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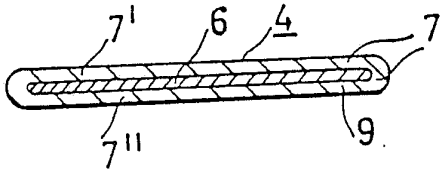


**(57) Abstract**

A method for producing strip (4) for the manufacture of tools which are intended primarily for material removing, cutting or like work, and for the manufacture of such tools, in which the strip and tools include parts which comprise a metallic material, such as steel, adapted to a high degree of hardness and wear resistance, and therewith suitable, and intended, for the manufacture of material removing, cutting, etc., tool parts, in which a strip-like body (4), the strip (4), is produced by reshaping an elongated blank which comprises more than one metallic material, where one or more of the metallic materials, such as material of the aforementioned kind adapted to a high degree of hardness etc., is applied with the aid of a casting technique. The method is particularly characterized in that casting is effected in an essentially known manner by direct casting of a metal melt. The invention also relates to apparatus for carrying out the method, and to strip and tools.

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# A method for producing strip for tools which are intended primarily for material removing or cutting work and for the manufacture of such tools; apparatus for carrying out the method; strip; and tools.

The present invention relates to a method for producing tool strip for the manufacture of tools which are primarily intended for material removing or cutting work, and for the manufacture of said tools, such as saw blades, knife blades and the like, where said strip and said tools include a metallic material which has been adapted to a high degree of hardness and wear resistance.

The invention also relates to apparatus for carrying out the method, and strip and tools.

The metallic material adapted to a high degree of hardness and wear is intended to form the cutting parts of the tool, i.e. the saw teeth, knife edge or corresponding cutters.

Tools of this kind are mainly produced from strip material, which is of the same kind as the material adapted to a high degree of hardness. This material is most often highly expensive, relatively speaking, due to its high content of alloying substances and to the high yield losses experienced in manufacture as a result of the high content of alloying substances. One serious drawback with this method, in which the whole tool, or substantially the whole tool is made of material which has been adapted to a high degree of hardness is that the tool is encumbered with the low toughness of the material.

Blades of this kind are also produced primarily from strip material, partly of a simple and less expensive kind,

intended primarily for carrying parts and attachement parts, and partly of a more expensive kind intended for cutting parts, wherewith strip parts of both kinds are joined together, by means of welding, mould casting or the like, such as to form a tool. Although the material costs are lower when applying this method of manufacture, the method is less attractive because of the number of additional manufacturing operations involved, primarily the welding or like operations, and also because it is difficult to obtain a holdable join, inter alia because only a very limited join surface is available.

Also known is a method in which a rectangular duplex blank-section is produced by casting complementary material on a part section. The method is low productive and necessitates the use of complicated and expensive mould casting procedures.

The present invention relates to a highly productive method which enables tools of the kind meant here to be produced at low costs and with which the resultant tools will not be encumbered with the drawbacks of given known tools, such as weak zones at the join, toughness deficiencies, and high costs.

The invention thus relates to a method for producing tool strip for the manufacture of tools which are mainly intended for material removal, cutting or like work, and to the manufacture of such tools, where said strip and tools include parts made of a metallic material, such as steel, which has been brought to a high degree of hardness and wear resistance and therewith suitable for forming the material removing or cutting parts of the tool, and in which manufacture a strip-like element, said strip, is effected by shaping an elongated blank which comprises

more than one metallic material, where one or more of said metallic materials, e.g. the material which has been adapted to a high degree of hardness etc., is applied by a casting or moulding technique. The method is particularly characterized in that casting of said one or more metallic materials is effected in an essentially known manner by direct casting of molten metal which is caused to run from a melt outlet part of a container and caused to form a continuous wire-like or rod-like body through stabilization with the aid of a wire-like body which passes continuously through the outlet part, whereafter the continuous jet of molten metal surrounding the wire-like body is caused to solidify around said body and collected, or by so-called dip forming in which a wire-like body is passed through a molten metal bath and a layer of the bath metal is frozen onto the wire-like body, wherein the wire-like body forms a central part of said blank and wherein one or more such metallic materials are applied such as to form a substantially concentric part of the blank when seen in cross-section.

