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Published:

— *with international search report (Art. 21(3))*

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(54) **Title**: CRUSHER

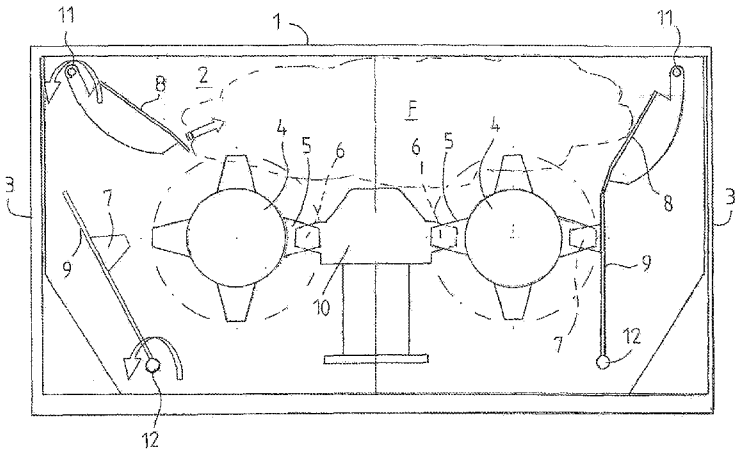


FIG. 1

(57) **Abstract**: A crusher comprising a box-like crusher frame (1) with two end walls (2) and two side walls (3) connecting the end walls;at least one crusher rotor (4) that is supported for a rotating movement inside the crusher frame (1) against its end walls (2); the circumference of the crusher rotor (4)having a plurality of crusher teeth (5)and the crusher having counter-blade structures (6, 7) arranged to cooperate with the crusher teeth (5) of the crusher rotor (4), and the material (F) fed into the crusher for crushing being intended to be fed essentially above the centre line of the rotor(s) (4) and to be crushed between the crusher teeth (5) of the crusher rotor (4) and the counter-blade structures (6, 7);wherein two hatches (8, 9) are arranged on at least one side wall (3) side of the crusher, the first hatch (8) being above the centre line of the crusher rotor (4) and pivoted at its top part to the crusher to be turnable toward the centre line of the crusher, and the second hatch (9) being mainly below the centre line of the crusher rotor (4) and movable away from the front of the crusher rotor (4).

WO 2014/188069 A1

Crusher

Background of the invention

[0001] The invention relates to a crusher that comprises a box-like frame with two end walls and two side walls connecting the end walls; at least one crusher rotor that is supported for a rotating movement inside the crusher frame against its end walls; the circumference of the crusher rotor having a plurality of crusher teeth, and the crusher having counter-blade structures arranged to cooperate with the crusher teeth of the crusher rotor, and the material fed into the crusher for crushing being intended to be fed essentially above the centre line of the rotor(s) and to be crushed between the crusher teeth and the counter-blade structures of the crusher rotor. Typically, the present crusher comprises two parallel crusher rotors, even though nothing prevents using a one-rotor crusher.

[0002] On the basis of their running speed, crushers may be divided into two categories: fast- and slow-running crushers. Fast-running crushers are efficient, but they require that the material being crushed be free from impurities, because, due to a high circumferential velocity of the crusher rotor, their structures cannot be protected by automatically released safety means. Additional problems include fire hazard and noise and dust problems, among others.

[0003] Slow-running crushers are considerably better suited for a wider range of material to be crushed, and they also tolerate impurities. Due to a slow circumferential velocity, their capacities remain low. An increase in the circumferential velocity implies an increased risk of crusher damage, and attempts have been made to prevent this by structures whose counter-blades give way, when foreign objects that are typically of metal are caught between the crusher teeth and the counter-blade structure.

[0004] However, the above manner of preventing damage to the crusher leads to expensive solutions and, therefore, in crushers of a lower price category the damage is avoided by limiting the kinetic energy of the crusher rotor to an as low a level as possible and by making the structures strong enough to endure a sudden stop. Generally, crushers have built-in automatics, with which the rotation direction of the crusher rotor is reversed and a new crushing attempt made. There may be several of these repetitions, but finally, when an object not suitable for crushing has ended up among the mate-

rial being crushed, the crusher stops and raises an alarm. After this, the foreign object is removed manually.

