



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:  
**09.05.2007 Bulletin 2007/19**

(51) Int Cl.:  
**B24D 13/04 (2006.01) B24B 29/00 (2006.01)**

(21) Application number: **06022590.1**

(22) Date of filing: **30.10.2006**

(84) Designated Contracting States:  
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR**  
Designated Extension States:  
**AL BA HR MK YU**

(71) Applicant: **Olimpia 80 SRL**  
**27020 Borgo San Siro PV (IT)**

(72) Inventor: **Travini, Vittorio**  
**27020 Borgo San Siro (PV) (IT)**

(74) Representative: **Coggi, Giorgio et al**  
**Racheli & C. S.p.A.**  
**Viale San Michele del Carso, 4**  
**20144 Milano (IT)**

(30) Priority: **08.11.2005 IT MI20052123**

(54) **System for satin finishing of sheet metal by means of mechanically fixed flap wheels**

(57) A system is described (1) for satin finishing of sheets of metal (4) by means of mechanically fixed flap wheels (6) -that is, flap wheels (6) whose flaps (9) are fixed mechanically to the hub (10) of the flap wheel (6) - which comprises at least one satin finishing station (5) - equipped with at least one mechanically fixed flap wheel (6) with a horizontal axis and with means (7) adapted to make the at least one mechanically fixed flap wheel (6)

rotate - and feed means (8) adapted to feed the sheets of metal (4) longitudinally through said satin finishing stations (5).

Advantageously, in order to compensate for the wear on the flaps (9) of the mechanically fixed flap wheels (6) and keep their peripheral speed and their removal pressure constant, the rotation speed of the mechanically fixed flap wheels (6) is increased and said wheels are moved vertically.

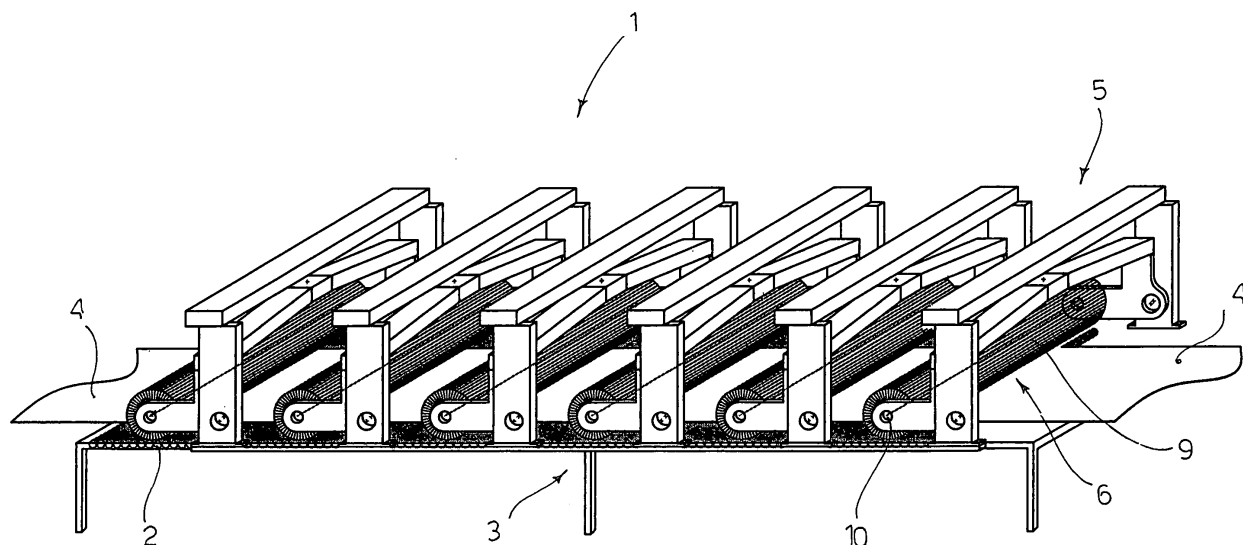


FIG. 1

## Description

**[0001]** The present invention refers to a system for satin finishing of sheet metal by means of mechanically fixed flap wheels (that is, flap wheels whose flaps are mechanically fixed to the hub of the flap wheel), which comprises at least one satin finishing station - equipped with at least one mechanically fixed flap wheel with a horizontal axis and with means adapted to cause the at least one mechanically fixed flap wheel to rotate - and means adapted to cause the sheet metal being processed to slide longitudinally through the satin finishing stations.

