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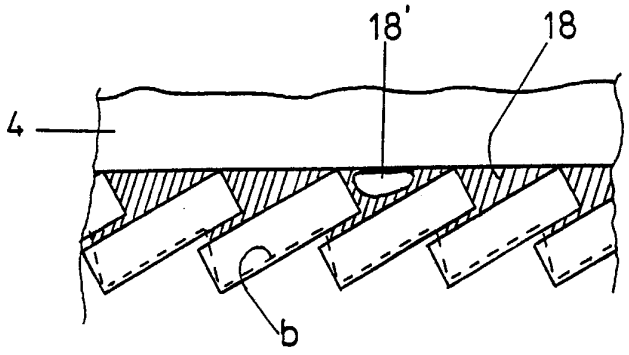
(54) Title: SAW OR CUTTING TOOL WITH INSERTED TEETH OF HARD METAL, WITH A MAJOR AXIS OF EACH TOOTH DISPOSED ALONG THE TOOTH FLANKS, AND A METHOD OF MAKING SAID TOOL



(57) Abstract

It is well known to improve the efficiency and the durability of saw blades by means of hard metal members secured to the front flank of the saw teeth so as to form the effective cutting edges and surfaces of the teeth. With the invention substantial advantages are achieved by mounting the hard metal (8) members in a more lying position on the rear flanks (12) of the teeth (6), as hereby the foremost end faces (14) of the members are used as cutting shares. It is even possible to completely avoid the teeth on the carrying saw blade (4), as the hard metal members may be laid up in suitably inclined positions and be secured to each other and to a straight edge on the carrier blade (4), such that they will form the saw teeth themselves. In the production a very simple grinding technique can be used for forming the required clearance above and aft of the active cutting edges.

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Saw or cutting tool with inserted teeth of hard metal, with a major axis of each tooth disposed along the tooth flanks, and a method of making said tool.

The present invention relates to a saw blade having cutting tooth parts of hard metal.

It has been found long ago that it is possible to manufacture saw blades with essentially reinforced teeth by providing these with soldered-on hard metal members, which can be sharpened and resharpenedso as to obtain a relatively very long and efficient lifetime. In principle it is sufficient that the members of blocks be secured as small parts locally at the tooth points, as the effective cutting depth of each tooth is relatively modest, but normally it is chosen to use larger, flat blocks which for a better fastening are hard soldered to most of the entire front flanks of the respective teeth, usually embedded in a recess therein, such that the blocks are well supported by the teeth of the saw blade. Typically, the blocks have a width which is a little larger than the thickness of the saw blade, whereby there will be no need for a conventional setting of the teeth to opposite sides.

Thus, the hard metal blocks will constitute the cutting front edge portions of the teeth, and normally they are mounted in a position in which their main plane is oriented more or less perpendicularly to the length direction of the row of teeth, optionally inclined somewhat forwardly or rearwardly relative to the working direction of the blade, all according the the desired cutting angle of the tooth, and at their outer ends they are sharpened by an oblique grinding for forming a foremost and outermost, sharp cutting edge. On their side faces the blocks are ground into a rearwardly narrowing shape, such that also at the sides there is provided a clearance behind the foremost, cutting side edges.

Inasfar as these saw blades with hard metal reinforced teeth are notoriously very advantageous one can hardly speak of disadvantages thereof, but in the present connection it should be noted that they are not unlimited durable, as it is experienced now and then that a tooth block or two may disappear, whereby in certain cases the whole saw blade will be unusable. Also it should be noted that these saw blades are relatively expensive, already because the grinding of the mounted blocks is effected by means of very complicated grinding machines, tooth by tooth.

In connection with the present invention it has been recognized that marked advantages are achievable by mounting the hard metal blocks in a quite different manner, viz. entirely released from the basic concept of the blocks acting as a front flank reinforcement on the teeth. They can still be mounted in connection with preshaped teeth on the saw blade, but in that case by a mounting on the rear flanks of the teeth, whereby they will be located, generally, with their length dimension pronouncedly inclined relative to the cutting direction. Thus, for the invention it is a basic condition that the hard metal blocks can be effectively supported via their proper hard soldering connection with the saw blade, as they will not necessarily be rearwardly positively supported by means of teeth on the blade. It has been found, however, that with the use of good hard soldering materials a fully effective securing of the blocks is achievable even with this arrangement.

