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(54) ROTOR FOR SCRAP SHREDDER

ROTOR FÜR EINEN ABFALLZERKLEINERER

ROTOR POUR UNE DECHIQUETEUSE DE DECHETS

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(56) References cited:
GB-A- 448 258
US-A- 4 702 424
US-B1- 6 422 495

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Description

[0001] The present invention refers to a rotor for a scrap shredder (waste, scrap materials, etc) including a supporting structure that carries a loading compartment and at least one rotor (positioned in a seat made in a loading compartment wall) designed to shred the scrap contained in the loading compartment, at least one pusher for pushing the scrap to be shredded against the rotor and means designed to move at the least one rotor and the at least one pusher.

[0002] The rotor normally consists of a cylindrical body that carries multiple pairs of blades, which protrude from the rotor and which interact with additional blades fixed to the two sides of the seat in which the rotor is placed.

[0003] The blades of each pair normally occupy opposite positions on the rotor surface.

[0004] No further design characteristics of the rotor (such as, for example, the layout of the blades along the rotor and/or the presence of a number of annular protrusions - also known as "ribs" - each of which bears a pair of blades and/or the shape of such ribs) will be described herein because they are already known and in any case they are extraneous to the invention.

[0005] Rotors for scrap shredders are known in which the blades consist of hard-material plates applied in an already known manner on tool holders carried by the rotor: these known rotors have some drawbacks, including the fact that the application (and the replacement) of such plates is a lengthy and expensive operation because it requires, for each plate, an accurate adjustment to bring it "into register" with the additional blades fixed to the sides of the seat in which the rotor is placed.

[0006] Moreover, the heat developed by friction during the scrap shredding heats (or overheats) the scrap during the shredding stage, altering (or being able to alter) its physical-chemical characteristics until it is brought to a melted or semi-melted state, with the consequent complete blockage of the shredder.

[0007] In order to avoid this drawback, it is common practice to cool the entire rotor, which not only requires a large number of refrigeration units to be provided and, hence, involves a (rather) high operating cost, but it also entails serious difficulties in cooling the scrap effectively and homogeneously during the shredding stage.

[0008] A scrap shredder whose rotor comprising cylindricol body with a bove is cooled is disclosed, for example, by GB-A-448 258**, where a T-section rotor provided with discs to form within the rotor two annular compartments for a cooling medium is shown.**

[0009] Object of this invention is to develop a rotor for a scrap shredder able to avoid the drawbacks presented by the known rotors; this object is achieved by means of a rotor providing the characterising elements illustrated in claim 1.

[0010] Additional advantageous features of the invention are the subject matter of the dependent claims.

[0011] The invention will now be described with reference to an embodiment that is purely illustrative (and hence not restrictive) illustrated in the appended figures, where:

- figure 1 shows schematically a perspective view of a rotor according to the invention, without blades;
- figure 2 shows schematically the rotor of figure 1 with a body according to the invention (having a pair of blades) withdrawn from its seat and another body according to the invention partially withdrawn from its seat;
- figure 3 shows schematically a perspective view of a body according to the invention;
- figure 4 shows schematically a cross section of the rotor made at the centerline of a body according to the invention;
- figure 5 shows the cross section of figure 4, in which said body has been removed;
- figure 6 shows a portion of the rotor sectioned along a plane passing through the rotor's axis of longitudinal symmetry.

[0012] In the appended figures the corresponding elements will be identified by using the same numerical references.

[0013] Figure 1 shows schematically a perspective view of a rotor 1 according to the invention, consisting of a cylindrical body (including a tang 2) the external surface of which has multiple ribs 3, parallel to one another, each of which incorporates a through hole 50, which also crosses the cylindrical body, in which a body 4 (figure 3), at each end of which a blade (41, 42) is made, is placed.

[0014] Without diverting from the scope of the invention, the ribs 3 may be omitted and the through holes 50 are made only in the cylindrical body.

[0015] The through holes 50 in which the bodies 4 are inserted are coplanar to one another and each through hole 50 is rotated relative to the adjacent through holes 50 so that the blades (41, 42) of the bodies 4 inserted in the holes 50 are offset from one another in a similar manner to the plates applied to known rotors.

[0016] The distance between the axes of longitudinal symmetry of two adjacent through holes 50 is less than the sum of the radii of the holes themselves, which thus interfere in the central area creating a recess 53 (figure 4) which places two adjacent through holes 50 in communication with one another.

[0017] Advantageously, the distance between the axes of two adjacent through holes 50 falls between about 85% and about 95% of the sum of the radii of the holes 50 and is preferably about 90% of this sum.

[0018] A seat 5 designed to accommodate the retainers 47 (figure 4), which hold the body 4 in the hole 50, is present near each through hole 50, as will be described with reference to figures 4 and 5.

[0019] The retainers 47 are not shown in figure 1.

[0020] The structure of rotor 1 (number and dimensions of the ribs 3, number and layout of the bodies 4 along the rotor 1, etcetera) will not be discussed herein because it is similar to the structure of the known rotors and in any case it is extraneous to the invention.

[0021] Figure 2 shows schematically the rotor of figure 1 with a body 4 withdrawn from the related through hole 50 and another body 4 partially withdrawn from the related through hole 50.

[0022] Figure 3 shows schematically a perspective view of a body 4 according to the invention, which includes a tang 45, at each end of which there is a cylindrical body (43, 44) in the shape of a blade (42, respectively 41).

