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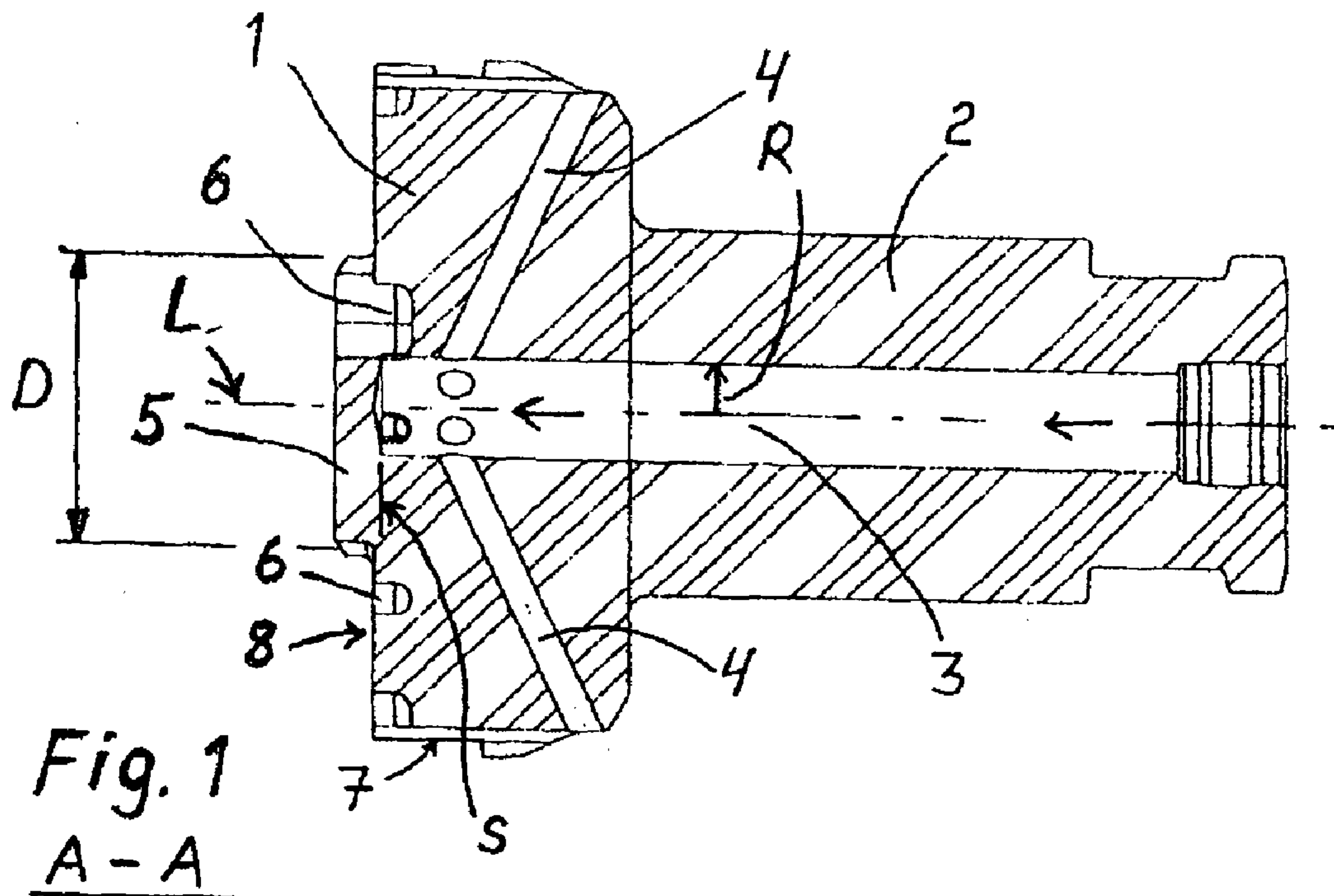
(71) **Demandeur/Applicant:**
LEHTI GROUP OY, FI