The invention also relates to apparatus for forming strip for the manufacture of tools which are primarily intended for material removing or cutting work, and for the manufacture of such tools, said strip and tools including parts made from a metallic material, such as steel, which has been adapted to a high degree of hardness and wear resistance and therewith suited and intended to form material removing or cutting parts. The apparatus is particularly characterized by the provision of devices for producing a strip-like body, said strip, by shaping an elongated blank while only slightly reducing the cross-sectional dimensions of the blank, or substantially in the absence of any such reduction, said blank comprising one or more metallic materials, and in which blank one or more

of said metallic materials, e.g. said material which has been adapted to a high degree of hardness, is present in the form of an essentially concentric part, with regard to the cross-section of the blank, which has been applied by a casting or molding technique.

The invention also relates to tools which are primarily intended for material removing or cutting work and which have the form of a substantially strip-like element, or strip, and include parts made of a metallic material, such as steel, which has been adapted to a high degree of hardness and wear resistance and is therewith suitable, and intended, to form material removing or cutting parts of the tool, and also to strip where said strip-like element, said strip, is produced by shaping an elongated blank and where one or more of said metallic materials, such as material of the kind which has been adapted or brought to a high degree of hardness etc., are applied by a casting or molding technique. The tools and strip are mainly characterized in that said casting is effected by the direct casting of a molten metal which is brought to run from a metal bath container through a melt outlet part therein and caused to form a continuous wire-like body by stabilizing with a wire-like body which passes continuously through the outlet part, whereafter the continuous jet of molten material surrounding the wire-like body is caused to solidify around the wire and collected, or is effected by so-called dip-forming in which a wire-like body is passed through a molten metal bath and a layer of metal is frozen onto said body, and in which one or more metallic layers are applied to said body such as to form a substantially concentric part with regard to the cross-section of the blank.

The invention will now be described in more detail with

reference to a number of exemplifying embodiments thereof and with reference to the accompanying drawings, in which

Figure 1 is a cross-sectional view of a wire-like blank for use with the inventive method and tool;

Figure 2 illustrates shaping of a blank, by rolling the blank into a strip-like body in accordance with the invention;

Figure 3 illustrates an inventive strip-like body in cross-section;

Figure 4 is a cross-sectional view of a first embodiment of a tool according to the invention;

Figure 5 is a cross-sectional view of a second embodiment of a tool according to the invention;

Figure 6 illustrates, in smaller scale, part of the tool shown in Figure 5 seen in the direction of the main plane of the tool;

Figure 7 is a cross-sectional view of a third embodiment of a tool according to the invention; and

Figure 8 is a cross-sectional view of a saw blade whose teeth comprise solely hard wear-resistant material.

In Figure 1 the reference numeral 1 identifies an elongated blank of essentially circular cross-section intended for the manufacture of strip-like bodies, or strip. The strip is thus intended for manufacturing tools which are mainly intended for material removing or cutting work, and the strip and tools include parts of a metallic material,

such as steel, which has been adapted or brought to a high degree of hardness and wear resistance and which is therewith suitable, and intended, to form the material removing or cutting parts of the tool.

The blank 1 comprises more than one metallic material, where one or more of said metallic materials, such as material of said kind which has been adapted to a high degree of hardness etc., are located as a substantially concentric part 2, as seen in the cross-section of the blank, which has been applied by a casting or moulding technique. The material need not have said high degree of hardness etc. at the blank stage. It is more preferable to bring the material to said high degree of hardness by, for instance, heat treating the material when shaping etc. has been completed. Thus, the material adapted to a high degree of hardness etc. may possess this degree of hardness or may be brought to said high degree of hardness, for instance, by heat treatment. The blank also includes a central part 3 which may have a circular cross-sectional shape, although such shape is not absolutely necessary. The embodiment illustrated in Figure 1 includes a part 2 shown in full lines, although further concentrical parts 2 are conceivable, as illustrated in chain lines in the Figure.

