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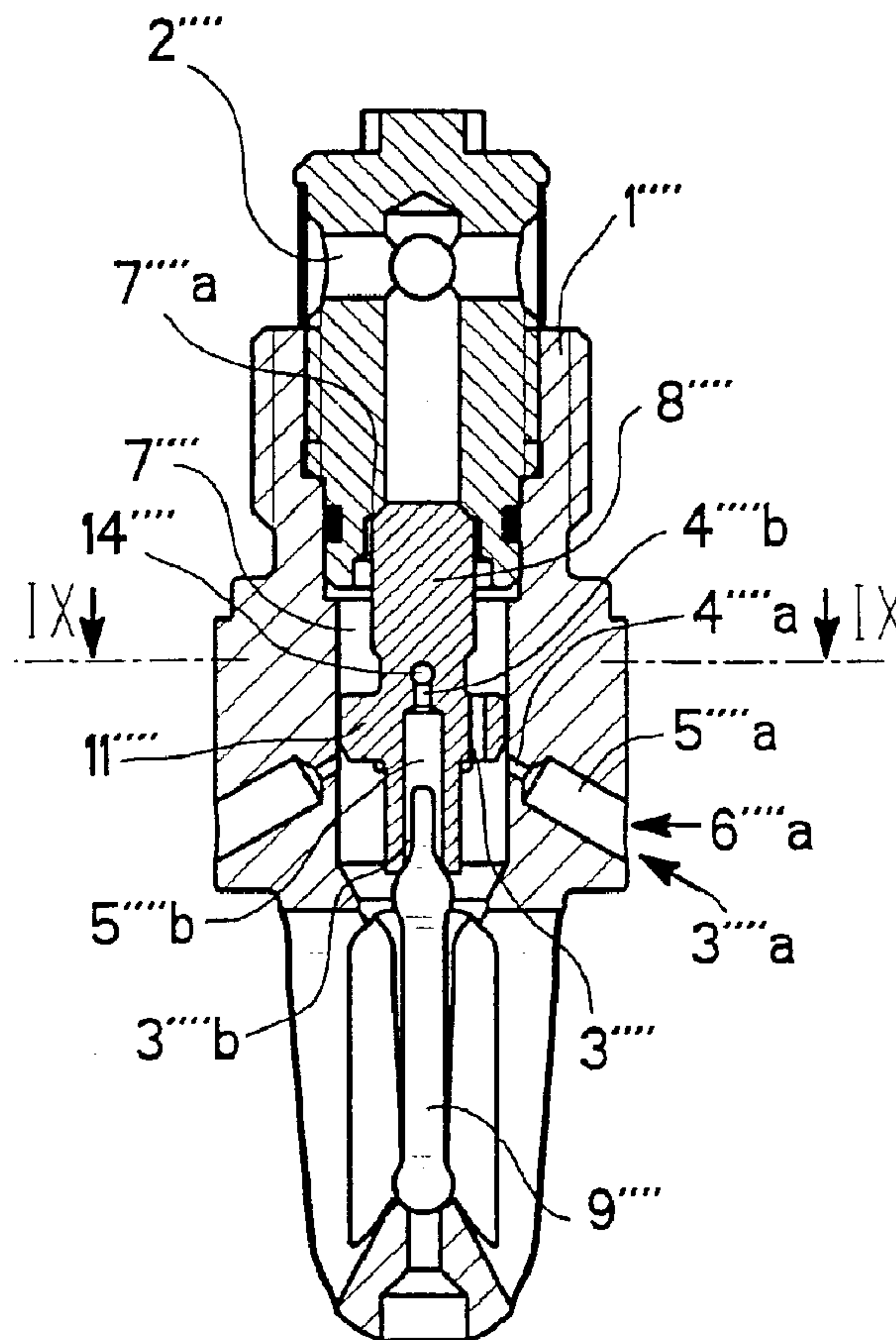
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(54) Titre : TETE DE VAPORISATION A BUSES OBTENUES PAR ALESAGE

(54) Title: SPRAYHEAD WITH NOZZLES MADE BY BORING



(57) Abrégé/Abstract:

The invention relates to a spray head for producing a liquid mist and preferably for extinguishing fire, the spray head comprising an inlet for receiving an extinguishing liquid, at least one nozzle that forms an opening in the exterior of the spray head for discharging

(57) **Abrégé(suite)/Abstract(continued):**

a mist of the extinguishing liquid and a passage connecting the inlet and the at least one nozzle such that the extinguishing liquid can be conveyed from the inlet to the opening, wherein: the at least one nozzle comprises a first boring and a second boring whose longitudinal axes are substantially aligned, the first boring having a relatively small width and the second boring having a relatively large width, such that the nozzle is capable of expanding a turbulent flow of extinguishing liquid as it flows from the first boring to the second boring, and the length of the second boring being sufficient for the expanded flow of extinguishing liquid to impact a wall of the second boring as it flows from the first boring to the opening, the nozzle thereby being capable of discharging a mist of extinguishing liquid from the opening.

Abstract

The invention relates to a spray head for producing a liquid mist and preferably for extinguishing fire, the spray head comprising an inlet for receiving an
5 extinguishing liquid, at least one nozzle that forms an opening in the exterior of the spray head for discharging a mist of the extinguishing liquid and a passage connecting the inlet and the at least one nozzle such that the extinguishing liquid can be conveyed from the inlet to the opening, wherein: the at least one nozzle comprises a first boring and a second boring whose longitudinal axes are
10 substantially aligned, the first boring having a relatively small width and the second boring having a relatively large width, such that the nozzle is capable of expanding a turbulent flow of extinguishing liquid as it flows from the first boring to the second boring, and the length of the second boring being sufficient for the expanded flow of extinguishing liquid to impact a wall of the second boring as it
15 flows from the first boring to the opening, the nozzle thereby being capable of discharging a mist of extinguishing liquid from the opening.

SPRAYHEAD WITH NOZZLES MADE BY BORING

BACKGROUND OF THE INVENTION

Technical Field

The invention relates to a spray head for producing a liquid mist and preferably for extinguishing fire, the spray head comprising a frame, an inlet and a passage leading to at least one nozzle with an opening including a first boring and a second boring, the first boring comprising a first diameter and the second boring a second diameter. The spray head nozzle is, when driven, intended to provide mist, i.e. small droplets when pressure is exerted in the nozzle.

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Description of the Related Prior Art

Spray heads capable of generating mist are known in the art. For example, US 5944113 discloses such a spray head.

In order to be able to spray mist with small droplets from known nozzles, the known spray head nozzles comprise openings into which various mechanical obstacles are arranged. Such a mechanical obstacle may be, for example, a rotating body, a stationary particularly shaped locking part, a helical spring etc.

When such obstacles are used a considerable drawback is that they reduce the efficiency of the spray head. This means that a fairly high effect is needed to provide a desired type of spray.

Said obstacles in the nozzles also mean that the structure of the nozzles and spray heads become fairly complicated. The nozzles are difficult to produce and they are supported in specific nozzle housings mounted into the frame of the spray head. Consequently the production costs of the spray head increase.

US 5881958 discloses a nozzle for discharging a mixture of a finely dispersed mist-like fluid. In order to achieve a homogeneously dispersed mixture throughout the spray pattern, the nozzles comprise recessed surfaces which cause fluid jets to produce negative pressure regions inwardly of a forward end

surface of the nozzle tip. These recessed surfaces require dedicated machining due to their configuration.

US 2813753 discloses a nozzle for producing a mist. The nozzle comprises passageways which terminate in respective recesses which are inclined at an angle with respect to the corresponding passageways. The recesses have a small length/diameter -ratio which in combination with said inclination makes it impossible - even with high pressures - to produce a directed mist spray with a high momentum. US 2813753 discloses three mechanisms in order to produce mist. The first mechanism is to let water to flow asymmetrically from a small passageway against a wall of a recess at the periphery of the nozzle; the second mechanism is to have small converging passageways to discharge against each other; and the third mechanism is to have a small passageway to discharge at high pressure against a recess without hitting the recess. The two first mechanisms enable to create mist at relatively low pressure, but the mist has low momentum even if pressure is increased. The third mechanism produces mist only if pressure is high.

The invention relates also to a method for forming a block of material a nozzle of a spray head for producing a liquid mist.

