



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) **EP 1 527 811 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.05.2005 Bulletin 2005/18

(51) Int Cl.7: **B01F 7/02**, B01F 15/00,
B28C 5/14

(21) Application number: **03425702.2**

(22) Date of filing: **30.10.2003**

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

- **Vincenzi, Lamberto**
41030 Staggia di San Prospero (Modena) (IT)
- **Lucca, Daniele**
41110 Modena (IT)
- **Alessi, Alessandro**
41110 Modena (IT)

(71) Applicant: **WAM S.p.A.**
I-41030 Cavezzo (Modena) (IT)

(74) Representative: **Gotra, Stefano**
BUGNION S.p.A.
Via Emilia Est 25
41100 Modena (IT)

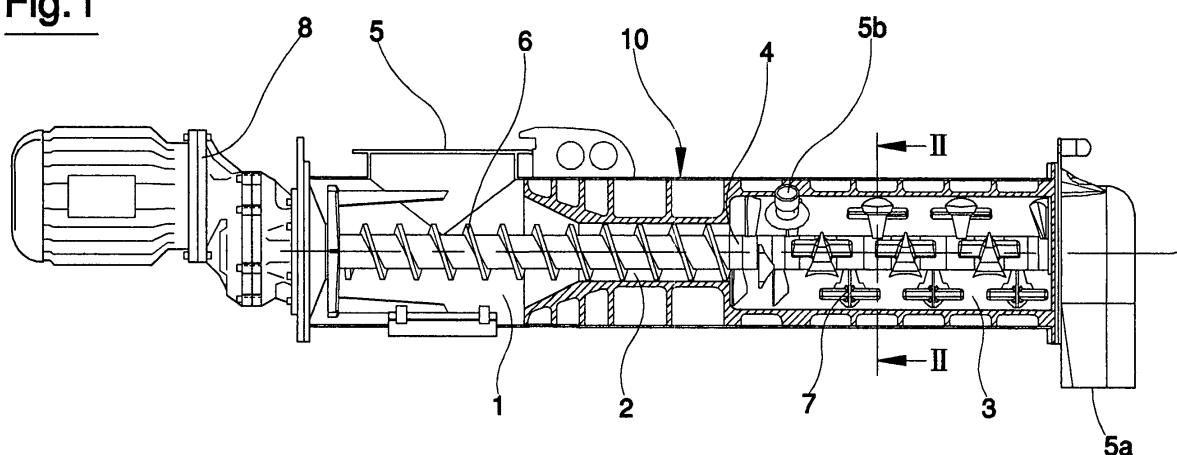
(72) Inventors:
• **Negrini, Davide**
46025 Poggio Rusco (Mantova) (IT)

(54) **An improved mixing and transporting device for powders and powder-liquid mixtures**

(57) The device is of a type comprising a cylindrical body (10) which defines one or more coaxial cylindrical chambers (1, 2, 3) having different internal diameters, all the cylindrical chambers (1, 2, 3) being crossed by a rotating shaft (4) which bears mixing and drawing tools (6, 7). The cylindrical body (10) is made in several parts, each of which parts defines a portion of cylindrical sur-

face of the cylindrical body and is removably connected to the other parts in order to reconstitute the cylindrical body. Means are provided for moving at least some of the parts of the cylindrical body to open at least a zone of the cylindrical body, creating an opening, which opening is freely accessible from outside, which zone corresponds to a section performed in a diameter plane of one or more of the coaxial cylindrical chambers.

Fig. 1



EP 1 527 811 A1

Description

[0001] The invention relates in particular, though not exclusively, to mixers used in the field of construction for mixing and homogenizing sand, aggregates and bonds with an addition of water to obtain cement mixtures and the like.

[0002] These devices generally comprise a cylindrical body which defines several coaxial cylindrical chambers having different diameters, which are crossed by a rotating shaft which bears the mixing and drawing tools, generally different for the various chambers, constituted by screws, mixers and the like.

[0003] The various cylindrical chambers are made with metal tubes or, more recently, with plastic materials of various nature. An example of this type of device is described in Italian Utility Model no 231057, belonging to the same applicant.