In accordance with one preferred embodiment of the invention the blank is produced in the form of a duplex with regard to material composition and includes herewith, in cross section a central part 3 and an outer layer which extends concentrically around the central part.

In accordance with the invention, said casting or moulding operation is effected in an essentially known manner, substantially in accordance with Swedish Patent 8003487-9, by

the direct casting of a molten metal, which is allowed to run from a container through a melt outlet port therein and caused herewith to form a continuous, wire-like body by stabilizing with the aid of a wire-like body which passes continuously through the outlet port, whereafter the continuous, exiting molten jet surrounding the wire-like body is caused to solidify around the wire and is collected.

Alternatively, the casting or moulding operation can be effected by so-called dip-forming, where a wire-like body is caused to pass through a molten metal bath and a layer of the metal is frozen onto the wire-like body.

Thus, in the aforesaid instances the wire-like body will form a central part 3 of the blank 1 and the solidified metal will form a concentrical part 2.

A strip-like body 4, said strip 4, is intended to be produced, in accordance with the invention, by re-shaping the cross-section of the blank 1, i.e. to flatten the blank 1. This is effected by re-distributing the cross-sectional material while maintaining reduction of the cross-sectional size of the blank at a relatively slight level, or at an insignificant or substantially non-existant level. As beforementioned, the body 4 is intended for the manufacture of tools 5, Figures 4-8, intended for material removing or cutting or like work, the blank 1 being intended to be deformed into a strip 4 which includes a centrally located strip-like layer 6, which is formed by the deformed central part 3, and at least one layer 7 which embraces the layer 6 and forms at least two strip-like layers 7', 7", one on each respective side of the layer 6.

Edge parts 8, teeth 8 or like elements which form material

removing or cutting parts 8 of the tool are formed on the body 4 by grinding, clipping or like operations.

In the embodiment of blade 5 illustrated in Figure 4, an edge 8 has been produced by bevelling or chamfering one long side 9 of the body 4. Figures 5 and 6 illustrate a saw blade, in which one long side 9 has been provided with teeth 8. Conceivably, both long sides 9 can be provided with teeth 8.

The layer 7, and herewith the layers 7', 7" of at least the embodiments illustrated in Figures 4-6 and 8 comprise said material which has been adapted to a high degree of hardness and wear resistance, for instance high-speed steel, this layer 7 corresponding to one or more cast or molded layers 2 of the blank 1. The central layer 6 and corresponding central part 2 suitably comprise a tough and relatively inexpensive material, such as a low-alloy steel, for example a low-carbon steel of commercial type.

Embodiments are conceivable which instead, or at least the central part 3, comprise said hard material, whereby an embodiment of edge parts 8, e.g. according to Figure 7 is suitable.

As illustrated in Figure 8, the tool 5, which in this case is a saw blade, can be configured so that edge or teeth 8 solely include one material, suitably a hard and wear resistant material. Embodiments according to, e.g., Figure 5 are also conceivable in which the teeth 8 are of duplex construction.

The apparatus for reshaping the blank 1 to an elongated body 4 illustrated schematically in Figure 2 includes at least one pair of rollers 10 between which the blank 1

is intended to be deformed by rolling. The rolls 10 preferably have a planar roll path, i.e. are cylindrical, at the location where deformation of the blank takes place. The roll diameter D is preferably so adapted in relation to the diameter of the blank 1 and reduction of the height of the blank during its passage through the roll nip as to achieve the desired increase in width as the blank is rolled.

According to one embodiment of apparatus according to the invention suitable devices, not shown, are provided for dividing the produced strip-like bodies 4 in the direction of their longitudinal axes into at least two parts, these thus form strip-like parts being intended for the manufacture of blades 5. There is obtained in this regard an edge 11, e.g., in accordance with the part shown in full lines in Figure 4.

