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(71) Applicant: **Technymon Tecnology Europe SpA
24060 Castelli Calepio (IT)**

(72) Inventor: **Mongodi, Raniero
24060 Castelli Calepio (BG) (IT)**

(74) Representative: **Bruni, Giovanni
Laforgia, Bruni & Partners
Corso Duca degli Abruzzi, 78
10129 Torino (IT)**

(54) Device to settle an uniform layer of powder on a metallic layer

(57) Device for settling an uniform layer of powder on a metal strip comprising at least a means for holding and supplying the powder (1), a system for advancing the strip (3) and characterized in that said means for holding and supplying the powder (1) comprises an outflow channel (8) with rectangular section which becomes nar-

rower while approaching to the outflow section and further characterized in that said system for advancing the strip (3) comprises a stationary blade (9) which levels the powder settled on the strip surface (7) so that it is uniform and planar.

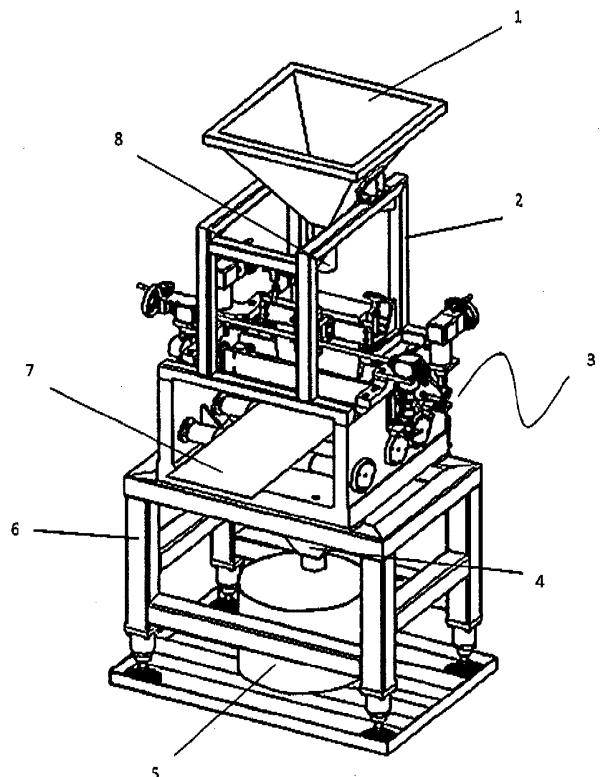


Fig. 1

Description

[0001] The present invention relates to a newly innerly designed and built device, able to settle an uniform layer of powder of bronze or other metals on a support surface. The support surface is represented by a metal strip in copper clad steel, on which the bronze powder is applied in order to obtain a multilayer final product to be used, for example, for the production of friction bearings. At the state of the art, there are known methods for the application of bronze powders on metal foils in order to obtain a multilayer product to be used in the field of friction bearings. An example of such application is provided in the US patent application n° US6042778, where there is described a method for the formation of a multilayer product. According to such technology, a thin layer of bronze powder is applied on the laminated metal support. In the following, such product is sintered and compacted so that it forms a layer with predetermined thickness (up to 20 weight percent). Another example is represented by the international patent application n° WO2008191592 A1 where there is described a multilayer product obtained by binding a layer of bronze powder on the metal plate, by means of a bonding agent and in the following it is laminated and dried.

[0002] Another example is represented by the US patent application n° US2910040 where it is described a device which makes an adhesion, of "coating kind", of a coating on a stripe of other material in order to obtain sheets having an uniform coating layer. The coating is preferably subjected to vibrations, in particular coming from the blade spreading the coating.

[0003] However, the known methods do not provide indications concerning the features of the settled layer, in particular those relative to uniformity and homogeneity.

[0004] The present invention provides to apply a layer of powder on a metal surface using a new device which distributes a powder based on bronze or other substances on a metal strip, in an uniform, homogeneous and planar way with respect to the support condition, with modifiable thickness according to the needs. The adhesion does not occur by "coating" but by means of a sintering method which follows the powder deposit.