20 BRIEF DESCRIPTION OF THE INVENTION

In a first aspect of the invention there is provided a spray head for producing a mist of extinguishing liquid, the spray head comprising an inlet for receiving an extinguishing liquid, at least one nozzle that forms an opening in the exterior of the spray head for discharging the mist of the extinguishing liquid and a passage connecting the inlet and the at least one nozzle such that the extinguishing liquid can be conveyed from the inlet to the opening, wherein: the at least one nozzle comprises a first boring and a second boring whose longitudinal axes are substantially aligned, the first boring having a relatively small width and the second boring having a relatively large width, such that the nozzle is capable of expanding a turbulent flow of extinguishing liquid as it flows from the first boring to the second boring, and the length of the second boring being sufficient for the expanded flow of extinguishing liquid to impact a

wall of the second boring as it flows from the first boring to the opening, the nozzle thereby being capable of discharging a mist of extinguishing liquid from the opening.

5 In accordance with a second aspect of the invention there is provided a method for forming from a block of material a nozzle of a spray head for producing a mist of extinguishing liquid, the method comprising: forming in the block of material a nozzle inlet for receiving an extinguishing liquid by drilling a first boring of a first diameter in the block of material; forming in the block of material a nozzle outlet for discharging a mist of the extinguishing liquid by
10 drilling a second boring of a second diameter in the block of material such that the longitudinal axis of the second boring is substantially aligned with the longitudinal axis of the first boring; wherein the step of forming the nozzle outlet comprises drilling the second boring to have a larger width than the first boring such that the nozzle is capable of expanding a turbulent flow of extinguishing
15 liquid as it flows from the first boring to the second boring and drilling the second boring to be of sufficient length for the expanded flow of extinguishing liquid to impact a wall of the second boring as it flows from the first boring to the opening, the nozzle thereby being capable of discharging a mist of extinguishing liquid from the opening.

20 The invention is based on the astounding observation that mist including very small droplets can be produced at relatively low pressures by using two essentially aligned borings, said borings being arranged after one another (in the direction of flow of fluid), without having to place mechanical obstacles into the nozzle/nozzles of the spray head, when the nozzles are
25 dimensioned as indicated in the attached claims. Very significant for the invention is that a high pressure is not necessarily needed in order to produce the mist, but the mist can be produced with a relatively low pressure, typically from about 10 bar upwards. The medium is immediately composed of very small droplets as it flows out of the nozzle.

30 An essential advantage of the spray head is that it comprises a high efficiency, whereby a fairly low effect is sufficient for producing a mist-like spray with very small droplets. This means that a fire extinguishing installation provided

with the spray heads of the invention may comprise a drive source and additional components which are smaller and considerably less expensive than the ones known. This is particularly important in surroundings where a limited and fairly minimal effect is available. Another essential advantage is that the construction and the fabrication of the spray head can be very simple. The nozzle borings can be simply drilled into the head. The number of components in the spray head can be drastically reduced. For example, in a sprinkler with a slidable spindle and a few nozzles and a heat-releasing ampoule, the number of components can be reduced from approximately 40 to 8 without having any negative effects on the function and safety of the spray head. In its simplest form the spray head may consist of only a single part. The structure of the spray head frame may be particularly simple and separate nozzles from the frame are not needed. The fact that no nozzles are needed means that the production costs for the spray head remain considerably lower than for the known spray heads providing mist.

The method for forming from a block of material a nozzle of a spray head for producing a liquid mist comprises the steps of:

- forming in the block of material a first, inlet part of the nozzle by drilling a first boring of a first diameter in the block;
- forming in the block of material a second, outlet part of the nozzle by drilling a second boring of a second diameter in the block, said borings communicating with and being at least essentially aligned with each other;

wherein the first diameter is smaller than the second diameter such that there is a variation of the diameter of the nozzle at the junction of the first boring and the second boring whereby on passage of liquid through the nozzle from the inlet part to the nozzle part the liquid is formed into a mist.

The method of the present invention enables very easy and fast fabrication of a nozzle.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following the invention is described in greater detail with reference to the attached drawings, in which

Figure 1 is a side view showing a first preferred embodiment of the

4a

spray head of the invention,

Figure 2 is a cross-section showing the spray head in Figure 1 following line II - II in Figure 1,

Figure 3 shows an enlarged detail of the spray head in Figure 1,

5 Figures 4 to 6 show a second, third and fourth preferred embodiment of the spray head of the invention,

Figure 7 show a fifth preferred embodiment of the spray head of the invention in an inactive position,

Figure 8 shows the spray head in Figure 7 in an active position, and

10 Figure 9 is a cross-section showing the spray head in Figure 7 following line IX - IX in Figure 3.

DETAILED DESCRIPTION OF THE INVENTION

Figure 1 and 2 is a cross-sectional side view, and a sectional top

view respectively, showing a spray head of the invention. The spray head comprises a frame 1 with an inlet 2. A main channel of the spray head is indicated by reference numeral 7. Six identical openings 3 comprising a first cylindrical boring 4 and a second cylindrical boring 5 are bored in the frame 1.

5 These borings 4, 5 which can be manufactured very easily form the nozzles 6 of the spray head. The borings 4, 5 can simply be drilled into the frame 1 by two cylindrical drill bits or alternatively by a single, stepped cylindrical drill bit. The latter alternative produces always two coaxial borings, whereas the first alternative enables to produce also such borings that not necessarily are co-
10 axial.

The length s of the first boring 4 is 0.25 to 15 times the diameter d of the first boring. Preferably s is 0.5 to 10 and most preferably 1 to 5 times d , in which case a high efficiency is obtained.

The first boring 4 has a smaller diameter d than the diameter D of the second boring. The diameter d is 10 to 90 % of D . Preferably the diameter d is 10 to 80 % of D and most preferably 20 to 70 % of D . The diameter d is preferably within the range of 0.5 to 2.5 mm and most preferably within 0.5 to 1.5 mm. By having said small dimensions of the first boring 4, a strongly turbulent liquid through the boring 4 already at relatively low pressures. The more
15 inclined the first boring 4 in relation to the main channel 7, the more turbulent becomes the flow in the first boring. A diameter interval typically ranging from about 0.3 to about 5 mm can still be considered to provide good results, but when the diameter d remains beneath about 0.3 mm there is a risk of the jet being blocked by dirt etc. A large diameter d renders the mist formation more
20 difficult if the pressure in the nozzle is not high. A large diameter d in combination with a preferably low pressure does typically not provide mist as a result.

The length S of the second boring 5 is about 1 to about 15, and preferably 1 to 10 times the diameter D thereof. A particularly good result is obtained when S is 1 to 5 times D . When the diameter D of the second boring
25 5 is about 50 mm at the most, a good result is obtained for most applications. However, exceptionally the diameter D may exceed 50 mm.

The turbulent medium flow from the first boring 4 expands immediately at the discharge end thereof into mist which hits the wall of the second boring 5.

35 It is crucial for the invention that the length S of the second boring 5 is long enough in order that the turbulent flow from the first boring 4 hits the

wall of the second boring along a certain minimum length. Therefore, preferably, the length S of the second boring 5 is greater than the length s of the first boring 4.

Figure 1 shows that the direction of the openings 3 is at an angle in relation to the main channel 7 of the spray head. This means that the medium flow, for example the flow of water-based extinguishing medium, in the boring 4 is at an angle θ in relation to the direction of the medium flow in the main channel 7. The angle θ is preferably between 10 and 90 degrees and most preferably 10 to 80 degrees, but may be up to approximately 120 degrees for some applications. The wider the angle θ the better the mist formation, but the penetration of the mist from the separate nozzles is reduced.

Figure 3 is an enlarged view of the nozzle 6 in Figure 1.

Figure 4 illustrates another preferred embodiment of a spray head of the invention. The embodiment deviates from the one in Figure 1 by a further nozzle 6'b being arranged above the nozzle 6'a (which can be considered to correspond with the nozzle 6). The geometry and the dimensioning of the nozzle 6'b correspond with those previously provided for the nozzles 6'a and 6. The nozzles 6'b and 6'a are parallel or may be diverging up to 45 degrees. An advantage with the further nozzle 6'b is that it substantially improves the penetration in comparison with a situation where no such further nozzle is present. The penetration improves (becomes stronger) because the mist-like sprays from the nozzles 6'a and 6 are sucked against each other, and a uniform forceful mist spray is obtained.

