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(54) **A protective tool for a bending tool**

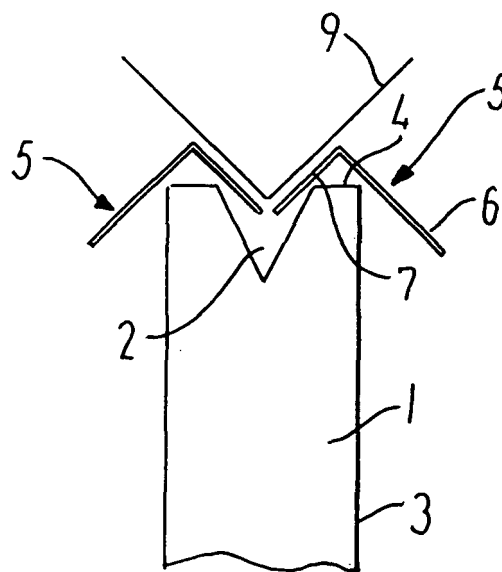
(57) A protective tool (5) for the protection of a workpiece, which is to be bent in a bending tool (1), is formed by at least one profile having two faces (6, 7), where the one face (6) is provided with magnets (8) for securing the protective tool to a lateral face on the bending tool (1), while the other face (7), which is perpendicular to the one face, engages a surface (4) on the bending tool (1) and extends inwards over a groove (2) of the bending tool.

When a workpiece is to be bent in the bending tool (1), the workpiece is positioned above two protective tools (5) which cover the groove (2) partly.

When a pressing tool (9) is caused to apply a pressure to the workpiece, the protective tools are released from the lateral faces of the bending tool and slide together with the workpiece, which is supported by the protective tools, down into the groove (2).

It is ensured in this manner that, during the bending process, the workpiece is not exposed to scratches and dents, which have to be removed subsequently by grinding and polishing.

If the workpiece, which is to be bent, is not plane, it is advantageous to support the protective tool by a support rail (11).



**FIG. 2**

## Description

**[0001]** The invention relates to a protective tool for the protection of a workpiece which is to be bent in a bending tool, said protective tool being disposed above a groove of the bending tool, said workpiece being arranged between the protective tool and a pressing tool.

**[0002]** When tooling workpieces which are to be bent in a bending tool having a V-shaped groove, the workpiece is moved inwards over the V-shaped groove and is bent by means of a pressing tool which presses the workpiece down into the groove.

**[0003]** During bending in the bending tool, the workpiece, which is typically of metal, such as aluminium, stainless steel, galvanized iron, copper, brass and the like, may be exposed to scratches and dents, which have to be removed subsequently by grinding, polishing and the like.

**[0004]** This, of course, is an undesirable subsequent treatment of the bent workpiece, which it is obviously desired to avoid.

**[0005]** JP 3094918 discloses a protective tool, which is intended to prevent workpieces, which are pressed in a bending tool, from being exposed to scratches and dents. The protective tool consists of a spring-biased plate, where a spring is secured at its one end to a groove in a bending tool and at its opposite end to the plate.

**[0006]** When the workpiece, which is to be bent, is positioned above the plate and is bent by a pressing tool, the plate will simultaneously be bent and press the spring together. After the bending process has been completed, the plate is straightened out by the spring.

**[0007]** This known protective tool consists of several parts and, because of the necessity of the spring which loses its spring force in the course of time, may have its mechanical properties changed, as a result of which the bending results may become disuniform.

**[0008]** In addition, the known protective tool has the drawback that its dimensions have to be adapted when used for bending with various groove widths.

**[0009]** Accordingly, an object of the invention is to arrive at a protective tool which, in addition to being easy to produce, is also extremely reliable and may be used for various groove widths, even after an extended period of use.