[0004] GB 2 068 758 discloses a mixing machine which comprises a rotary agitator located in a cylindrical casing and driven by a motor and reduction gear. The casing at least partially contains a sleeve made of low friction co-efficient and resilient material. Spaced from the inner surface of the casing this sleeve and the casing along at least part of its length is formed as two longitudinally divided hinged doors there being an annular chamber between both parts of the sleeve and the backing parts of the casing doors.

[0005] GB 1 599 856 discloses an apparatus for the continuous production of mortar or cement comprising a charging container for receiving dry mortar or cement, a feed channel arranged to receive the dry mortar or cement from the charging container, and a mixing chamber arranged to receive dry mortar or cement from the feed channel and having means for supplying water to the mortar or cement for mixing therewith, a metering screw having a first portion disposed in said feed channel for meteringly conveying said dry mortar or cement to the mixing chamber and a second portion, extending into the charging container which portion is provided with at least one interruption.

[0006] US 4 572 674 disclose an apparatus for mixing charges of flowable solid materials has a hollow cylindrical housing with two upright end walls and a hollow shell between the end walls. The lower part of the shell has a large material evacuating opening sealable by two mirror symmetrical doors which are pivotable about horizontal axes. The opening extends all the way between the end walls and is large enough to allow for gravitational outflow of the entire contents or the housing irrespective to the angle of repose of the charge. The doors are bounded by edge faces which make oblique angles with their external surfaces and abut against complementary edge faces of the end walls and shell. Sealing strips on the shell and end walls are engaged by deforming members at the external surfaces of the doors when the opening is closed. The abutting edge faces of the doors also make oblique angles with the respective ex-

ternal surfaces.

[0007] Though considerable improvements have resulted from the introduction of plastic chambers, these devices exhibit some drawbacks concerning the cleanliness of the inside of the devices, especially in the not-infrequent case of mixers destined for production of cement mixes where the mixtures under production solidify internally of the mixers themselves.

[0008] The main aim of the present invention is to obviate the above-described drawbacks by providing a device of the above type in which the internal cleaning operations are facilitated, with easier removal of any solidified parts remaining.

[0009] An advantage of the invention is that it obtains the desired results economically and with easy application.

[0010] These aims and advantages and more besides are all achieved by the invention as it is characterised in the appended claims.

[0011] Further characteristics and advantages of the present invention will better emerge from the detailed description that follows of a preferred but non-exclusive embodiment of the invention, illustrated purely by way of nonlimiting example in the accompanying figures of the drawings, in which:

figure 1 is a vertical elevation in section of the device of the invention;

figure 2 is a section of the device of the invention, made along line II-II of figure 1, in an open position for cleaning and in a first embodiment thereof;

figure 3 is a section of the device of the invention, made along line II-II of figure 1, in an open position for cleaning and in a second embodiment thereof.

The device of the invention is generally used for mixing and homogenizing powders to which water is usually added to obtain a paste mixture; a typical application of the device is in the field of construction, for obtaining cement mixtures or the like.

[0012] These devices generally comprise a cylindrical body 10 which defines three coaxial cylindrical chambers having different internal diameters, respectively: a first chamber 1, where the various powders and aggregates are mixed, being introduced through an inlet mouth 5; a second chamber 2 for turning and batching the mixed powders; a third chamber 3 in which the powders are mixed with water, introduced through a mouth 5b, and homogenized to result in a final product (for example a cement mixture) which exits the mixer through an outlet mouth 5a.

[0013] In constructional terms the device, and in particular its cylindrical body, is made in various ways: for example, the cylindrical body defining the various chambers can be obtained using metal tubular elements of various diameters, or can be made with tubular elements made of plastic or polyurethane, having different internal diameters and possibly being covered with met-

al covers (tubes or cages); the external shapes of the sections of these elements can also be of various shapes, while the internal shapes of the section (those defining the internal chambers) are of circular shape.

[0014] The chambers are crossed by a rotating shaft 4, powered by a gear reducer 8, which bears the mixing and drawing tools. The mixer shaft illustrated in the figures of the drawings is provided with a screw 6 which develops about the shaft in the first and second chambers, and share-type mixers 7 arranged in the third chamber. These tools can be made of metal, plastic or in a metal material covered with plastic.

[0015] The above is a summary description, including elements all known in the prior art, of a possible embodiment of a device to which the solutions of the present invention can be applied. The solution which will be described herein below can however be applied to devices which are not necessarily conformed exactly as described above.

