet 145 of the weft passage 143. The entire deflective inflow portion 18 is surrounded by the air flow passage 16.

[0016] The weft passage 143 of the thread guide 14 has a circular sectional configuration. The area of the deflective inflow portion 18 formed by slicing the weft passage 143 along the plane S (the area of the shaded portion in Fig. 1C) is larger than that of the circular sectional portion of the weft passage 143.

[0017] The weft Y, which is passed through the weft passage 143 of the thread guide 14 and the traction passage 133 in the accelerating tube 13, receives a driving force due to the air flow in the traction passage 133 in the accelerating tube 13 in front of the forward end of the thread guide 14. The traction passage 133, which constitutes the weft passage in front of the weft passage 143, is connected to the air flow passage 16, and is a region where the weft Y and air flow exist.

[0018] The first embodiment provides the following advantages:

(1-1) In Fig. 2, the arrows in the air flow passage 16, in the vicinity of the outlet of the weft passage 143, and in the traction passage 133 directly in front of the outlet of the weft passage 143 indicate air flow velocity. Fig. 2 shows the flow velocity distribution in the air flow passage 16, in the vicinity of the outlet of the weft passage 143, and in the traction passage 133 directly in front of the outlet of the weft passage 143 in the first embodiment when the pressure of the compressed air supplied to the weft conveying nozzle 11 is 1 kg/cm^2. In Fig. 6, the arrows in the air flow passage 16A, in the vicinity of the outlet of the weft passage 143A, and in the traction passage 133A directly in front of the outlet of the weft passage 143A indicate air flow velocity. Fig. 6 shows the flow velocity distribution in the air flow passage 16A, in the vicinity of the outlet of the weft passage 143A, and in the traction passage 133A in the base tube 131A directly in front of the outlet of the weft passage 143A when the pressure of the compressed air supplied to the weft conveying nozzle 11 is 1 kg/cm^2 in the prior art with no deflective inflow portion 18. In both Figs. 2 and 6, the flow velocity distribution is obtained through theoretical calculation on the assumption that the diameter of the weft passage 143, 143A is approximately several mm. In Figs. 2 and 6, the longer the arrow, the higher the flow velocity. The maximum flow velocity is approximately equal to sound velocity.

In the conventional weft conveying nozzle 11A of Fig. 6, the air flow velocity directly in front of the outlet of the thread guide 14A is minimum in the vicinity of the extension of the center axis line L of the weft passage 143A in the thread guide 14A. The air flow around the outlet of the thread guide 14A is symmetrical with respect to the periphery of the outlet of the thread guide 14A. Most of the air flow from the air flow passage 16A to the traction passage 133A is substantially parallel to the inner peripheral surface of the base tube 131A. This directivity in outflow is due to the symmetry of the cylindrical configuration of the thread guide 14A at the outlet of the thread guide 14A, that is, the symmetry of the air flow passage 16A in the periphery of the outlet of the thread guide 14A.

In the weft conveying nozzle 11 of Fig. 2, the air flow velocity directly in front of the outlet of the thread guide 14 is minimum in the close vicinity of the inner peripheral surface of the base tube 131. And, the air flow velocity in the vicinity of the extension of the center axis line L of the weft passage 143 is high. The air flow around the outlet of the thread guide 14 is asymmetrical with respect to the periphery of the outlet of the thread guide 14. The outflow of air from the air flow passage 16 to the traction passage 133 shows a wide directivity ranging from the direction substantially parallel to the plane S for forming the deflective inflow portion 18 to the direction substantially parallel to the inner peripheral surface of the base tube 131. This directivity in outflow is due to the existence of the deflective inflow portion 18.

The existence of the deflective inflow portion 18 shifts, directly in front of the outlet of the thread guide 14, the minimum velocity portion of the air flow from the vicinity of the extension of the center axis line L of the weft passage 143 toward the inner peripheral surface of the base tube 131, causing a high velocity air flow to enter the vicinity of the extension of the center axis line L. Thus, the high velocity portion of the air flow directly in front of the outlet of the thread guide 14 is effectively utilized in the flying of the weft Y, and an improvement is achieved in terms of weft driving force. Thus, it is possible to provide a weft conveying nozzle advantageous in achieving an increase in weft inserting speed.