It may require a very thorough explanation to verify why this mounting of the blocks is extra advantageous, but a main point will be that the blocks are now turned in a manner such that the combined cutting and contact pressure will act generally in the longitudinal direction of the blocks and not in their cross direction as for conventionally mounted blocks. Thereby

the blocks can much better resist large forces without being subjected to the splitting influence as observable for steeply projecting blocks, and the result is a substantially improved durability, which for certain types of saws may give rise to the grant of no less than a lifelong guarantee of the product. This will be further discussed below.

While it may be correct to characterize the invention by an inverted tooth supported mounting of the hard metal blocks it will nevertheless be an important aspect of the invention that use can be made of a carrier blade element which is not preshaped with any kind of teeth, but only exhibits a rectilinear tooth carrier edge. Particularly with the use of obliquely disposed tooth blocks it is possible to fasten these to the rectilinear blade edge and to each other in a manner such that they will form a tooth pattern determined by their own geometrical shape. The distance between the tooth points may even be variable with the use of one and the same type of hard metal blocks, viz. all according to these being mounted and secured by soldering in a more or less inclined position.

While the term 'hard metal blocks' has so far been used for blocks of a planar shape, the invention provides for quite outstanding advantages by the use of blocks of round rod elements, see below.

It is a further important aspect of the invention that the grinding of the teeth may be effected in a particularly simple manner for achieving the desired cutting clearance both behind the outer tips of the teeth and behind the front side edges thereof, as for this purpose it is not necessary to utilize any complicated machinery for working the saw blade member tooth by tooth. Instead it is possible to use simple cutting or grinding tools, which may work the blade member by a single linear throughrun thereof, whereby it

will be obtained automatically that a grinding down of the width of each tooth from from the outer tooth end width to the smaller thickness of the carrier blade will imply that each of the inclined tooth blocks will be narrowed rearwardly, inasfar as this will also be the direction inwardly towards the carrier blade. For the production price it is very important that the required grinding can be effected that simply and rapidly, with the use of a very cheap tool system.

In the following the invention is described in more detail with reference to the drawings, in which:

Figs. 1-3 are plan views of saw blades designed according to the invention,

Fig. 4 is a corresponding, enlarged view of a saw blade according to a special embodiment of the invention,

Figs. 5 and 6 are end views of the saw blade shown in conjunction with applied grinding tools,

Fig. 7 is a plan view of a saw blade as worked according to Figs. 5 or 6,

Fig. 8 is a view of the lower edge area of a thus treated saw blade,

Fig. 9 is a perspective view of a special embodiment of the invention,

Fig. 10 is a corresponding view of a slightly modified embodiment,

Figs. 11 and 12 are end views of special embodiments,

Fig. 13 is a side view of a hard metal block used therein,

Fig. 14 is a perspective view of still a further embodiment of the invention,

Fig. 15 is a schematic illustration of a grinding operation thereon,

Fig. 16 is a perspective end view thereof,

Fig. 17 is a lateral view of still another embodi-

ment of the invention,

Fig. 18 an end view thereof,

Fig. 19 a side view of a saw blade with an associated bow member,

Fig. 20 a side view of an alternative saw blade according to the invention, and

Fig. 21 a lateral view of a circular saw blade.

In Fig. 1 is shown a saw blade 2 consisting of a carrier blade 4, which is provided with a toothing 6 and with hard metal blocks or plates 8 secured to the teeth by hard soldering. The teeth have a relatively steep front flank 10 and a more inclined rear flank 12, and the blocks 8, which may appear as flat, rectangular plate members, are secured with a flat side against the rear flank 12 and with their upper or rear end face abutting the front flank 10 of the preceding tooth. The blocks 8 are slightly broader than the thickness of the carrier blade, such that they project slightly to both sides thereof. At their outer ends the blocks exhibit an end face 14 forming a desired cutting angle with the line of operation of the tooth row. This shape can be determined already by the production of the blocks 8, but it can be obtained also by a reasonably simple cross grinding of the blocks after the mounting thereof.