[0005] Said device comprises means for supplying the powder, provided with a particularly shaped outflow channel and leveling means for the settled layer. According to another embodiment, the device comprises a micrometric adjusting system able to determine the thickness, the quantity, the planarity of the bronze powder to be settled on the metal surface, able to determine the peculiarity of the same product.

[0006] These and other advantages will be clearer in the detailed description of the invention, which will specifically refer to drawings 1-5, figures 1-6, in which there is shown an absolutely not limiting embodiment of the invention.

[0007] In particular:

- fig. 1 shows an axonometric view of an example of device according to the invention as a whole;
- fig. 2 shows a plan view scheme of the advancing system of the metal strip;
- fig. 3 shows a frontal view scheme of the advancing system of the metal strip;
- fig. 4 shows a section view of the advancing system of the metal strip;
- fig. 5 shows a detail of the blade which levels the powder on the metal strip surface;
- fig. 6 shows a detail of the upper holding and supplying hopper of the powder.

[0008] Referring to said figures, the device according to the present invention is provided with many elements as a whole and comprises: an upper hopper 1 for holding and supplying the powder, which is supported on a support structure 2, positioned on the advancing system of the metal strip 3, a lower hopper 4 for collecting the excessive powder and a container 5 for recovering the excessive powder, which can be simply extracted. Said advancing system of the metal strip 3 is positioned on the support structure 6, is adjustable in height and having anti-vibrant supporting feet, to which it is constrained the lower hopper 4.

[0009] The powder contained in the upper hopper 1 goes down for gravity through an outflow channel 8 on the metal strip 7. Said outflow channel 8 has a rectangular section, which becomes narrower while approaching to the outflow section.

[0010] According to a preferred embodiment, the length of said rectangular outflow section 8 is approximately equal as the width of the metal strip and its width is equal to about 3 mm. The latter dimension is optimized in order to accompany the powder the nearest possible to the metal plate so that the powder particles are not dispersed.

[0011] Said steel strip 7, coil shaped at the beginning, after being unwound by an unwinding reel and successively straightened, passes in an advancing system of the strip 3 and proceeds constantly. Here, the steel strip 7 is supported on a series of rolls 11 and is further guided by an upper roll 13 up to meet a blade 9 which levels the powder on the surface of the metal strip 7 in a homogeneous and planar way with respect to the same surface of the strip. The blade 9 shown in detail in fig. 5 has a slightly convex shape according to its length, so that it is slightly nearer to the metal strip in its central portion than to its periphery. The blade, when positioned at the desired distance, is stationary and so vibration free. It has a contact layer in strong metal and its working temperature is the ambient one. Its particular configuration allows further to improve the distribution of the powder on the strip, since the slight vibrations which, in any case, are originated from the device movement, tend to bring the powder to the center of the same metal plate.

[0012] Said metal strip 7 has to planar and perfectly clean, before the powder is settled thereon.

[0013] A lower hopper 4 for collecting powder allows to recover the excessive powder which falls after being leveled by the blade 9 and precipitates in the collection container 5.

[0014] The upper roll 13 and the blade 9 are controlled with micrometric actuation devices 12 and it is possible to move them both upwards and downwards. They can be controlled also for the parallel movement or only from the desired side, remaining in the fixed position from the opposite side. The moving of these two micrometric actuation devices 12 varies while the desired thickness varies and the position is controlled by means of millesimal digital comparators arranged on each side, two for the blade 9 and two for the roll 13.

[0015] In the following the strip meets grooved and cushioned wheels 14, which guide it laterally and avoid that the just settled powder layer is ruined by contact with other surfaces; the position of said wheels cannot be controlled.

[0016] The thus obtained strip is characterized by an homogeneous bronze layer with controlled thickness, which is uniform and co-planar to the metal support, which is then suitable to be used as friction bearing.