(1-2) As shown in Fig. 6, a swirl Q1 is symmetrically generated in the forward end portion of the thread guide 14A. When injection-inserting two wefts of the same kind alternately from a pair of weft conveying nozzles 11, air under a pressure of approximately 1 kg/cm^2 is supplied to the weft conveying nozzle 11 for the weft at standby for weft insertion so that the weft at standby for weft insertion may not be detached from the weft conveying nozzle 11. In this case, it is likely that the symmetrical swirl Q1 adversely affect the weft Y at standby for weft insertion. In particular, in the case of a filament thread, unweaving is likely to occur, which leads to a weaving flaw.

As shown in Fig. 2, a swirl Q2 is also generated in the forward end portion of the thread guide 14. However, the generation of the swirl Q2 is asymmetrical. This difference between the swirls Q1 and Q2 is due to the existence of the deflective inflow portion 18, and the influence of the swirl Q2 on the weft at standby for weft insertion is smaller than that of the swirl Q1 on the weft at standby for weft insertion, no unweaving occurring even in the case of a filament thread.

(1-3) Generally speaking, the diameter of the weft passage 143 of the thread guide 14 for passing the weft Y is as small as severalmm. Thus, when forming a number of deflective in flow portions at the forward end of the thread guide by cutting as in the case of the thread passing nozzle disclosed in Japanese Patent Application Laid-Open No. Hei 9-21035, a very sophisticated machining technique is required. In contrast, the formation of the unitary deflective inflow portion 18 by cutting can be effected relatively easily.

(1-4) The construction in which the deflective inflow portion 18 is formed by cutting the forward end portion of the thread guide 14 along the plane S so as to slice the weft passage 143 is the most simple from the viewpoint of the formation of the deflective inflow portion 18.

[0019] In the present invention, the second embodiment of Fig. 3, the third embodiment of Fig. 4, and the fourth embodiment of Fig. 5 are also possible.

[0020] In the second embodiment of Fig. 3, a deflective inflow portion 19 is formed by cutting the forward end portion of the thread guide 14 along the unitary surface S1 so as not to slice the weft passage 143. In the third embodiment of Fig. 4, a deflective inflow portion 20 is formed by cutting the forward end portion of the thread guide 14 along a unitary concave surface C1 so as to slice the weft passage 143. In the fourth embodiment of Fig. 5, a deflective inflow portion 21 is formed by cutting the forward end portion of the thread guide 14 along a unitary convex surface C2 so as to slice the weft passage 143.

[0021] Each of the deflective inflow portions 19 through 21 in the second through fourth embodiments is surrounded by the air flow passage 16.

Claims

1. A weft conveying nozzle (11) in an air jet loom, comprising a weft passage (143) into which a weft (Y) is introduced for guidance and an air flow passage (16) for causing air to flow toward said weft passage (143) along an outer peripheral surface of a thread guide (14), which forms said weft passage (143), said air flow passage (16) being extended to a weft route in front of said weft passage (143) to overlap the same,

   wherein said weft passage (143) in said thread guide (14) has a circular sectional configuration, and wherein a unitary deflective inflow portion (18, 19, 20, 21) for making an area of the outlet portion of said weft passage (143) in said thread guide (14) larger than that of the circular cross-section is formed by cutting from the outlet (144) side toward the inlet (145) side of said weft passage (143).

2. A weft conveying nozzle in an air jet loom according to Claim 1, wherein said unitary deflective inflow portion (18, 19, 20, 21) is arranged in a unitary surface.

3. A weft conveying nozzle in an air jet loom according to Claim 2, wherein said unitary deflective inflow portion (18, 19, 20, 21) is formed by cutting the forward end portion of said thread guide (14) along a plane (S, S1) obliquely intersecting the center axis line (L) of said weft passage (143).