[0016] The cylindrical body of the device is made in several parts, each of which defines a portion of cylindrical surface of the cylindrical body; the various parts are connected to the cylindrical body and are reciprocally and removably connectable, to build, when connected up, the cylindrical body and to make the mixer as if the cylindrical body were made in a single piece (or in several coaxial single pieces, should the embodiment desired be that which is herein illustrated).

[0017] The device comprises means for moving the removable parts of the cylindrical body which enable removal or displacement of the parts so as to open a zone of the cylindrical body or create an opening therein, freely accessible from the outside, which corresponds to a section made along a diameter plane of one or more of the coaxial cylindrical chambers or parts thereof. In particular, the parts of cylindrical surface and the means for moving are conformed, for reasons that will better emerge herein below, in such a way as to create the freely-accessible opening from the outside at the position of the third chamber 3, where the powder is mixed with the liquid, i.e. where the cement mixture is formed.

[0018] In a first embodiment, the cylindrical body 10 comprises, at the third chamber 3, a first semi-cylindrical half-shell 10a which is arranged superiorly to a second semi-cylindrical half-shell 10b, which is fixed to the remaining part of the cylindrical body 10 and constitutes the lower part of the third chamber 3. The first half-shell 10a is hinged to the second half-shell 10b at a common generatrix 11 and is removably connected to the second half-shell 10b, by means of screws or in any other known way, at a generatrix 11a.

[0019] When the first half-shell 10a is connected to the second half-shell 10b the cylindrical body is reconstituted, at the position of the third chamber, as in normal mixers. By loosening the connection between the half-shells and rotating the upper, first half-shell 10a, the third chamber is opened at the position denoted by the section made with a diameter plane of the chambers,

which makes the whole chamber freely accessible from the outside.

[0020] In a second embodiment of the invention, the cylindrical body 10 comprises, at the position of the third chamber, a first quarter-shell 10c and a second quarter-shell 10d, which are arranged superiorly to the second half-shell 10b, which second half-shell 10b is fixed to the remaining part of the cylindrical body 10 and constitutes the lower part of the third chamber 3. The first and second quarter-shells 10c and 10d are each hinged to the second half-shell 10b at a generatrix each, 11 and 11a, and are removably connected to each other, for example by a clamp, screws or in any other known way, at their generatrices 11b and 11c which are not hinged to the second half-shell 10b.

[0021] In this case too, when the quarter-shells 10c and 10d are connected one to another the cylindrical body is reconstituted at the third chamber position, as in normal mixers. By opening the connection between the quarter-shells 10c and 10d and rotating the quarter-shells at their hinges, an opening at the third chamber is realized, corresponding to a section of the chamber 3 along a diameter plane. Thus the whole third chamber 3 is made freely accessible from outside.

[0022] In both possible above-described embodiments, the part of rotating shaft 4 which crosses the third chamber 3 is connected removably to the remaining part of the rotating shaft using means of known type, so as to be easily detached from the remaining part of the shaft. In order to facilitate this operation the mobile shells can be conformed and arranged in such a way as to provide a freely-accessible opening from the outside also at the second chamber 2.

[0023] The mobile shell system as described above could also be applied not just to the second and third chambers of the mixer, but also to the entire cylindrical body thereof. It is, however, preferable only to apply it to the third chamber (or at most to the second chamber as well) as it is in this position that the opening created in the cylindrical body is particularly useful; the third chamber is where the powders are mixed with water to obtain the cement, so it is in the third chamber that solidification of the chamber contents occurs in known-type mixers, creating significant problems of cleaning and removal of the solidified product. In the mixer of the invention, even where there is solidification of the cement inside the mixer, the conformation of the cylindrical body with movable shells and the conformation of the shaft, in detachable parts as described above, create an opening of the cylindrical body which facilitates extraction of the content of the third chamber, even where there is a solidified mass having a total volume equal to the volume of the chamber itself. In cases of cement solidification, the chamber itself functions as a sort of "die", and opening it enables the solidified cement therein to be removed.

[0024] The removal of the cement is made particularly easy in cases where the internal walls of the cylindrical

body 1 which define the various chambers, in particular the third chamber 3 in which the powders are mixed with water, are made of a plastic material; using plastic also renders the need for use of seals unnecessary in the contact zones of the various mobile parts of the cylindrical body inasmuch as the plastic material guarantees good seal at the contact zones between the various parts, when the parts are connected to re-constitute the cylindrical body 1 for normal mixer operation. Obviously the invention is also applicable to mixers having metal chambers; in this case the extraction of any solidified cement is slightly less facilitated and it will be necessary to use seals between the mobile parts of the cylindrical body.