As will be understood the choice of material of the parts 2, 3 both individually and with regard to the combination, and therewith of the strip-like body 4, is made with regard to the use for which the blade is intended. Thus, the material adapted for high wear resistance may comprise, e.g., high-speed steel, stainless steel or a high carbon steel other than high-speed steel. It is also conceivable to produce both the part 3 and the part 2 from essentially the same metallic material, where the part or parts 2 are applied by casting or molding techniques but where the material in said parts 2, 3 can be considered in this context to be mutually different metallic materials.

The apparatus and blade function, and also the tool according to the invention and the inventive method will be understood in all essentials from the aforegoing.

A blank 1, whose cross-section preferably comprises solely partially a material adapted to a high degree of hardness etc. intended to form material removing parts 8 of a tool 5 is thus produced partially by means of casting or moulding in the aforedescribed manner. The blank 1 is re-shaped so as to achieve the desired distribution of material across the cross-section of the strip-like body 4. The blank is shaped to a strip-like body 4, e.g., by rolling the blank. There are formed in this way strip-like layers which, subsequent to being ground or correspondingly worked, form material removing or cutting parts of the tool.

The reduction in cross-section and the increase in width achieved when rolling the blank can be controlled by the geometry of the rolls. With an increasing contact zone 12 in the rolling direction between rolls 10 and blank 1 in relation to the width of the blank, the relative increase in width will increase and said reduction decrease.

It will be understood from the aforegoing that the invention enables a blade 5 of the kind meant here to be produced at much lower costs than is possible with known techniques. Direct casting affords a high degree of flexibility with regard to the selection of material etc., and results in high production capacity. Re-shaping of the blank in accordance with the aforegoing also contributes to this high degree of flexibility. The part 2, when applicable the stabilizing wire, can be produced at low cost, since it comprises a simple material, such as low-carbon steel of commercial steel type. Particularly good adhesion is obtained between the parts 2, 3, since the boundary surface is created at the casting or moulding stage. It is, of course, important that the cross-sectional shape cast will lie close to the cross-sectional

shape of the finished product.

The invention has been described in the aforegoing with reference to various embodiments thereof. It will be understood that more embodiments are conceivable and that minor modifications can be carried out without departing from the concept of the invention.

For example, embodiments are conceivable in which the core 2 and the outer layer 3 comprise essentially the same material.

When suitable from the aspect of manufacture, reshaping of the blank can be effected with the blank in a hot state, in which case reshaping of the blank is preferably effected in connection with the casting operation and the blank being preferably permitted to cool to only a slight extent subsequent to being cast.

Naturally, the body 4 may be hand moulded for the manufacture of tools in a number of ways. It is suitable, in many instances, for at least one part of at least one long side of the body 4 to incorporate material removing or cutting parts 8 of a tool produced form the body 4.

As beforementioned, the cross-sectional dimensions of the elongated blank will suitably lie close to the cross-sectional dimensions of the strip-like body. A substantially round blank having a diameter of about 1-8 mm is considered suitable for many applications. Consequently, the dimensions of the blank subsequent to being cast will suitably lie within this range. It will be understood, however, that blank dimensions which lie outside this range are also conceivable.

The invention shall not therefore be considered limited to the aforedescribed and illustrated embodiments, since modifications and variations can be made within the scope of the following claims.

Claims

1. A method for producing strip intended for the manufacture of tools intended primarily for material removing, cutting or like work, and for the manufacture of said tools, where said strip and tools include parts which are made from a metallic material, such as steel, adapted to a high degree of hardness and wear resistance, and herewith suitable, and intended, to form material removing, cutting etc., parts of the tool, where a strip-like body, said strip, is produced by reshaping an elongated blank which comprises more than one metallic materials, where one or more of said metallic materials, such as material of said kind adapted to a high degree of hardness etc., is applied by a casting technique, characterized in that said casting is effected in an essentially known manner by direct casting of a metal melt which is caused to run from a container through an outlet port therein and caused to form a continuous wire-like body by stabilizing with the aid of a wire-like body which passes continuously through the outlet port, whereafter the jet of molten metal surrounding the wire-like body is caused to solidify around the wire and is collected, or by so-called dip-forming in which a wire-like body is passed through a molten metal bath and a layer of metal is frozen onto the wire-like body, the wire-like body forming a central part (3) of the blank (1), and one or more of said metallic materials being applied to form a substantially concentrical part (2) in the cross-section of the blank (1).