(72) **Inventeurs/Inventors:**
AHONEN, JUKKA, FI;
SAMMATTI, JUSSI, FI

(74) **Agent:** KIRBY EADES GALE BAKER

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(54) **Title: DRILL BIT**



(57) **Abrégé/Abstract:**

Hammering and rotatable drill bit (1), which is meant for ground and rock drilling, said drilling device comprising a hollow shaft (2), said shaft having a hole (3) which is adjusted to direct flushing air onto the drilling surface to the front of the drill bit (1) and further

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

from there towards the outer edge of the drill bit (1) wherein the drill bit (1) comprises a drilling part (5) which protrudes from the surface of the drill bit, functions as a drill point and drills the mid-area of the hole to be created wherein the mentioned part (5) is adjusted to prevent the flushing flow from flowing directly through the mentioned hole (3) located inside the shaft (2) onto the drilling surface. The mentioned part (5) is arranged to allow the outlet of the flushing flow in a sideways direction to the grooves (6) belonging to the drilling surface which grooves lead to the edge of the drill bit (1) and is arranged to allow the outlet also partly to the front of the drill bit to the drilling surface by adjusting the groove (6), which leads to the edge of the drill bit (1), to start from the mentioned part (5) from such a distance (d) from the centre line (L) of the drill bit (1) which distance (d) is less than the radius (R) of the hole.

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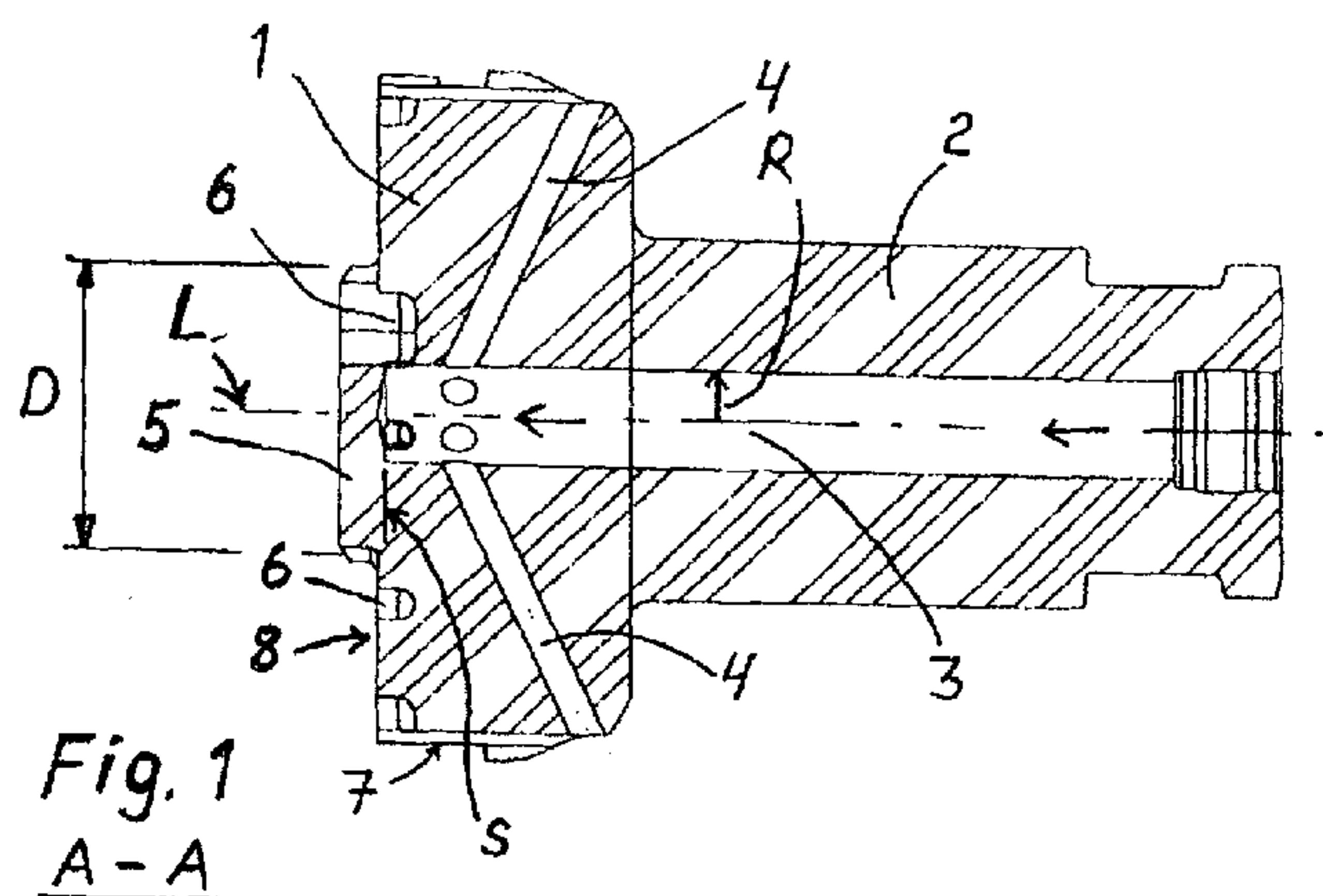
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(71) Applicant: **LEHTI GROUP OY** [FI/FI]; Turkkirata 27 -
29, FI-33960 Pirkkala (FI).(72) Inventors: **AHONEN, Jukka**; Satamakatu 8 B, FI-33200
Tampere (FI). **SAMMATTI, Jussi**; Hopeatie 93, FI-39150
Pinsiö (FI).(74) Agent: **NIEMINEN, Taisto**; Patenttitoimisto T Nieminen
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(54) Title: DRILL BIT



