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(54) **Tool for manually straightening possibly dents located in the sheet body of motorised vehicles**

(57) A tool (1) for manually straightening possible dents located in the sheet body of motorised vehicles, comprising a rigid body (2) having at least one end (3) adapted to be pressed against the dent to be straightened. The at least one end of the rigid body is advantageously coated with or made of a synthetic material, preferably plastic.

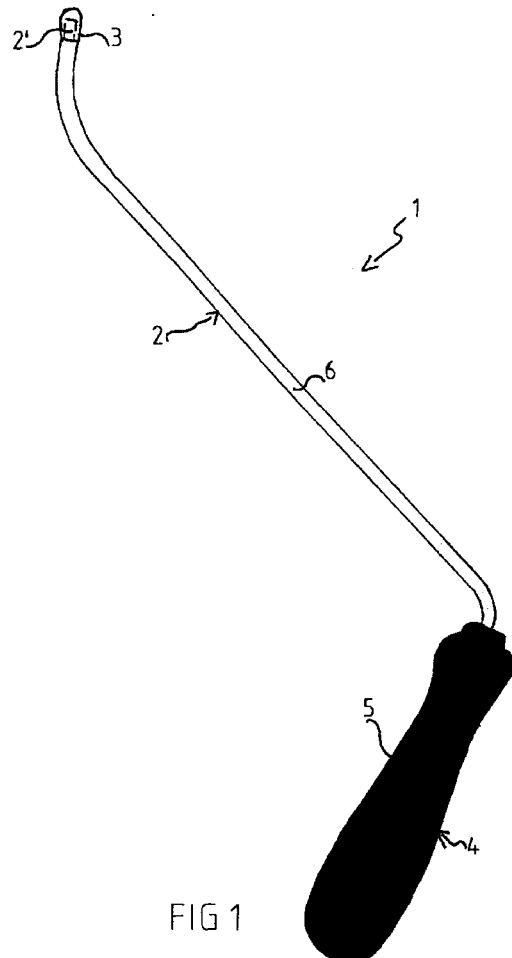


FIG 1

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**Description**Field of application

**[0001]** The present invention relates to a tool for manually straightening possible dents located in the sheet body of motorised vehicles.

**[0002]** In particular, the present invention relates to a tool of the above-mentioned type comprising a rigid body having at least one end adapted to be pressed against the dent so as to straighten it.

**[0003]** In this specification and following claims, with the term: "dents", it is intended to mean any deformations in the sheet body of motorised vehicles usually caused by atmospheric factors such as hail, by mistakes in the vehicle production line, or by slight accidents during the use of the vehicle.

**[0004]** With the term: "straighten", "straightening", it is intended to mean the operation of removing the dent by exerting a predetermined pressure on it so as to bring the sheet to its original status, in any case to have a perfectly flat (smooth) sheet without any hump or dip.

**[0005]** This operation is particularly delicate and difficult in motorised vehicles where the sheet body has already been treated (galvanised) and painted. In fact, the slightest mistake in the pressure exerted on the dent may cause the external layer of paint to break or crack, thus making it necessary to repaint the entire damaged part of the sheet body.

**[0006]** As a consequence, in the field of motorised vehicles there is an ever-increasing need to provide tools allowing both to manually straighten possible dents located in the sheet body very quickly and efficiently, and to minimise the risk of damaging the external paint layer so as to avoid expensive repainting operations.

**[0007]** This need is especially felt in the field of light and heavy motor vehicles since, to the purpose of avoiding strong depreciation of both new and old vehicles, one requirement is that any work done on the sheet body keep the paint layer intact and unaltered, which, among the other things, has its basic function in the protection of the sheet from rapid deterioration.

Prior Art

**[0008]** To the purpose of meeting the above requirement, several tools in a number of shapes and sizes have been proposed in the field which allow the manual straightening of possible dents located in the sheet body of motorised vehicles.