**[0002]** For finishing (satin finishing and/or polishing) of sheet metal, systems with abrasive cloths are currently used, in which each finishing station comprises a pair of opposed finishing heads, each of which comprises a ring of abrasive cloth carried by a drive roller and by a roller which holds the abrasive cloth in contact with the surface to be processed.

**[0003]** The finishing heads are positioned vertically and machine simultaneously the two opposite sides of a sheet metal fed in a per se known manner between the finishing heads.

**[0004]** These known systems present numerous limits and drawbacks, amongst which:

- the abrasive cloths wear out very rapidly, drastically reducing their removal capacity and no longer guaranteeing the initial standard of finishing: it is therefore necessary to stop the system often to replace the worn-out cloths, which can sometimes be reused in the finishing heads that carry out rougher finishing;
- the heat produced during processing of sheet metal by means of the abrasive cloths makes it necessary to cool the sheets of metal with water, which results in the formation of sludge which must be removed.

**[0005]** Also known to the art are systems for satin finishing of pipes by means of flap wheels, whose performance is nevertheless conditioned by the limitations inherent in the flap wheels traditionally used in these systems, since it has been found experimentally that during satin finishing (also because of the heat that develops through friction between the flaps and the surface to be satin finished) the temperature of a conventional flap wheel (and in particular of its hub) reaches such high values as (to be able) to cause a physical alteration in the components used to make the conventional flap wheel, degrading in particular the binding and cohesive characteristics of the material (normally a resin) used as adhesive to fix the flaps to the hub.

**[0006]** This fact, together with the high speed of the wheel (which can reach 30 -- 35 m./s) means that the material used as adhesive loses (or can lose) its ability to retain the flaps in place, overcoming the centrifugal force acting on said flaps. It has in fact been found experimentally that the flaps gradually become detached from the wheel hub and consequently the life of the flap

wheel and of its ability to remove material from the surface to be processed is reduced.

**[0007]** The drawbacks and limitations inherent in conventional flap wheels have not thus far allowed flap wheel systems capable of satin finishing sheet metal with satisfactory results to be produced.

**[0008]** In fact it has been found experimentally that the length of conventional flap wheels cannot exceed about 10 cm: to satin finish sheets of metal with a greater width it would be necessary to use two or more conventional flap wheels side by side but the satin finished sheet metal would have lines coinciding with the gaps that are inevitably present between the side-by-side flap wheels.

**[0009]** Flap wheels of new design are currently available on the market, referred to in the present description as "mechanically fixed flap wheels", in which the flaps are fixed mechanically to the hub: these mechanically fixed flap wheels are free from the drawbacks and limitations inherent in conventional flap wheels.

**[0010]** Mechanically fixed flap wheels are known, for example, from patent application number MI2005A000483 in the name of the applicant and are commercially available.

**[0011]** Object of the present invention is to overcome the above-mentioned limits and drawbacks presented by satin finishing systems for sheet metal with sand belts and those with conventional flap wheels, allowing sheet metal to be satin finished -- with a uniformly even surface finish -- with a single mechanically fixed flap wheel, which has proved to be strong enough to be able to have the same width as the sheet metal to be satin finished.

**[0012]** This object is achieved by means of a satin finishing system produced according to the present invention, which has the characterising features illustrated in claim 1; further advantageous characteristics of the invention form the subject matter of the dependent claims.

**[0013]** Further characteristics of the invention will be made clearer by the detailed description that follows, referring to a purely exemplifying and therefore non-limiting embodiment, illustrated in the appended drawings, wherein:

- Figure 1 is a diagrammatic perspective view of a satin finishing system according to the invention;
- Figure 2 is a diagrammatic side view of one of the satin finishing stations of Figure 1, in which the inner parts have been shown "in transparency";
- Figure 3 is a diagrammatic head-on rear view of the satin finishing station of Figure 2.