2. A method according to claim 1, characterized in that reshaping of the blank is effected with only slight reduction, or essentially no reduction at all of the cross-section of the elongated blank (1).

3. A method according to claim 1 or 2, characterized in that said blank (1) is produced in duplex with regard to material composition and herewith includes in cross-section a central part (3) and an outer part (2) which extends concentrically around the central part (3).

4. A method according to claim 1, 2 or 3, characterized by forming the outer part (2) of said blank (1) with a material adapted to a high degree of hardness etc.

5. A method according to claim 1, 2, 3 or 4, characterized in that in addition to including material adapted to a high degree of hardness the blank (1) also includes a metallic material of relatively high toughness, such as a low alloy steel, e.g. a low-carbon steel of commercial steel type.

6. A method according to claim 1, 2, 3, 4 or 5, characterized in that at least a part of at least one long side (9) of a strip-like body (4) produced from the elongated blank (1) is provided with material removing, etc., parts (8) of a tool (5) produced from the strip-like body (4).

7. A method according to claim 1, 2, 3, 4, 5 or 6, characterized by dividing the strip-like body (4) produced from the elongated blank (1) in the direction of the longitudinal axis of said body, so as to produce at least two strip-like bodies suitable for the manufacture of tools (5).

8. A method according to claim 1, 2, 3, 4, 5, 5 or 7, characterized in that reshaping of the elongated blank (1) is effected in a manner to obtain desired material distribution over the cross-section of the strip-like body (4).

9. A method according to claim 1, 2, 3, 4, 5, 6, 7 or 8, characterized by reshaping the elongated blank (1) by rolling the blank between rolls (10), preferably with a substantially planar roll path.

10. A method according to claim 1, 2, 3, 4, 5, 6, 7, 8 or 9, characterized by reshaping the elongated blank (1) with the blank in a hot state, reshaping preferably being effected in conjunction with the casting operation while preferably permitting the blank to cool solely to a limited extent.

11. A method according to claim 9 or 10, characterized by selecting the diameter (D) of the rolls (10) in relation to the cross-sectional dimensions of the elongated blank (1), such as to obtain a suitable, desired increase in width when rolling the blank.

12. A method according to claim 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 or 11, characterized in that the material adapted to a high degree of hardness is a high-speed steel.

13. Apparatus for producing strip for the manufacture of tools which are intended primarily for material removing, cutting or like work, and for the manufacture of said tools, said strip and tools including parts which comprise a metallic material, such as steel, which has been adapted to a high degree of hardness and wear resistance and is therewith suited, and intended, to form material removing, cutting etc. tool parts, characterized by devices (10) for producing a strip-like body (4), said strip (4), by reshaping an elongated blank (1) with only a slight reduction, or substantially no reduction in the cross-section of said blank, said blank comprising more than one metallic material, and in which blank (1) one or more of said

metallic materials, such as material of said kind adapted to a high degree of hardness etc., has the form of a substantially concentrical part (2) in the cross-section of the blank (1) and is applied with the aid of a casting technique.

14. Apparatus according to claim 13, characterized by at least one pair of rolls (10), by means of which said blank is reshaped by rolling.

15. Apparatus according to claim 14 , characterized in that said rolls (10) have a planar roll path.

16. Apparatus according to claim 14 or 15, characterized in that the diameter (D) of said rolls (10) is adapted in relation to the diameter of the wire-like blank (1) such as to obtain a suitable, desired increase in width during the rolling operation.