[0023] The diameter of cylindrical body 44 is greater than the diameter of cylindrical body 43.

[0024] To allow the bodies 4 to be easily inserted into the through holes 50, the radius of the tang 45 of a body 4 must be less than the radius of the related through hole 50 by an amount greater than the difference between the sum of the radii of two adjacent through holes 50 and the distance between their axes of longitudinal symmetry.

[0025] Finally, the cylindrical body 44 contains a seat 46 in which the retainers 47 (figure 4) are engaged.

[0026] Figure 4 shows schematically a cross section of the rotor 1 made at the centerline of a body 4; figure 4 shows the rotor 1 (sectioned), the adjacent rib 3 and the body 4, inserted in the through hole 50 and held in place by the retainers 47 consisting, in the embodiment described herein, of a screw - inserted in the seat 5 (figure 1) - which engages in the recess 46 (figure 3).

[0027] The central part of the tang 45 has been removed to show the recess 53 present in the side wall of the through hole 50 and belonging to the cooling system for the blades (41, 42), which will be described with reference to figure 6.

[0028] The annular cavity 52, delimited by the sidewall of the hole 50 and by the tang 45 (the central part of which, removed, has been indicated in figure 4 with dashed lines) also belongs to the cooling system for the blades (41, 42).

[0029] Figure 5 shows the cross section of figure 4, in which the body 4 has been removed to show the section of the through hole 50, which includes three overlapping cylindrical areas with progressively increasing diameter:

- a first cylindrical area 54, having a diameter substantially equal to (and in any case not less than) the diameter of the cylindrical area 43 of the body 4;
- a second cylindrical area 55, having a diameter larger than that of the first area 54 but less than that of cylindrical area 44 of body 4, the tang 45 and the second cylindrical area 55 defining an annular cavity 52;
- a third cylindrical area 56, having a diameter larger than that of the second cylindrical area 55 and substantially equal to (and in any case not less than) the diameter of the cylindrical area 44 of the body 4.

[0030] The recess 53, present in the sidewall of the second area 55 of the hole 50, brings two adjacent annular cavities 52 into communication with one another.

[0031] A body 4 is applied to the rotor 1 by inserting it in a hole 50 starting from its smaller-diameter area 43 until its area 44 comes in contact with the annular projection 57 which forms a surface connecting the second and the third area (55, 56) of the through hole 50 and by securing it using the retainers 47, inserted in the seat 5 adjacent to the through hole 50, which engage in the seat 46 present in the cylindrical body 44 belonging to the body 4.

[0032] When the body 4 is secured in the through hole 50, the blades (41, 42) protrude from the rotor 1.

[0033] To install (or to replace) a pair of blades (41, 42) it is sufficient to insert the body 4 into the corresponding through hole 50 (if necessary, after removing the retainers 47 and the body 4 carrying the blades to be replaced) until the area 44 is brought into contact with the annular projection 57, to turn (if necessary) the body 4 to align its seat 46 with the seat 5 and to secure it using the retainers 47, without having to carry out any lengthy and expensive adjustment operations, as required by the known rotors for installing (or for replacing) a plate.

[0034] Figure 6 shows a portion of the rotor 1 sectioned along a plane passing through the rotor's axis of longitudinal symmetry.

[0035] Figure 6 illustrates the axial hole 61 made inside the tang 2 of the rotor 1 and the multiple through holes 50 - each of which houses a body 4 - interconnected by the recesses 53, whilst it does not show the area of rotor 1, opposite the area providing the tang 2, in which a further axial hole is made.

[0036] For simplicity of graphical representation, figure 6 indicates with the relevant numerical references only one of the bodies 4, of the annular cavities 52 and of the recesses 53.

[0037] The bodies 4, the annular cavities 52 and the recesses 53 illustrated in figure 6 do not feature the same form because they are rotated relative to the other.

[0038] The recesses 53 present in the side walls of the second cylindrical areas 55 of the through holes 50 place ordinately in communication with one another the axial hole 61, the annular cavities 52 (delimited by the second areas 55 of the holes 50 and by the tangs 45 of the corresponding bodies 4) that surround the tangs 45 and the additional axial hole made in the area of the rotor 1 opposite that where the tang 2 is present.

[0039] Inside the rotor 1 there is hence an axial channel (consisting of the axial hole 61, of the annular cavities 52, of the recesses 53 and of the additional axial hole) in which a coolant circulates and directly cools the blades (41, 42) carried by the bodies 4, essentially cooling the mass of the bodies 4 rather than the mass of the entire rotor 1 as it is required for the known rotors: this allows a drastic reduction in the refrigeration units to be provided to keep the blades (41, 42) at a pre-set temperature and, hence, a significant energy saving.

Claims

1. Rotor (1) for scrap shredder consisting of a cylindrical body, including a tang (2), wherein multiple through holes (50), coplanar to one another and rotated relative to the adjacent through holes (50), are provided, a body (4) - at each end of which there is a blade (41, 42) - being placed in each of said through holes (50), the distance between the axes of longitudinal symmetry of two adjacent through holes (50) being less that the sum of the radii of the holes themselves, which interfere in the central area creating a recess (53) which places the two adjacent through holes (50) in communication with one another.

2. Rotor (1) as in claim 1, in which the outer surface of the cylindrical body contains multiple ribs (3) parallel to one another, **characterised by** the fact that in each rib (3) one of the through holes (50) in which a body (4) is placed is realized, said through hole (50) also crossing the cylindrical body.