Figure 5 illustrates a third embodiment of a spray head of the invention. The embodiment deviates from the one in Figure 1 by comprising an air channel 15'' that leads from an opening 16'' in the frame to the second boring 5''. The air channel 15'' ends up in the boring 5'' by means of an opening 17''. The opening 17'' of the air channel 15'' is close to a transition 45'' between the first and the second borings. The diameter of the air channel 15'' is, for example, 0.5 to 1.5 times the diameter of the second boring 5''. The air channel 15'' considerably improves the penetration of the mist spray from the nozzle 6''. The air channel does not, however, considerably affect the droplet size in the mist. In the Figure the air channel 15'' is vertically directed downwards, but can be considered to be directed in other ways in relation to the main direction (spray direction) of the nozzle 6''; the opening should, however, be an opening which is in contact with air (or gas) outside the spray head. The

air channel 15'' can also be considered to extend upwards from the boring 5''.

Figure 6 illustrates a fourth preferred embodiment of a spray head of the invention. The embodiment deviates from the one in Figure 1 by comprising a liquid channel 18''' that extends from an opening 17''' in the wall of the boring 5''' to an opening 16''' in the passage 7'''. The liquid channel 18''' runs by means of an opening 17'' in the boring 15''. The opening 17''' of the liquid channel 18'' is close to the transition 45''' between the first and the second borings but need not be positioned there. The diameter of the liquid channel 18''' is, for example, 0.5 to 1.5 times the diameter of the first boring 4''.

10 The liquid channel 18''' considerably improves the penetration of the mist spray from the nozzle 6'''. However, the liquid channel does not really affect the drop size of the mist. In the Figure the liquid channel 18''' is horizontal but can also be considered to be placed at different angles in relation to the main direction (spray direction) of the nozzle 6'''; the opening 16''' should, however, have a fluid connection with the passage 7'''. The liquid channel 18''' can also be considered to extend upwards from the boring 5'''.

Figures 7 to 9 show a fifth preferred embodiment of a spray head of the invention. The spray head comprises an inlet 2''', a frame 1''' and a number of nozzles 6'''a, 6'''b. The structure and the dimensioning of the nozzles 6'''a, 6'''b correspond with those of the nozzles 6 in Figure 1. The same measurements therefore hold true for the borings 4''' and 5''' as for the borings 4 and 5. The preferred embodiment in Figures 7 to 9 deviates from the one in Figure 1 and 2 by the spray head comprising a spindle 8''' and a release means 9''' that explodes or melts in heat, for example, a glass ampoule.

20 6'''a, 6'''b correspond with those of the nozzles 6 in Figure 1. The same measurements therefore hold true for the borings 4''' and 5''' as for the borings 4 and 5. The preferred embodiment in Figures 7 to 9 deviates from the one in Figure 1 and 2 by the spray head comprising a spindle 8''' and a release means 9''' that explodes or melts in heat, for example, a glass ampoule.

25 In this case, a sprinkler is concerned, owing to the release means 9'''.

The spindle 8''' is slidably arranged in an air channel 7''' in the nozzle frame 1'''. In Figure 7 the sprinkler is in a standby mode. The glass ampoule 9''' is intact and the spindle 8''' closes a channel 7'''a between the inlet 2''' and the main channel 7'''. The spindle 8''' comprises a channel 14''' that leads to a nozzle 6'''b at the lower end of the sprinkler. The channel 14''' connects the nozzle 6'''b with the main channel 7'''. A connection between the channel 14''' and the inlet 2''' does not exist when the sprinkler is in the standby mode; the connection is opened when the spindle slides down into the position shown in Figure 8. The geometry of the nozzle 6'''b is similar to the one of nozzle 6'''a; the dimensions are only slightly smaller. Therefore the internal geometry and dimensioning of the borings 4'''b and 5'''b are identical to

30 that leads to a nozzle 6'''b at the lower end of the sprinkler. The channel 14''' connects the nozzle 6'''b with the main channel 7'''. A connection between the channel 14''' and the inlet 2''' does not exist when the sprinkler is in the standby mode; the connection is opened when the spindle slides down into the position shown in Figure 8. The geometry of the nozzle 6'''b is similar to the one of nozzle 6'''a; the dimensions are only slightly smaller. Therefore the internal geometry and dimensioning of the borings 4'''b and 5'''b are identical to

35 one of nozzle 6'''a; the dimensions are only slightly smaller. Therefore the internal geometry and dimensioning of the borings 4'''b and 5'''b are identical to

those of the borings 4''''a and 5''''a. The ampoule 9'''' is supported at the top against the nozzle 6''''b.

The spindle 8'''' comprises a wider piston-like portion 11'''' that supports the piston on the channel 7'''''. The piston-like portion 11'''' comprises three through bores 3'''''. When the spray head is in the position shown in Figure 8, medium may flow from the inlet 2'' through the borings 3'''' towards the top of the spindle 8'''' and out from the spray head. By means of the borings 3'''' a favourable effect can be achieved on the penetration of the spray from the nozzle 6''''b.

If the ampoule 8'''' in Figure 7 explodes, the spindle 8'''' slides into the position shown in Figure 8 and the channel 7''''a is opened. Here the connection between the inlet 2'''' and the nozzles 6''''a, 6''''b and the boring 3'''' remains open and extinguishing medium may flow from the nozzles. When the spindle 8'''' is in the position shown in Figure 8, a space 5''''c is formed beneath the boring 3'''' between the lower part of the spindle and the nozzle frame 1, said space having the same function as the borings 5''''a and 5''''b, i.e. the space 5''''c allows a nozzle 6''''c having the same structures and dimensioning as the nozzles 6''''a and 6''''b to be formed. It is obvious that in the piston-like part 11'''' borings having the same geometry as the borings 3''''a and 3''''b, i.e. borings comprising a boring with a larger diameter in addition to a boring with a smaller diameter, can be made instead of the borings 3''''.

The embodiment in Figures 7 to 9 can preferably comprise nozzles according to Figure 4 to 6, i.e. nozzles arranged one after the other, or nozzles including an air channel or a liquid channel in order to improve the penetration.

Figures 1 and 3 to 7 clearly indicate that the transition between the first borings 4, 4'a, 4'b, 4'', 4''', 4''''a, 4''''b and the second borings 5, 5'a, 5'b, 5'', 5''', 5''''a, 5''''b in the openings 6, 6'a, 6'b, 6'', 6''', 6''''a, 6''''b is beveled i.e. the second boring has a truncated conical end surface, cf. the transition 45 in Figure 3, for example. The angle in the bevel may vary. It should also be observed that a bevel is not necessarily needed at all, in which case the angle and the transition from the smaller boring to the larger boring is 90 degrees. This applies not only to the embodiment shown in Figure 3, but also to the other embodiments.

The invention has above been described only with reference to examples. It is therefore pointed out that the details of the invention may deviate within the scope of the attached claims in many ways from the examples. In

the embodiments in Figures 1 to 9 the first boring and the second boring are aligned. However, exact alignment is not necessary, and therefore claim 1 defines "essentially aligned". It is contemplated that within the scope of the invention and said expression the direction of the second boring may deviate up
5 to approximately 25 degrees from the direction of the first boring. Further, the borings of the nozzles do not have to be cylindrical and do not have to be integrated into the same component (typically into the frame of the spray head) even though this is to be preferred considering the production of the nozzles. In the different embodiments the borings do not necessarily have to be coax-
10 ial, and the borings can be straight -sided. The number of the nozzles may also vary.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A spray head for producing a mist of extinguishing liquid, the spray head
5 comprising an inlet for receiving an extinguishing liquid, at least one nozzle that forms an opening in the exterior of the spray head for discharging the mist of the extinguishing liquid and a passage connecting the inlet and the at least one nozzle such that the extinguishing liquid can be conveyed from the inlet to the opening, wherein:

10 the at least one nozzle comprises a first boring and a second boring whose longitudinal axes are substantially aligned, the first boring having a relatively small width and the second boring having a relatively large width, such that the nozzle is capable of expanding a turbulent flow of extinguishing liquid as it flows from the first boring to the second boring, and the length of the second
15 boring being sufficient for the expanded flow of extinguishing liquid to impact a wall of the second boring as it flows from the first boring to the opening, the nozzle thereby being capable of discharging a mist of extinguishing liquid from the opening.

20 2. The spray head as claimed in claim 1, wherein the length of the second boring is greater than the length of the first boring.

3. The spray head as claimed in claim 1 or 2, wherein the first boring is capable of producing a turbulent flow in an extinguishing liquid flowing from the
25 passage into the first boring.

4. The spray head as claimed in claim 3, wherein the first boring is capable of producing a turbulent flow in extinguishing liquid having a relatively low pressure.