**[0009]** For example, EP-A-0 681 876 shows some tools comprising a rigid metal body with a first end adapted to be pressed against the dent so as to straighten it; a second end opposed to the first one supplied with handgrip to allow the manual use of the tool, and a central part being a connection stem between the two ends.

**[0010]** Although in some respects advantageous, tools according to prior art require much experience and considerable manual ability and skill of the operator to be used satisfactorily, that is, minimising damages to the external paint layer of the sheet body.

**[0011]** In fact, when using the tools described above, it is very difficult to straighten the sheet without cracking or breaking (although slightly) the external paint layer.

**[0012]** According to the analysis carried out by the applicant, it seems that this is mainly due to the fact that the tip or end to be pressed against the dent exerts a strong pressure on it only on a limited part of the sheet surface, so as to cause the external paint layer to break at the point of contact.

**[0013]** This problem becomes more serious when "difficult" dents must be straightened (for example, deep and narrow dents), or when they are located in delicate parts of the sheet body (for example, where the sheet body is curvilinear).

**[0014]** Consequently, the tools described above can be used satisfactorily only for some types of dents exclusively by highly qualified and skilled operators.

**[0015]** Owing to these disadvantages, the use of tools according to the prior art for manually straightening possible dents located in the sheet body is still particularly difficult to date, and the integrity of the external paint layer is not guaranteed. Hence, the increasingly felt requirement of making these repairs quick, reliable and inexpensive has not been met yet.

Summary of the invention

**[0016]** The problem underlying the present invention is to provide a tool for manually straightening possible dents located in the sheet body of motorised vehicles. The tool must be easy to use and effective, and it must allow a rapid and accurate straightening of the sheet without causing any damage to the external paint layer so as to prevent any depreciation of the vehicle or the need of costly repainting of the sheet body.

**[0017]** According to the present invention, the above-mentioned problem is solved with the tool described above, which is characterised in that at least one end of the rigid body is coated with a synthetic material, preferably plastic.

**[0018]** According to an alternative embodiment of the invention, the technical problem on the contrary is solved with a tool for manually straightening possible dents located in the sheet body of motorised vehicles comprising a rigid body having at least one end adapted to be pressed against the dent so as to straighten it, the end being made of a synthetic material, preferably plastic.

**[0019]** Thanks to the present invention, it is advantageously possible to straighten possible dents located in the sheet body of motorised vehicles quickly, easily and efficiently without any danger of breaking or dam-

aging the external paint layer.

**[0020]** In fact, unlike the prior art tools in which the end used to straighten the dent is made of a rigid - usually steel - material, according to the present invention the part of the tool in contact with the dent is advantageously coated with or made of a synthetic material.

**[0021]** Particularly advantageous results have been achieved by using a sufficiently hard synthetic material that was at the same time slightly capable of being deformed, such as a polymeric material chosen in the group comprising amidic polymers, styrene polymers (like shockproof polystyrene), olefinic polymers, fluorinates and their mixtures. Particularly satisfactory results have been achieved by using a material based on Nylon™ or Teflon™.

**[0022]** In this way, the end or ends of the tool to be pressed against the dent are slightly capable of being deformed so that, when said ends are pressed with force against the dent, they flatten enough to increase the supporting surface.

**[0023]** Consequently, the thrust force needed to straighten the sheet is spread on it more evenly and on a larger surface with respect to what can be achieved with prior art tools, thus preventing any damage to the external paint layer of the sheet body even if the tool is handled incorrectly or without attention.

**[0024]** To this purpose, it is important to note that contrary to the constant teachings of the prior art, which requires an extremely hard material such as steel as surface to oppose the sheet efficiently during its straightening, thanks to the present invention it has been surprisingly noticed that if a slightly softer material is used for the tool end that is pressed against the dent, it is possible to operate more quickly and efficiently when straightening the sheet, furthermore preventing any damage to the paint layer coating the sheet body.

**[0025]** It must be finally noted that the tool according to the present invention is particularly easy to be manufactured and it does not require the use of expensive materials.