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- 6. Device according to any one of the preceding claims, wherein said means for holding and supplying the powder (1) is an upper hopper.
- 7. Device according to any one of the preceding claims, wherein said strip (7) meets grooved and cushioned wheels (14) which guide it laterally and avoid that the just settled powder layer is ruined by contact.
- 8. Device according to any one of the preceding claims, further comprising a lower hopper (4) for collecting the excessive powder and a container (5) for recovering the excessive powder.

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Claims

1. Device for settling an uniform layer of powder on a metal strip comprising at least a means for holding and supplying the powder (1), a system for advancing the strip (3) and **characterized in that** said means for holding and supplying the powder (1) comprises an outflow channel (8) with rectangular section which becomes narrower while approaching to the outflow section and further **characterized in that** said system for advancing the strip (3) comprises a stationary blade (9) which levels the powder settled on the strip surface (7) so that it is uniform and planar.
2. Device according to claim 1, wherein said system for advancing the strip (3) comprises a plurality of rolls (11), on which said strip (7) and an upper roll (13) are supported with guide function.
3. Device according to claim 2, wherein said upper roll (13) and said blade (9) are controlled by micrometric actuation devices (12), to obtain various thicknesses.
4. Device according to any one of the preceding claims, wherein said outflow channel (8) with rectangular section has a length approximately equal to the width of the metal strip and a width equal to about 3 mm.
5. Device according to any one of the preceding claims, wherein said blade (9) has a slightly convex shape according to its length, so that it is slightly nearer to the metal strip in its central portion than to its periph-