30 5. The spray head as claimed in any one of claims 1 to 4, wherein the first boring diverges at an angle to the passage such that a flow of extinguishing liquid

in the first boring and the second boring will be at an angle relative to a flow of extinguishing liquid in the passage.

5 6. The spray head as claimed in claim 5, wherein the angle between the passage and the first boring is 10 to 120 degrees.

10 7. The spray head as claimed in any one of claims 1 to 6, wherein the width of the first boring is relatively small such that the first boring is capable of producing a turbulent flow in an extinguishing liquid flowing from the passage into the first boring at a relatively low pressure.

8. The spray head as claimed in any one of claims 1 to 7, wherein the ratio of the width of the first boring to the width of the second boring is 0.1 to 0.9.

15 9. The spray head as claimed in any one of claims 1 to 8, wherein the ratio of the length of the first boring to the width of the first boring is 0.25 to 15.

20 10. The spray head as claimed in any one of claims 1 to 9, wherein the ratio of the length of the second boring to the width of the second boring is 1 to 15.

11. The spray head as claimed in any one of claims 1 to 10, wherein the first boring and the second boring are cylinder-like borings.

25 12. The spray head as claimed in any one of claims 1 to 11, wherein the first boring and the second boring are straight-sided.

13. The spray head as claimed in any one of claims 1 to 12, wherein the width of the second boring does not exceed 50mm.

30 14. The spray head as claimed in any one of claims 1 to 13, wherein the width of the first boring is 0.3 to 5mm.

15. The spray head as claimed in any one of claims 1 to 14, wherein the second boring terminates at the opening in the spray head.

16. The spray head as claimed in any one of claims 1 to 15 wherein the first
5 and second borings are formed by the spray head.

17. The spray head as claimed in any one of claims 1 to 16, wherein the spray head comprises a first nozzle and a second nozzle, each comprising a first boring and a second boring and each diverging from the passage to form a respective
10 opening in the exterior of the spray head.

18. The spray head as claimed in claim 17, wherein the first nozzle is located closer to the inlet than the second nozzle.

15 19. The spray head as claimed in claim 18, wherein the first nozzle and the second nozzle diverge from the passage at substantially the same angle such that the first nozzle and the second nozzle extend from the passage in parallel.

20. The spray head as claimed in claim 18, wherein the first nozzle and the
20 second nozzle diverge from the passage at different angles such that the first nozzle and the second nozzle diverge from each other as they extend from the passage.

21. The spray head as claimed in claim 20, wherein the first and second
25 nozzles diverge from each other at an angle of up to 45 degrees.

22. The spray head as claimed in any one of claims 1 to 21, wherein the spray head comprises an air channel extending from an opening in a wall of the second boring to an opening in the exterior of the spray head.

23. The spray head as claimed in claim 22, wherein the opening in the wall of the second boring from which the air channel extends is located close to a boundary at which the second boring meets the first boring.

5 24. The spray head as claimed in any one of claims 1 to 23, wherein the spray head comprises a liquid channel extending from an opening in a wall of the second boring to an opening in a wall of the passage.

10 25. The spray head as claimed in any one of claims 1 to 24, wherein the spray head comprises a spindle slidably arranged in the passage such that the spindle is capable of sliding from a first position in which it closes the passage such that the passage no longer connects the inlet and the at least one nozzle to a second position in which the passage is open such that it connects the inlet and the at least one nozzle.

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26. The spray head as claimed in claim 25, wherein the spindle comprises a nozzle comprising a first boring and a second boring having substantially the same geometrical proportions as the at least one nozzle.

20 27. The spray head as claimed in claim 26, wherein the first and second borings of the nozzle comprised in the spindle are formed into an end of the spindle which faces away from the inlet.

25 28. The spray head as claimed in claim 26 or 27, wherein the spindle comprises a channel connecting the nozzle comprised in the spindle to the passage.

30 29. The spray head as claimed in any one of claims 25 to 28, wherein the spindle comprises a piston-like part whose width corresponds to the width of the passage.

30. The spray head as claimed in claim 29, wherein the piston-like part comprises at least one through-bore.

5 31. The spray head as claimed in any one of claims 25 to 30, wherein the spray head comprises a heat release means and the spindle is arranged to be supported by the heat release means.

10 32. The spray head as claimed in any one of claims 6 to 31 as dependent directly or indirectly on claim 4, wherein the combination of the angle at which the first boring diverges from the passage and the width of the first boring is such that the first boring is capable of producing a turbulent flow in a liquid flowing from the passage into the first boring at a relatively low pressure.

15 33. A method for forming from a block of material a nozzle of a spray head for producing a mist of extinguishing liquid, the method comprising:

forming in the block of material a nozzle inlet for receiving an extinguishing liquid by drilling a first boring of a first diameter in the block of material;

20 forming in the block of material a nozzle outlet for discharging a mist of the extinguishing liquid by drilling a second boring of a second diameter in the block of material such that the longitudinal axis of the second boring is substantially aligned with the longitudinal axis of the first boring;

25 wherein the step of forming the nozzle outlet comprises drilling the second boring to have a larger width than the first boring such that the nozzle is capable of expanding a turbulent flow of extinguishing liquid as it flows from the first boring to the second boring and drilling the second boring to be of sufficient length for the expanded flow of extinguishing liquid to impact a wall of the second boring as it flows from the first boring to the opening, the nozzle thereby being capable of discharging a mist of extinguishing liquid from the opening.

30 34. The method as claimed in claim 33, wherein the steps of forming the nozzle inlet and the nozzle outlet comprise forming the first and second borings as cylinder-like borings.

35. The method as claimed in claim 33 or 34, wherein the steps of forming the nozzle inlet and the nozzle outlet comprise forming the first and second borings to be straight-sided.

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36. The method as claimed in any one of claims 33 to 35, wherein the step of forming the nozzle outlet comprises forming the second boring to have a truncated conical end surface.

10 37. The method as claimed in any one of claims 33 to 36, wherein the step of forming the nozzle inlet and the nozzle outlet comprise forming the first and second borings to be elongate.

15 38. The method as claimed in any one of claims 33 to 37, wherein the steps of forming the nozzle inlet and the nozzle outlet comprise forming the first and second borings such that the ratio of the width of the first boring to the width of the second boring is 0.1 to 0.9.

20 39. The method as claimed in any one of claims 33 to 38, wherein the steps of forming the nozzle inlet and the nozzle outlet comprise forming the first and second borings such that the ratio of the length of the first boring to the width of the first boring is 0.25 to 15.

25 39. The method as claimed in any one of claims 33 to 39, wherein the steps of forming the nozzle inlet and the nozzle outlet comprise forming the first and second borings such that the ratio of the length of the second boring to the width of the second boring is 1 to 15.