**[0014]** In the appended figures like elements will be identified by the same reference numerals.

**[0015]** Figure 1 shows diagrammatically a perspective view of the satin finishing system 1 according to the invention which comprises, in combination with each other:

- a bed of rollers 2 with horizontal axes, mounted idly and carried by a support 3, on which a sheet metal

4 slides: the roller bed 2, the support 3 and the sheets of metal 4 will not be described because they are per se known;

- at least one satin finishing station 5 (better described with reference to Figures 2 and 3), equipped with at least one flap wheel 6 and with means 7 (not shown in Figure 1) adapted to set in rotation the at least one flap wheel 6; in Figure 1 six satin finishing stations 5 are shown, which carry out an increasingly high standard of satin finishing;
- feed means 8 (not shown in figure 1), adapted to feed the sheet metal 4 along the roller bed 2 and through the at least one finishing station 5.

**[0016]** A characterising feature of the satin finishing system forming the subject matter of the present invention is the fact that the flap wheels 6 are mechanically fixed flap wheels, that is, the flaps 9 of each flap wheel 6 are fixed mechanically to the hub 10 of said wheel.

**[0017]** In the embodiment described herein each satin finishing station 5 comprises a mechanically fixed flap wheel 6 but, without departing from the scope of the invention, each satin finishing station 5 can comprise two or more mechanically fixed flap wheels 6, parallel to each other, and made to rotate by means 7.

**[0018]** Without departing from the scope of the invention, the mechanically fixed flap wheels 6 can be replaced by grinding wheels or any other of functionally equivalent abrasive means other than abrasive cloths or conventional flap wheels.

**[0019]** The feed means are advantageously present at the beginning and at the end of the roller bed 2 and between two adjacent satin finishing stations 5.

**[0020]** Furthermore, since the heat produced during processing of the sheet metal by means of the mechanically fixed flap wheels 6 is less than that produced during processing by means of abrasive cloths or conventional flap wheels, during processing the sheet metal can be cooled by means of jets of air coming from delivery nozzles (omitted in the figures because they are per se known and in any case outside the scope of the present invention) placed upstream of each satin finishing station 5. The use of water as a cooling means with the consequent formation of sludge is thus avoided and it is possible to use a dust suction system, omitted in the figures because it is per se known and in any case outside the scope of the invention.

**[0021]** For the sake of simplicity of the graphic representation, only one satin finishing station 5, the mechanically fixed flap wheel 6 belonging to the station 5, and the flaps 9 and the hub 10 belonging to said mechanically fixed flap wheel have been identified by the relative reference numerals in Figure 1.

**[0022]** Figure 2 shows diagrammatically a side view of one of the satin finishing stations 5 of Figure 1, whose inner parts are shown "in transparency".

**[0023]** The satin finishing station 5 of Figure 2 comprises a supporting structure 11, rocking around pivots

14 carried - in a per se known manner - by the support 3, inside which are placed at least:

- a mechanically fixed flap wheel 6,
- means 7 (per se known), adapted to make the mechanically fixed flap wheel 6 rotate and consisting, in the embodiment described herein, of at least one electric motor connected in a per se known manner to the mechanically fixed flap wheel 6;
- means 8 (per se known), adapted to feed the sheet metal 4 through the satin finishing station 5 and consisting, in the embodiment described herein, of at least one motorised roller acting on the sheet metal 4.

**[0024]** In the embodiment described herein the supporting structure 11 consists of two side plates 12 (connected to each other by side members 13) which carry at least the mechanically fixed flap wheel 6, the means 7 adapted to make the mechanically fixed flap wheel 6 rotate, and the means 8 adapted to feed the sheet metal 4 through the at least one satin finishing station 5.

**[0025]** In Figure 2 the ends of the two side members 13 can be seen, one of which can be seen in Figure 3.

**[0026]** To compensate for wear on the mechanically fixed flap wheel 6 and to keep its peripheral speed and removal pressure constant, each satin finishing station 5 advantageously further comprises adjustment means adapted to modify the speed of rotation of the flap wheel 6 and move it vertically.