**[0026]** Further features and advantages of the present invention will appear more clearly from the following indicative and non-limiting description of an embodiment of the invention, made with reference to the attached drawings.

#### Brief description of the drawings

**[0027]** In such drawings:

- Figure 1 shows a schematic perspective view of a tool for manually straightening possible dents located in the sheet body of motorised vehicles according to an embodiment of the present invention;
- Figure 2 shows a schematic and enlarged view in longitudinal section of a detail of tool in figure 1;

- Figure 3 shows a schematic perspective view of a part of tool for manually straightening possible dents located in the sheet body of motorised vehicles according to a further embodiment of the present invention.

#### Detailed description of one preferred embodiment

**[0028]** With reference to figures 1-3, figure 1 shows as a whole a tool for manually straightening possible dents located in the sheet body of motorised vehicles.

**[0029]** The tools shown in figures 1-3 are just two examples of an entire series of tools usually used to straighten the sheet.

**[0030]** Said tools can be of several shapes and sizes as they range from the hammer to the pin or strut as shown in figure 3, to the levers shown in figure 1.

**[0031]** Both shape and size of the tools for manually straightening the sheet body of motorised vehicles depend on the particular use of each tool.

**[0032]** In fact, they must allow reaching and straightening dents even if they are located in the most distant and inaccessible points of the sheet body of motorised vehicles.

**[0033]** To this purpose, we must note that the straightening operation must be carried out from inside the vehicle since dents caused by accidents or by hail on the sheet body consist of an hollow inwards. Consequently, the operator must insert the tool under the sheet (once the vehicle coating has been removed) to reach the dent wherever it is located.

**[0034]** Document EP-A-0 681 876 describes an example of how the dents located in the sheet body of motorised vehicles are usually straightened.

**[0035]** Tool 1 essentially comprises a rigid body 2 with at least one end 3 adapted to be pressed against the dent (not shown in the figure) to be straightened.

**[0036]** The example in figure 1 shows an S-shaped tool having a rigid body 2 which, besides the end 3, comprises also another end 4 on the opposite side provided with handle 5 to allow the manual use of the tool, and a central part 6 being a connection stem between ends 3 and 4.

**[0037]** Length and diameter of the central stem-part 6, as well as the shape of the pointed end 3 of the tool may vary freely according to the type of use required and the dent to straighten.

**[0038]** Furthermore, the angle of handle 5 with respect to the central stem-part 6 can vary at will according to the operator's requirements. For example, the handle may be placed on the same axis as the central part 6, or it may be rotated by 180° with respect to the example in figure 1 so as to have a U-shaped tool.

**[0039]** The type of tool shown in figure 1 is essentially used as lever by hooking the central part 6 to a removable rest fastened to an internal cavity in the sheet body of a motorised vehicle, and operating on handle 5 to press the end 3 with gauged strength

against the dent so as to straighten the sheet properly.

**[0040]** According to an embodiment of the present invention, the end 3 is advantageously made of a synthetic material, preferably plastic.

**[0041]** As pointed out before, the presence of a synthetic material in correspondence with the end adapted to straighten the sheet with the pressure exerted by the operator is an easy and effective solution to the serious problem of breaks and damage to the external paint layer that coats the sheet body of motorised vehicles protecting it from atmospheric agents.

**[0042]** Thanks to the present invention, the sheet body does not require repainting anymore, and there is no risk that, while straightening the sheet, the motorised vehicle is depreciated due to breakage in the external paint layer. Furthermore, the presence of a tip (end 3) made of synthetic material surprisingly simplifies straightening operations too, since the operator's accuracy in pressing the dent is less critical.

**[0043]** In the type of embodiment of the invention shown in figures 1 and 2, the end 3 of synthetic material is fixed to the rigid body 2 in correspondence with an appendix 2' of the latter. This detail is highlighted in figure 2, which shows the enlarged end part of the tool near the end 3.