[0025] The mobile parts of the cylindrical body are also limited to the zone of the third chamber 3, although this is not strictly indispensable, as in other parts of the cylindrical body, especially the first chamber, there are devices present, for example the inlet mouth 5, which can be connected to other organs (for example a loading hopper, not illustrated) and can therefore be difficult to move. It is not indispensable to have openings at the outlet mouth 5a, which are independently dismountable in case of necessity, as the conformation of the mouth, facing downwards, makes any stagnation and consequent solidification of the product inside the mouth itself highly unlikely.

[0026] The above-described means for connecting enable easy manual movement of the various shells and are easily and economically realizable. It is however possible, for example by using gear reducers, to mechanize the movement; it is also possible, for example in the first embodiment, to have a removable connection on both generatrices of the shells and to enable manual displacement of the upper shell or a motorized translation thereof. Motorized solutions are however expensive and barely practical, especially given the limited weight of the shells to be moved and the environment, generally building sites, where mixers are normally in operation. It is also possible to insert the mobile shells in the underlying part of the mixers and open the mixer from below, keeping the upper part of the cylindrical body fixed. This solution can be used for example where it is desired to open the whole cylindrical body without any impediments caused by parts of the mixer connected to other organs, such as for example the loading mouth. The shells defining the openable parts of the cylindrical body can however be arranged in any radial position of the cylindrical body itself, though the indicated part seems to be the most practical.

[0027] In any case, whatever the connection and movement systems used for the various detached parts of the cylindrical body and their positioning, it is important that the removal of these parts enables an opening to be afforded in the cylindrical body which enables extraction of the contents of the mixer chamber, in particular of the contents of the third chamber in which the powders are mixed with the liquid, where solidification

of the resulting cement is possible. In relation to this last point, especially where the chambers have plastic walls, the freely-accessible opening can be afforded by mobile parts not exactly corresponding to the line drawn by a diameter section plane of the chambers, but slightly smaller. Thanks to the natural elasticity of the chamber walls thus obtained, the opening can easily be deformed to remove the material contained in the chamber. This solution would therefore be completely equivalent to what is claimed.

Claims

1). An improved mixing and transporting device for powders and powder-liquid mixtures, of a type having a cylindrical body (10) which defines a first, a second, a third chamber (1, 2, 3) having different internal diameters, all the cylindrical chambers (1, 2, 3) being crossed by a rotating shaft (4) which bears mixing and drawing tools (6, 7); said cylindrical body (10) being made in several parts, each of which parts defines a portion of cylindrical surface of the cylindrical body, all of which parts are removably connectable one to another in order to reconstitute the cylindrical body; said improved mixing and transporting device comprising means for moving at least some of the parts of the cylindrical body to open at least a zone of the cylindrical body, creating an opening, which opening is freely accessible from outside, which zone corresponds to a section performed in a diameter plane of one or more of the coaxial cylindrical chambers, or of a part of one or more of the coaxial cylindrical chambers; said means for moving being conformed in such a way as to create the opening which is freely accessible from the outside at a position corresponding to the third chamber (3);

characterised in that the cylindrical body (10) comprises, at the third chamber (3), a first semi-cylindrical half-shell (10a) arranged above a second semi-cylindrical half-shell (10b) and is removably connected thereto in order to reconstitute the cylindrical body (10) at the third chamber (3).

2) The device of claim 1, **characterised in that** a part of the rotating shaft (4) which crosses the third chamber (3) is removably connected by means of known type to a remaining part of the rotating shaft.

3) The device of claim 1, **characterised in that** the first half-shell (10a) is removably connected to the second half-shell (10b) at a generatrix (11a) and is hinged to the second half-shell (10b) at a common generatrix (11).

4) The device of claim 1, **characterised in that** the cylindrical body (10) comprises, at the third cham-

ber (3), a first quarter-shell (10c) and a second quarter-shell (10d) arranged superiorly of a second half-shell (10b) and removably connected thereto, in order to be able to reconstitute the cylindrical body (10) at the third chamber.