**[0027]** For example, the adjustment means (not described in detail because they are per se known) comprise at least one sensor adapted to detect the current absorbed by the means 7 and a logic unit which, in response to a change in the current absorbed, modifies the intensity of the current supplied to the means 7 to keep the speed of rotation of the flap wheel 6 constant and controls means 15 adapted to move the supporting structure 11 vertically to keep the removal pressure of the flap wheel 6 constant; in the embodiment described herein, the means 15 consist of a hydraulic or pneumatic cylinder having one end connected to a side member 13 of the supporting structure 11 and the other to a bar 17 integral with the support 3.

**[0028]** If the width of the sheet metal 4 is less than the length of the mechanically fixed flap wheels 6, each satin finishing station 5 further comprises means (indicated as a whole with reference numeral 16 and not described herein because they are per se known) adapted to swing the satin finishing station 5 cyclically in a transverse direction with respect to the direction of feed of the sheet metal 4 to spread the wear on the mechanically fixed flap wheel 6 belonging to the satin finishing station 5 evenly along the whole length of said flap wheel.

**[0029]** Figure 3 shows diagrammatically a head-on rear view of the satin finishing station 5 of Figure 2; visible in Figure 3 are the roller bed 2, the means 7 adapted to set in rotation the mechanically fixed flap wheel 6 (not visible in figure 3), the supporting structure 11 comprising

the side plates 12 carried by the pivots 14 and connected by at least one side member 13, the means 15 adapted to move the supporting structure 11 vertically and the means 16 adapted to swing the satin finishing station 5 cyclically in a direction transversal to that of feeding of the sheet metal 4.

**[0030]** Without departing from the scope of the invention, a person skilled in the art can make to the satin finishing system previously described all the changes and improvements suggested by normal experience and/or by the natural evolution of the art.

## Claims

1. A system (1) for satin finishing, by means of flap wheels (6), of sheet metal (4) moving on a bed of rollers (2) with a horizontal axis carried by a support (3), which comprises in combination with each other:

- at least one satin finishing station (5) equipped with at least one flap wheel (6) and with means (7) adapted to cause the at least one flap wheel to rotate (6);

- feed means (8), adapted to feed the sheet metal (4) along the roller bed (2) and through the at least one satin finishing station (5);

**characterised in that** the at least one flap wheel (6) is a mechanically fixed flap wheel, whose flaps (9) are mechanically fixed to the hub (10) of the flap wheel (6).

2. A satin finishing system (1) as in claim 1, **characterised in that** each satin finishing station (5) comprises a supporting structure (11), rocking around pivots (14) carried by the support (3), inside which is placed at least one mechanically fixed flap wheel (6), means (7) adapted to make the mechanically fixed flap wheel (6) rotate, and means (8) adapted to feed the sheets of metal (4) through the satin finishing station (5).

3. A satin finishing system (1) as in claim 2, **characterised in that** the supporting structure (11) consists of two side plates (12) connected to each other by means of the side member (13) and **in that** the at least one mechanically fixed flap wheel (6), the means (7) adapted to make the at least one flap wheel rotate and the means (8) adapted to feed the sheets of metal (4) through the satin finishing station (5) are carried by the side plates (12).

4. A satin finishing system (1) as in claim 2, **characterised in that** the means (7) adapted to cause the at least one mechanically fixed flap wheel (6) to rotate consist of at least one electric motor connected to the at least one mechanically fixed flap wheel (6).

5. A satin finishing system (1) as in claim 2 **characterised in that** the means (8) adapted to feed the sheet metal (4) through the at least one satin finishing station (5) consist of at least one motorised roller acting on the sheet metal (4).

6. A satin finishing system (1) as in claim 1, **characterised in that** each satin finishing station (5) further comprises adjustment means adapted to change the speed of rotation of the at least one mechanically fixed flap wheel (6) and move it vertically.

