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(54) Automatic cleaning device for heat transfer apparatus

(57) The device uses a brush (1) that slides parallely to the strips that compose the grill (4.1) of the heat transfer apparatus (4). The ends of the brush (1) or some blocks (2) fixed to the brush (1), slide in some guides (3.1) composed from section bars (3). The ends of the brush (1) are fixed - directly or through some blocks (2) - to a drawing flexible element such as a belt (5) that moves in an alternate way following an eight shaped path and it slides on at least four pulleys (6, 7). One of them acts as a driving wheel and the others act as transmission gears. Every motive pulley (7) engages on the driving shaft of an electric engine (8) controlled from an electronic apparatus. This apparatus is equipped with a timer that controls its ignition and its switching off after lapses of time. It also controls the reversal of the drawing flexible element through some electronic impulses after having checked the brush (1) position.

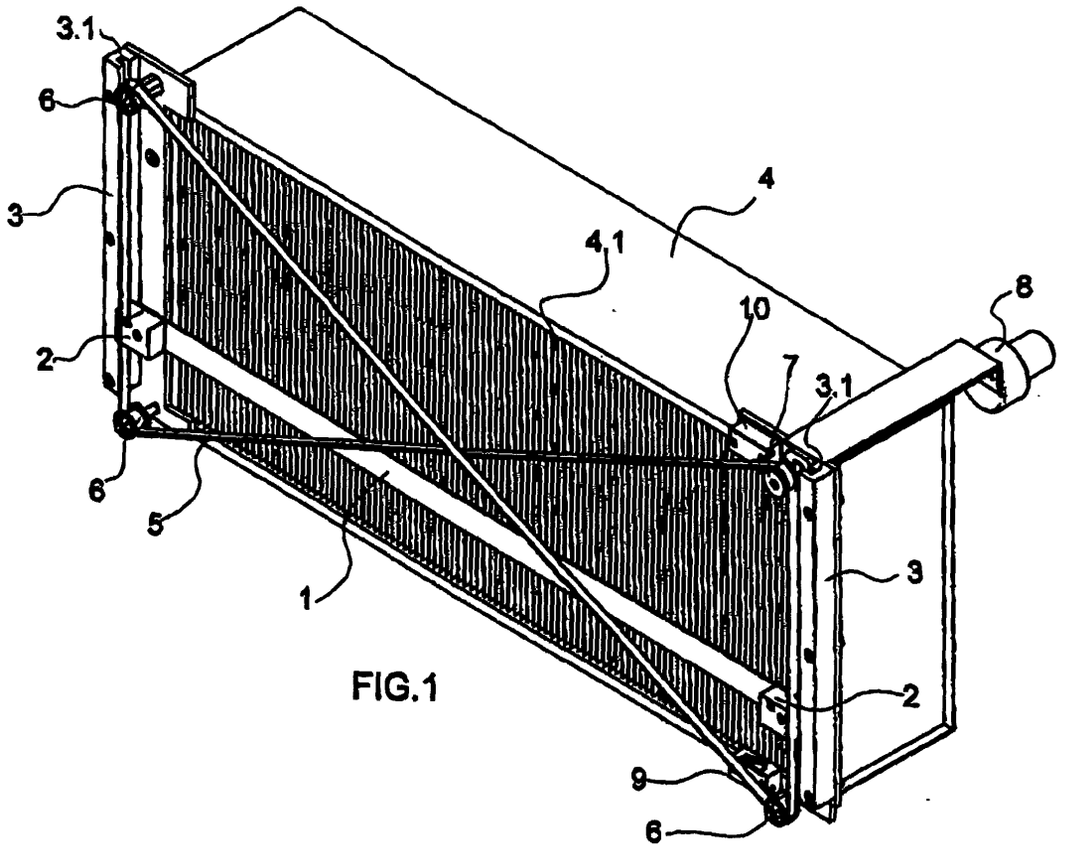

FIG.1

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Description

[0001] This patent is concerned with a device that cleans the grills that protect the component delegated to the thermic exchange of heat transfer apparatuses and especially to the component that refrigerate the refrigerating cases and cabinets.