It will be noted that the impact on the teeth during sawing by a movement towards the left will be directed predominantly in the direction of the flatness of the blocks 8, viz. as the resultant of the straight rearwardly directed cutting pressure on the tooth point and the upwardly directed pressure owing to the downwardly directed contact pressure of the saw blade against the member being worked. This amounts to a more favourable impact on the blocks than where these are placed in a steep position at the front flank of the thenteeth, and it is reasonable to believe that this contributes to a remarkably high durability of saw

blades designed in accordance with the invention.

In Fig. 2 it is shown that with one ground type of carrier blade 4 it is possible to produce more variants of saw blades, viz. by mounting the plate blocks 8 with a higher or lower mutual spacing.

In the embodiment shown in Fig. 3 the saw is designed such that the blocks 8 entirely fill out the tooth recesses and overlap each other slightly, hereby touching each other; they are mutually connected by the hard soldering. This type of embodiment is important in that the mutually connected blocks 8 will produce a pronounced stiffening of the blade. The blocks themselves are non-bendable in an almost absolute sense, so the resulting flexibility will be limited to the small degree conditioned by the soldering material between the blocks. For a given thickness the blade appears as a surprisingly stiff unit, what can be of large practical importance for the provision of an absulutely straight cut, while for compass saws the free end of the saw blade cannot easily come into noticeable side oscillations, which under circunstances makes the sawing much easier and contributes to a higher durability of the saw.

Fig. 4 illustrates a further development, according to which the blocks 8 are mounted, mutually, in the same manner as in Fig. 3, but here without any toothing on the carrier blade. It has been recognized that the carrier blade may just as well be terminated along the straight line a shown in Fig. 3, as the space occupied by the teeth 6 may then just be filled out with soldering material 18, as shown in Fig. 4. With the use of suitable, simple auxiliaries for the successive mounting of the blocks 8 it is as easy to arrange the blocks without supporting teeth, and of course it is a clear advantage that the required carrier blades should not be provided with any kind of toothing.

This is advantageous not only for a cheap production of the carrier blade, which is in Fig. 4 designated 4', but also because with one single type of carrier blade it is possible to produce saw blades with so to speak all possible tooth configurations. The tooth pitch can be changed by mounting the hard metal blocks in a more or less inclined position or, respectively, by using blocks of different thickness; furthermore, the tooth shape may be further modified by cross grinding, such that, by way of example, the blade member shown in Fig. 4 may be finished with a tooth configuration along the shown dotted line b. It will even be possible to produce blades with a tooth configuration that varies along the blade, e.g. with increased tooth pitch over a partial middle length. The transition to a smaller pitch at the ends can be arranged as an even transition, inasfar as the blocks 8 should not necessarily be laid in fully parallel positions.

As shown at 18' in Fig. 4 the soldering material should not necessarily completely fill out the triangular spaces adjacent the tooth roots. The presence of air spaces 18' both imply a saving of soldering material and a possibility of an improved ventilation cooling of the saw.

When using rectangular blocks 8 Fig. 5 will be an end or sectional view of any of the embodiments according to Figs. 1-4. Just as for saw blades of relevant known types it will mostly be desirable that a clearance be provided from the outer front edge of the blocks both upwardly towards the carrier blade and rearwardly towards the rear side of the tooth. This can be done in a very simple manner, viz. as indicated by bringing a pair of grinding discs 20 into a position, in which they just touch the carrier blade 4 at the root of the blocks and at the same time reach to the broader, lower front edge of the block, whereafter the premounted blade member is

only displaced in its longitudinal direction all the way along the tooth row. Hereby all the blocks will automatically be shaped with the contour shown in Fig. 6, i.e. with the desired clearance upwardly. Also, Fig. 6 shows that the same is obtainable by means of grinding discs 22 rotating in other planes.

By a hatching in Fig. 7 it is indicated that the tooth sides along an uppermost zone h1 will be ground fully into the side of the carrier blade 4, while along a middle zone h2 they will project increasingly from the blade side down to a lower zone h3, which represents the tooth points only, having the largest width. In the linear zone designated H through the root areas of the shaped teeth the tooth widths will thus be somewhat between the blade width and the outer tooth width, and when the blocks are ground as described the teeth, therefore, seen from below, will automatically be shaped as shown in Fig. 8, i.e. now shaped with the desired rearward side clearance. Thus, the teeth can be worked solely by a simple run-through grinding, without any individual tooth grinding.