5

5) The device of claim 4, **characterised in that** the first quarter-shell (10c) and the second quarter-shell (10d) are hinged to the second half-shell (10b) at a generatrix (11, 11a) and are removably connected one to another at generatrices thereof which are not hinged to the second half-shell (10b).

10

6) The device of claim 1, **characterised in that** an internal surface of the cylindrical body (10) which delimits the third chamber (3) is made of a plastic material.

15

8) The device of claim 1, comprising a second chamber (2) for pushing and batching the powders, **characterised in that** the means for moving are conformed such as to create the opening which is freely-accessible from outside at the second chamber (2).

20

25

30

35

40

45

50

55

Fig. 1

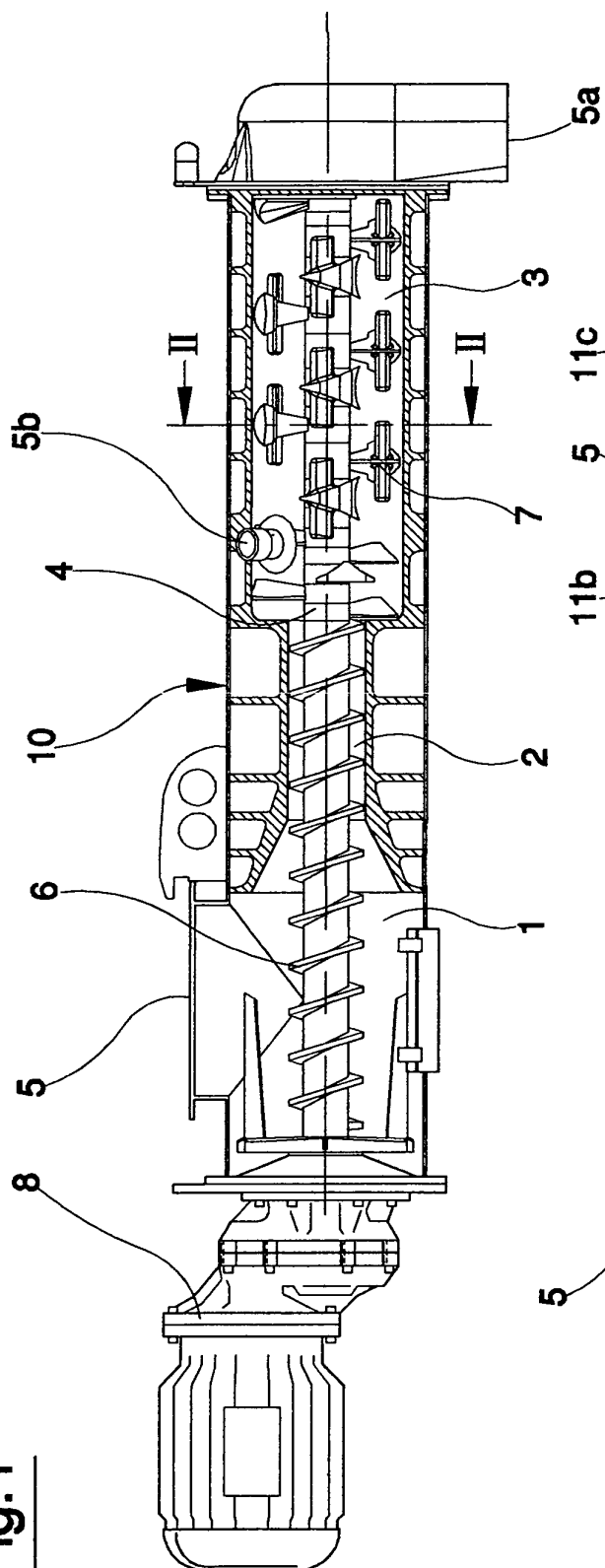


Fig. 2

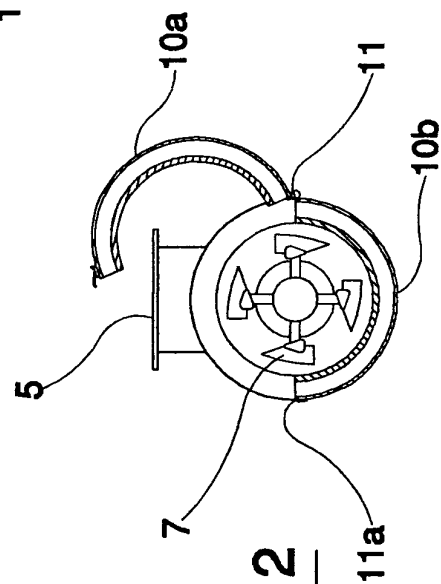
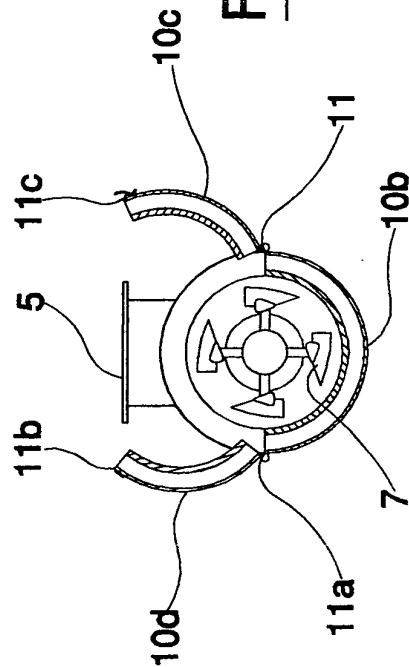


Fig. 3





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 42 5702

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	GB 2 068 758 A (ARANA ERANA A) 19 August 1981 (1981-08-19)	1,2,4,5,8	B01F7/02 B01F15/00 B28C5/14
Y	* page 1, line 5 - line 20 *	3,6,7	
	* page 1, line 81 - line 96 *		
	* page 1, line 102 - line 109 *		
	* page 2, line 15 - line 26 *		
A	* figures 1,2 *	9	

Y	EP 1 172 136 A (WAM SPA) 16 January 2002 (2002-01-16)	1-3,8	
A	* column 1, line 3 - line 15 *	4-7,9	
	* column 2, line 26 - line 29 *		
	* column 2, line 39 - line 46 *		
	* column 4, line 10 - line 22 *		
	* figures 1,5 *		

Y	GB 1 599 856 A (MATHIS FERTIGPUTZ) 7 October 1981 (1981-10-07)	1-5,8	
A	* page 1, line 9 - line 17 *	6,7,9	
	* page 1, line 40 - line 56 *		