State of the art

[0002] In the refrigerated cases' sector are used some refrigerating apparatuses that produced the required cold to preserve food or any other product they may contain. These apparatuses are composed by a series of adjoining tubes where the refrigerating gas or liquid flows. The purpose of these tubes is to allow the loss of heat. These tubes are usually protected, on their external part, by a grill made of metallic strips.

[0003] Unfortunately, while using these apparatuses, a remarkable problem is found: the dirty in the ambience (hair, dust, crumbs, hairs) creates a felt that fix itself on the above mentioned grill. In time This felt becomes thicker and thicker till it turns into a sort of thermic insulator. Therefore, the refrigerated cases'functionality is reduced more and more, causing firstly an increase in the electrical consumption and then causing irreversible damages due to the overheating of the system itself. The components have to be repaired or replaced forcing the user to face high costs. Moreover, the food kept in the case can go bad before the repair has been done.

[0004] The same problem can be found on the warmed cases and on the thermal conditioners, sometimes having equal or bigger economic losses when, for instance, a room containing scientific instruments or powerful computers needs to be cooled.

[0005] To solve this kind of problem, many devices have been planned for the cleaning of these grills. Some of them, just like the ones described on the Japanese Patents Nr. 09114378 and 09261264, use a brush that slides on the grill and removes the dusty matter. The ends of the brush are lodged in some guides and the movement is controlled from an arm or cable joined to the cabinet's door. These devices are extremely simple and practical but, unfortunately, not all the cases, refrigerated or not, or the air-conditioning units are equipped with doors.

[0006] It is also necessary to mention the U.S.A. Patent Nr. 5211028 that solves the problem [*della pulizia*] with a brush that moves on the same direction of the strips of the grill. The ends of this brush are lodged in some guides but the movement is manual. It can be done by operating on an arm that is pivoted on the lateral side of the grill.

[0007] Other similar and already known devices have the availability of automatic control means, but they are very complicated, expensive and very hard to maintain.

Summary of the Invention

[0008] The purpose of this invention is to place at the users' disposal a device for the cleaning of the heat-transfer apparatuses. This device should be simple, extremely effective, with automatic control, cheap, and easy in the maintenance.

[0009] This and other purposes are achieved by this device, as better explained on the claims, that utilizes a brush or a comb that slides on the grill that protect the tubes of the thermic exchange of the heat-transfer apparatuses.

[0010] The ends of the brush or the comb are lodged in guides. The guides on section bars are coaxial to the metallic strips of the grill and are positioned on its sides.

[0011] Alternatively there are some intermediate components, or parts of them, fixed on the ends of the brush or comb, and they are lodged in the above mentioned guides.

[0012] The alternating movement of the brush or the comb is caused by the action of a drawing flexible element - a belt or a chain - where the ends of the brush or comb are fixed (directly or by intermediate elements).

[0013] The drawing flexible element moves alternately following an eight shaped run and it slides on at least four gearings such as pulleys or sprocket wheels. At least one of them is the driving wheel and the other act as transmission wheel. Proper devices for stretch regulation such as a belt tightener pulley or a chain tightener are provided when the drawing flexible element has considerable dimensions.

[0014] Every engine gearing engages on the driving shaft of an electrical engine. This engine is controlled from an electric apparatus equipped with a timer. Some limit stop controls avoid the drawing flexible element going on with its movement when the brush or the comb reaches the grill's ends.

Brief description of the drawings

[0015] Further characteristics and adavantages of the invention shall result primarily from the description of a preferred but not necessarily sole form of embodiment of the present device, which is illustrated for indicative and not restrictive purposes in the enclosed drawings, where:

- fig. 1 shows a perspective view of the device according to the invention secured to a cooling apparatus;
- fig. 2 shows a perspective view of the same device from the side which is turned over the cooling apparatus;
- fig. 3 shows a detail of the same device;
- fig. 4 shows a detail of a guide and of an intermediate element of the device.