3. Rotor (1) as in claim 1, **characterised by** the fact that the distance between the axes of longitudinal symmetry of two adjacent through holes (50) falls between about 85% and about 95% of the sum of their radii.

4. Rotor (1) as in claim 3, **characterised by** the fact that the distance between the axes of longitudinal symmetry of two adjacent through holes (50) is about 90% of the sum of their radii.

5. Rotor (1) as in claim 1, **characterised by** the fact that the body (4) includes a tang (45), at each end of which there is a cylindrical body (43, 44) in the shape of a blade (42, respectively 41).

6. Rotor (1) as in claim 5, **characterised by** the fact that the diameter of the cylindrical body (44) is greater than the diameter of the cylindrical body (43).

7. Rotor (1) as in claim 5, **characterised by** the fact that the cylindrical body (44) contains a seat (46) in which retainers (47) designed to secure the body (4) in the through hole (50) are engaged.

8. Rotor (1) as in claims 1 and 5, **characterised by** the fact that the radius of the tang (45) of a body (4) is less than the radius of the related through hole (50) by an amount greater than the difference between the sum of the radii of the two adjacent through holes (50) and the distance between their axes of longitudinal symmetry.

9. Rotor (1) as in claims 1 and 5, **characterised by** the fact that each through hole (50) includes the following cylindrical areas of progressively increasing diameter:

   - a first cylindrical area (54), having a diameter (substantially) equal to the diameter of the cylindrical area (43) of the body (4);
   - a second cylindrical area (55), having a diameter greater than that of the first cylindrical area (54) but less than that of the cylindrical area (44) of the body (4);
   - a third cylindrical area (56), having a diameter greater than that of the second cylindrical area (55) and (substantially) equal to the diameter of the cylindrical area (44) of the body (4).

10. Rotor (1) as in claim 9, **characterised by** the fact that the second cylindrical area (55) of each through hole (50) and the tang (45) of the corresponding body (4) define an annular cavity (52).

11. Rotor (1) as in claims 1 and 10, **characterised by** the fact that two adjacent annular cavities (52) are placed in communication with one another by the recess (53).

12. Rotor (1) as in claim 9, **characterised by** the fact that a body (4) is applied to the rotor (1) by inserting it in a through hole (50) starting from its smaller-diameter cylindrical area (43) until its cylindrical area (44) comes into contact with an annular projection (57) which forms a connecting surface between the second and the third cylindrical areas (55, 56) of the through hole (50) and by securing it by means of retainers (47), inserted in a seat (5) adjacent to the through hole (50), which are engaged in a seat (46) in the cylindrical body (44) belonging to the body (4).

13. Rotor (1) as in claim 12, **characterised by** the fact that, in order to replace at least one blade (41, 42), the retainers (47) and the body (4) carrying the at least one blade (41, 42) to be replaced, already located in a through hole (50), are removed before inserting a new body (4) in the through hole (50).

14. Rotor (1) as in at least one of the previous claims, **characterised by** the fact that axial holes are provided inside the tang (2) of the rotor (1) and inside the area of the rotor (1) opposite that containing the tang (2), by the fact that the recesses (53) present in the side walls of the second cylindrical areas (55) of the through holes (50) place ordinately in communication with one another the axial hole present in the tang (2), the annular cavities (52) surrounding the tangs (45) of the bodies (4) and the additional axial hole made in the area of the rotor (1) opposite that containing the tang (2) and by the fact that in an axial channel, located inside the manner rotor (1) and consisting of the axial hole present in the tang (2), of the annular cavities (52), of the recesses (53)

and of the additional axial hole made in the area of the rotor (1) opposite that containing the tang (2), a coolant is made to flow that cools the bodies (4) for cooling the blades (41, 42) carried by the bodies (4).

Patentansprüche

1. Rotor (1) für einen Abfallzerkleinerer, umfassend einen zylindrischen einen Mitnehmer (2) enthaltenden Körper, in dem mehrere Durchgangslöcher (50) koplanar zueinander und zu den benachbarten Durchgangslöchern (50) gedreht bereitgestellt sind, wobei ein Körper (4), dessen beide Enden jeweils mit einer Klinge (41, 42) ausgestattet sind, in jedem Durchgangsloch (50) angeordnet ist, wobei der Abstand zwischen den Achsen der Längssymmetrie zwei benachbarter Durchgangslöcher (50) kleiner ist als die Summe der Radien der Löcher selbst, die in den zentralen Bereich eingreifen, der eine Vertiefung (53) bildet, die die beiden benachbarten Durchgangslöcher (50) miteinander in Verbindung bringt.

2. Rotor (1) nach Anspruch 1, wobei die Außenfläche des zylindrischen Körpers mehrere parallel zueinander liegende Rippen (3) enthält, **dadurch gekennzeichnet, dass** in jeder Rippe (3) ein Durchgangsloch (50) ausgefiihrt ist, in den ein Körper (4) eingesetzt ist, wobei das Durchgangsloch (50) auch den zylindrischen Körper quert.

3. Rotor (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Abstand zwischen den Achsen der Längssymmetrie zwei benachbarter Durchgangslöcher (50) zwischen etwa 85% und etwa 95% der Summe ihrer Radien misst.