In the embodiment illustrated in Fig. 9 there is used hard metal blocks 8 of a circular cylindrical shape, and it is illustrated that also these blocks have been side ground in the discussed way, this appearing from the facets designated 26. The use of such round stick blocks is very advantageous in more respects. The formed lateral grooves between the blocks may convey both ventilation air and cutting liquid between the working area and the outer surroundings. Besides, there will be no need for special chip breakers, as the chips will cut with a U-shaped cross section, whereby in connection with their natural curving in the longitudinal direction they will be broken into very short pieces that can be received and pushed forwardly in the free triangular spaces along the rooth row.

In Fig. 9 the blocks are arranged as in Fig. 3, and they could be arranged according to Fig. 4 as well. In Fig. 10 is shown an embodiment corresponding to Fig. 1, but having cylindrical stick blocks; Such a design has been found well suited for sawing of concrete, where the blocks will not even have to be side ground. Even steel nails or reinforcing iron in the concrete can be cut easily.

The hard metal blocks can be produced with any desired shape, also with a half circular cross section or with preshaped, inclined side faces, which, by a correct mounting of the blocks, may render the said side grinding superfluous.

It is also possible to produce blocks having, as indicated in Fig. 11, confer also Fig. 13, a special foot profile, of which a portion 30 will be suited to be received in a cut edge groove at the free edge of the carrier blade 4, whereby an extra safe fastening of the blocks by their soldering may be achieved. As shown in Fig. 12 it is even possible to establish a holding engagement between the blocks and the carrier blade, such that the blocks are mounted by insertion along the edge of the carrier blade, whereby the mounting of the blocks is further facilitated.

The embodiment shown in Fig. 14 is characterized in that every other tooth, designated 8", is shaped with chamfered corners 34. Hereby there will be a certain division of labour between the teeth, see also Fig. 16, as the teeth 8" may break up a groove in front of the regular teeth 8, which will then more easily effect the cutting of the remaining outer groove portions. The facets 34 may be preshaped on the particular blocks, but it is another possibility that identical blocks 8 be used, only such that in the first instance all the blocks 8" are mounted, whereafter a length grinding is carried out for forming the facets 34, e.g. as suggested

in Fig. 15, whereafter the remaining blocks 8 are mounted. If desired, all of the blocks may thereafter be side ground as discussed above.

In Figs. 17 and 18 an embodiment is shown, in which the carrier blade 4 is designed with actively cutting teeth 38, at the rear flanks of which there is secured broader hard metal blocks 8 in a manner such that the outer cutting edges of these blocks are located slightly, e.g. 0.2-0.4 mm, higher than the points of the teeth 38. Hereby the teeth 38 will form a narrow precut groove in front of the cutting blocks 38 to facilitate the working of the latter.

In Fig. 19 it is shown that the saw blade 2 can be designed with end portions 40 which are depending beyond the cutting line of the teeth and are in a low level connected with an upstanding driving bow 42; by this arrangement, e.g. in connection with a mechanically moved cold saw, it is counteracte that the saw blade capsizes by the applied contact pressure.

Just because the blocks 8 can be designed with almost any desired shape it will be possible that they can be shaped with engagement parts not only as shown in Fig. 12, but additionally as shown in Fig. 20, where they are shown having coupling parts 44,46, which, by a shooting together of the 'blocks' along the holding track designated 48 on the carrier blade 4, will holdingly engage each other end by end. This may stabilize the blocks to such an extent that it may be possible to reduce the strength of the fastening otherwise, e.g. such that it will be sufficient to fasten the blocks by a glueing technique that will be easier to accomplish than the discussed hard soldering.

The invention is in no way limited to the saw blades shown, partly because there will be many further possibilities with respect to the tooth shaping, and partly because not only 'saw blades' are concerned, but

also endless saw bands and not least rotating saw blades, whether flat as shown by a loose example in Fig. 21 or cylindrical, front cutting tubular saw blades. The invention is related to all kinds of cutting tools.

Generally, the blocks 8 should be inclined such that their front face may assume a reasonable cutting angle without the tooth point being too thin. Normally this will be possible for block inclinations up to 45-50° with the horizontal, but especially in case of negative cutting angles inclinations of up to some 60° may be usable.