[0005] Solutions are known, in which the front wall of the crusher is opened around a joint in the bottom or top part of the wall, and a foreign object can be removed through the opening. In these solutions, the view to the crusher rotors often remains so narrow that it is difficult to remove a foreign object through them and the opening also cannot be utilised during maintenance, such as during the replacement of the crusher rotor.

[0006] Structures are also known, in which the entire side wall can be slid upward by means of a chain hoist. In this solution, like in the one mentioned earlier, a big drawback is that, when stopping occurs at a time, when the crusher and the feeding funnel for material to be crushed on top of it are still full of material, the material to be crushed discharges through the opening and causes various problems to the environment.

[0007] The following publications, among others, represent the prior art: US 2010252670 A1, EP 2042238 A1, DE 102006050051 A1, US 200686850 A1, US 7222805 B1, US 5743472 A, GB 2278788 A, US 5248100 A, EP 458059 A1, and US 4385732 A.

Summary of the invention

[0008] The object of the invention is to develop the crusher of the type described in the beginning in such a manner that the aforementioned problems will be solved. This object is achieved by a crusher of the invention that is characterised in that two hatches are arranged on at least one side wall side of the crusher, the first hatch being above the centre line of the crusher rotor and pivoted at its top part to the crusher to be turnable toward the centre line of the crusher, and the second hatch being mainly below the centre line of the crusher rotor and movable away from the front of the crusher rotor. Preferred embodiments of the invention are disclosed in the dependent claims.

[0009] Thus, in the invention, there are two separate doors or hatches that are hinged to the crusher, for instance, and that may operate independent of each other. The structure prevents extra material from flowing out of the crusher and permits an easier and more hygienic removal of a foreign object. The idea of the invention is that when the upper hatch opens inward, it prevents the crusher rotor and any material still in the feeding funnel from flowing out of the crusher, whereas foreign objects are easily removed through the lower hatch that opens or slides away from the rotor.

List of figures

[0010] The invention will now be described in more detail in light of three preferred embodiments and with reference to the accompanying drawings, in which

Figure 1 is a simplified cross-sectional view of a crusher of the invention provided with two crusher rotors,

Figure 2 is a simplified cross-sectional view of a second crusher of the invention provided with two crusher rotors, and

Figure 3 is a simplified cross-sectional view of yet another crusher of the invention provided with one crusher rotor.

Detailed description of the invention

[0011] Firstly, Figure 1 shows by way of example and in a highly simplified manner a crusher of the invention that has a box-like frame 1 with two end walls 2 (of which only the rearmost is visible) and two side walls 3 connecting the end walls 2. Inside the crusher frame 1, on its end walls 2, two parallel crusher rotors 4 are supported, which are driven, i.e. rotated, with conventional actuators that are not shown herein. On the circumference of both crusher rotors 4, there are a plurality of crusher teeth 6, and on the crusher, counter-blade structures 6 and 7 that cooperate with respective crusher teeth 5 of both crusher rotors 4. One counter-blade structure 6 is formed by means of a centre beam 10 in the middle of the crusher, between the crusher rotors 4, the centre beam extending at least to the height of the axles of the crusher rotors 4, and the counter-blade structure 6 is fastened to this centre beam 10. The material F fed into the crusher for crushing is intended to be fed essentially above the centre line of the rotors 4 and to be crushed between the crusher teeth 5 of the crusher rotors 4 and the counter-blade structures 6 and 7 while the crusher rotors 4 are rotated.

[0012] The crusher rotor 4 may rotate mainly in one direction only, in which case the crushing of the material F takes place against either of the counter-blade structures 6 or 7. Crushing may also take place as the crusher rotor 4 rotates in either direction, in which case crushing is done against both counter-blade structures 6 and 7.