4. Rotor (1) nach Anspruch 3, **dadurch gekennzeichnet, dass** der Abstand zwischen den Achsen der Längssymmetrie zwei benachbarter Durchgangslöcher (50) etwa 90% der Summe ihrer Radien misst.

5. Rotor (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** der Körper (4) einen Mitnehmer (45) enthält, an dessen beiden Enden ein zylindrischer Körper (43, 44) in der Form einer Klinge (42, beziehungsweise 41) vorgesehen ist.

6. Rotor (1) nach Anspruch 5, **dadurch gekennzeichnet, dass** der Durchmesser des zylindrischen Körpers (44) größer ist als der Durchmesser des zylindrischen Körpers (43).

7. Rotor (1) nach Anspruch 5, **dadurch gekennzeichnet, dass** der zylindrische Körper (44) ein Auflager (46) enthält, in das Halterungen (47) eingreifen, die dazu dienen, den Körper (4) in dem Durchgangsloch (50) zu sichern.

8. Rotor (1) nach Anspruch 1 und 5, **dadurch gekennzeichnet, dass** der Radius des Mitnehmers (45) eines Körpers (4) um einen Betrag kleiner ist als der Radius des dazugehörenden Durchgangslochs (50), der größer ist als die Differenz zwischen der Summe der Radii der beiden benachbarten Durchgangslöcher (50) und dem Abstand zwischen ihren Achsen der Längssymmetrie.

9. Rotor (1) nach Anspruch 1 und 5, **dadurch gekennzeichnet, dass** jedes Durchgangsloch (50) die folgenden zylindrischen Bereiche mit allmählich zunehmendem Durchmesser enthält:

- einen ersten zylindrischen Bereich (54) mit einem Durchmesser (im Wesentlichen) gleich dem Durchmesser des zylindrischen Bereichs (43) des Körpers (4),
- einen zweiten zylindrischen Bereich (55) mit einem Durchmesser, der größer ist als der des ersten zylindrischen Bereichs (54) aber kleiner als der des zylindrischen Bereichs (44) des Körpers (4),
- einen dritten zylindrischen Bereich (56) mit einem Durchmesser, der größer ist als der des zweiten zylindrischen Bereichs (55) und (im Wesentlichen) gleich dem Durchmesser des zylindrischen Bereichs (44) des Körpers (4).

10. Rotor (1) nach Anspruch 9, **dadurch gekennzeichnet, dass** der zweite zylindrische Bereich (55) jedes Durchgangslochs (50) und der Mitnehmer (45) des entsprechenden Körpers (4) einen ringförmigen Hohlraum (52) beschreiben.

11. Rotor (1) nach Anspruch 1 und 10, **dadurch gekennzeichnet, dass** zwei benachbarte ringförmige Hohlräume (52) durch die Vertiefung (53) in Verbindung zueinander gebracht werden.

12. Rotor (1) nach Anspruch 9, **dadurch gekennzeichnet, dass** ein Körper (4) auf den Rotor (1) aufgebracht wird, indem er, beginnend mit dem zylindrischen Bereich (43) mit dem kleineren Durchmesser, in ein Durchgangsloch (50) eingesetzt wird, bis sein zylindricher Bereich (44) einen ringförmigen Vorsprung (57) berührt, der eine Verbindungsfläche zwischen der zweiten und der dritten Verbindungsfläche (55, 56) des Durchgangslochs (50) ausbildet, und er mittels Halterungen (47) befestigt wird, die in ein Auflager (5) neben dem Durchgangsloch (50) eingesetzt sind, die mit einem Auflager (46) in dem zylindrischen Körper (44) in Eingriff stehen, der zu dem Körper (4) gehört.

13. Rotor (1) nach Anspruch 12, **dadurch gekennzeichnet, dass** zum Austauschen mindestens einer Klinge (41, 42) die Halterungen (47) und der Körper

(4), der mindestens eine auszutauschende Klinge (41, 42) trägt, der sich bereits in einem Durchgangsloch (50) befindet, entnommen werden, bevor ein neuer Körper (4) in das Durchgangsloch (50) eingesetzt wird.

14. Rotor (1) nach mindestens einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** axiale Löcher in dem Mitnehmer (2) des Rotors (1) und in dem Bereich bereitgestellt sind, der dem den Mitnehmer (2) enthaltenden Bereich des Rotors (1) gegenüberliegt, **dadurch**, dass die in den Seitenwänden der zweiten zylindrischen Bereiche (55) der Durchgangslöcher (50) vorgesehenen Vertiefungen (53) das in dem Mitnehmer (2) vorhandene axiale Loch, die die Mitnehmer (45) der Körper (4) umgebenden ringförmigen Hohlräume (52) und das zusätzliche axiale Loch in dem Bereich des Rotors (1) gegenüber dem den Mitnehmer (2) enthaltenden Bereich genau miteinander verbinden,
und **dadurch**, dass in einem axialen Kanal, der in dem Rotor (1) angeordnet ist und aus dem in dem Mitnehmer (2) vorhandenen axialen Loch, den ringförmigen Hohlräumen (52), den Vertiefungen (53) und dem zusätzlichen axialen Loch in dem Bereich des Rotors (1) gegenüber dem den Mitnehmer (2) enthaltenden Bereich besteht, ein Kühlmittel fließt, das die Körper (4) zum Kühlen der Klingen (41, 42), die von den Körpern (4) getragen werden, kühlt.