However, it is to be noticed that saw blades according to Fig. 4, which are built up solely by the juxtaposition of the hard metal blocks, can be considered from another angle, inasfar as, as mentioned, it is possible to shape the teeth as desired by the grinding thereof; at the extreme, the blocks may be located side by side, projecting perpendicularly from the mounting edge, such that they form a border, in which, by grinding, it is possible to produce a toothing of any desired shape, whereas the tooth pitch will not even have to correspond with the block pitch.

C L A I M S :

1. A saw blade or a corresponding scrubbing or cutting tooth carrying tool member, the active teeth of which are constituted by hard metal blocks fastened to a carrier blade, the thickness of which is smaller than the width of the hard metal blocks, characterized in that the hard metal blocks are mounted pronouncedly inclined forwardly/outwardly in the working direction of the saw blade, such that the active cutting edge is constituted by the outer edge of their rear side area.

2. A saw blade according to claim 1, characterized in that the carrier blade is provided with a configuration of saw teeth, to the rear sides of which the hard metal blocks are secured, preferably by hard soldering.

3. A saw blade according to claim 1, characterized in that the carrier blade is designed with a straight lined carrier edge for the outwardly projecting hard metal blocks, which are mounted closely juxtaposed and are secured to both the carrier blade and to each other

4. A saw blade according to claim 3, characterized in that the tooth formation is shaped by grinding into the respective front and/or rear faces of the blocks.

5. A saw blade according to claim 1, characterized in that the projecting side edge portions of the blocks are ground by a flat or hollow grinding parallel with the row of teeth, whereby a cutting clearance is provided both inwardly towards the carrier blade and behind the cutting tooth edge.

6. A saw blade according to claim 1, characterized in that the blocks are shaped such that their cutting edges extend in a convex curved manner.

7. A saw blade according to claim 1, characterized in that the blocks are of a fully or partly cylindrical shape. 8. A saw blade according to claim 3, characterized in that the foot portions of the teeth and the

holding edge of the carrier blade cooperating therewith are profiled with mutually engaging portions.

9. A method of manufacturing a saw blade according to claim 1, by which hard metal blocks are mounted on a carrier blade so as to form effective roughing or cutting teeth, characterized in that the hard metal blocks are secured in positions, in which their main direction in the plane of the blade forms an angle of at most 45° with the direction of the row of teeth rearwardly from the cutting tooth edge, the blocks being arranged or shaped with their front faces forming a larger angle with the said direction, such that their cutting edge is formed by the edge between the front face and the lateral and rear faces of the blocks, the blocks being secured to rear edge areas of teeth on the carrier blade and/or directly to their respective neighboring blocks.

10. A method according to claim 9, where the lateral side areas of the blocks projecting from the carrier blade are ground for forming a cutting clearance above and behind the cutting tooth edges, characterized in that this grinding at either side of the blade is effected as a single operation by a longitudinal plan or hollow grinding of the zone area between the side of the carrier blade at the root area of the blocks and the projecting, outer end portions of the blocks.