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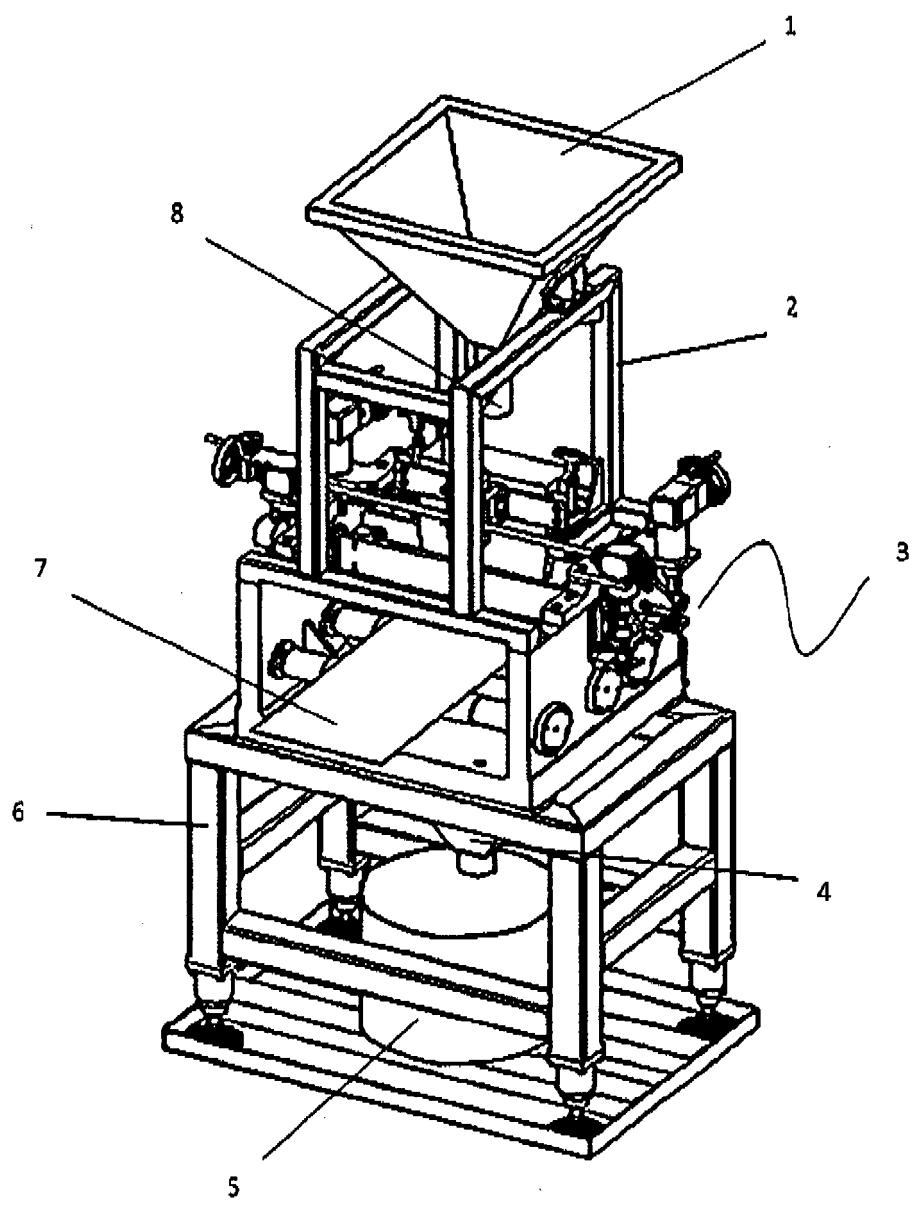
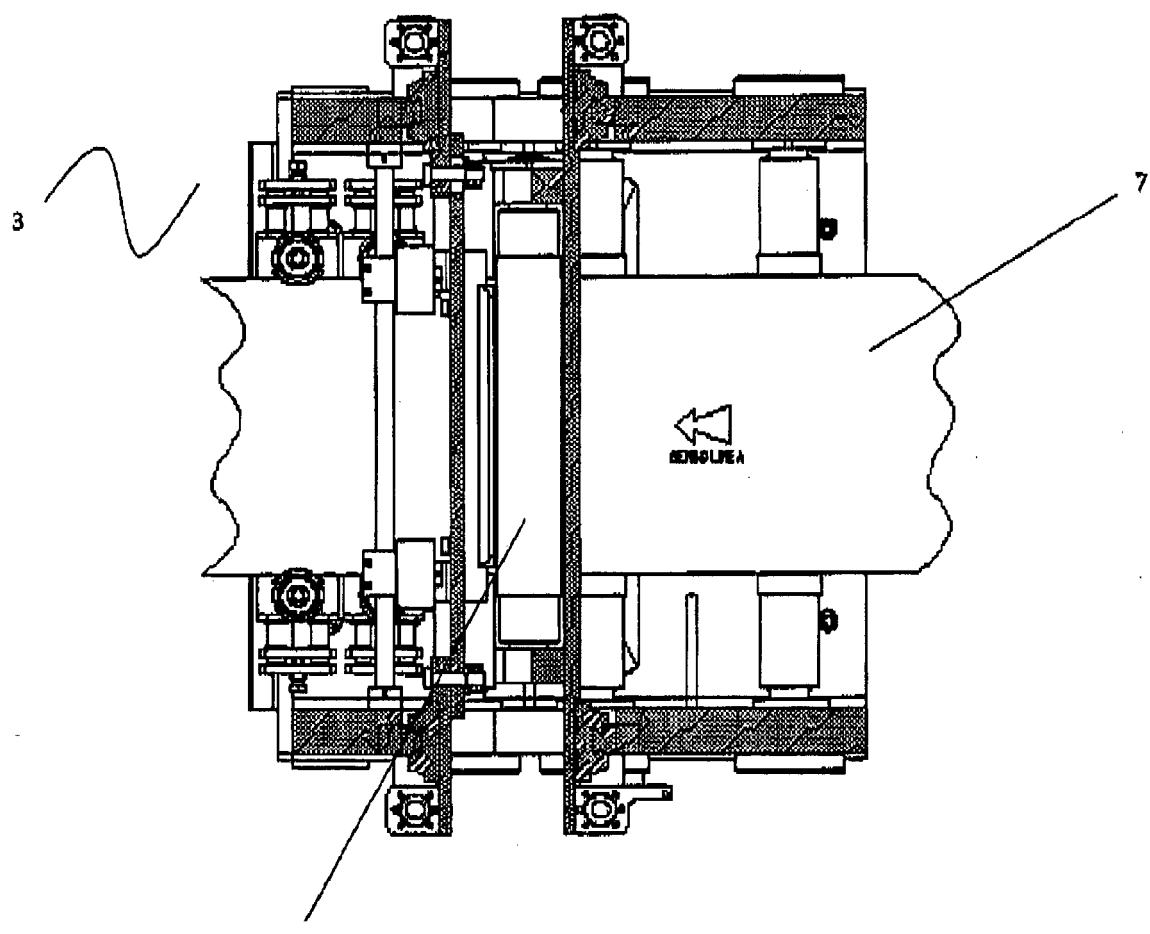