Revendications

1. Rotor (1) pour déchiqueteuse de déchets se composant d'un corps cylindrique, comprenant une pointe (2), dans lequel de multiples trous traversants (50), coplanaires entre eux et tournés par rapport aux trous traversants (50) adjacents, sont fournis, un corps (4) - à chaque extrémité duquel se trouve une lame (41, 42) - étant placé dans chacun desdits trous traversants (50), la distance entre les axes de symétrie longitudinale de deux trous traversants adjacents (50) étant inférieure à la somme des rayons des trous proprement dits, qui interfèrent dans la zone centrale en créant un renfoncement (53) qui met les deux trous traversants adjacents (50) en communication entre eux.

2. Rotor (1) selon la revendication 1, dans lequel la surface extérieure du corps cylindrique contient de multiples nervures (3) parallèles entre elles, **caractérisé par le fait que** dans chaque nervure (3) l'un des trous traversants (50) dans lequel un corps (4) est placé est réalisé, ledit trou traversant (50) croisant également le corps cylindrique.

3. Rotor (1) selon la revendication 1, **caractérisé par le fait que** la distance entre les axes de symétrie longitudinale de deux trous traversants adjacents (50) est comprise entre environ 85 % et environ 95 % de la somme de leurs rayons.

4. Rotor (1) selon la revendication 3, **caractérisé par le fait que** la distance entre les axes de symétrie longitudinale de deux trous traversants adjacents (50) est d'environ 90 % de la somme de leurs rayons.

5. Rotor (1) selon la revendication 1, **caractérisé par le fait que** le corps (4) comprend une pointe (45), à chaque extrémité de laquelle se trouve un corps cylindrique (43, 44) en forme de lame (42, respectivement 41).

6. Rotor (1) selon la revendication 5, **caractérisé par le fait que** le diamètre du corps cylindrique (44) est supérieur au diamètre du corps cylindrique (43).

7. Rotor (1) selon la revendication 5, **caractérisé par le fait que** le corps cylindrique (44) contient un siège (46) dans lequel sont engagées des fixations (47) conçues pour fixer le corps (4) dans le trou traversant (50).

8. Rotor (1) selon les revendications 1 et 5, **caractérisé par le fait que** le rayon de la pointe (45) d'un corps (4) est inférieur au rayon du trou traversant associé (50) d'une quantité supérieure à la différence entre la somme des rayons des deux trous traversants adjacents (50) et la distance entre leurs axes de symétrie longitudinale.

9. Rotor (1) selon les revendications 1 et 5, **caractérisé par le fait que** chaque trou traversant (50) comprend les zones cylindriques suivantes de diamètre progressivement croissant :

- une première zone cylindrique (54), ayant un diamètre (sensiblement) égal au diamètre de la zone cylindrique (43) du corps (4) ;
- une deuxième zone cylindrique (55), ayant un diamètre supérieur à celui de la première zone cylindrique (54) mais inférieur à celui de la zone cylindrique (44) du corps (4) ;
- une troisième zone cylindrique (56), ayant un diamètre supérieur à celui de la deuxième zone cylindrique (55) et (sensiblement) égal au diamètre de la zone cylindrique (44) du corps (4).

10. Rotor (1) selon la revendication 9, **caractérisé par le fait que** la deuxième zone cylindrique (55) de chaque trou traversant (50) et la pointe (45) du corps correspondant (4) définissent une cavité annulaire (52).

11. Rotor (1) selon les revendications 1 et 10, **caractérisé par le fait que** deux cavités annulaires adjacentes (52) sont mises en communication entre elles par le renfoncement (53).

12. Rotor (1) selon la revendication 9, **caractérisé par le fait qu'**un corps (4) est appliqué au rotor (1) en l'insérant dans un trou traversant (50) en commençant par sa zone cylindrique de petit diamètre (43) jusqu'à ce que sa zone cylindrique (44) entre en contact avec une projection annulaire (57) qui forme une surface de connexion entre les deuxième et troisième zones cylindriques (55, 56) du trou traversant (50) et en la fixant au moyen de fixations (47), insérées dans un siège (5) adjacent au trou traversant (50), qui sont engagées dans un siège (46) dans le corps cylindrique (44) appartenant au corps (4).

13. Rotor (1) selon la revendication 12, **caractérisé par le fait que**, pour remplacer au moins une lame (41, 42), les fixations (47) et le corps (4) transportant l'au moins une lame (41, 42) à remplacer, déjà situés dans un trou traversant (50), sont enlevés avant d'insérer un nouveau corps (4) dans le trou traversant (50).

14. Rotor (1) selon au moins l'une des revendications précédentes, **caractérisé par le fait que** des trous axiaux sont fournis à l'intérieur de la pointe (2) du rotor (1) et à l'intérieur de la zone du rotor (1) opposée à celle contenant la pointe (2), **par le fait que** les renfoncements (53) présents dans les parois latérales des deuxièmes zones cylindriques (55) des trous traversants (50) mettent de manière ordonnée en communication l'un avec l'autre le trou axial présent dans la pointe (2), les cavités annulaires (52) entourant les pointes (45) des corps (4) et le trou axial supplémentaire effectué dans la zone du rotor (1) opposée à celle contenant la pointe (2) et **par le fait que** dans un canal axial, situé à l'intérieur du rotor (1) et se composant du trou axial présent dans la pointe (2), des cavités annulaires (52), des renfoncements (53) et du trou axial supplémentaire effectué dans la zone du rotor (1) opposée à celle contenant la pointe (2), il est amené à s'écouler un liquide de refroidissement qui refroidit les corps (4) pour refroidir les lames (41, 42) transportées par les corps (4).