**[0044]** By doing so, there is advantageously an extremely strong and reliable fastening between the body 2 and the end 3 that allows using the tool also for a long time without any danger of the end 3 detaching from the body 2.

**[0045]** Figure 3 shows a part of a tool for manually straightening possible dents located in the sheet body of motorised vehicles obtained according to another embodiment of the present invention.

**[0046]** In this case, the rigid body 2 is provided with at least one end 3 adapted to be pressed against the dent to be straightened, which is advantageously coated with a synthetic material, preferably plastic.

**[0047]** The coating of synthetic material is shown in figure 3 with the reference numeral 7.

**[0048]** It must be noted that, according to this type of embodiment, the end 3 of the tool is of the prior-art type, that is, it is made of a rigid material, for example steel, integral with body 2. In other words, the end 3 is an integral part of rigid body 2.

**[0049]** Unlike the prior art tools, however, the end 3 adapted to be pressed against the sheet to be straightened is advantageously coated with a synthetic material (coating 7) so as to have all the aforesaid advantages with reference to the type of embodiment in figures 1-2, in particular greater ease and rapidity of use of the tool and protection of the paint layer coating the sheet body.

**[0050]** For the purpose of making coating 7 adhere to the end 3 of the rigid body 2 in the best way so as to use the tool for long periods without any danger of coating 7 detaching from the end 3, the latter is preferably provided with holes, notches or rough surfaces of various types that allow firm and strong fixing of the syn-

thetic material.

**[0051]** For this purpose, numeral 8 in figure 3 shows a hole made in the end 3 filled with the synthetic material of coating 7, which keeps the latter in adherence with the end 3.

**[0052]** Unlike the tool in figure 1, the tool shown in the example in figure 3 is used as pin or strut, that is, for direct transmission of the pressure exerted by the operator from a handle (not shown in the figure) to the end 3, and from this end to the sheet to be straightened.

**[0053]** The embodiment of the invention in figure 3 is particularly suited both for making new tools and, advantageously, for modifying already existing tools of the prior art. This way, they would be considerably improved by applying a coating 7 of synthetic material in correspondence with their working ends according to the present invention.

**[0054]** According to a particularly advantageous aspect of the present invention, the preferred synthetic material is a relatively hard plastic material, such as Nylon™ or Teflon™.

**[0055]** In fact, said material has proved to have suitable features both with regard to its capability of being deformed when compressed, so as to guarantee an optimum distribution of stresses on the sheet to be straightened avoiding possible damage to the external paint layer, and with regard to wear resistance.

**[0056]** Finally, particularly satisfactory results have been achieved with a coating 7 of synthetic material having a thickness ranging between 0,5-10 mm, preferably between 1-7 mm.

**[0057]** The same is true of the synthetic material thickness of the end 3, defined between an external surface thereof and appendix 2' of the rigid body 2.

**[0058]** Said thickness is to be preferred since it allows exploiting at best the capability of being deformed features of the synthetic material and at the same time it is thin enough to effectively transmit the pressure exerted by the operator to the sheet.

**[0059]** It must be noted that a too thick or thin thickness may on the one hand not be effective anymore to prevent damage to the external paint layer. On the other hand, it may weaken the end 3 making it subject to break during use.

**[0060]** Anyhow, it is clear that in some cases it may be convenient to operate with synthetic materials having thickness different from that just quoted.

**[0061]** Even though the present invention is mainly intended for tools for manually straightening dents located in the sheet body of motorised vehicles, its scope of protection must be regarded as extended also to other fields requiring the straightening of painted sheets without damaging the paint layer.

**[0062]** For example, the tools object of the present invention can be used advantageously also in industrial fields (such as in the field of refrigerators) where, in order to prevent down-grading and depreciation of the finished product, the straightening of possible dents of

painted sheet parts caused during the assembly and stocking of the product is required.