Detailed description a preferred embodiment

[0016] The present device utilizes a brush 1. This is composed of a steel or aluminium section bar 1.1 and of bristles 1.2 in semi-rigid synthetic material whose nearest ends are locked by the section bar 1.1 itself. A block 2 with a groove 2.1 is fixed by screws and rivets to each end of the section bar 1.1. An end 2.2 of each block 2 slides in a guide 3.1 made of a section bar 3 that is fixed on a aside of a grill 4.1 of the heat transfer apparatus 4. The two section bars 3 have the same longitudinal axis of the strips that form the grill 4.1.

[0017] The two blocks 2 are fixed by screws and rivets to a belt 5 which is housed in the above mentioned grooves 2.1.

[0018] Belt 5 slides on four pulleys 6, 7 that are on the vertexes of an imaginary quadrilateral. Its path is not quadrangolar but it is shaped like an eight. This belt 5 runs between the two couples of pulleys 6-6 and 6-7 parallel with the two section bars 3 and crosses on the central part. A pulley 7, motive, engages on the driving shaft of an electric motor 8 while the remaining pulleys 6 act as transmission pulleys.

[0019] The electric engine 8 is controlled from an electric apparatus which is not illustrated on the figures. This engine is equipped with a timer that controls the ignition and the switching off of the electric engine 8 after some lapses of time. The cleaning cycle is controlled from a timer which is situated in the electronic apparatus and starts counting from the beginning of the power supply.

[0020] The starting of the electric engine 8 causes the rotation of the motive pulley 7 and the belt 5. Taken into consideration that the ends of brush 1 are fixed to belt 5 through the blocks 2, these are forced to [*ad esempio verso il basso*] slow down parallely to the strips of the grill 4.1 of the heat transfer apparatus 4 that are shown vertically on the figures.

[0021] The bristles 1.2 of the brush 1 slide on and between the strips of the grill 4.1 taking away all the gathered impurities.

[0022] The top-down movement of brush 1 goes on till the section bar 1 of the brush 1 touches an electric micro switch 9 that is placed on the base of the grill 4.1. The operation of this switch disconnectes the electric flux and the brush 1 stops.

[0023] With the next operation of the electric engine 8, which is always controlled from the above mentioned electronic device, belt 5 turns in the opposite direction and forces brush 1 to move to the top. Also in this occasion the strips of the grill 4.1 are cleaned from the gathered impurities.

[0024] When the section bar 1.1 of the brush 1 reaches the top of the strips, it touches a second electric micro switch 10 placed on the top of the grill 4.1. The operation of this switch disconnectes the electric flux and the brush 1 stops.

[0025] The reverse of belt 5 is controlled by electronic impulses after a position test of brush 1 on the lower micro switch 9 or on the upper micro switch 10.

Claims

1. Automatic cleaning device for heat transfer apparatuses that utilizes a brush (1) or a comb that slides parallely with the strips that compose the grill (4.1) which protects the tubes used for the thermic exchange of the heat transfer apparatus (4); the ends of the brush (1) or comb are housed in some guides (3.1) composed by section bars; these said section bars are coaxial to the strips that compose the grill (4.1) and are placed on its sides; the said device is **characterised by** the fact that the ends of the said brush (1) or comb are fixed - directly or by some intermediate elements - to a drawing flexible element; this said element moves in a alternate way on an eight shaped path and slides on at least four gearings; at least one of the said gearings is the driving gearing and the other three act as transmission gearings; proper devices for stretch adjustement of the drawing flexible element are provided when the element has considerable dimensions; at least two couples of gearings are placed at the ends of the above mentioned section bars (3) and the drawing flexible element runs between the two couples of gearings that are in parallel with the section bars (3) and crosses in the central part; each driving gearing engages on the driving shaft of an electric engine (8) which is controlled from an electronic device equipped with a timer that controls the ignition and the switching off of the electric engine (8) after a lapse of time; this said electronic device controls also the reverse of the drawing flexible element by electronic impulses after having verified the brush (1) or comb position; limit stop electronic tests, such as electric micro switches (9, 10), placed at the ends of the said section bars (3), interact with the described electronic device that controls the electric motor (8) and do not let the drawing flexible element go ahead with the movement when the brush (1) or comb reaches the ends of the grill (4.1).

