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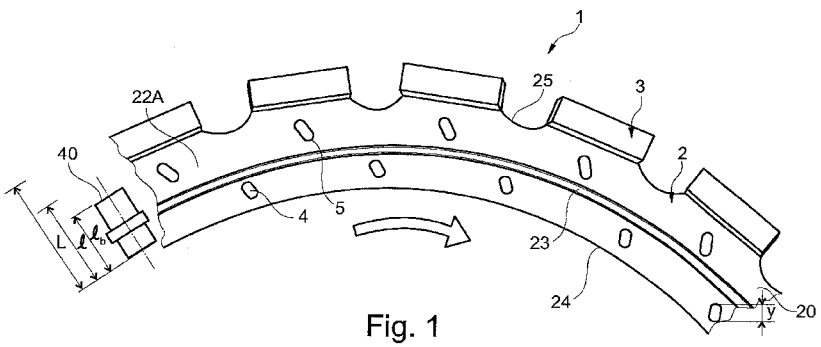

Fig. 1

(57) Abstract: The present invention relates to an annular saw blade comprising an annular body (2) having cutter means (3) arranged at its outer periphery, which body (2) has a radial extension (1) that considerably exceeds the thickness at (T) and is provided with from each other facing side surfaces (20, 21), comprising an annular drive area (22) having at least one drive face (22A, 22B) arranged to transfer a driving power from two opposing driving rollers (40, 50), or one driving roller with an opposing counterforce roller (50), said rollers (40, 50) being arranged with their axes of rotation in the radial direction to bear against both side surfaces (20, 21), said body (2) being provided with recesses (4, 5) arranged to relieve stresses in the body (2) imparted via said rollers (40, 50).

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RING BLADE AND USE OF RING BLADE

TECHNICAL FIELD

The present invention relates to an annular saw blade comprising an annular body having cutter means arranged at its outer periphery, which body has a radial extension that considerably exceeds the thickness and is provided with from each other facing side surfaces, comprising an annular drive area having at least one drive face arranged to transfer a driving power from two opposing driving rollers, or one driving roller with an opposing counterforce roller, said rollers being arranged with their axes of rotation in the radial direction to bear against both side surfaces.

BACKGROUND

Annular saw blades are characterized by having no centre part, whereby the saw depth gets greater than the circle radius. Examples of fields of use is within fire defense for sawing roofs, walls and floors irrespective of the occurrence of nails or other iron objects, sawing car bodies and other steel sheet and iron constructions; sawing concrete pipes, sawing asphalt, making holes in walls of concrete and lightweight concrete, etc.

A first category of annular saw devices in which the annular saw blade is supported by a centre disc that is attached to a blade holding fixture in the saw machine is known from SE 8002265-0 and US 2,972,363. This design gives some additional costs which is the main reason for the development of alternative annular saw machines without centre disc. Other prior art annular saw devices are presented in US 3,135,304, US 3,930,310 and US 2,972,363.

Another prior art category of annular saw machines is adapted to suspend the annular saw blade without a centre support. One driving principle that has been known for a long time, from SE 70233 e.g., is based on two opposing rollers that are used to drive the annular saw blade. A present day variant is shown in US2009/0229133. In order to eliminate the risk of slipping, the driving rollers (sometimes just one driving roller and one counterforce roller) must bear against the sides of the blade at a relatively high bearing pressure. This high pressure, especially in combination with the heat release that takes place in connection with sawing, gives a rolling action resulting in stresses being formed in the blade. In time, such stresses can be built up to undesirable levels resulting in the risk of blade breaking which in turn means large damage risks.

BRIEF DESCRIPTION OF THE INVENTION

It is an object of the present invention to make an annular saw blade that eliminates or at

least minimizes the above mentioned problems, which is achieved by an annular saw blade according to claim 1.

Thanks to the design according to the invention there is a chance for the stresses that are transferred from the driving rollers to the blade to be absorbed in the blade without the risk of a critical accumulated build-up of stresses in the blade body, which means a considerably reduced risk of blade breaking.