(57) **Abstract:** Hammering and rotatable drill bit (1), which is meant for ground and rock drilling, said drilling device comprising a hollow shaft (2), said shaft having a hole (3) which is adjusted to direct flushing air onto the drilling surface to the front of the drill bit (1) and further from there towards the outer edge of the drill bit (1) wherein the drill bit (1) comprises a drilling part (5) which protrudes from the surface of the drill bit, functions as a drill point and drills the mid-area of the hole to be created wherein the mentioned part (5) is adjusted to prevent the flushing flow from flowing directly through the mentioned hole (3) located inside the shaft (2) onto the drilling surface. The mentioned part (5) is arranged to allow the outlet of the flushing flow in a sideways direction to the grooves (6) belonging to the drilling surface which grooves lead to the edge of the drill bit (1) and is arranged to allow the outlet also partly to the front of the drill bit to the drilling surface by adjusting the groove (6), which leads to the edge of the drill bit (1), to start from the mentioned part (5) from such a distance (d) from the centre line (L) of the drill bit (1) which distance (d) is less than the radius (R) of the hole.



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DRILL BIT

Object of the invention is a hammering and rotatable drill bit belonging to a drilling device and meant for ground and rock drilling through a hollow shaft of which bit
5 flushing air is directed to the drilling surface to the front of the drill bit and further from it towards the outer edge of the drill bit.

Dill bits according to the above presented preamble are previously known for example from a Finnish patent application no. 20120269 in which flushing air is directed towards the centre of the drill bit and the flushing flow is turned to the side inside the drill bit
10 from which location it continues along the duct which is located inside the drill bit till the duct opens to be a groove, which leads towards the outer edge of the drill bit on the surface of the drill bit.