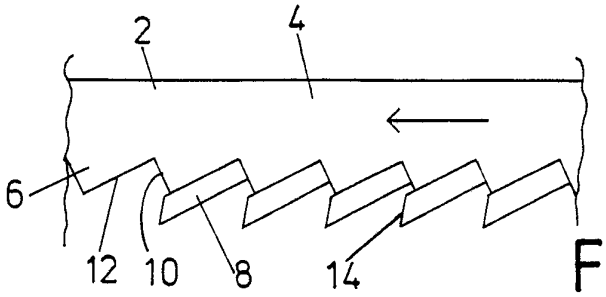


Fig.1

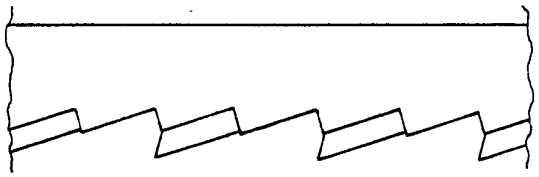


Fig.2

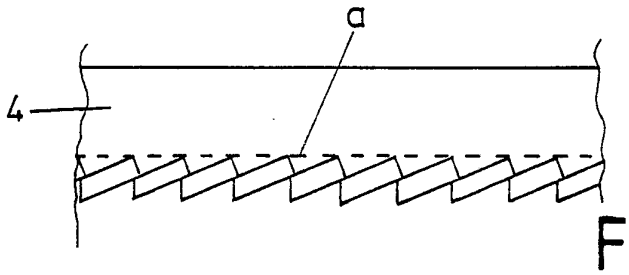


Fig.3

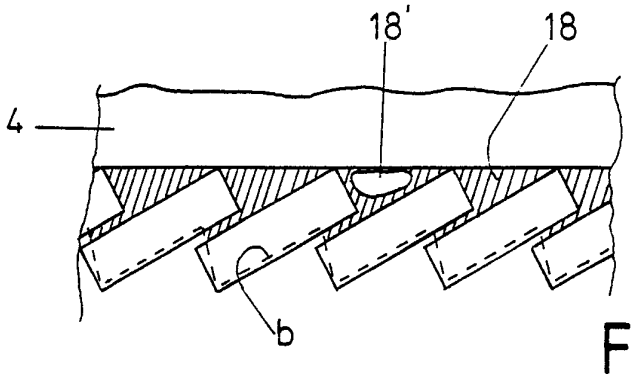


Fig.4

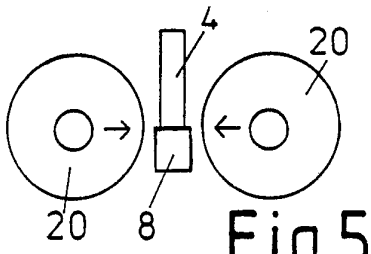


Fig.5

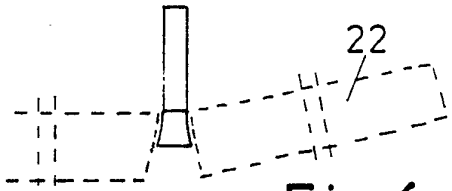


Fig.6

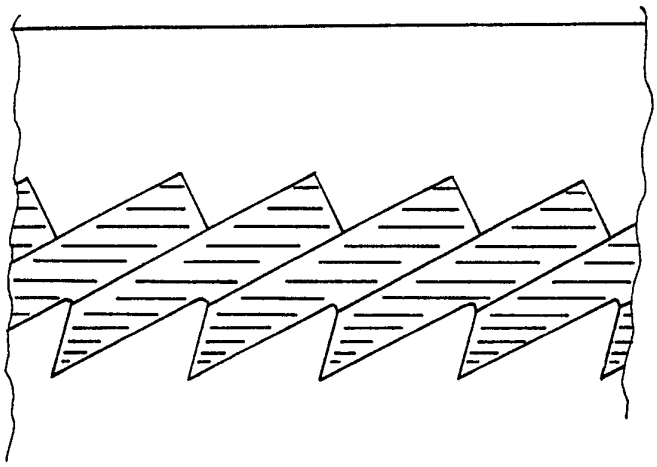
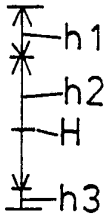