Fig. 1



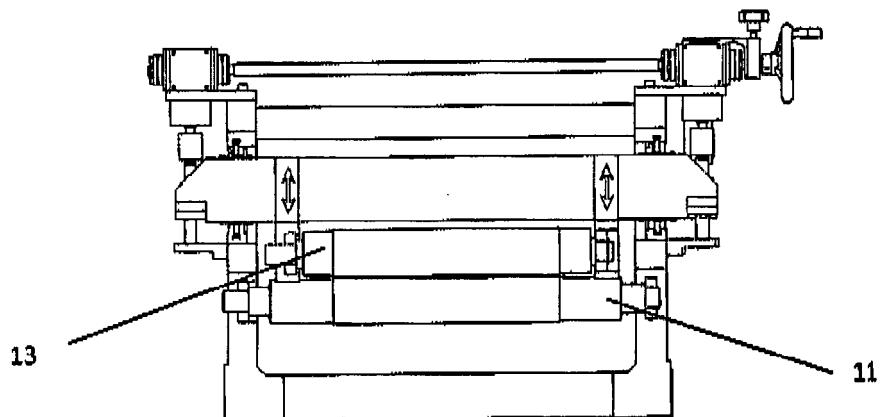


Fig.3

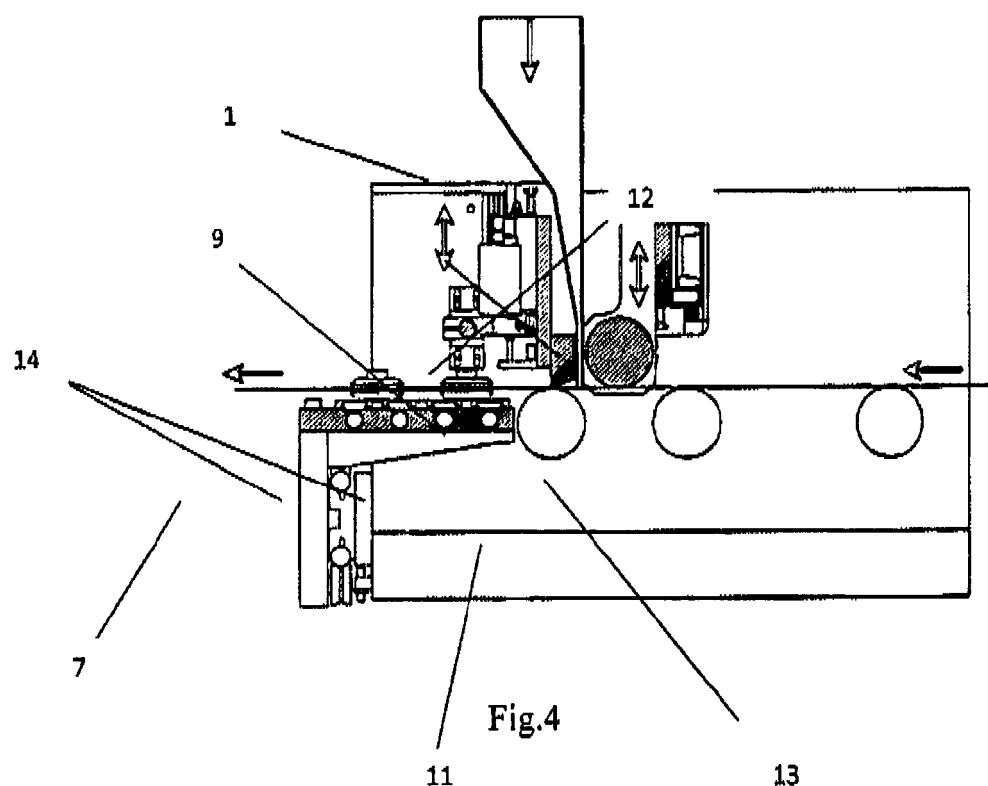


Fig.4

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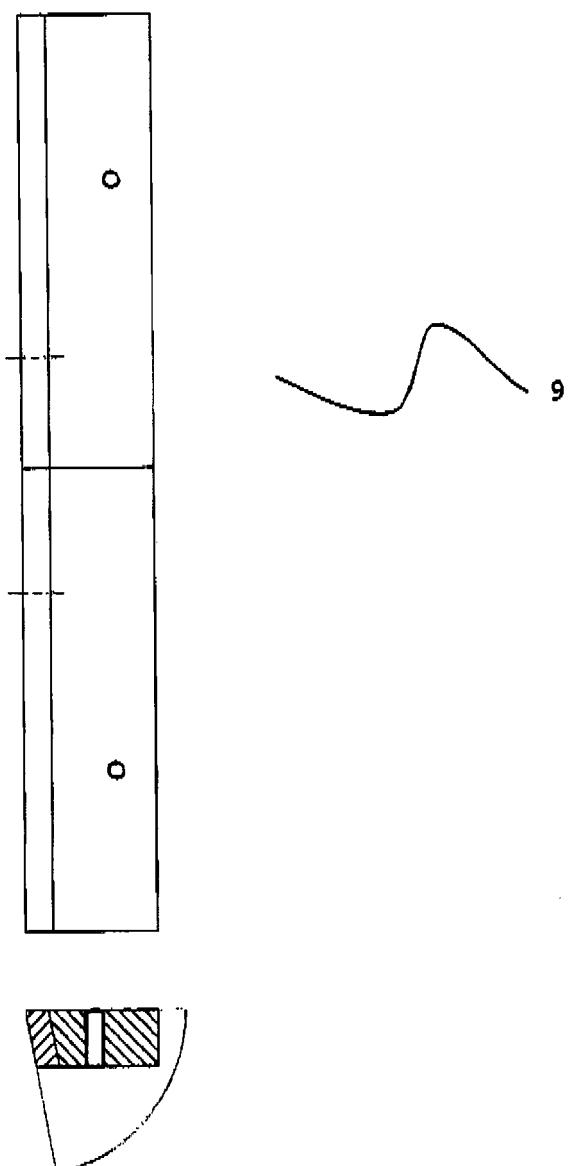