**[0010]** The object of the invention is achieved by a protective tool of the type defined in the introductory portion of claim 1, which is characterized in that it is formed by an angular profile having two faces, of which the one face is detachably secured to a lateral face of the bending tool, while the other face, completely or partly, covers the groove and a surface of the bending tool.

**[0011]** In use, before bending of a workpiece is carried out, the protective tool will thus be detachably secured to the bending tool, and when the workpiece, after having been placed above the bending tool, is affected by a pressing tool, both the workpiece and the protective tool will be moved together down into the groove of the bend-

ing tool.

**[0012]** An expedient way of securing the protective tool is, as stated in claim 2, that it is secured to the lateral face of the bending tool by means of magnets.

**[0013]** It is advantageous, as stated in claim 3, that two protective tools are arranged symmetrically above the groove, which provides the advantage that the protective tool is not subjected to bending forces during bending.

**[0014]** In the event that a workpiece is to be held stably during the bending process, it is advantageous, as stated in claim 4, that the faces of the protective tool disposed above the groove, are secured to each other by a tape.

**[0015]** If the workpiece, which is to be bent, is not plane, it is an advantage, as stated in claim 5, that the face of the protective tool, when this face assumes a position which is clear of the lateral face of the bending tool, engages a V-shaped support rail, and moreover, as stated in claim 6, that a lateral face on the support rail is detachably secured to the lateral face of the bending tools by magnets, which ensure a good attachment of both the bending tool and the support rail, and, as stated in claim 7, that a surface of the support rail is secured to the lower side of the one face of the protective tool by magnets.

**[0016]** A further expedient embodiment of the protective tool is, as stated in claim 8, that it is configured as a right angle.

**[0017]** The invention will now be explained more fully with reference to the drawing, in which

fig. 1 shows a protective tool according to the invention arranged in a bending tool before bending of a workpiece,

fig. 2 shows the protective tool of fig. 1 in a working position just before bending of a workpiece,

fig. 3 shows the protective tool of fig. 1 secured to the bending tool by tape,

fig. 4 shows a support rail for the support of the protective tool according to the invention, while

fig. 5 shows the position of the protective tool after a workpiece has been bent.

**[0018]** In fig. 1, the numeral 1 designates a bending tool, which has a groove 2, shown here as being V-shaped. The bending tool has a lateral face 3 and is terminated at the top by surfaces 4 on each side of the groove 2.

**[0019]** The numeral 5 designates a protective tool according to the invention, of which there are two. In a starting position, they are disposed symmetrically on their respective sides of the bending tool 1.

**[0020]** The protective tool 5 is configured as an angular profile having two faces 6, 7, where the one face engages the lateral face 3 on the bending tool, while the other face 7 engages the surface 4 of the bending tool and extends

partly inwards over the groove 2.

[0021] As will be seen, the protective tool in fig. 1 is secured to the lateral face 3 of the bending tool 1 by means of magnets 8.

[0022] In fig. 2, two protective tools 5 are shown with a position on the bending tool just before a pressing tool 9 has completed the bending of a workpiece (not shown). Prior to being affected by the pressing tool 9, this workpiece was disposed on top of the protective tools in the starting positions of these, cf. fig. 1.

[0023] As shown in fig. 2, the protective tools have been disengaged from the lateral faces 3 of the bending tools and have been moved together with the workpiece (not shown) down into the groove.

[0024] After the bending process has been completed and the workpiece removed, the protective tools will be returned to their starting positions in fig. 1, following which a new bending process may be initiated.

[0025] Owing to the presence of the protective tools, the workpieces, which are being bent, will be protected against scratches and dents, which would otherwise require subsequent treatment in the form of grinding and polishing.

[0026] Fig. 3 also shows the protective tools 5 in their starting positions as shown in fig. 1. As will be seen, the two protective tools 5 are secured to each other by means of tape 10, which ensures a better control of the bending process.

[0027] With reference now to fig. 4, it will be explained how a non-plane workpiece, which has optionally been pre-bent, may be tooled in the bending tool 1 using a support rail.