Fig.7



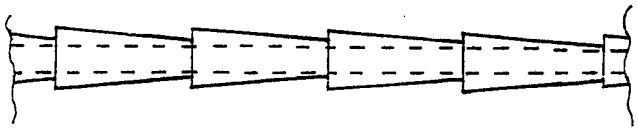


Fig.8

Fig.9

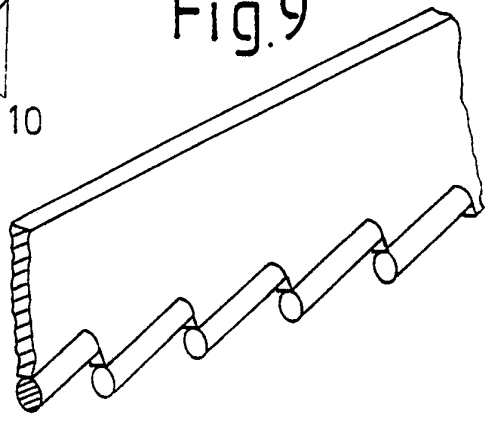


Fig.10

Fig.11

Fig.12

Fig.13

Fig.14

Fig.15

Fig.16

Fig.17

Fig.18

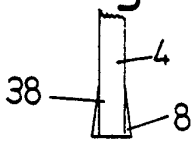


Fig.19

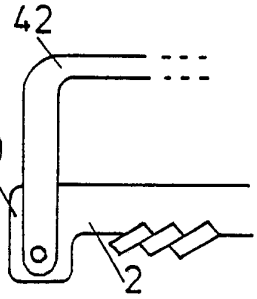


Fig.20

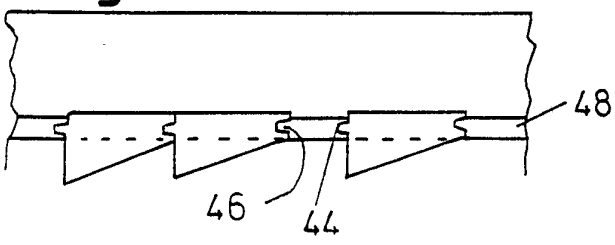
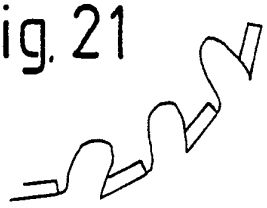


Fig.21



INTERNATIONAL SEARCH REPORT

International Application No PCT/DK 92/00006

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: B 23 D 61/04, 61/14, 65/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
IPC5	B 23 D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched[8]

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category *	Citation of Document,[11] with indication, where appropriate, of the relevant passages[12]	Relevant to Claim No.[13]
X	DE, A1, 1926246 (PAHLITZSCH) 26 November 1970, see page 3, line 24 - page 4, line 31; figure 1	1,2,6,7, 8,9
Y	--	10
X	US, A, 4324163 (LAVELLE) 13 April 1982, see column 2, line 38 - column 3, line 7; figures 1-3	1,2,9
	--	
X	US, A, 4135421 (BERTRAM ET AL.) 23 January 1979, see column 3, line 63 - column 4, line 31; figures 1-3	1,2,9
	--	
X	US, A, 3712348 (KULIK ET AL.) 23 January 1973, see column 3, line 3 - line 15; figure 4	1,2
	--	

* Special categories of cited documents:[10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
1st April 1992	1992 -04- 03
International Searching Authority	**Signature of Authorized Officer**
SWEDISH PATENT OFFICE	Petter Sörsdahl

Form PCT/ISA/210 (second sheet) (January 1985)

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	SE, B, 434607 (GLYNN ARTHUR ELLIS) 6 August 1984, see figures 8,9; claims 12-14 --	10
A	DE, C, 328187 (ADOLF SIEPER) 5 June 1919, see figures 1,3; claim 9 --	1-3,9
A	FR, A1, 2052136 (SOCIÉTÉ ANONYME TECHMETA) 9 April 1971, see figures 1-3; claims 1-4 --	1,7,9
A	WO, A1, 9105636 (TYROLIT SCHLEIFMITTELWERKE SWAROVSKI KG) 2 May 1991, see abstract; figures 1,4 --	1,8
A	US, A, 4098149 (WRIGHT) 4 July 1978, see figure 1; claim 1 --	4,5, 10
A	Patent Abstracts of Japan, Vol 9, No 198, M404, abstract of JP 60- 62409, publ 1985-04-10 (TETSUKAZU NAKAJIMA) --	4,5, 10

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.PCT/DK 92/00006

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 28/02/92 The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-A1- 1926246	70-11-26	NONE		
US-A- 4324163	82-04-13	AU-B-	538572	84-08-16
		AU-D-	7057081	81-11-26
		CA-A-	1147244	83-05-31
		EP-A-B-	0040421	81-11-25
US-A- 4135421	79-01-23	NONE		
US-A- 3712348	73-01-23	AT-A-B-	315459	74-04-15
		CH-A-	532991	73-01-31
		DE-A-	2101614	72-07-27
		FR-A-	2075536	71-10-08
SE-B- 434607	84-08-06	CA-A-	1074212	80-03-25
		CH-A-	624873	81-08-31
		DE-A-	2816428	78-10-19
		FR-A-B-	2392753	78-12-29
		GB-A-	1597465	81-09-09
		US-A-	4214499	80-07-29
DE-C- 328187	19-06-05	NONE		
FR-A1- 2052136	71-04-09	NONE		
WO-A1- 9105636	91-05-02	NONE		
US-A- 4098149	78-07-04	NONE		