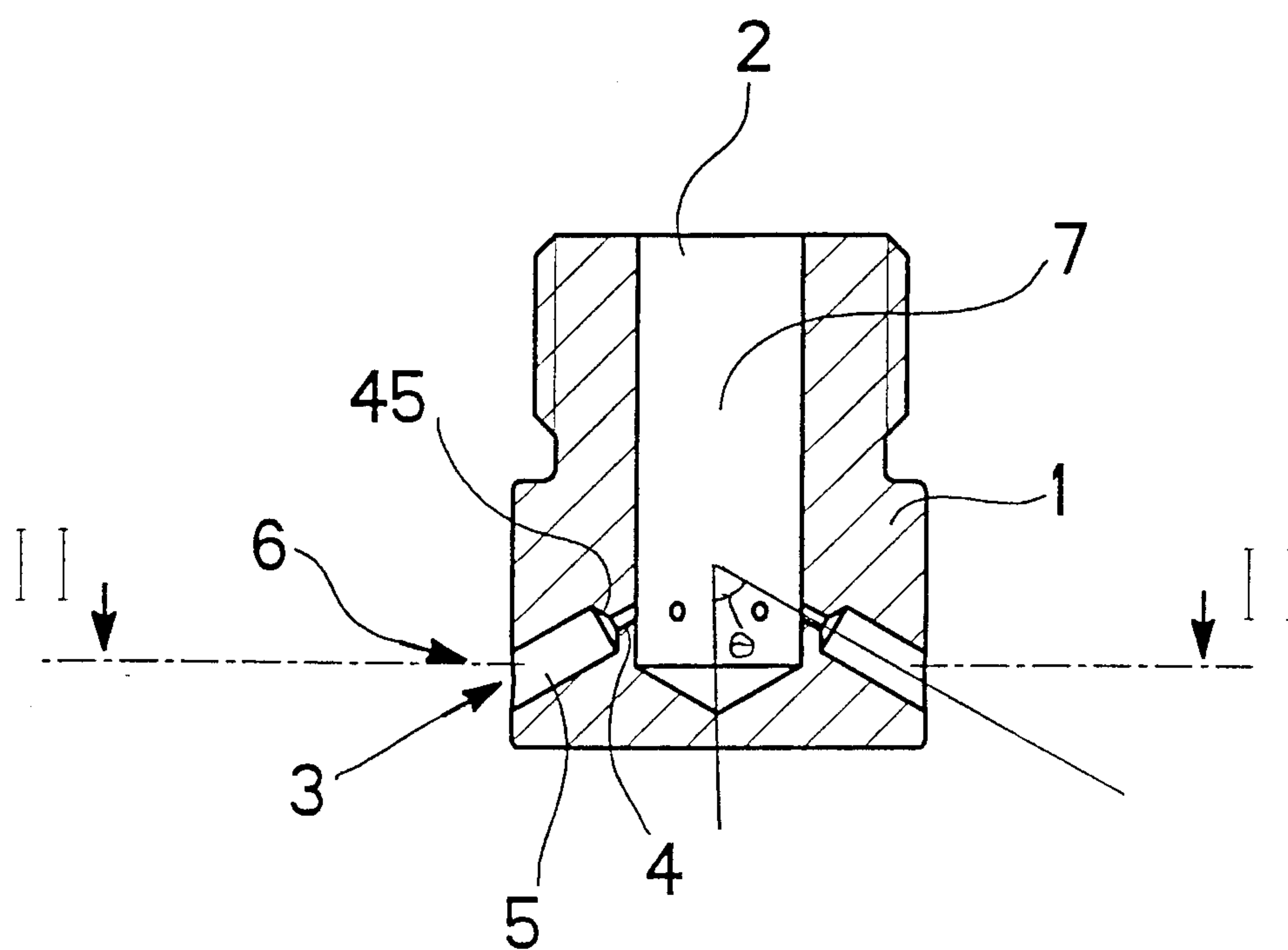
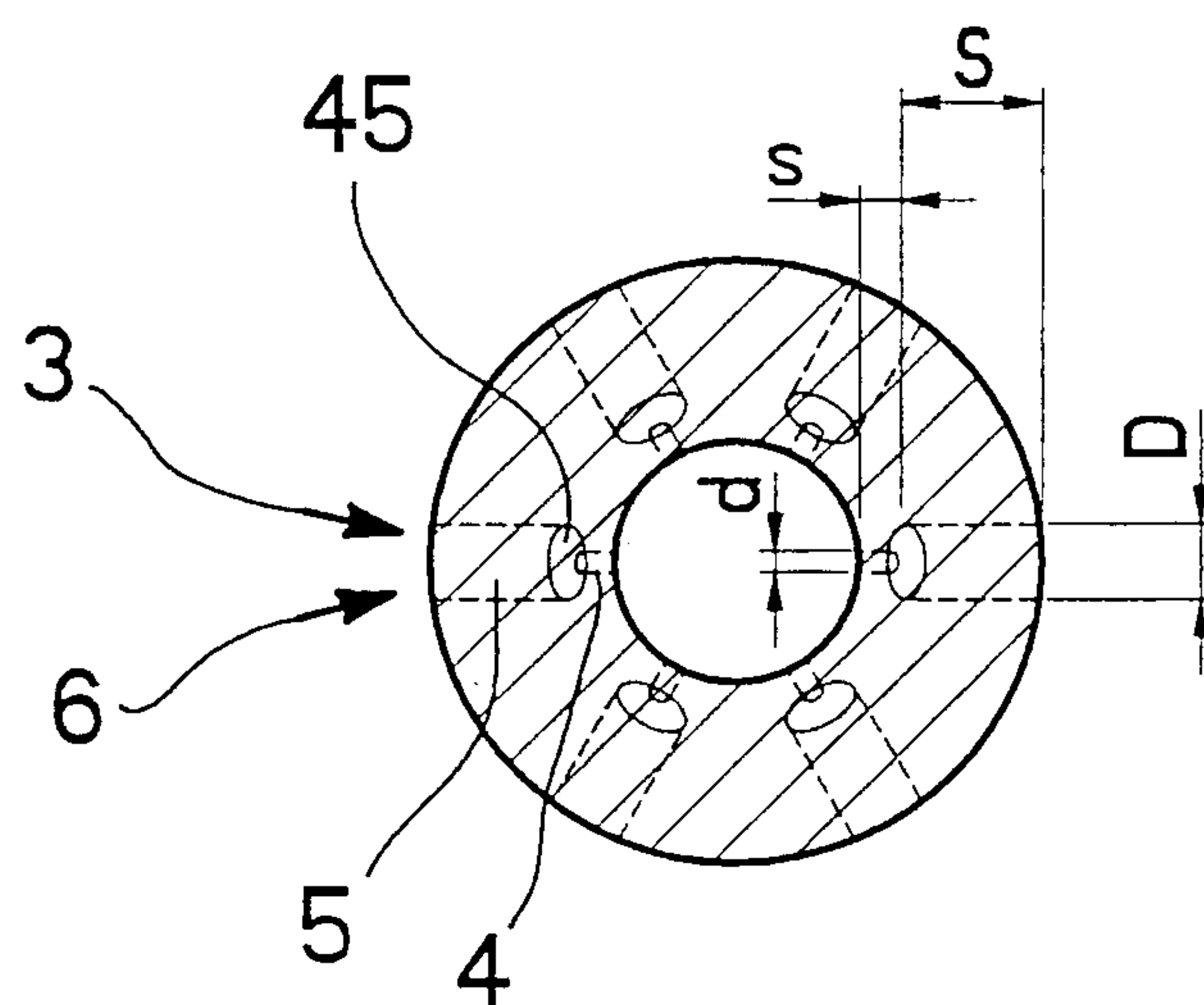
30 40. The method as claimed in any one of claims 33 to 49, the method comprising forming a passage in the block of material that is connected to the nozzle inlet and that diverges at an angle to the nozzle inlet such that a flow of

extinguishing liquid in the nozzle will be at an angle relative to a flow of extinguishing liquid in the passage.