[0013] Two hatches 8 and 9 are arranged on the side of each side wall 3 of the crusher, the first hatch 8 being above the centre line of the crusher rotor 4 and pivoted by joints 11 at its top part to the end walls 2 of the

crusher to be turnable toward the centre line of the crusher, and the second hatch 9 being mainly below the centre line of the crusher rotor 4 and pivoted at its bottom part by joints 12 to the end walls 2 of the crusher to be turnable away from the crusher rotor 4. The ends of the first and second hatches 8 and 9 facing each other engage in the closed position. In this exemplary implementation, the lower, second hatch 9 comprises a second counter-blade structure 7.

[0014] The structure of Figure 2 differs from that of Figure 1 only in that the lower, second hatch 9' is now formed of a sieve below the crusher rotor 4, which is at a selected distance from the crusher teeth 5 of the crusher rotor 4 and extends to a selected sector of the crusher rotor 4, whereby this sieve forming the second hatch 9' is pivoted at one end to the crusher by joints 12' to be turnable away from the crusher rotor 4 on the side wall 3 side of the crusher. This hatch 9' does not contain an actual counter-blade structure, but may also have properties that crush material.

[0015] Figure 3, in turn, shows a crusher that is provided with one crusher rotor 4 and that is essentially one half of the crusher of Figure 1. The centre beam 10 is then also halved into a "side beam" 10a. Correspondingly, the crusher of Figure 2 can also be made into a halved structure in the same manner.

[0016] When a hard object that is typically of metal enters between the crusher rotor 4, its crusher teeth 5 and counter-blade structure 6, 7, the crusher rotor 4 stops and raises an alarm. In cases, where the crushing does not take place against the counter-blades 7 on the top hatch 8, the removal of foreign objects is started by rotating the crusher rotor 4 in the opposite direction, in which case the foreign object comes close to the lower hatch 9, 9' that can be opened. The upper hatch 8 is then turned inward toward the centre of the crusher, in which case the material to be crushed on top of the crusher rotor 4 moves toward the centre of the crusher and is prevented from flowing out. Next, the lower hatch 9, 9' is opened to gain clear access to the crusher rotor 4 and the foreign object can easily be removed.

[0017] The above description of the invention is only intended to illustrate the basic idea of the invention. A person skilled in the art may thus vary its details within the scope of the attached claims. Therefore, the lower, second hatch may also be a hatch that can be slid away from the front of the crusher rotor. The hatch structure may also be on only one side of the crusher,

or there may be differing hatch structures on the opposite sides of the crusher. The hatch structures may also form part of the side walls.

Claims

1. A crusher comprising:

a box-like crusher frame (1) with two end walls (2) and two side walls (3) connecting the end walls;

at least one crusher rotor (4) that is supported for a rotating movement inside the crusher frame (1) against its end walls (2); the circumference of the crusher rotor (4) having a plurality of crusher teeth (5) and the crusher having counter-blade structures (6, 7) arranged to cooperate with the crusher teeth (5) of the crusher rotor (4), and the material (F) fed into the crusher for crushing being intended to be fed essentially above the centre line of the rotor(s) (4) and to be crushed between the crusher teeth (5) of the crusher rotor (4) and the counter-blade structures (6, 7);

c h a r a c t e r i s e d in that two hatches (8, 9, 9') are arranged on at least one side wall (3) side of the crusher, the first hatch (8) being above the centre line of the crusher rotor (4) and pivoted at its top part to the crusher to be turnable toward the centre line of the crusher, and the second hatch (9, 9') being mainly below the centre line of the crusher rotor (4) and movable away from the front of the crusher rotor (4).

2. A crusher as claimed in claim 1, c h a r a c t e r i s e d in that it has two parallel crusher rotors (4).

3. A crusher as claimed in claim 1 or 2, c h a r a c t e r i s e d in that the lower, second hatch (9) is pivoted at its bottom part to the crusher to be turnable away from the rotor.

4. A crusher as claimed in claim 3, c h a r a c t e r i s e d in that the lower, second hatch (9) comprises at least part of the counter-blade structure (7) of the crusher.

5. A crusher as claimed in claim 1 or 2, c h a r a c t e r i s e d in that the lower, second hatch (9') is formed of a sieve below the crusher rotor (4), which is at a selected distance from the crusher teeth (5) of the crusher rotor (4) and extends to a selected sector of the crusher rotor (4), and that this sieve forming the second hatch (9') is pivoted at one end to the crusher to be turnable away from the crusher rotor (4) on the side wall (3) side of the crusher.