7. A satin finishing system (1) as in at least one of the preceding claims for satin finishing of sheets of metal (4) having a width smaller than the length of the at least one mechanically fixed flap wheel (6), **characterised in that** each satin finishing station (5) further comprises means (16) adapted to swing the satin finishing station (5) cyclically in a direction transversal to the direction of feed of the sheet metal (4) to spread the wear of the at least one mechanically fixed flap wheel (6) belonging to the satin finishing station (5) evenly along the whole length of said flap wheel.

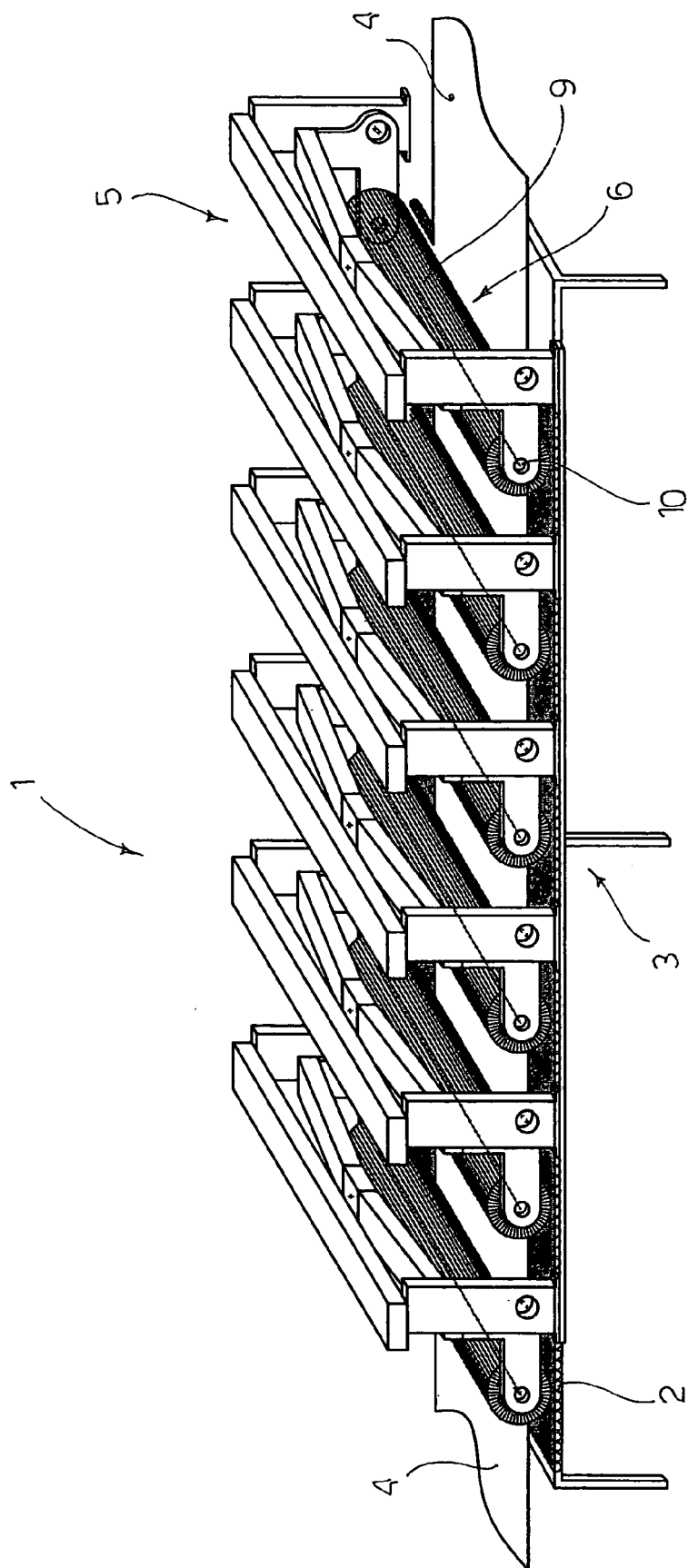


FIG. 1

FIG. 2

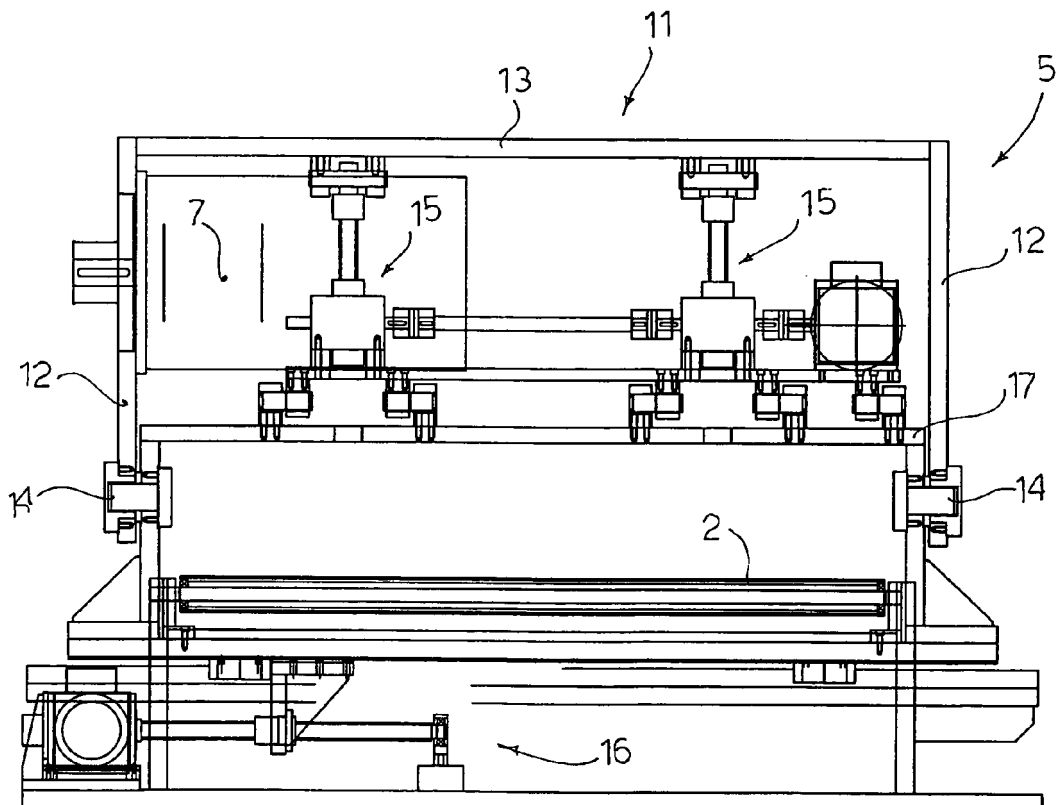
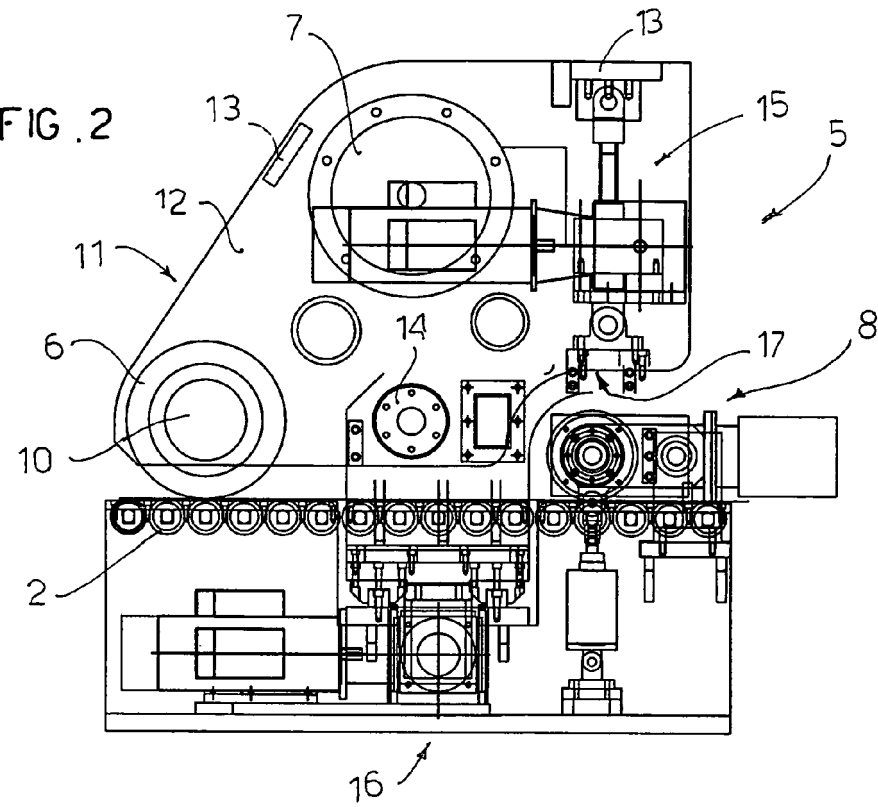