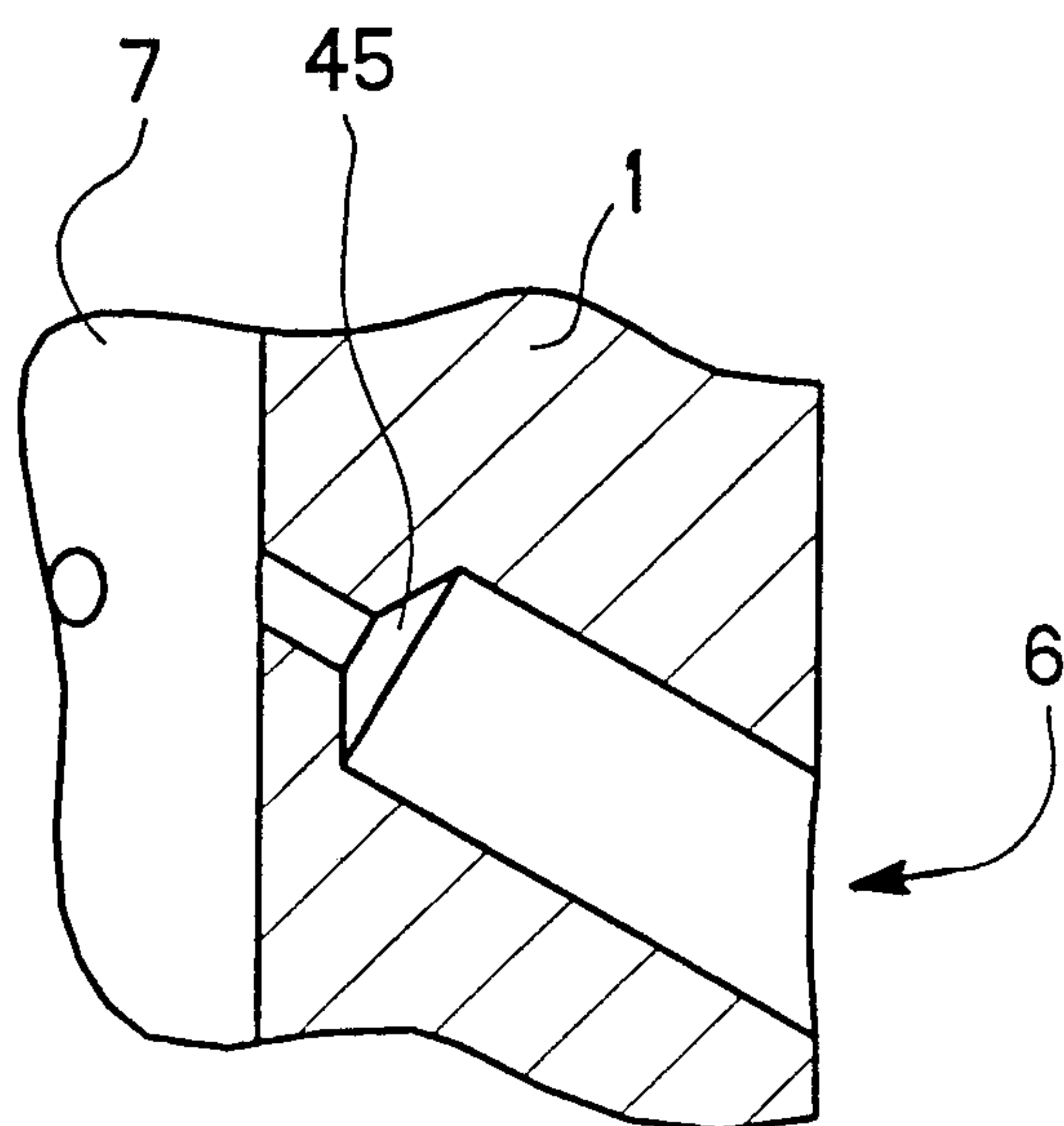
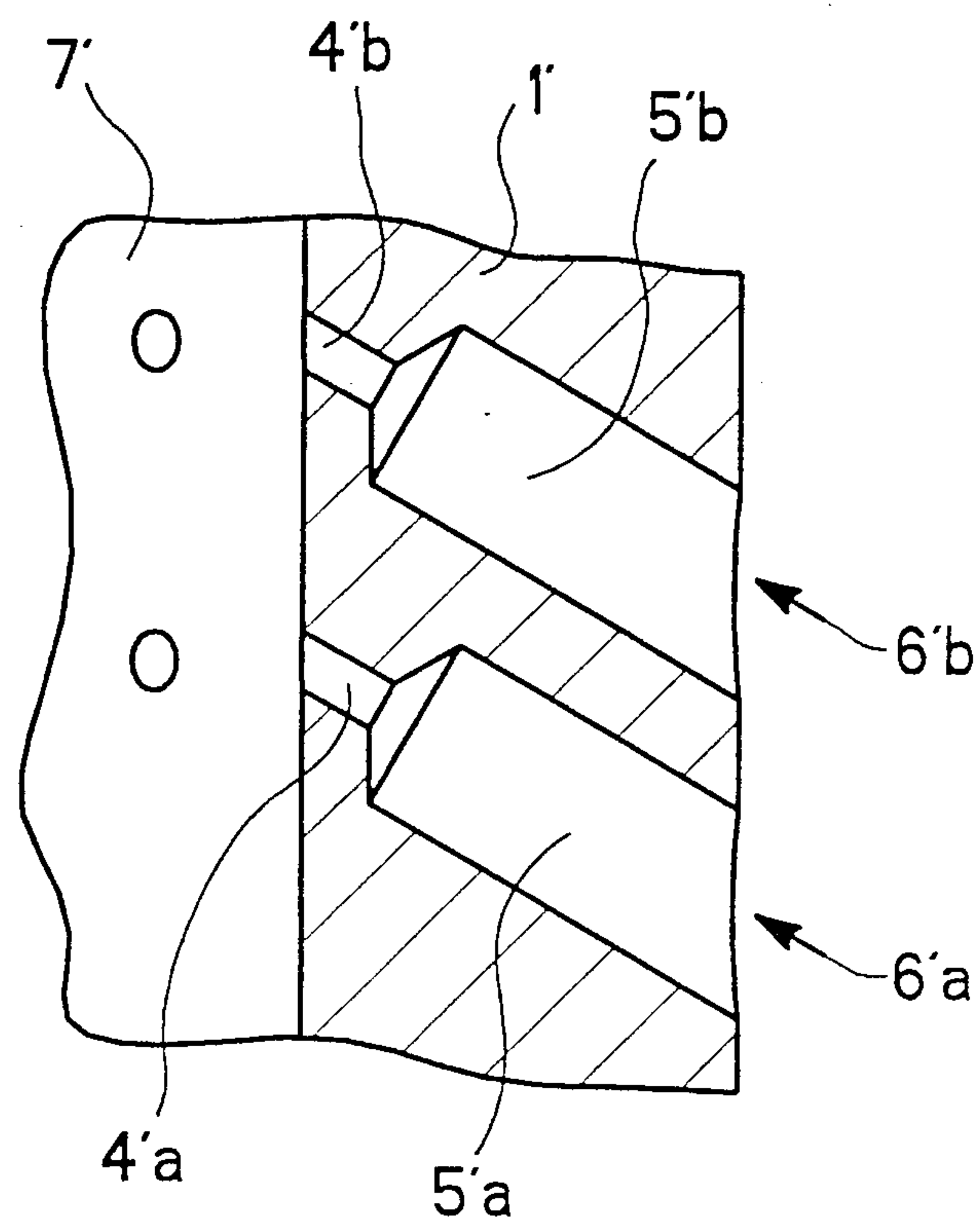
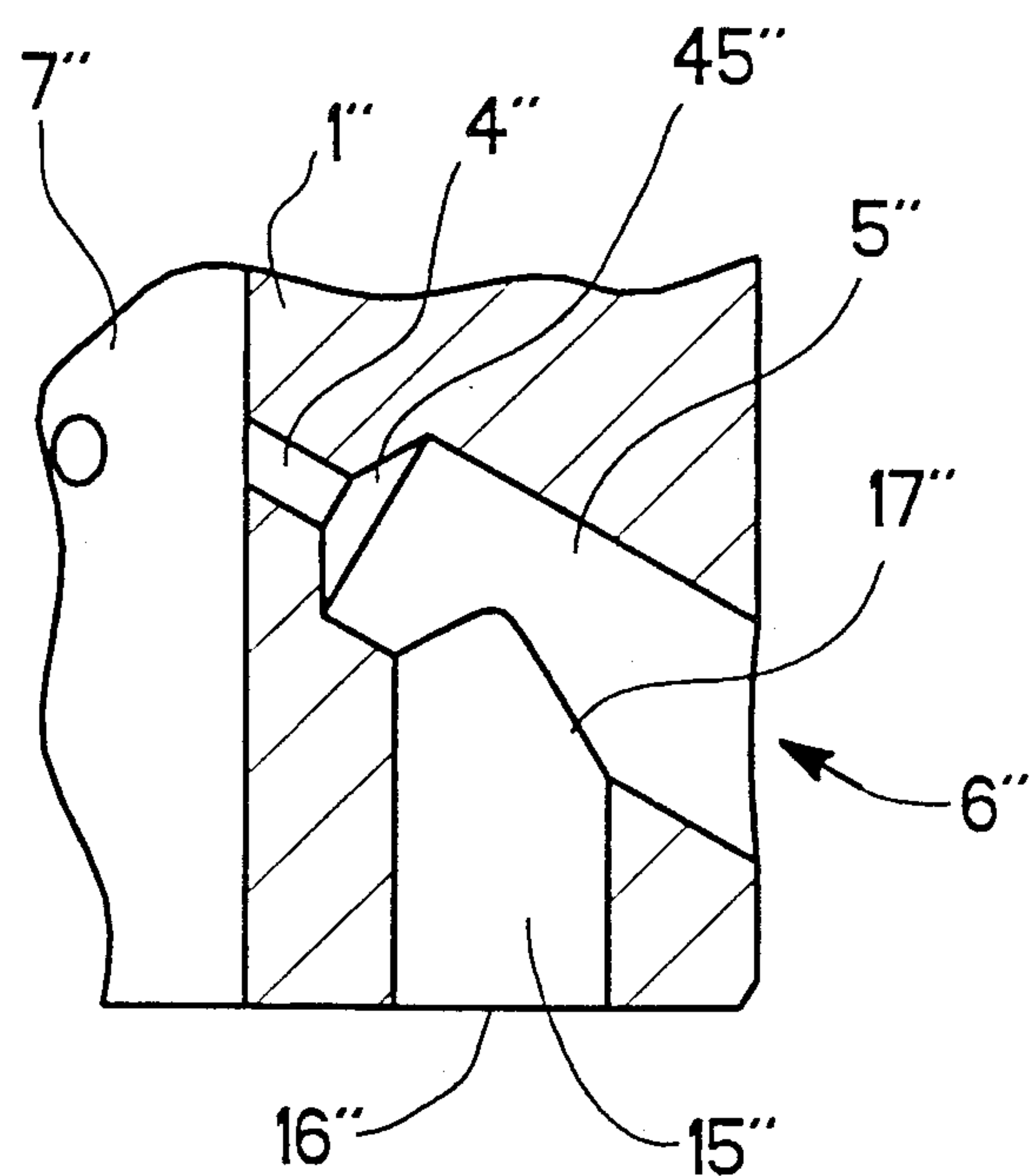
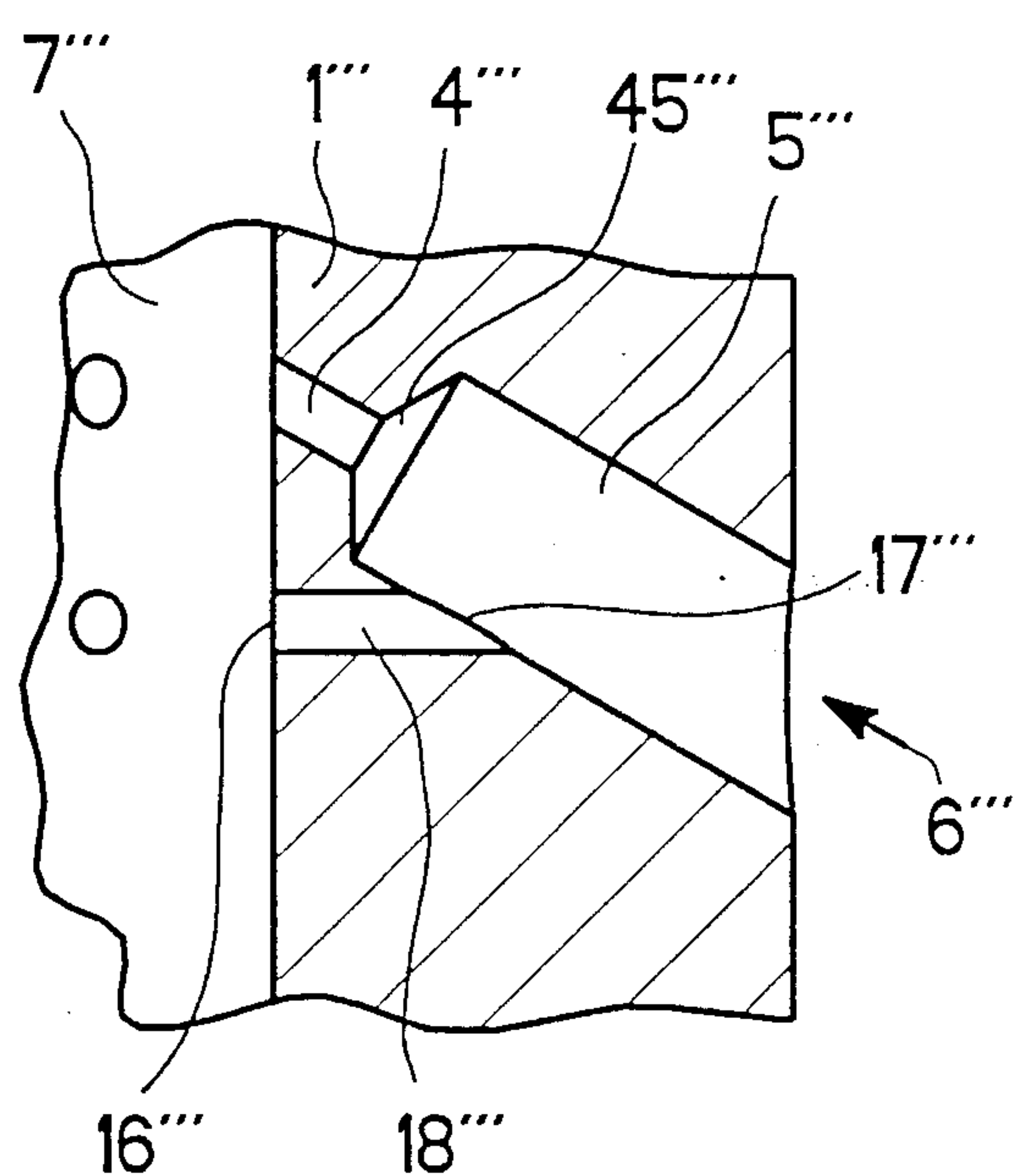
41. The method as claimed in any one of claims 33 to 40, wherein the steps of
5 forming the nozzle inlet and the nozzle outlet comprise forming the first and second borings such that the length of the second boring is greater than that of the first boring.