[0028] Relative to fig. 1, the protective tools must now be positioned such that they are not secured by means of the magnets 8 on the one face 6 of the protective tool.

[0029] A support rail 11 is used for stabilizing the protective tool 1, said support rail being formed by a profile which has a lateral face 13 and a surface 12. The lateral face 13 has magnets 14, while the surface 12 has magnets 15.

[0030] The support rail is secured to the lateral face 3 of the bending tool by means of the magnets 14, while the lower side of the one face 6 of the bending tool is secured to the surface 12 of the support rail 11 by means of the magnets 15, after the support rail has been displaced in the direction of the arrow 16.

[0031] The bending process may then be implemented as explained previously, it being now the support rails which are released from the bending tool during the bending process.

[0032] Finally, fig. 5 shows a workpiece 17, which is supported by the protective tools 5, after the bending process has been terminated.

[0033] When the workpiece 17 is removed from the bending tool 1, the protective tools will assume the position as shown in fig. 1, following which a new bending process may be initiated.

## Claims

1. A protective tool (5) for use in connection with a bending tool (1) having a groove (2), said protective tool being disposed at the top on the bending tool, so that the workpiece, which is to be bent, is pressed down against the protective tool and the groove of the bending tool, **characterized in that** the protective tool (5) is made in two parts, each of which engages a lateral face (3) and an upper side (4) of the bending tool (1).
2. A protective tool according to claim 1, **characterized in that** each part (5) is shaped as a right-angled profile member comprising an upper member (7), which covers the groove (2) completely or partly, as well as a lateral member (6).
3. A protective tool according to claims 1 and 2, **characterized in that** the lateral member (6) is provided with magnets (8) for adhesion to the lateral face (3) of the bending tool (1).
4. A protective tool according to claims 1 and 2, **characterized in that** the parts (5) are held together on the bending tool (1) by means of tape (10).
5. A protective tool according to claims 1 - 4, **characterized in that** the face (6) of the protective tool, when said face assumes a position which is clear of the lateral face (3) of the bending tool, engages a V-shaped support rail (11).
6. A protective tool according to claim 5, **characterized in that** a lateral face (13) of the support rail (11) is detachably secured to the lateral face (3) of the bending tool by magnets (14).
7. A protective tool according to claims 5 - 6, **characterized in that** a surface (12) of the support rail (11) is secured to the lower side of the one face (6) of the protective tool (5) by magnets (15).
8. A protective tool according to claims 1 - 7, **characterized in that** it is configured as a right angle.