### Claims

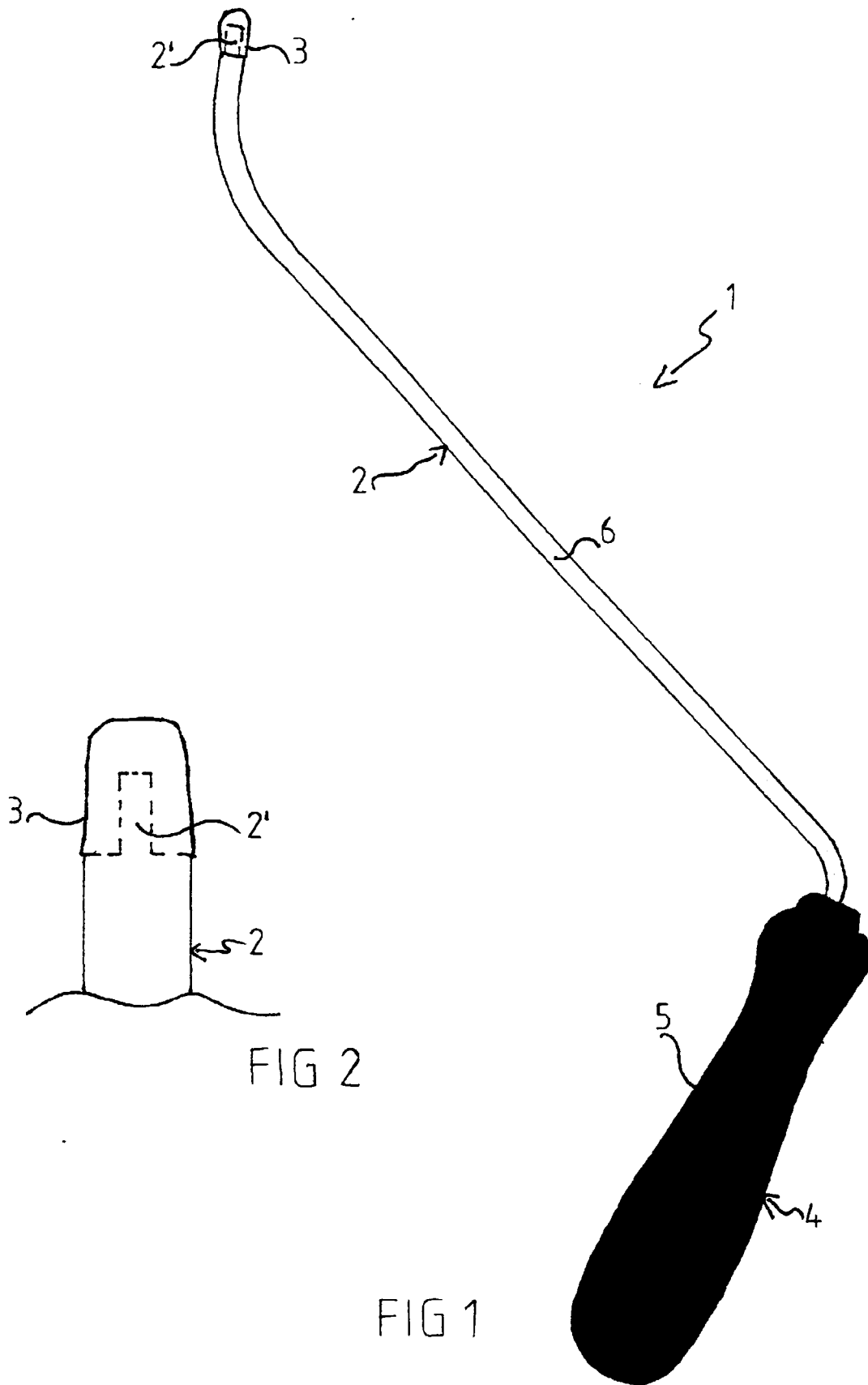
1. Tool for manually straightening possible dents located in the sheet body of motorised vehicles, comprising a rigid body having at least one end adapted to be pressed against the dent to be straightened, characterised in that said at least one end of the rigid body is coated with a synthetic material, preferably plastic. 5  
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2. Tool for manually straightening possible dents located in the sheet body of motorised vehicles, comprising a rigid body having at least one end adapted to be pressed against the dent to be straightened, said at least one end being made of a synthetic material, preferably plastic. 15  
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3. Tool according to claims 1 and 2, characterised in that the synthetic material is Nylon™ or Teflon™.
4. Tool according to claim 2, characterised in that said at least one end of synthetic material is fixed to the rigid body in correspondence with one respective appendix of the latter. 25
5. Tool according to any one of claims 1 or 4, characterised in that the coating or end of synthetic material has a thickness ranging between 0,5 - 10 mm, preferably between 1-7 mm. 30
6. Use of a synthetic material, preferably Nylon™ or Teflon™, as contact surface in tools for manually straightening possible dents located in the sheet body of motorised vehicles. 35