2. Automatic cleaning device, according to claim 1, **characterised by** the fact that the said drawing flexible element is a belt (5) or a chain.

3. Automatic cleaning device, according to claim 1, **characterised by** the fact that the said gearings are pulleys (6, 7) or toothed gears.

4. Automatic cleaning device, according to claim 1, **characterised by** the fact that in the guides (3.1) of these said section bars (3) slide the said intermediate elements that connect the ends of the brush (1) or comb to the drawing flexible element.

5. Automatic cleaning device, according to claims 1 and 2, **characterised by** the fact that in the guides (3.1) of these said section bars (3) slide some parts (such as an end (2.2)) of said intermediate elements that connect the end of the brush (1) or comb to the drawing flexible element.

6. Automatic cleaning device, according to claim 1, **characterised by** the fact that the said intermediate elements that connect the ends of the brush (1) or comb to the drawing flexible element are blocks (2).

7. Automatic cleaning device, according to claim 1, **characterised by** the fact that the said devices for the drawing flexible element tension adjustement are a belt tightener or a chain tightener.

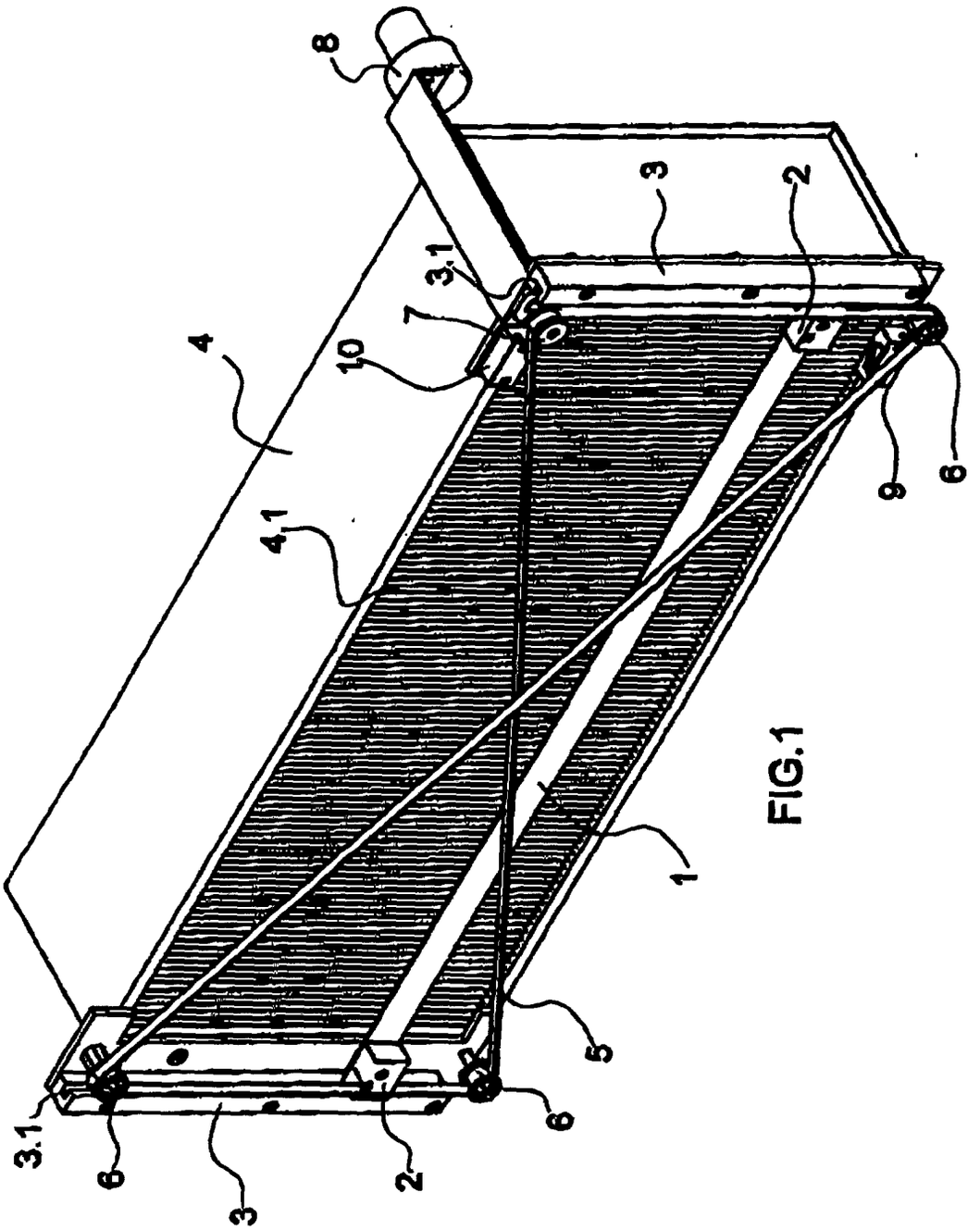


FIG.1

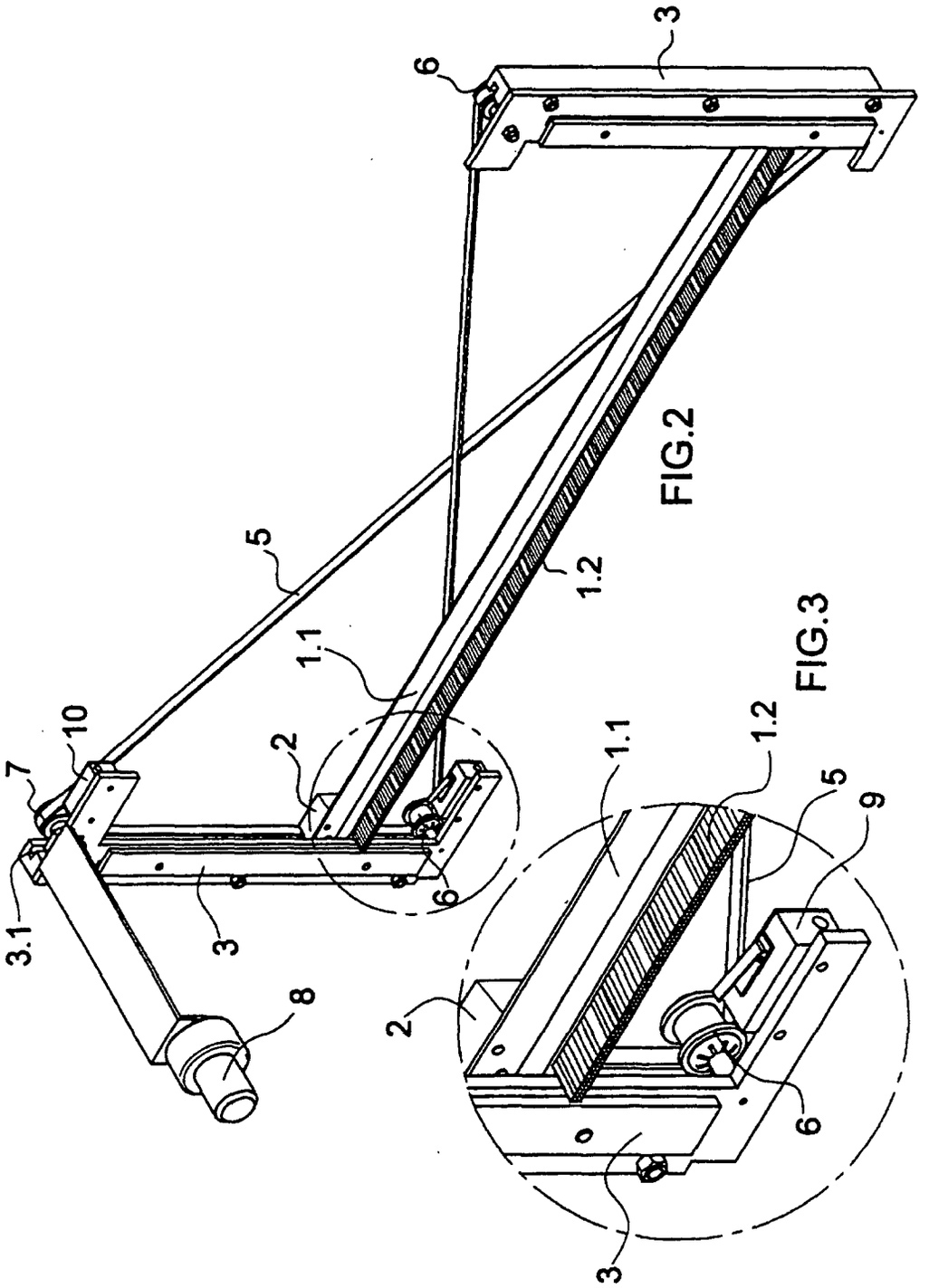
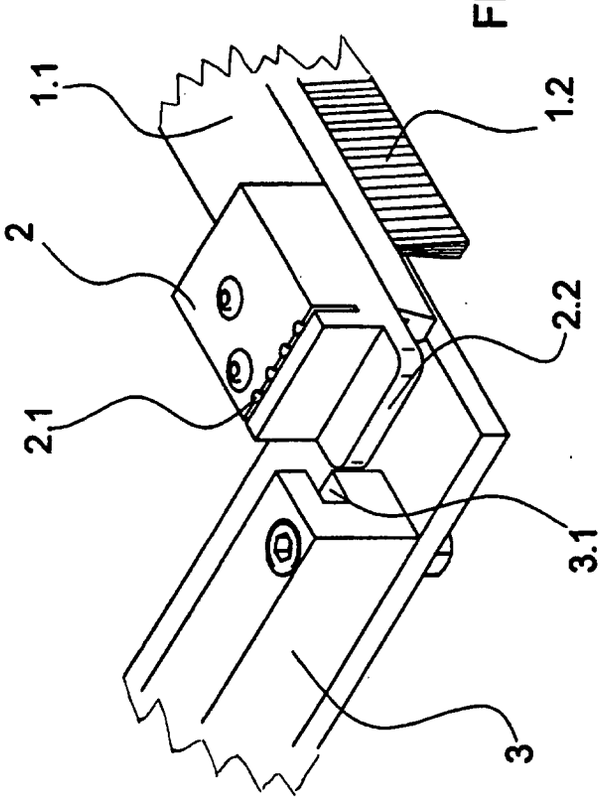


FIG.2

FIG.3

FIG.4



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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5380

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)
D,Y	US 5 211 028 A (REMO DALL ANESE) 18 May 1993 (1993-05-18) * the whole document *	1-7	B08B1/00 F28G1/02
Y	DE 29 06 079 A (GUADALUPI MARIO) 30 August 1979 (1979-08-30) * page 7 - page 13; figures *	1-7	
A	US 6 041 612 A (STRINGER STEVEN C) 28 March 2000 (2000-03-28) * the whole document *	1-7	

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B08B
F28G
A47L
F25B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 September 2004	Plontz, N

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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This annex lists the patent family membersrelating 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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