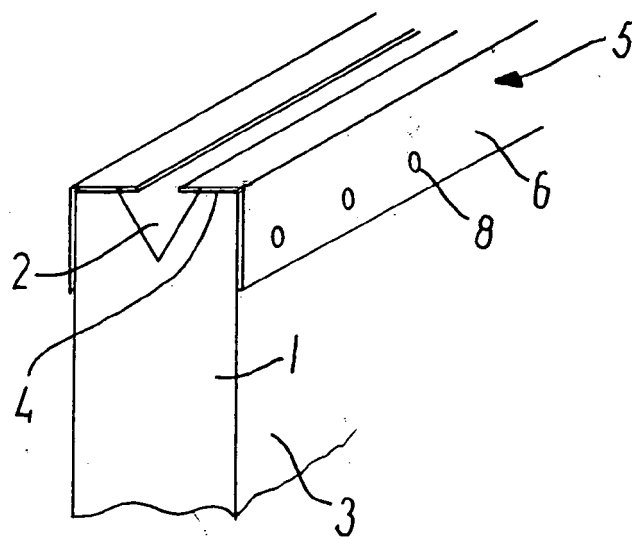


FIG. 1

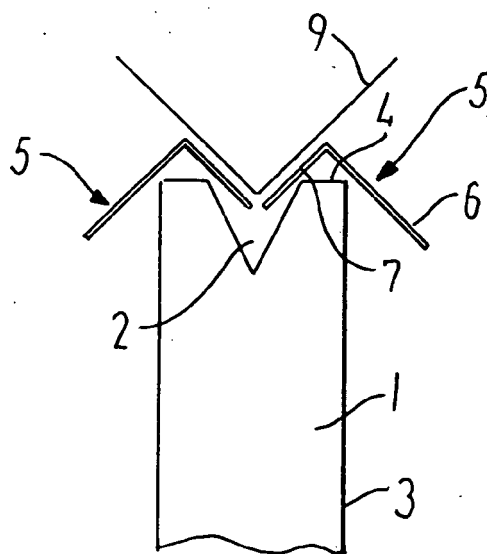


FIG. 2

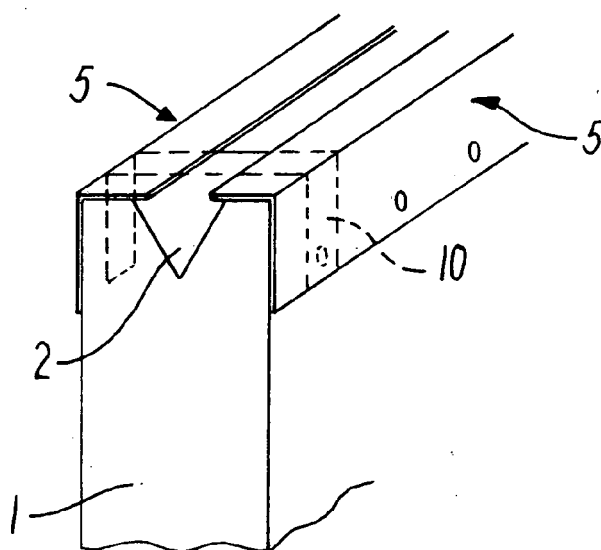


FIG. 3

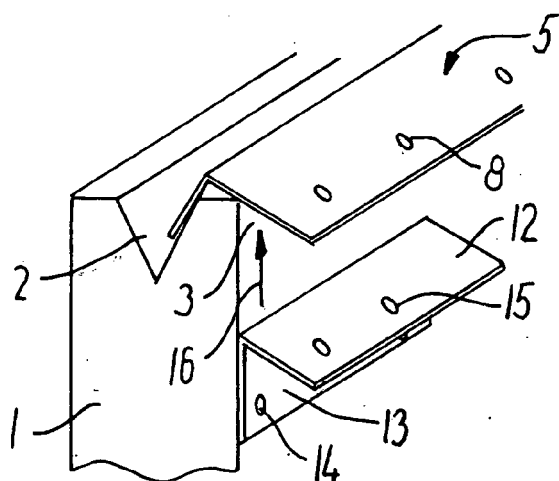


FIG. 4

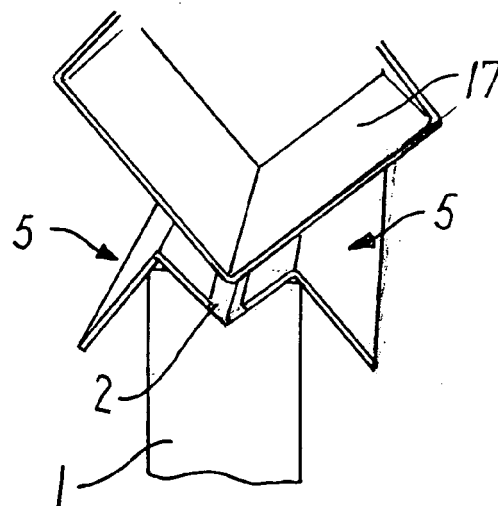


FIG. 5



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Application Number  
EP 08 38 8019

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 November 2008	Examiner Vinci, Vincenzo
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... &amp; : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03.82 (P4/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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