17. Apparatus according to claim 13, 14, 15 or 16, characterized by devices for dividing strip-like bodies (4) in the direction of their longitudinal axes, the thus formed strip-like parts being intended for the manufacture of tools (5).

18. Tools intended primarily for material removing, cutting or like work in the form of a substantially strip-like body, a strip, and including parts made of a metallic material, such as steel, adapted to a high degree of hardness and wear resistance, and herewith suitable, and intended, to form the material removing, cutting, etc., parts of the tool, and strip, where said strip-like body (4), said strip (4), is produced by reshaping an elongated blank (1) comprising more than one metallic material , where one or more said metallic materials, such as materi-

al of said kind adapted to a high degree of hardness etc., is applied by casting, characterized in that said casting is effected by direct casting of a metallic melt which is caused to run from a container through an outlet port and therewith caused to form a continuous, wire-like body by stabilizing with the aid of a wire-like body passing continuously through the outlet port, whereafter the continuous jet of molten metal surrounding the wire-like body is caused to solidify around the wire and is collected, or by so-called dip-forming, in which a wire-like body is caused to pass through a molten metal bath and a layer of the melt is frozen onto the body, one or more of said metallic materials being applied to form a part (2) which is essentially concentrical in the cross-section of the blank.

19. A tool and strip according to claim 18, characterized in that said reshaping is effected with only slight reduction, or essentially no reduction in the cross-section of the elongated blank (1).

20. A tool and strip according to claim 18, characterized in that the blank (1) is duplex with regard to material composition and, in cross-section herewith includes a central part (3) and an outer part (2) which extends concentrically around the central part (3).

21. A tool and strip according to claim 18, 19 or 20, characterized in that the material adapted to a high degree of hardness etc. is applied in the form of an outer part (2) of said blank (1), the tool (5) including a central strip-like part (6) which is totally or partially surrounded by the material adapted to a high degree of hardness.

22. A tool and strip according to claim 18, 19, 20 or 21,

characterized in that in addition to including said material adapted to a high degree of hardness the strip-like body also includes a metallic material having a relatively high degree of toughness, such as a low alloy steel, e.g. a low-carbon steel of commercial steel type.

23. A tool and strip according to claim 18, 19, 20, 21 or 22, characterized in that at least a part of at least one long side (9) of a strip-like body (4) produced from the elongated blank (1) includes material removing, etc., parts (8) of the tool (5) produced from the strip-like body (4).

24. A tool and strip according to claim 18, 29, 20, 21, 22 or 23, characterized in that the strip-like body from which the tool (5) is produced is manufactured by dividing the strip-like body (4) produced from the elongated blank (1) along the longitudinal axis of said body (4).

25. A tool and strip according to claim 18, 19, 20, 21, 22, 23 or 24, characterized in that said material removing, etc., parts (8) consist solely of one metallic material, or of several metallic materials, and therewith having, e.g., a duplex structure.