42. The spray head comprising a nozzle formed by the method of any one of
10 claims 33 to 41.

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*Fig.1**Fig.2*

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*Fig. 3**Fig. 4**Fig. 5**Fig. 6*

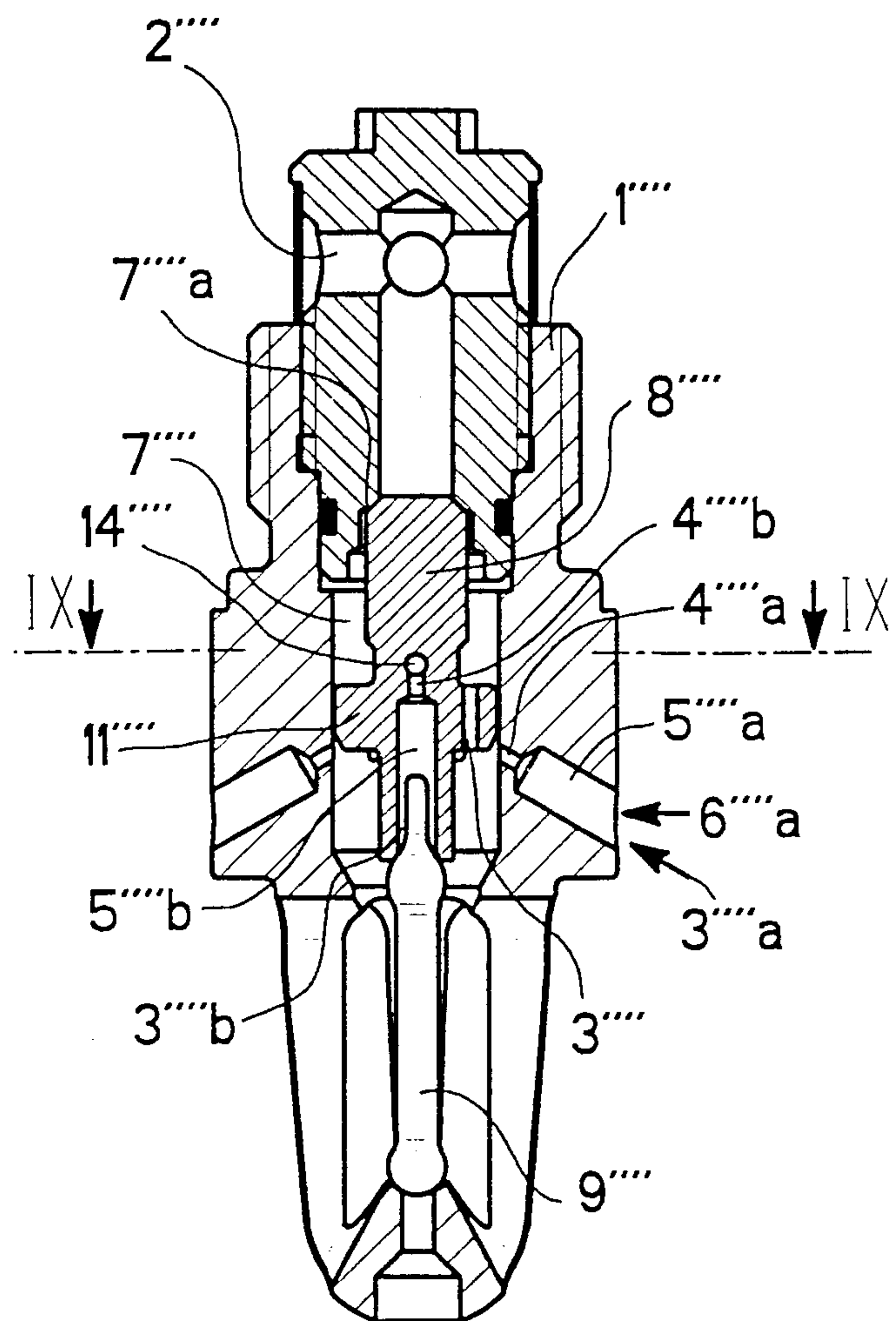


Fig. 7

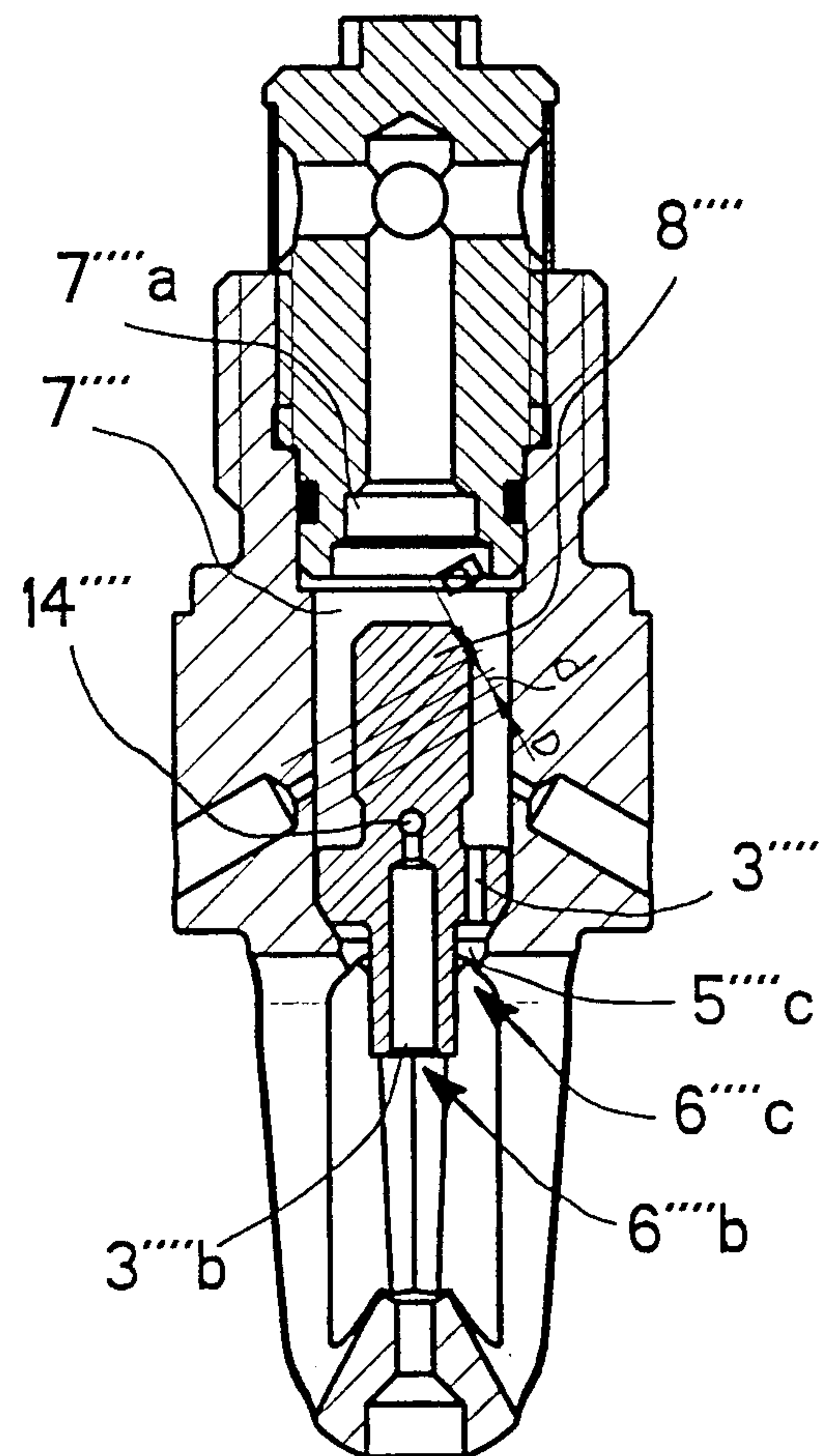


Fig.8

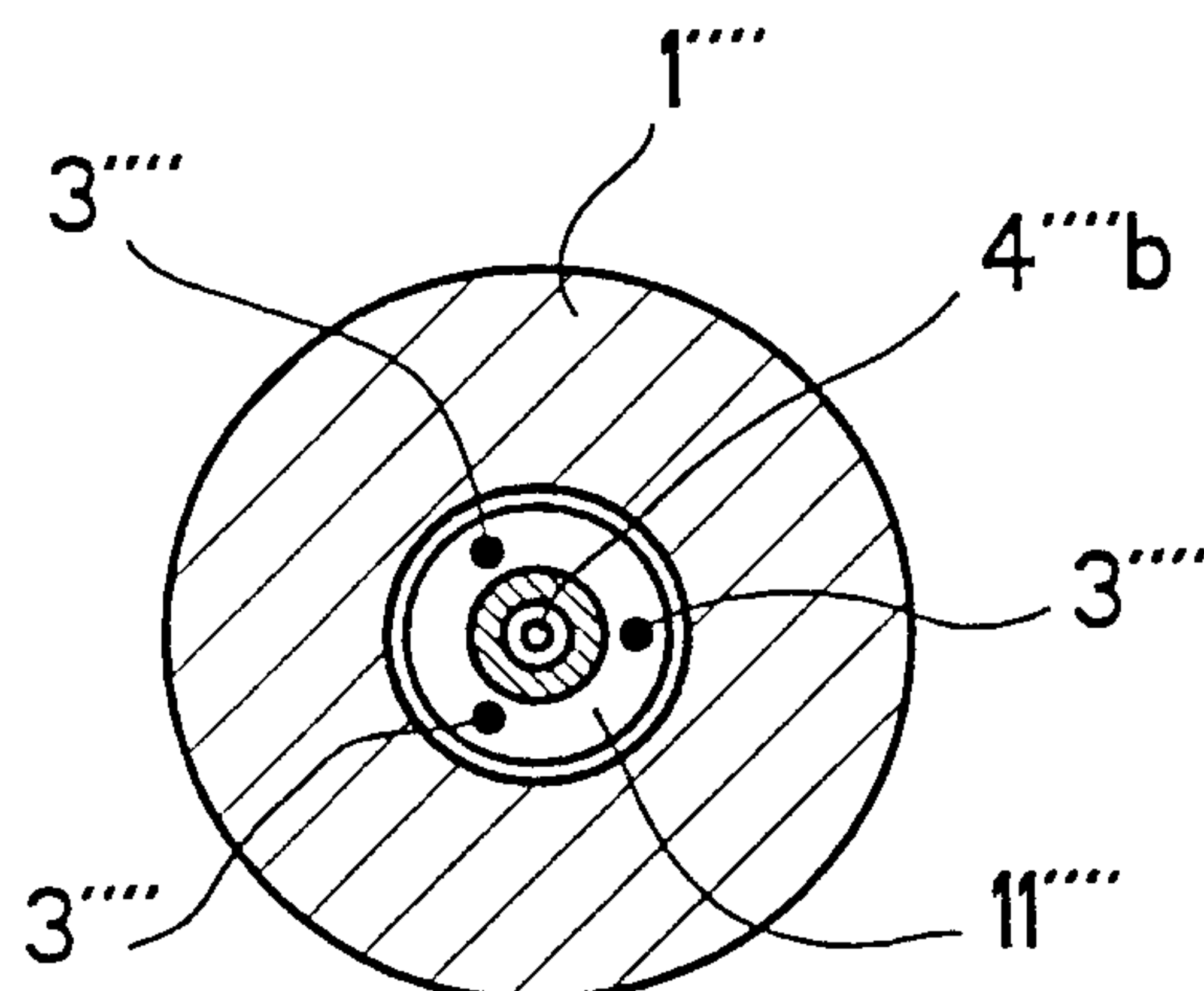


Fig.9