Fig.5

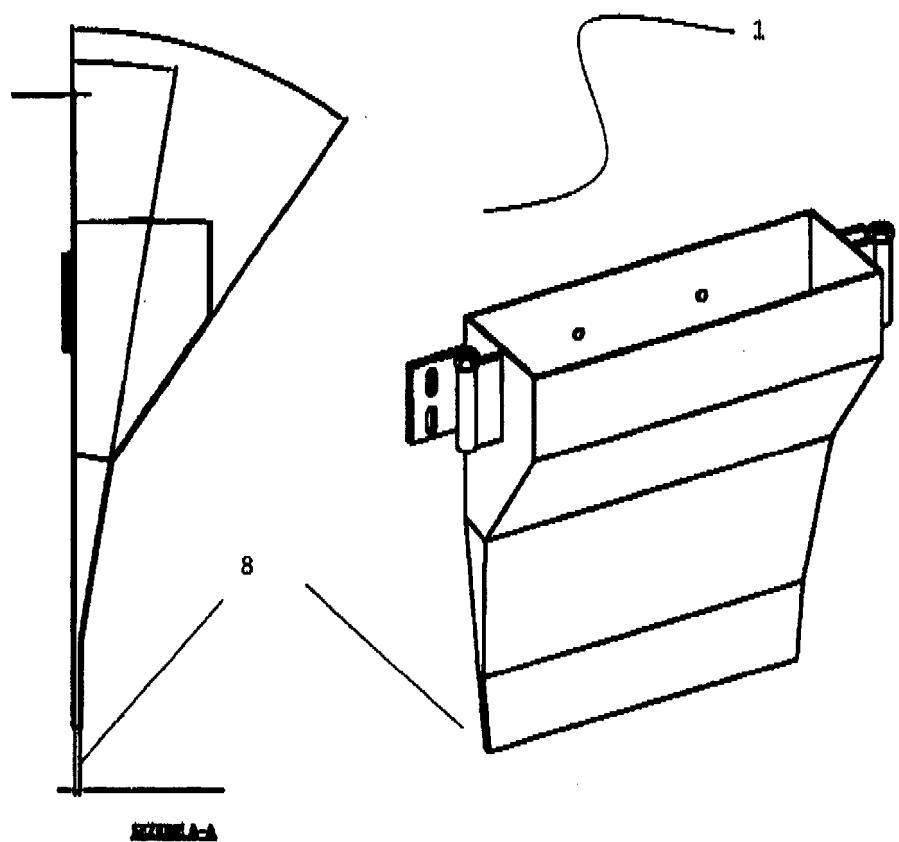


Fig.6



EUROPEAN SEARCH REPORT

Application Number
EP 13 00 5152

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X, D	US 2 910 040 A (KONRAD AGAHD) 27 October 1959 (1959-10-27)	1-6	INV. B05C11/04
A	* column 1, line 47 - line 63 * * column 3, line 10 - line 15 * * figures *	7,8	B05C19/04
Y	----- WO 2005/080010 A1 (VOXELJET GMBH [DE]; EDERER INGO [DE]; KASHANI-SHIRAZI KAVEH [DE]) 1 September 2005 (2005-09-01)	1	
A	* page 17; figures *	8	
Y	----- DE 11 46 652 B (VARTA AG) 4 April 1963 (1963-04-04) * column 3, line 25 - column 4, line 20; figures *	1	
A	----- DE 10 2006 035856 A1 (RUEMMER SYSTEM ENGINEERING GMB [DE]) 14 February 2008 (2008-02-14) * the whole document *	1,2,8	
A	----- WO 02/083323 A2 (GENERIS GMBH [DE]; EDERER INGO [DE]; TUERCK HARALD [DE]; HOECHSMANN RA) 24 October 2002 (2002-10-24) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC)
	-----		B05C
The present search report has been drawn up for all claims			
1	Place of search	Date of completion of the search	Examiner
EPO FORM 1503 03.82 (P04C01)	The Hague	27 January 2014	Barré, Vincent
CATEGORY OF CITED DOCUMENTS		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 & : member of the same patent family, corresponding document	
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			

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

EP 13 00 5152

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.

27-01-2014

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 2910040	A	27-10-1959	CH DE FR GB US	319253 A 1012582 B 1083793 A 742761 A 2910040 A	15-02-1957 25-07-1957 12-01-1955 04-01-1956 27-10-1959
WO 2005080010	A1	01-09-2005	DE EP JP JP US US WO	102004008168 A1 1715959 A1 4809248 B2 2007522927 A 2008260945 A1 2012094026 A1 2005080010 A1	08-09-2005 02-11-2006 09-11-2011 16-08-2007 23-10-2008 19-04-2012 01-09-2005
DE 1146652	B	04-04-1963	CH DE	356591 A 1146652 B	31-08-1961 04-04-1963
DE 102006035856	A1	14-02-2008	NONE		
WO 02083323	A2	24-10-2002	AT AU DE DE EP ES JP JP US WO	289531 T 2002311072 A1 10117875 C1 10291577 D2 1377389 A2 2242029 T3 4102671 B2 2004523356 A 2004170765 A1 02083323 A2	15-03-2005 28-10-2002 30-01-2003 15-04-2004 07-01-2004 01-11-2005 18-06-2008 05-08-2004 02-09-2004 24-10-2002

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 6042778 A [0001]
- WO 2008191592 A1 [0001]
- US 2910040 A [0002]