According to other aspects of the invention;

- said recesses are positioned within said annular drive area,
- said recesses comprise at least one inner group and one outer group, where the outer recesses preferably have a larger maximum dimension than the maximum dimension of the inner recesses,
- a guiding groove is arranged between said inner and outer groups,
- at least one of said recesses is elongated,
- at least some of the recesses have a longitudinal extension that is arranged to contribute to liquid transport,
- the longitudinal extension is directed such that an acute angle is formed to the radius of the blade,
- the major part of the recesses, preferably all of them, are through recesses.

BRIEF DESCRIPTION OF THE DRAWINGS

In the following, the invention will be described in greater detail with reference to an exemplifying embodiment, where:

Fig. 1 shows a portion of an annular saw blade according to the invention, as seen from a first side thereof and with a driving roller being schematically indicated,

Fig. 2 shows the blade in a planar view as seen from the inside, with the driving rollers schematically indicated,

Fig. 3 shows the blade as seen from a second side, and

Fig. 4 shows a cross-section of the blade, with the driving rollers* schematically indicated, and

Fig. 5 shows a cross-section of the blade according to an alternative embodiment, with the driving rollers or guiding rollers schematically indicated.

* driving or guiding rollers (depending on system)

DETAILED DESCRIPTION

Figs. 1 and 2 show a portion of an annular saw blade 1 according to a preferred embodiment of the invention, as seen in profile. The annular cutting blade 1 has an annular body 2 with a radial extension of ca 5-15% of the diameter of the blade. The body 2 is provided with cutting members 3, usually diamond cutters, at its outer periphery 25, resulting in an increase of the total radial dimension L of body 2 including cutters 3. Recesses 4, 5 are arranged in the body 2 with the purpose of relieving stresses that form as the driving means 40, 50 in the form of radially directed driving counteracting rollers affect the blade 1 to rotate.

As is clear from Fig. 2, the body 2 is of uniform thickness in the axial direction, which thickness T is considerably smaller than the radial extension l of the body 2, and has essentially parallel side surfaces 20, 21 facing away from each other. A guiding groove 23 is arranged in one of the faces 20 and intended to interact with a maneuvering cam 45 on one of the driving rollers 40. The driving rollers 40, 50 have a radial extension l_b that is smaller than the total radial extension l of the annular body 2. The entire envelope surface of the driving rollers 40, 50 bears against the body 2 within an area 22 that is denoted a driving area. Accordingly, this driving area is constituted of equally sized part side surfaces 22A, 22B on both sides 20, 21.

In order to avoid slipping, a relatively large clamping force must be exerted when driving the blade 1. These clamping forces affect the material of the body, which usually is some type of high-strength steel, such that stresses are formed, which in time results in some material dislocation. Thanks to the recesses 4, 5 there is room to allow for some dislocation of the material, whereby large inner stresses are prevented from building up inside the body 2.

Fig. 3 shows a view from the other side of the blade 1, having a drive face 22B without a guiding groove. It is clear from the drawing that the recesses 4, 5 suitably are positioned in different groups, suitably an inner group 4 and an outer group 5 respectively (there may however be more groups), where an outer group 5 advantageously has recesses with a relatively large maximum cross-sectional dimension x, and an inner group 4 has a smaller maximum cross-sectional dimension y. It is furthermore clear that the inner and outer groups 4, 5 suitably are positioned such that they are staggered in relation to each other, preferably with the same spacing β, which means that the inner recesses 4 preferably are positioned about midways between two outer recesses 5. It is also shown that the recesses 4, 5 suitably are positioned such that they do not extend to the area of the driving groove 23, i.e. such that the outer end of an

inner recess 4 ends some distance before the inner edge of the guiding groove 23 and the inner end of an outer recess 5 ends just beyond the outer edge of the guiding groove 23. Suitably, the outer recesses 5 have such an extension that their outer ends are positioned in the vicinity of the outer end area of the driving zone 22 and the inner recesses 4 such that their inner end is positioned in the vicinity of the inner end zone of the driving area 22.