4. A weft conveying nozzle in an air jet loom according to Claim 3, wherein said unitary deflective inflow portion (18, 19, 20, 21) is formed by cutting the forward end portion of said thread guide (14) along said plane (S) so as to slice said weft passage (143).

5. A weft conveying nozzle in an air jet loom according to Claim 2, wherein said unitary deflective inflow portion (18, 19, 20, 21) is formed by cutting the forward end portion of said thread guide (14) along a curved surface (C1, C2) obliquely intersecting the center axis line (L) of said weft passage (143).

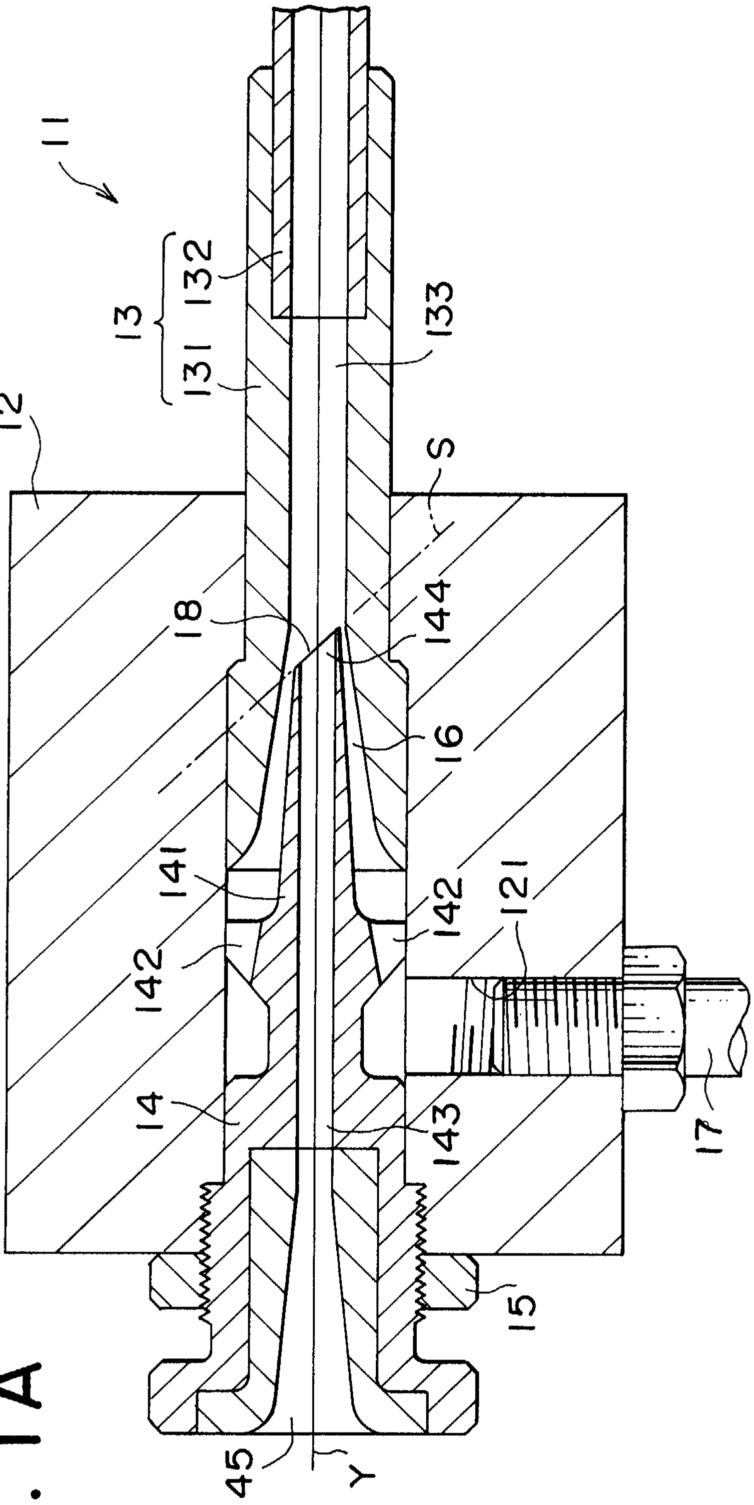

FIG. 1A