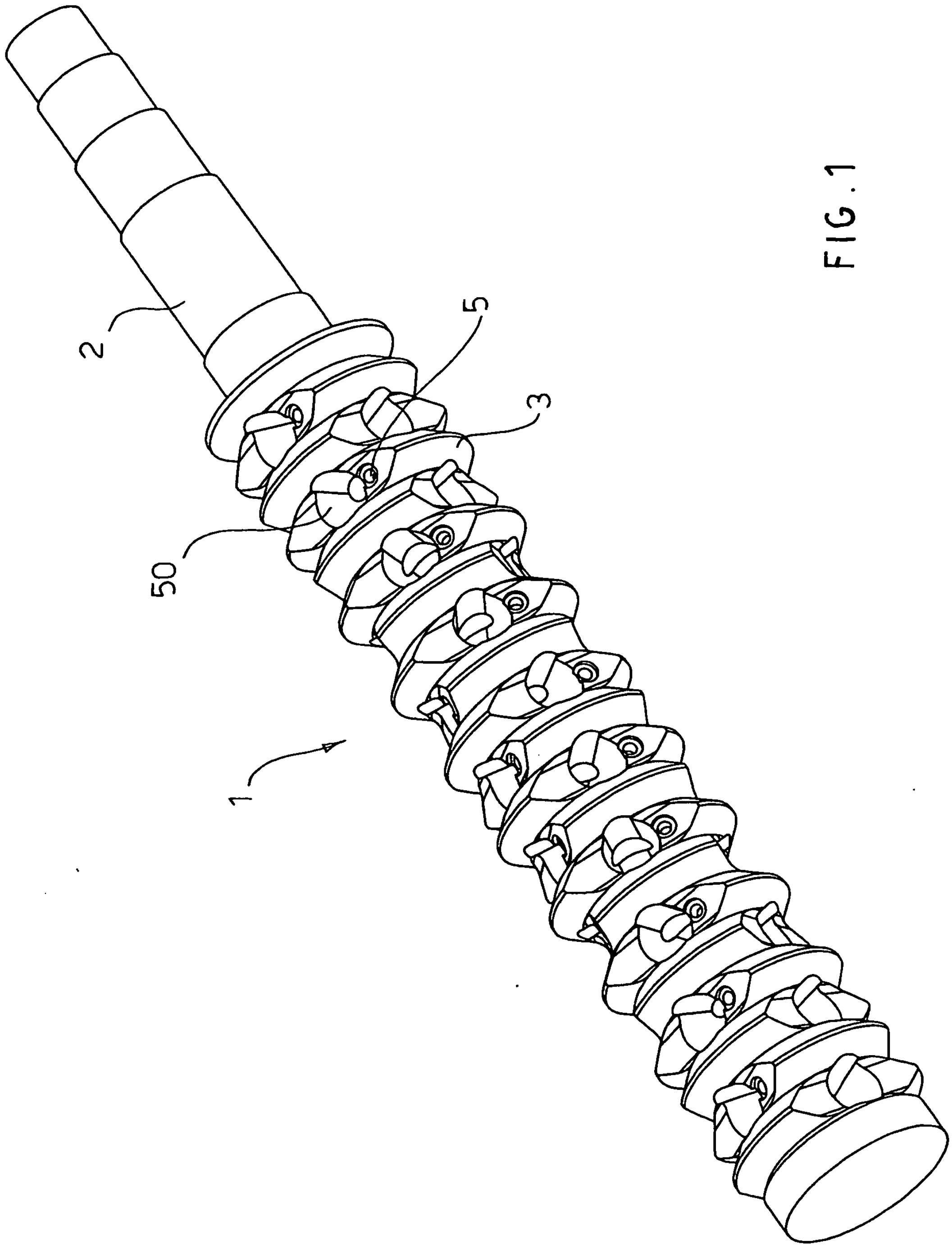

FIG. 1

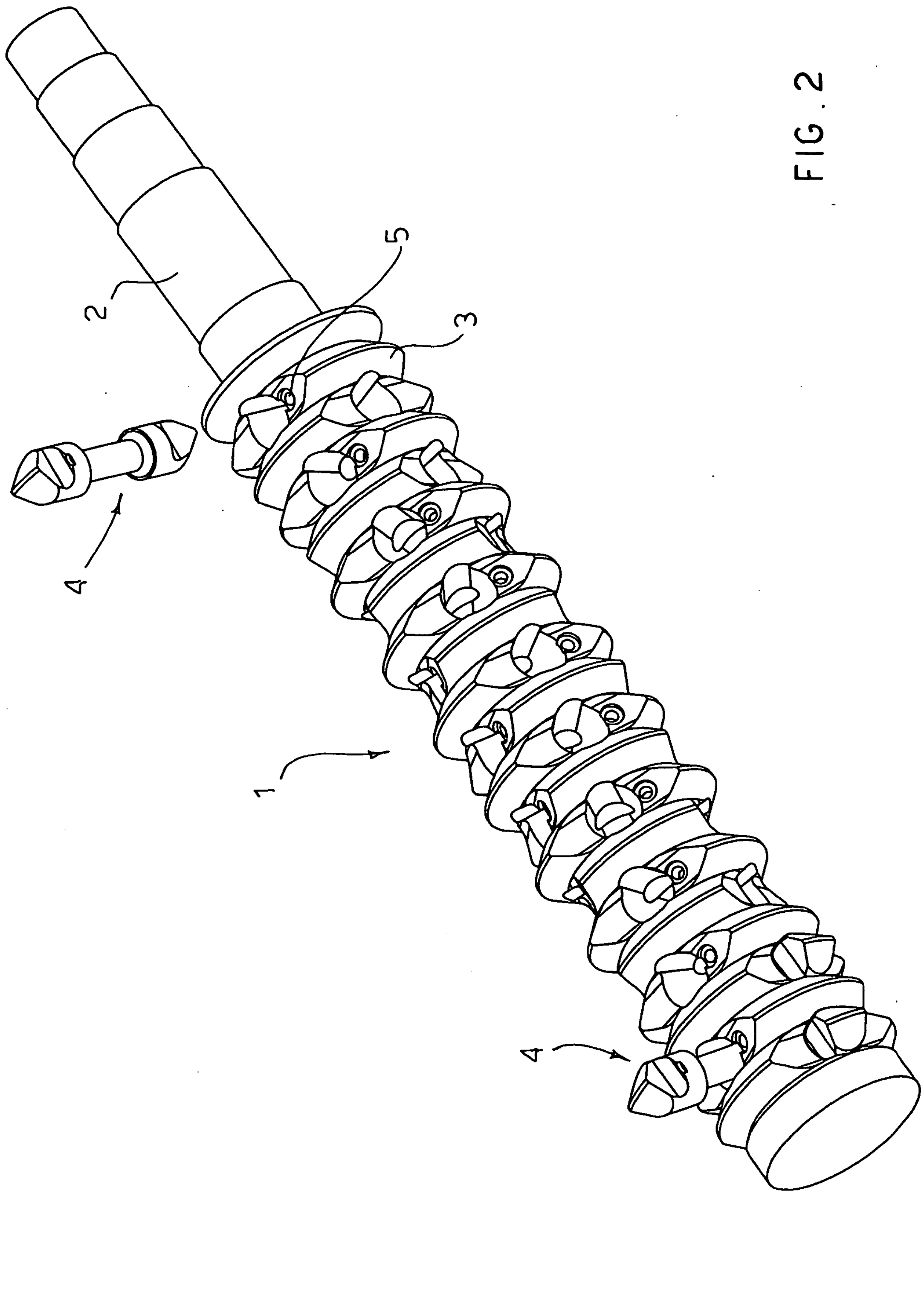

FIG. 2

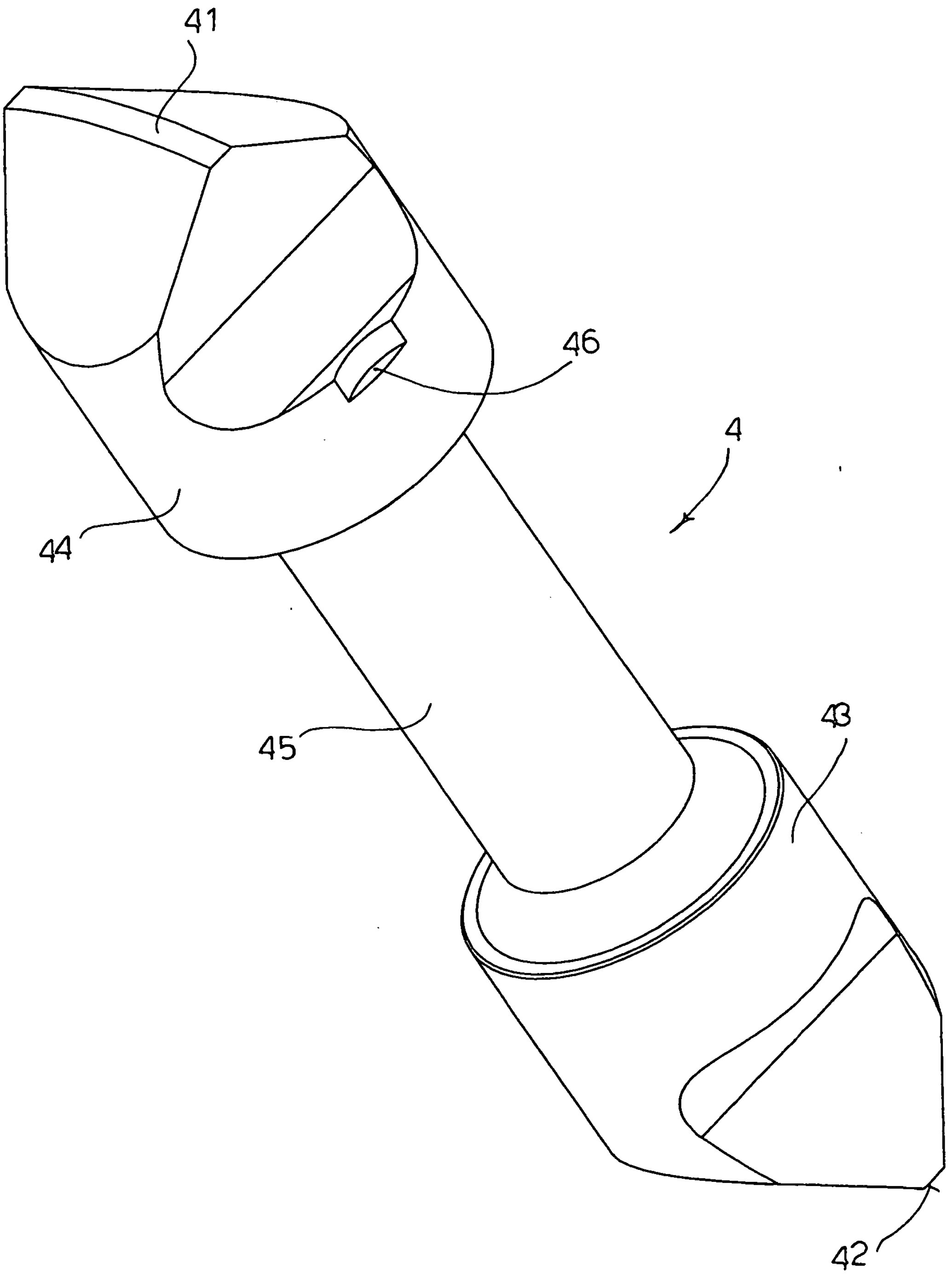