With the objective of improving liquid transport to the saw cut (in order to ameliorate the cutting ability and the life of the blade), the extension of the recesses 4, 5 can advantageously be made such that liquid transport is optimized in terms of feed to the saw cut, which includes a large variety of embodiments, such as giving them an angle α to the radius of the blade, whereby the blade 1 rotation may result in a positive pumping liquid feed effect. According to a preferred embodiment of the invention the recesses 4, 5 are arranged with a longitudinal extension x, y in the range of 4-40% x l, and a transverse extension in the range of 4-20% x l, having corner radiuses in the range of 0.1-4 mm, and preferably $x \geq y$, more preferably $x > y$, and even more preferred $x > 1.5y$. Furthermore, all too sharp radiuses should be avoided in the recesses 4, 5, which preferably are constituted by through recesses, and it is preferred that radiuses of less than 0.5 mm are not employed, whereby the radiuses more preferably are 1-5 mm.

Fig. 5 shows yet another embodiment according to the invention, in which a circular groove 7 is used instead of the recesses 4, 5 with the purpose of rearranging stresses in the body 2 being transferred via the rollers 40, 50. The groove 7 suitably has about the same dimensions as the guiding groove 23. According to a preferred embodiment the groove 7 has a depth t that is at least 30% of the thickness tof the blade body 2. More preferred, the groove 7 has a depth t in the range of 40-90% of the body thickness, more preferred 50-80%. According to the preferred embodiment, the width of the groove 7, i.e. in the radial direction, is about equal to the width of the guiding groove 23, whereby the relation between these two grooves 7, 23 is that their widths are about the same but preferably within the range of ±20%. In a similar manner, the depth of the relieving groove 7 is suitably equal to the depth of the guiding groove 23, preferably having a deviation of ±20% at the most.

It is realized that the invention is not limited to the above described but can be varied within the scope of the claims. It is for example obvious to the person skilled in the art that the recesses 4, 5 can be of very varying design in order to fulfill the function of enabling relief. It is also realized that the recesses 4, 5 can extend in the form of bends, in order e.g. to give an even better pumping effect. It is furthermore realized that various

variants of combinations of relieving grooves 7 and recesses 4, 5 can be used, whereby for example a plurality of relieving grooves 7 can be used with or without recesses, and also that a relieving groove 7 can be combined with one or more groups of recesses.

The recesses can be made in a number of traditional ways but preferably laser cutting or some other present day technique is used which results in very fine cutting surfaces, as it is an advantage that these are without scratches or notches that otherwise may give a weakening effect. It is also realized that round/circular recesses can be used instead of elongated recesses, which recesses can be of varying size, whereby it is possible to produce extremely small and fine holes by laser cutting such that a type of perforation is formed instead.

CLAIMS

1. Annular saw blade comprising an annular body (2) having cutter means (3) arranged at its outer periphery, which body (2) has a radial extension (l) that considerably exceeds the thickness at (T) and is provided with from each other facing side surfaces (20, 21), comprising an annular drive area (22) having at least one drive face (22A, 22B) arranged to transfer a driving power from two opposing driving rollers (40, 50), or one driving roller with an opposing counterforce roller (50), said rollers (40, 50) being arranged with their axes of rotation in the radial direction to bear against both side surfaces (20, 21), characterized in that said body (2) is provided with at least one recess (4, 5, 7) arranged to relieve stresses in the body (2) imparted via said rollers (40, 50).

2. Annular saw blade according to claim 1, characterized in that said recesses (4, 5) are positioned within said annular drive area (22).

3. Annular saw blade according to claim 1 or 2, characterized in that said recesses (4, 5) comprise at least one inner group (4) and one outer group (5), where the outer recesses (5) preferably have a larger maximum dimension (x) than the maximum dimension (y) of the inner recesses (4).

4. Annular saw blade according to claim 3, characterized in that a guiding groove (23) is arranged between said inner (4) and outer (5) groups.

5. Annular saw blade according to any of the preceding claims, characterized in that at least one of said recesses (4, 5) is elongated.

6. Annular saw blade according to claim 5, characterized in that at least some of the recesses (5) have a longitudinal extension that is arranged to contribute to liquid transport.

7. Annular saw blade according to claim 6, characterized in that the principal longitudinal extension is directed such that an acute angle (α) is formed to the radius of the blade.

8. Annular saw blade according to any of the preceding claims, characterized in that the major part of the recesses (4, 5), preferably all of them, are through

recesses.

9. Annular saw blade according to claim 1, characterized in that a guiding groove (23) is arranged on one side of the body (2) and that said at least one recess (7) is in the form of at least one groove on the other side of the body (2).