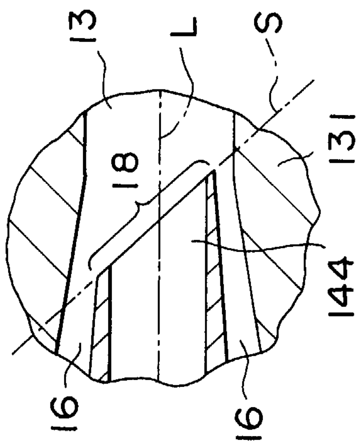

FIG. 1B

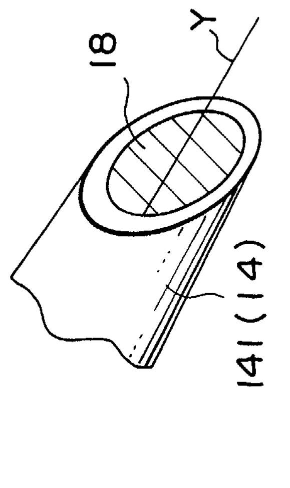

FIG. 1C

FIG. 2

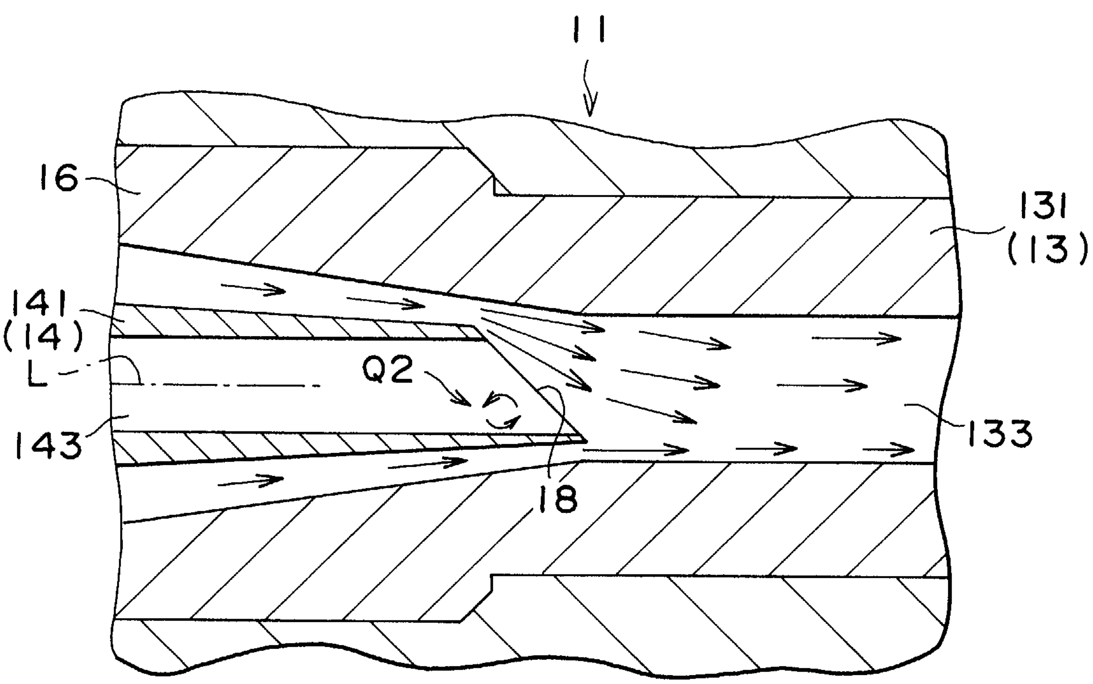

FIG. 3

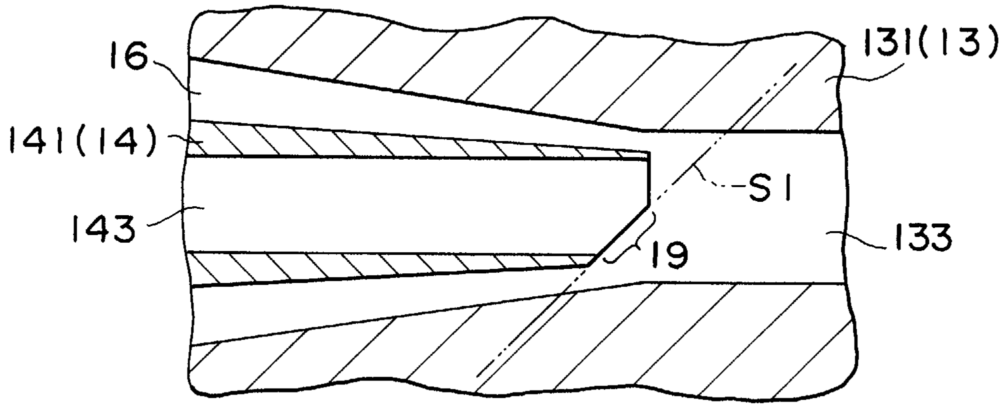

FIG. 4

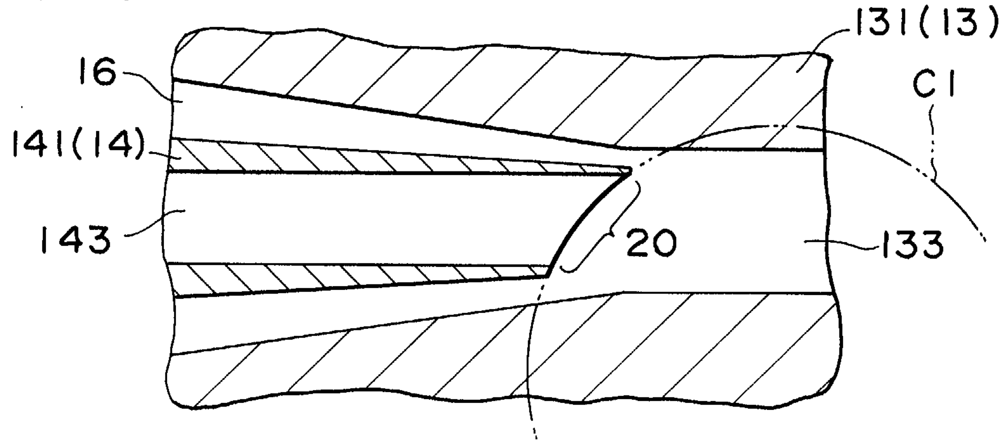

FIG. 5

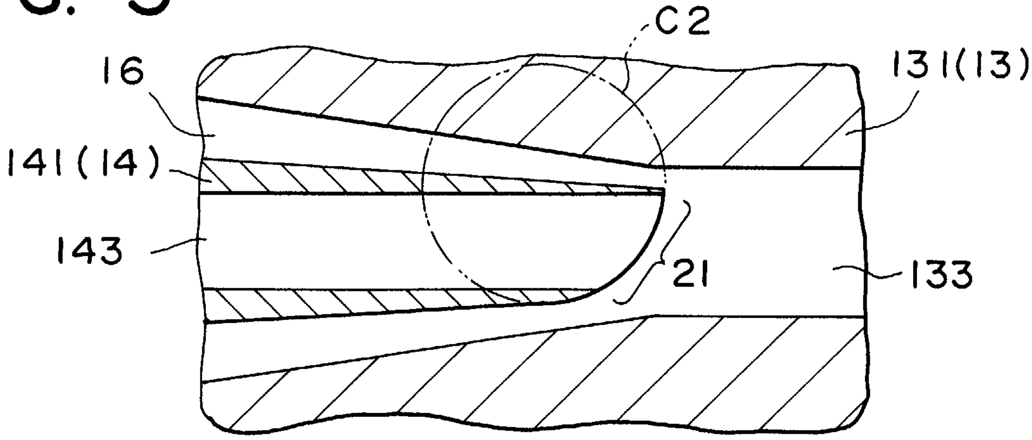

FIG. 6