FIG. 3

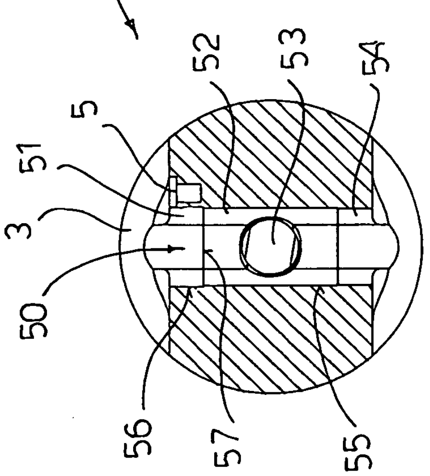

FIG.5

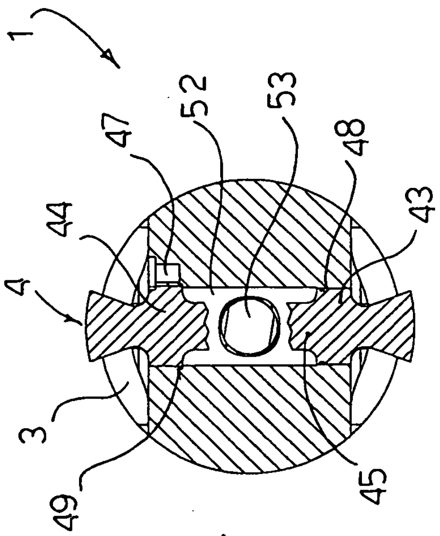

FIG.4