10. Annular saw blade according to claim 9, characterized in that the depths (3) of said grooves (7) is at least 30% of the thickness (t)of the body (2), preferably 40-90%, more preferred 50-80%.

11. Method in connection with sawing with an annular saw blade according to any of the preceding claims, characterized in that at least some of said recesses (4, 5) are designed to transport liquid to the saw cut.

12. Method according to claim 9, characterized in that liquid is added in such a way that the liquid flows into, and at least partly through, at least some of said recesses (4, 5).

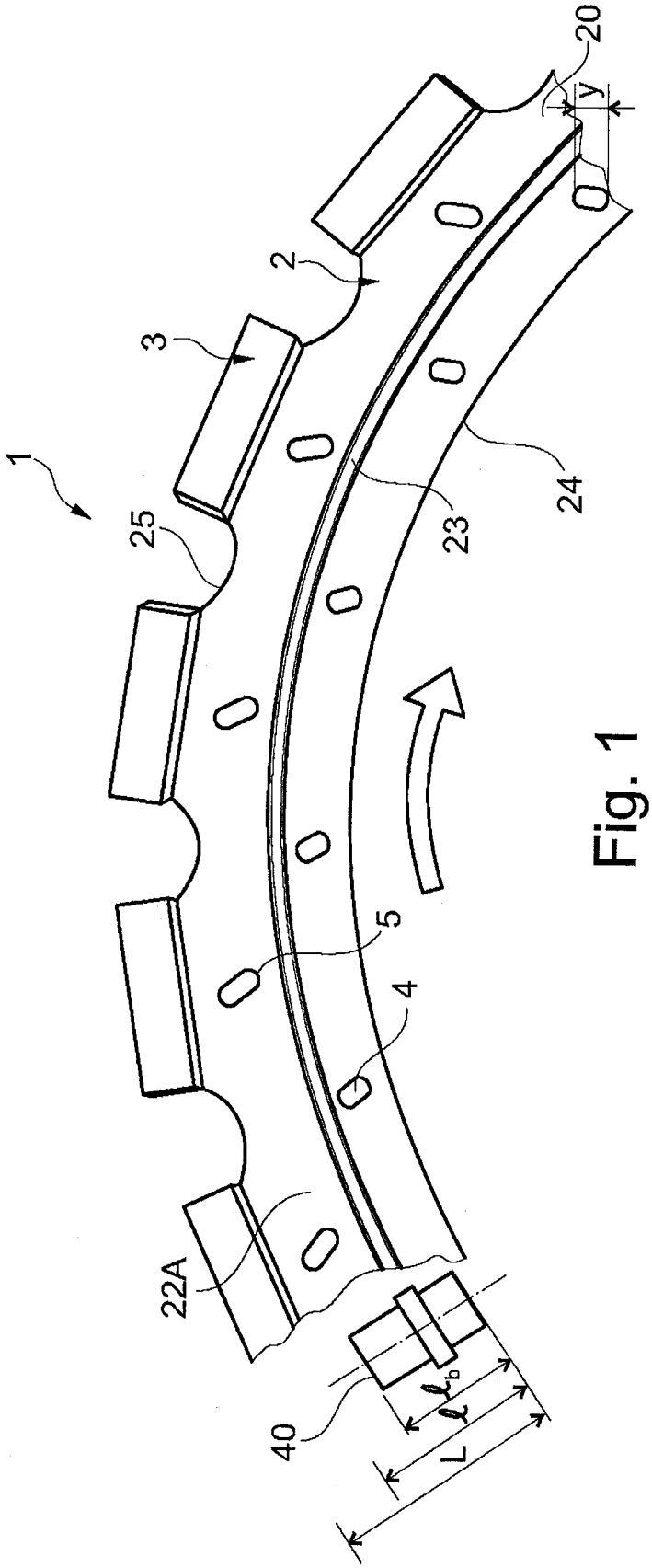

Fig. 1

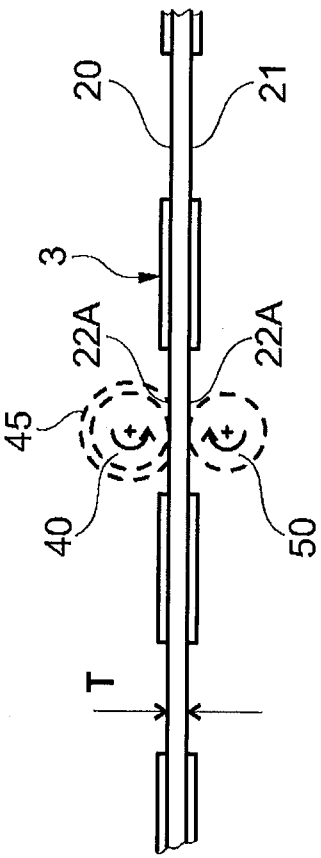

Fig. 2

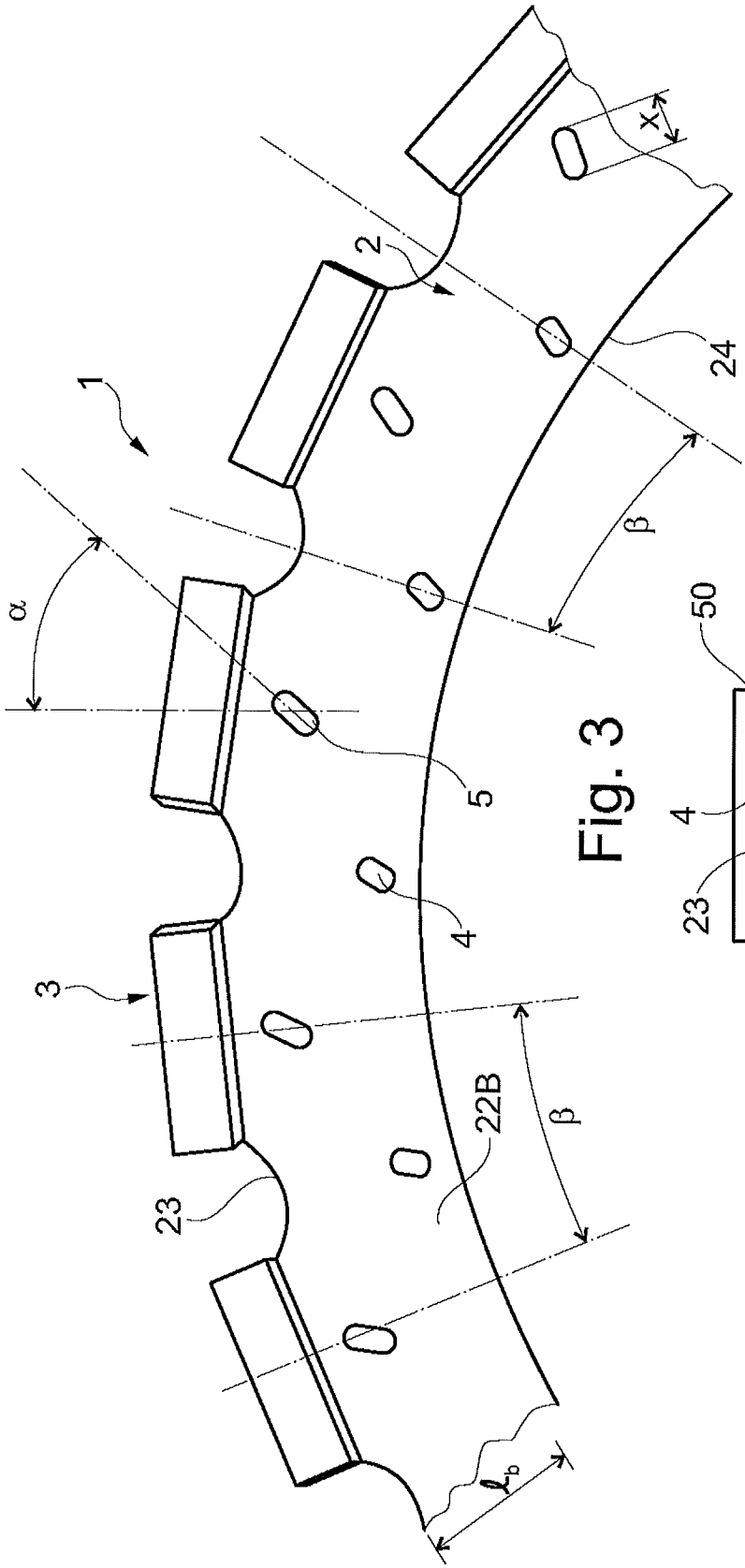

Fig. 3

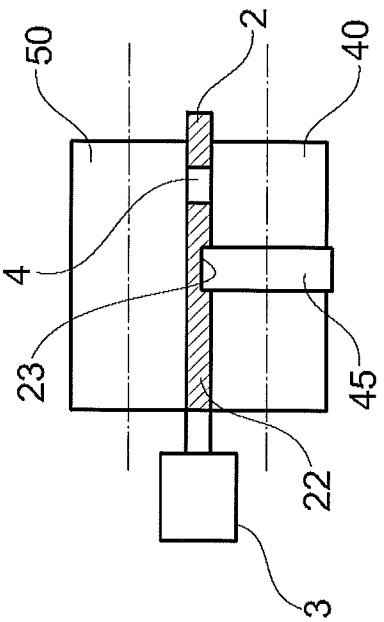

Fig. 4

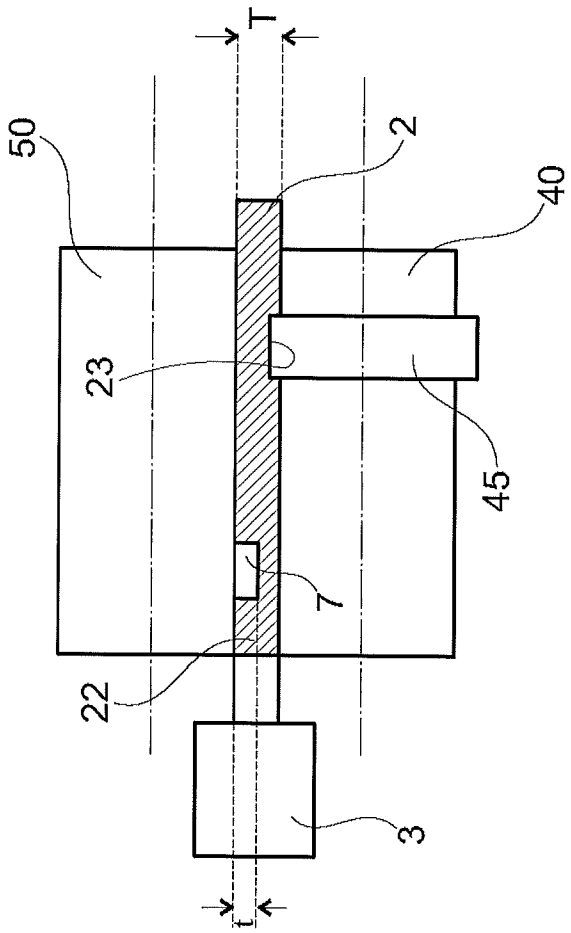