Fig. 1

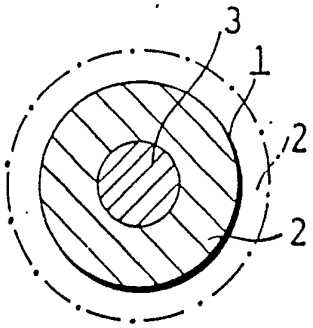



Fig. 2

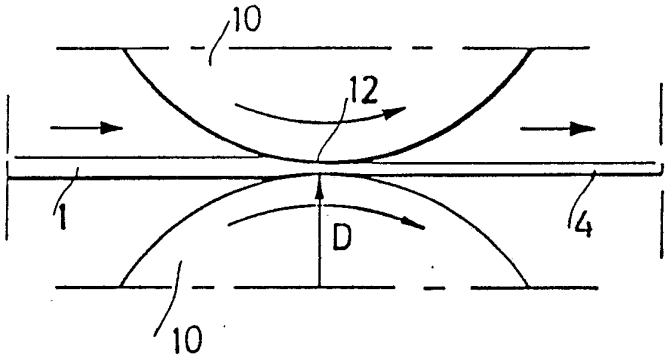



Fig. 3

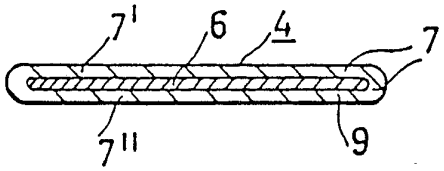



Fig. 4

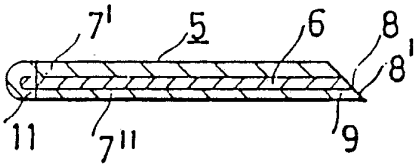



Fig. 5

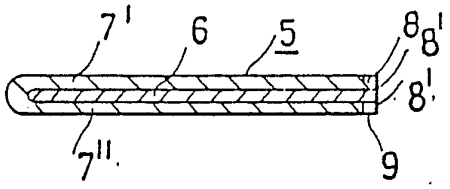



Fig. 7

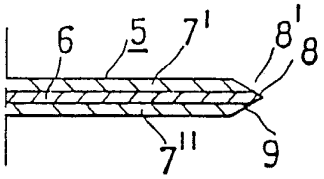



Fig. 6

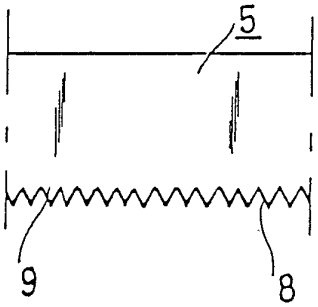
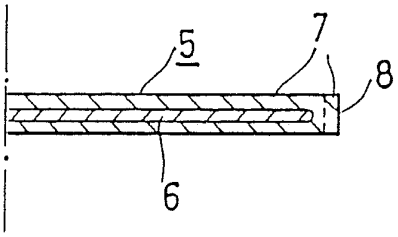



Fig. 8



# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE88/00176

## 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 [4]

B 22 D 19/06, B 23 P 15/28// B 22 D 19/00

## II. FIELDS SEARCHED

Minimum Documentation Searched [7]

| Classification System | Classification Symbols |
|---|---|
| IPC 4 | B 22 D 11/00, 19/00, /06, 23/04; B 21 D 47/04; B 23 P 15/28 |

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

SE, NO, DK, FI classes as above

## III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

| Category [10] | Citation of Document, [11] with indication, where appropriate, of the relevant passages [12] | Relevant to Claim No. [13] |
|---|---|---|
| Y | GB, A, 377 146 (HENRY G THOMPSON & SON) 21 July 1932 See figures, claims | 1-12, 18-25 |
| Y | GB, A, 610 244 (JESSOP STEEL COMAPANY) 13 October 1948 See figures, page 1, lines 10-22 | 1-12, 18-25 |
| Y | US, A, 4 479 530 (EKEROT) 30 October 1984 Whole document & WO, 81/03136 GB, 2085336 EP, 0051611 SE, 427090 | 1-12, 18-25 |
| X | US, A, 4 098 319 (BRINKMANN) 4 July 1978 See figures | 13-17 |
| X | SE, B, 344 028 (GENERAL ELECTRIC COMPANY) 27 March 1972 See figures | 13-17 |

.../...

* Special categories of cited documents: [10]

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

"E" earlier document 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)

"O" document referring to an oral disclosure, use, exhibition or other means

"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

"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.

"&" document member of the same patent family

## IV. CERTIFICATION

| Date of the Actual Completion of the International Search | Date of Mailing of this International Search Report |
|---|---|
| 1988-07-04 | 1988 -07- 05 |
| **International Searching Authority** | **Signature of Authorized Officer** |
| Swedish Patent Office | Ulf Nyström |

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 | DE, A, 1 483 671 (VEB EDELSTAHLWERK 8 MAI 1945) 25 September 1969 See figures, claims | 1-12, 18-25 |