6. A crusher as claimed in claim 1 or 2, c h a r a c t e r i s e d in that the lower, second hatch is formed of a hatch that is slidable away from the front of the crusher rotor (4).

7. A crusher as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that the ends of the first and second hatches (8, 9, 9') facing each other engage in the closed position.

8. A crusher as claimed in any one of claims 1 to 7, c h a r a c t e r i s e d in that, in the closed position, the ends of the first and second hatches facing each other engage a support beam arranged between them.

9. A crusher as claimed in any one of claims 2 to 8, c h a r a c t e r i s e d in that in the centre of the crusher, between the crusher rotors (4), there is a centre beam (10) that extends at least to the height of the axles of the crusher rotors (4) and that the centre beam (10) comprises at least part of the counter-blade structure (6) of the crusher.

10. A crusher as claimed in claim 9, c h a r a c t e r i s e d in that both sides of the crusher comprise a similar hatch structure (8, 9, 9').

11. A crusher as claimed in claim 9, c h a r a c t e r i s e d in that different sides of the crusher comprise differing hatch structures (8, 9, 9').

12. A crusher as claimed in any one of the preceding claims, c h a r a c t e r i s e d in that the hatch structures (8, 9) form part of the side wall (3).

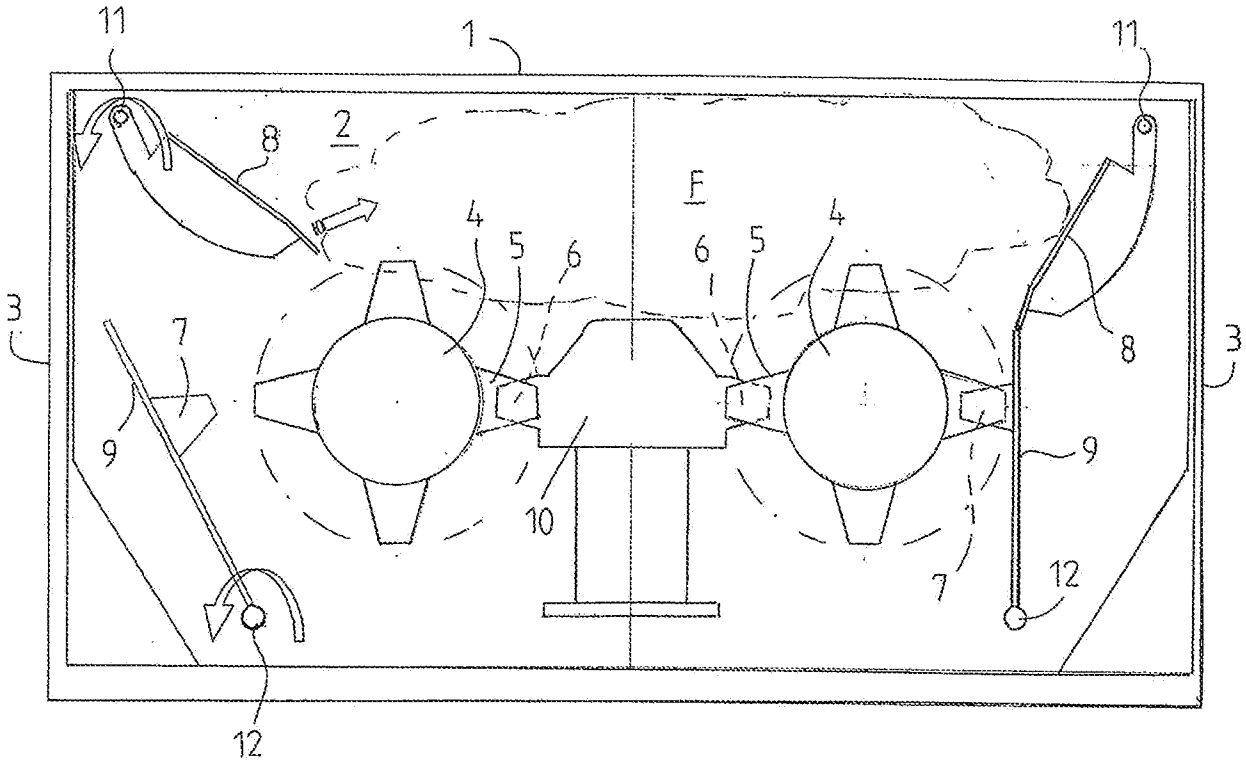

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FIG. 1

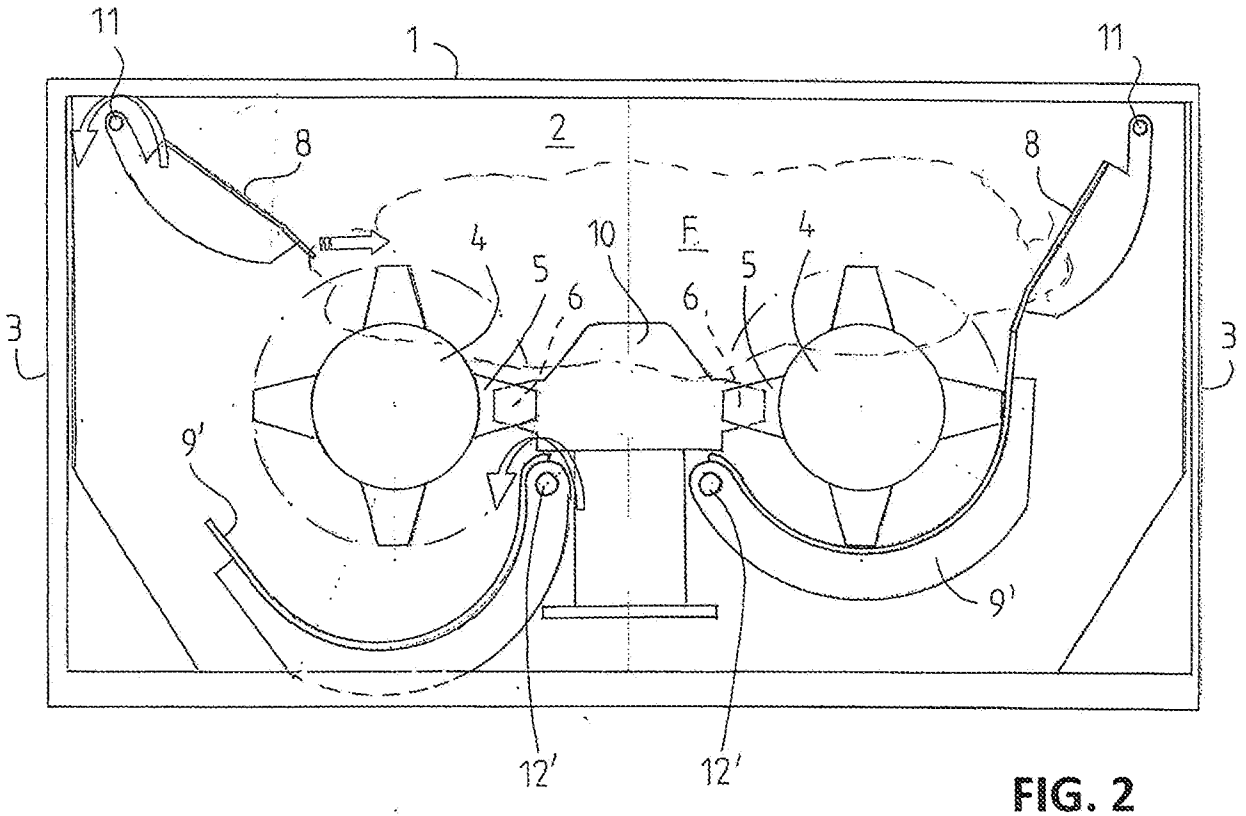

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FIG. 2

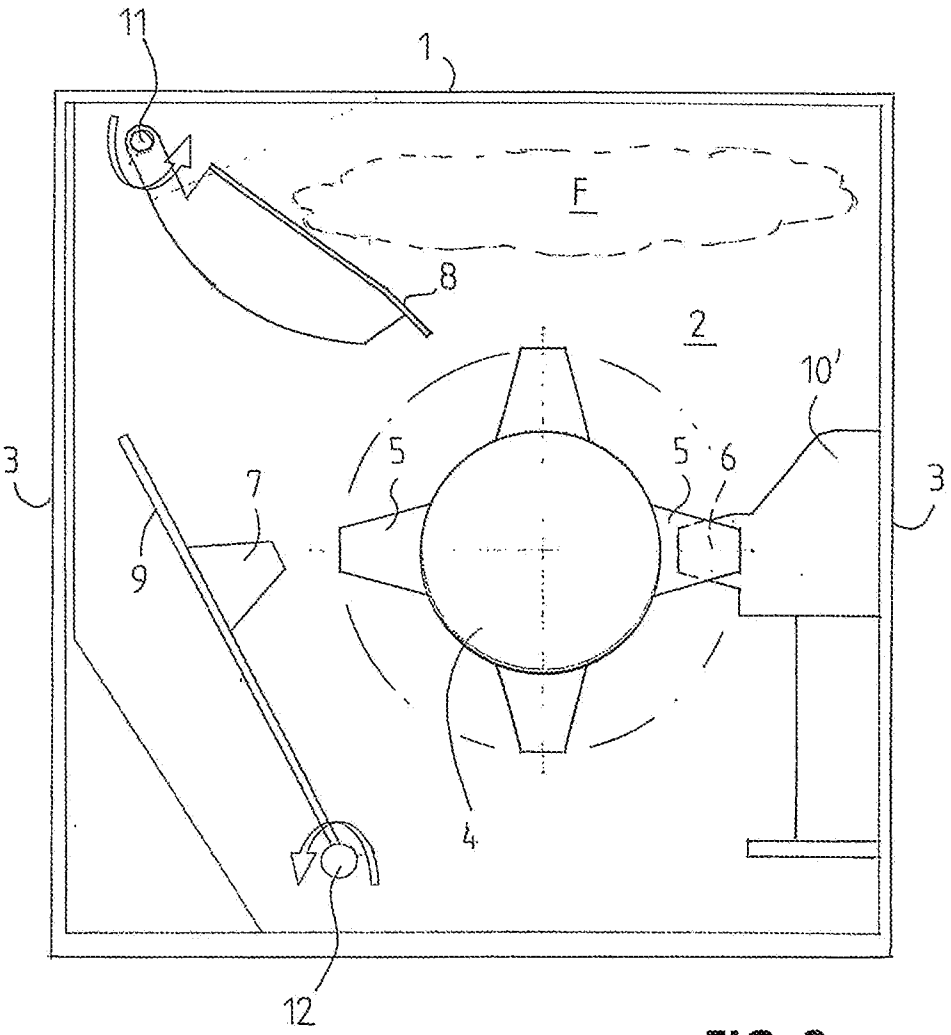


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2014/050387

A. **CLASSIFICATION OF SUBJECT MATTER**

See extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: B02C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

FI, SE, NO, DK

Electronic data base consulted during the international search (name of data base, and, where practicable, search terms used)

EPO-Internal, WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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X	figures 1 and 3	1, 2
Y		3, 4, 8-11
	EP 1371420 A1 (LINDNER RECYCLINGTECH GMBH [AT]) 17 December 2003 (17.12.2003)	
X	figures 1 and 2	1, 5-7, 12
	US 6845931 B1 (SMITH LEWARD NILE [US]) 25 January 2005 (25.01.2005)	
Y	figure 2	3, 4
	US 2149571 A (BATTEY WILLIAM A) 07 March 1939 (07.03.1939)	
Y	figure 2	8
	WO 2012131162 A1 (BMH TECHNOLOGY OY [FI]) 04 October 2012 (04.10.2012)	
Y	figure	9-11

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT
Information on Patent Family Members

International application No.
PCT/FI2014/050387

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		FI 20115288 A	26/09/2012

INTERNATIONAL SEARCH REPORT

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CLASSIFICATION OF SUBJECT MATTER

IPC
B02C 13/31 (2006.01)