In the above described publication a drill bit is presented with the structure of which drill bit one aims to prevent the strong flushing flow from hitting the drilling surface when
15 soft ground is being drilled. The flushing flow is directed towards the edge of the drill bit being fully turned in a sideways direction and when it has reached the surface of the drill bit it is still directed in a groove on the surface of the drill bit. This kind of flushing flow is capable of transferring the soft ground away from the drilling surface when the drill bit rotates and there is enough flow in the grooves of the drill bit which flow is not directed
20 towards the surface to be drilled but towards the outer edge of the drill bit. In this solution the mid-area of the drill bit will have a weak structure because inside the drill bit the flushing duct, which is directed to the front, must be arranged very close to the front surface of the drill bit and the ducts that are directed to the side from it are also located very close to front surface of the drill bit covering the distance when they are inside the
25 bit crown. In the above mentioned implementation the mid-area of the drill bit also gets very little flushing because all the flushing air is directed in the direction of the radius of the crown along the drilled holes to the edges of the crown.

In order to eliminate the above presented disadvantages a new drill bit has been developed with the help of which drill bit an essential improvement can be reached in
30 relation to the known technology. It is characteristic of the invention that the mentioned part is arranged to allow the outlet of the flushing flow in a sideways direction to the

grooves belonging to the drilling surface which grooves are directed to the edge of the drill bit and to allow the outlet also partly to the front of the drill bit to the drilling surface by adjusting the groove, which leads to the edge of the drill bit, to start from the
5 mentioned part from such a distance from the centre line of the drill bit which distance is less than the radius of the hole of the flushing duct.

The advantage of the invention is the fact that the structure of the drill bit can be made to be stronger, further a part that directs the drilling is created to the front part of the drill bit when at the same time the part is being utilized for the arranging of the flushing agent
10 ducts. The flushing agent flow is not directed perpendicularly to the drilling surface but mainly to the side and only partly diagonally towards the drilling surface and thus does not loosen too much soil from the drilling surface. The flushing flow is released to the frontal surface of the bit from near by the centre point of the bit in which case the flushing air carries all the drilled material away with it and no drilled material will be left in the
15 mid-area. Air flow bursts out mainly in a sideways direction and the flow is spread considerably widely and evenly because the flow is not directed by directing it along the drilled hole. Because the flushing agent bursts out immediately from the mid-hole, the pressure drops strongly and no excessive flushing is directed onto the drilling surface which would cause the air to penetrate into the ground or would loosen too much soil.

20 In the following the invention is described more detailed by referring to the accompanying drawing in which

Figure 1 shows a drill bit according to the invention as a side and section view.

Figure 2 shows the drill bit of the figure 3 directly from the front.

Figure 3 shows a drill bit according to the invention diagonally seen.

25 Figure 4 shows the directing part as an enlargement.

In the figure 1 the drill bit 1 and the shaft 2 belonging to it are shown as a section view. The flushing flow is directed through a hole 3 which is directed through the drill bit 1 and the centre line L of the shaft towards the front surface of the drill bit 1. The hole 3 however ends at the level s before the mentioned surface and the flushing flow is turned
30 to the side with the help of such a solution in which it is possible for the flushing flow to move in a sideways direction towards the outer edge of the drill bit 1 along grooves 6 which are formed to be curvilinear. These grooves 6 also transfer the drilling waste to the

outer edge of the drill bit 1 and further from there backwards along an outlet duct 7 and further along the drilled hole onto the ground surface.

5 The hole 3 ends in the drill bit 1 at the level s in such a way that the grooves 6 start from the side of the hole 3 in this case in three different directions. The grooves 6 are still split immediately at their starting part to be two separate grooves 6. The grooves 6 are arranged in relation to the hole 3 in such a way that the grooves 6 start from the centre line L of the drill bit 1 at the distance d which is less than the radius R of the hole 3. The starting point of the grooves 6 is located at the distance d from the centre line L and this
10 distance d is less than the radius R of the hole 3. This results in a fact that the flushing flow can partly turn also diagonally towards the drilling surface when one of its parts, most advantageously exactly the largest part, turns in a sideways direction and proceeds along the grooves 6 in a sideways direction.