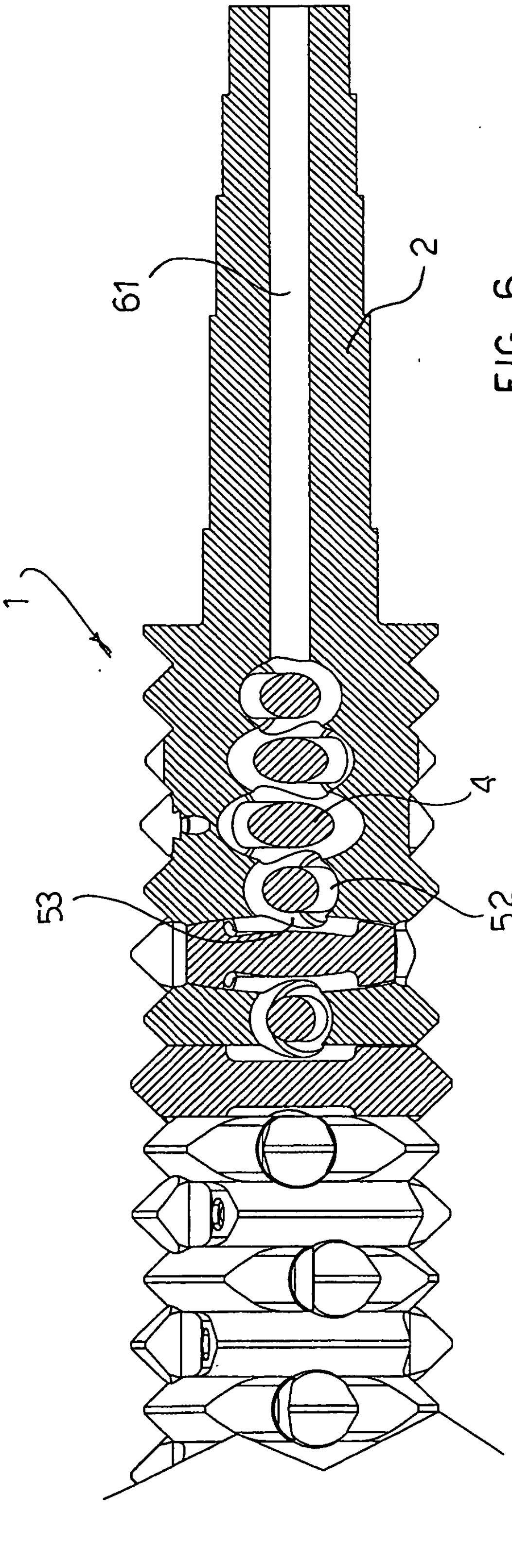

FIG. 6

REFERENCES CITED IN THE DESCRIPTION

Patent documents cited in the description

- GB 448258 A **[0008]**