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2012/050266

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B23D, B27B, B28D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, PAJ, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 2703825 A1 (RICHARD FELDE), 3 August 1978 (1978-08-03); abstract; figures --	1-12
A	US 2972363 A1 (SANTILLI RUGGERO), 21 February 1961 (1961-02-21); figures; claim 1 --	1-12
A	SE 8002265 L (JOHANSSON MATS A), 26 September 1981 (1981-09-26); abstract; figures --	1-12
A	US 3135304 A (BREER CARL F ET AL), 2 June 1964 (1964-06-02); figures; claim 1 --	1-12

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
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Date of the actual completion of the international search	Date of mailing of the international search report
01-06-2012	05-06-2012
Name and mailing address of the ISA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. + 46 8 666 02 86	Authorized officer Fredrik Strand Telephone No. + 46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2012/050266

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3930310 A (SANTILLI ERMANNO), 6 January 1976 (1976-01-06); abstract; figures --	1-12
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A	FR 2859931 A3 (PARLID SERVICES LTD), 25 March 2005 (2005-03-25); abstract; figures --	1-12
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A	US 5369886 A1 (GALLATIN CHARLES A), 6 December 1994 (1994-12-06); abstract; figures -- --------	1-12

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B28D 1/04 (2006.01)

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FR	2859931	A3	25/03/2005	NONE			
US	5182976	A1	02/02/1993	NONE			
US	5369886	A1	06/12/1994	NONE			