At the same time the grooves 6 start from a planar directing part 5 which is formed in the
15 centre of the drill bit 1 and drills the mid-area of the hole in which case the grooves 6 are deeper regarding this part than outside the mentioned part 5. Due to the part 5 the hole 3 can be extended inside the drill bit 1 at least to the same level where the front surface of the drill bit 1 is outside the part 5. The part 5 also functions as the directing part of the drilling by drilling the top part of the hole. Due to the part 5 the drilling surface of the
20 drill bit 1 can be made to endure drilling hammerings despite the weakening caused by the hole 3 which weakening in this case will be nearly eliminated. The diameter D of the part 5 is most advantageously 25 – 60 % of the diameter of the drill bit 1.

In one implementation way in order to reduce the flushing flow to be directed onto the drilling surface inside the drill bit 1, part of the flushing flow is turned to be a return flow
25 with the help of ducts 4 already before the hole 3 ends.

Figure 2 shows the drill bit from the front and figure 3 diagonally as a side view. It can be seen in the figures that the starting points of the grooves 6 start from inside a cylindrical part. It can be seen in the figure 2 that the length of the radius of the hole 3 is slightly longer than the distance from the centre line L of the hole 3 to the starting point of the
30 grooves 6.

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In the figure 4 the starting point of the groove 6 is shown more accurately in which starting point the groove 6 has a starting wall 9 which is directed in the drilling direction.

The bottom of the groove 6 is at the level h and the bottom of the hole 3 is at the level s.

- 5 The distance d of the starting wall 9, in other words the starting point of the groove 6 from the centre line L of the hole 3 is most advantageously $0,7 - 0,99 \times R$ in which case R is the radius of the hole 3.

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CLAIMS

1. Hammering and rotatable drill bit (1), which is meant for ground and rock drilling, said drilling device comprising a hollow shaft (2), said shaft having a hole (3) which is
5 adjusted to direct flushing air onto the drilling surface to the front of the drill bit (1) and further from there towards the outer edge of the drill bit (1) wherein the drill bit (1) comprises a drilling part (5) which protrudes from the surface of the drill bit, functions as a drill point and drills the mid-area of the hole to be created wherein the mentioned part (5) is adjusted to prevent the flushing flow from flowing directly through the mentioned
10 hole (3) located inside the shaft (2) onto the drilling surface, **characterized** in that the mentioned part (5) is arranged to allow the outlet of the flushing flow in a sideways direction to the grooves (6) belonging to the drilling surface which grooves lead to the edge of the drill bit (1) and is arranged to allow the outlet also partly to the front of the drill bit to the drilling surface by adjusting the groove (6), which leads to the edge of the
15 drill bit (1), to start from the mentioned part (5) from such a distance (d) from the centre line (L) of the drill bit (1) which distance (d) is less than the radius (R) of the hole (3) of the flushing duct.
2. Drill bit according to the claim 1, **characterized** in that the groove (6) is adjusted to such depth to the part (5) that drills the mid-area that the groove (6) extends deeper in the
20 drill bit (1) than the level (s) of the bottom of the hole (3) wherein the groove (6) is connected to the hole (3).
3. Drill bit according to the claim 1, **characterized** in that the distance (d) of the starting point of the groove (6) from the centre line (L) of the hole (3) is $(0,7 - 0,99) \times R$ when R is the radius of the hole (3).
- 25 4. Drill bit according to the claim 1, **characterized** in that the groove (6) comprises a starting wall (9) at the starting point of the groove (6) which starting wall is directed in the drilling direction.
5. Drill bit according to the claim 1, **characterized** in that the flushing agent duct, the hole (3) which is located inside the drill bit (1) extends to the level (s) which is essentially
30 over the level (h) at which level (h) the bottom of the groove (6) is located at the starting point of the groove (6).

6. Drill bit according to the claim 1, **characterized** in that part of the flushing agent flow is directed to turn backwards along the ducts (4) that are formed inside the drill bit (1).

7. Drill bit according to the claim 1, **characterized** in that the drilling diameter (D) of the
5 directing part (5) is 25 – 60 % of the drilling diameter of the drill bit (1).