	* page 2, line 23 - line 59 *		
	* figures 1,5 *		

Y	FR 1 137 434 A (VINCENT CHARLES-VICTOR) 28 May 1957 (1957-05-28)	1,2,4,5	
	* page 1, column 1, paragraph 5 - paragraph 6 *		
	* figures 1,2,5 *		

Y	US 4 572 674 A (MATHIS PAUL ET AL) 25 February 1986 (1986-02-25)	1,2,6,7	
	* column 1, line 6 - line 20 *		
	* column 3, line 3 - line 18 *		
	* figure 2 *		

A	DE 201 07 479 U (WAGNER GMBH J) 12 September 2002 (2002-09-12)	1-9	
	* the whole document *		

The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 5 April 2004	Examiner Real Cabrera, R
CATEGORY OF CITED DOCUMENTS 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		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	

1

EPO FORM 1503 03.82 (P04C01)

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

EP 03 42 5702

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.

05-04-2004

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
GB 2068758	A	19-08-1981	ES	247574 Y	01-01-1981
			ES	254740 Y	01-10-1981
			DE	3047250 A1	24-09-1981
			FR	2471807 A1	26-06-1981
			IT	1134784 B	13-08-1986
			MX	155105 A	27-01-1988

EP 1172136	A	16-01-2002	IT	B020000429 A1	14-01-2002
			EP	1172136 A1	16-01-2002

GB 1599856	A	07-10-1981	NONE		

FR 1137434	A	28-05-1957	NONE		

US 4572674	A	25-02-1986	DE	3337437 A1	02-05-1985
			AT	26929 T	15-05-1987
			AU	562893 B2	18-06-1987
			AU	3413984 A	18-04-1985
			CA	1225389 A1	11-08-1987
			DE	3463452 D1	11-06-1987
			EP	0142003 A2	22-05-1985
			ES	8603144 A1	01-04-1986
			JP	60097033 A	30-05-1985
			KR	8800478 Y1	12-03-1988
			ZA	8407708 A	29-05-1985

DE 20107479	U	12-09-2002	DE	20107479 U1	12-09-2002

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82