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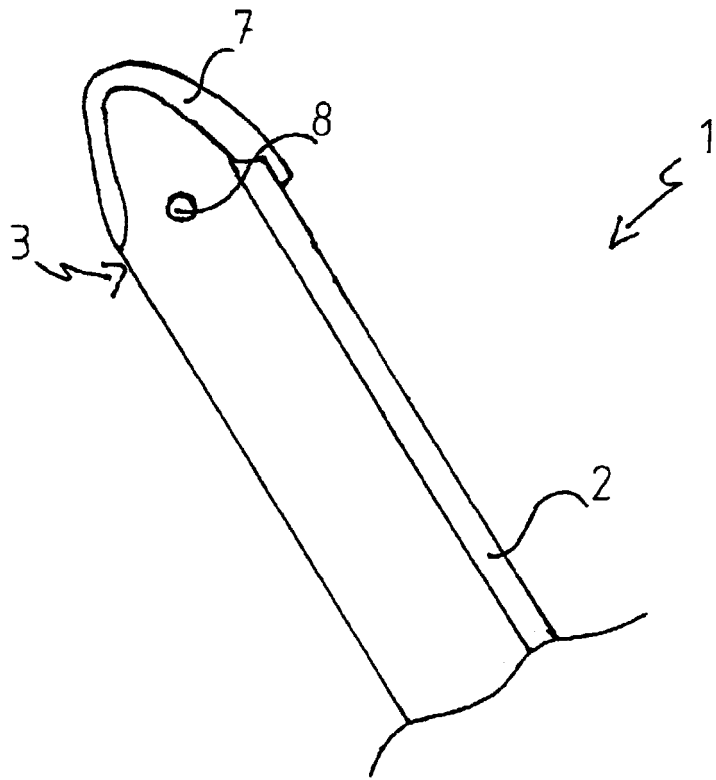


FIG. 3



European Patent  
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EUROPEAN SEARCH REPORT

Application Number  
EP 99 20 2028

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.CI.7)
X	DE 40 15 389 A (KANJA PETER ;BOEHM RALF (DE); MAUCKNER MAREN (DE)) 21 November 1991 (1991-11-21) * column 2, line 65 - line 68 * * column 7, line 16 - line 25 * ---	1, 3, 5, 6	B21D1/06
X,D	EP 0 681 876 A (DOMBEY LTD) 15 November 1995 (1995-11-15) * column 3, line 15 - line 17 * ---	2-6	
X	DE 42 38 408 A (TYSON WILLIAM L) 3 February 1994 (1994-02-03) * column 2, line 38 - line 39 * ---	2-6	
E	DE 198 06 617 A (SAUTTER) 19 August 1999 (1999-08-19) * column 1, line 43 - line 45; figures * -----	2-6	
			TECHNICAL FIELDS SEARCHED (Int.CI.7)
			B21D
The present search report has been drawn up for all claims			
Place of search <b>THE HAGUE</b>		Date of completion of the search <b>21 January 2000</b>	Examiner <b>Ris, M</b>
<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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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 20 2028

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on  
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21-01-2000

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