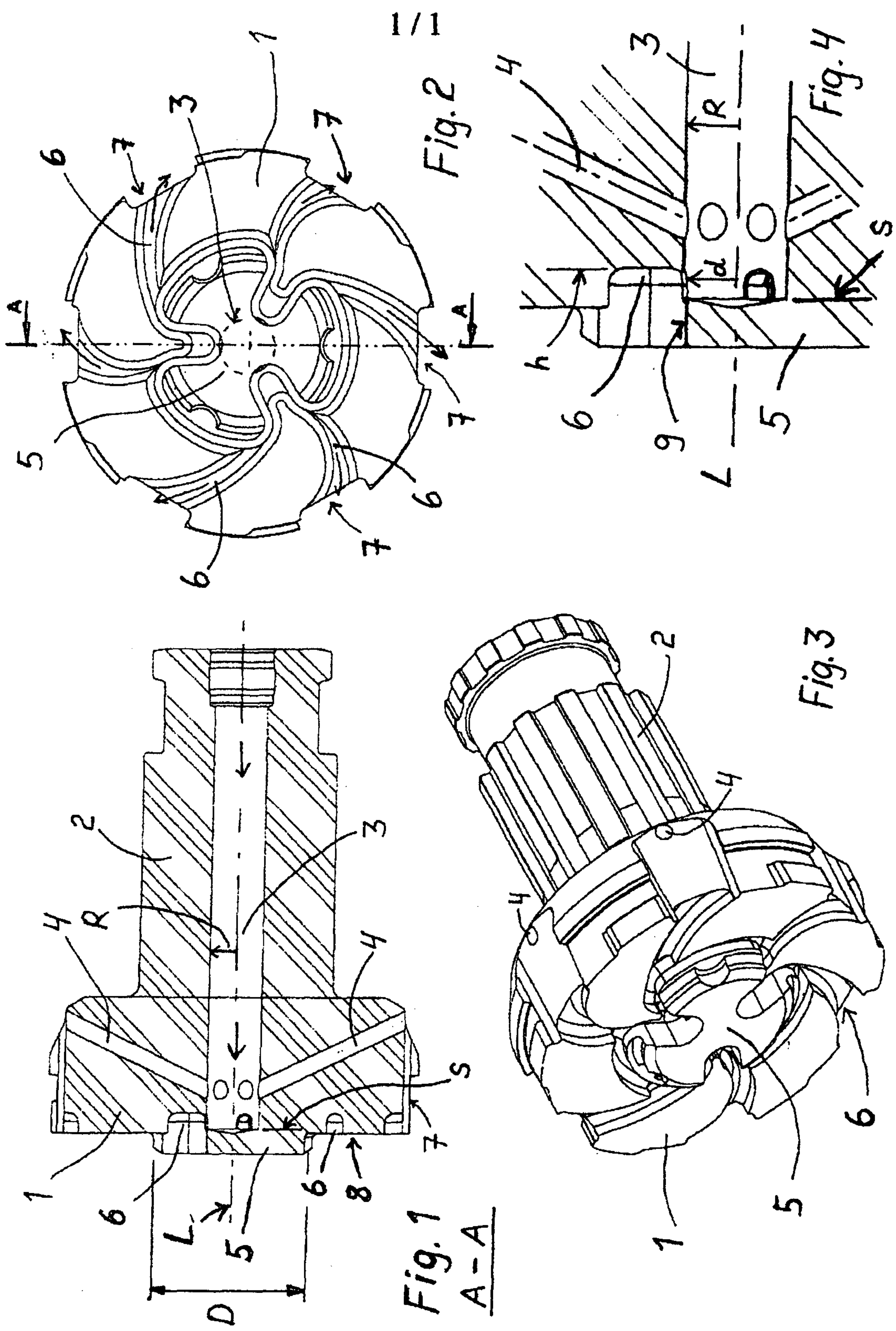
8. Drill bit according to the claim 1, **characterized** in that the directing part (5) is a plane surface.