FIG. 3



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 06 02 2590

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                         |                                                      |                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|-----------------------------------------|
| Category                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Citation of document with indication, where appropriate, of relevant passages                                                                           | Relevant to claim                                    | CLASSIFICATION OF THE APPLICATION (IPC) |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | EP 1 350 600 A1 (OLIMPIA 80 SRL [IT])<br>8 October 2003 (2003-10-08)<br>* paragraphs [0012] - [0019]; figures 1-4<br>*                                  | 1-7                                                  | INV.<br>B24D13/04<br>B24B29/00          |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | WO 03/092956 A (COSTA LEVIGATRICI SPA<br>[IT]; BAU ELIGIO [IT]; ZANUSO NEVIO [IT])<br>13 November 2003 (2003-11-13)<br>* page 7, lines 5-9; figure 14 * | 1-7                                                  |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | DE 38 03 857 C1 (ERNST, PAUL, DIPL.-ING. ,<br>6925 ESCHELBRONN, DE)<br>1 December 1988 (1988-12-01)<br>* the whole document *                           | 1-7                                                  |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | GB 392 692 A (BUDD INTERNAT CORP)<br>25 May 1933 (1933-05-25)                                                                                           |                                                      |                                         |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | GB 1 461 570 A (HAWKER SIDDELEY AVIATION<br>LTD) 13 January 1977 (1977-01-13)                                                                           |                                                      |                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                         |                                                      | TECHNICAL FIELDS<br>SEARCHED (IPC)      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                         |                                                      | B24B<br>B24D                            |
| The present search report has been drawn up for all claims                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                         |                                                      |                                         |
| Place of search<br>Munich                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                         | Date of completion of the search<br>15 December 2006 | Examiner<br>Koller, Stefan              |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone<br/>Y : particularly relevant if combined with another document of the same category<br/>A : technological background<br/>O : non-written disclosure<br/>P : intermediate document</p> <p>T : theory or principle underlying the invention<br/>E : earlier patent document, but published on, or after the filing date<br/>D : document cited in the application<br/>L : document cited for other reasons</p> <p>&amp; : member of the same patent family, corresponding document</p> |                                                                                                                                                         |                                                      |                                         |

2  
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 06 02 2590

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  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

15-12-2006

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date                                                                                                                                                                                    |
|-------------------------------------------|---------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EP 1350600                                | A1                  | 08-10-2003                 | AT 324224 T 15-05-2006<br>IT MI20020684 A1 02-10-2003                                                                                                                                                  |
| WO 03092956                               | A                   | 13-11-2003                 | AT 320878 T 15-04-2006<br>AU 2003240472 A1 17-11-2003<br>BR 0309763 A 15-02-2005<br>EP 1503881 A1 09-02-2005<br>ES 2259763 T3 16-10-2006<br>IT VI20020080 A1 03-11-2003<br>US 2005164614 A1 28-07-2005 |
| DE 3803857                                | C1                  | 01-12-1988                 | NONE                                                                                                                                                                                                   |
| GB 392692                                 | A                   | 25-05-1933                 | NONE                                                                                                                                                                                                   |
| GB 1461570                                | A                   | 13-01-1977                 | NONE                                                                                                                                                                                                   |