9. Drill bit according to the claim 1, characterized in that grooves (6) are at least partly curvilinear.

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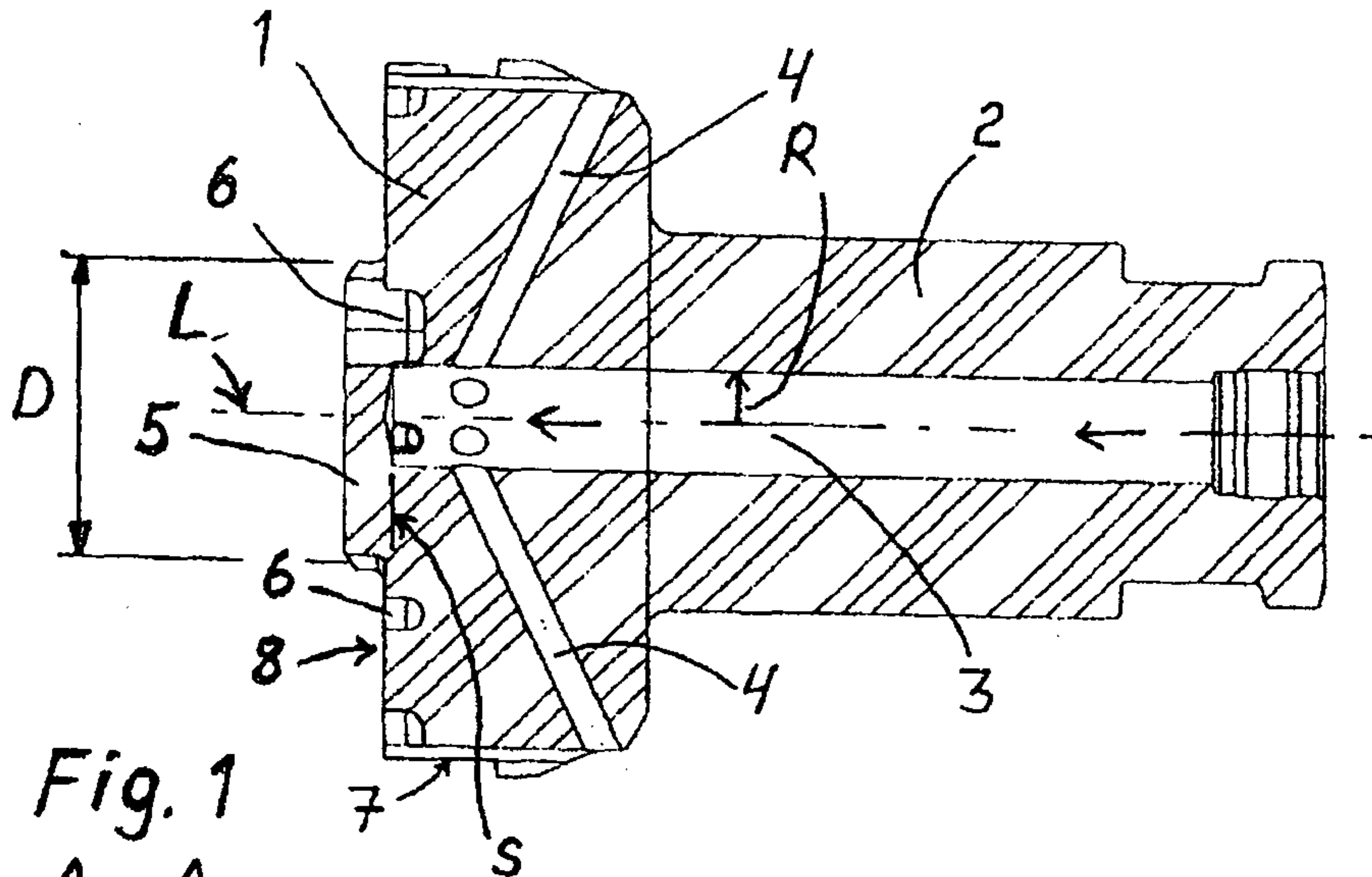


Fig. 1
A-A