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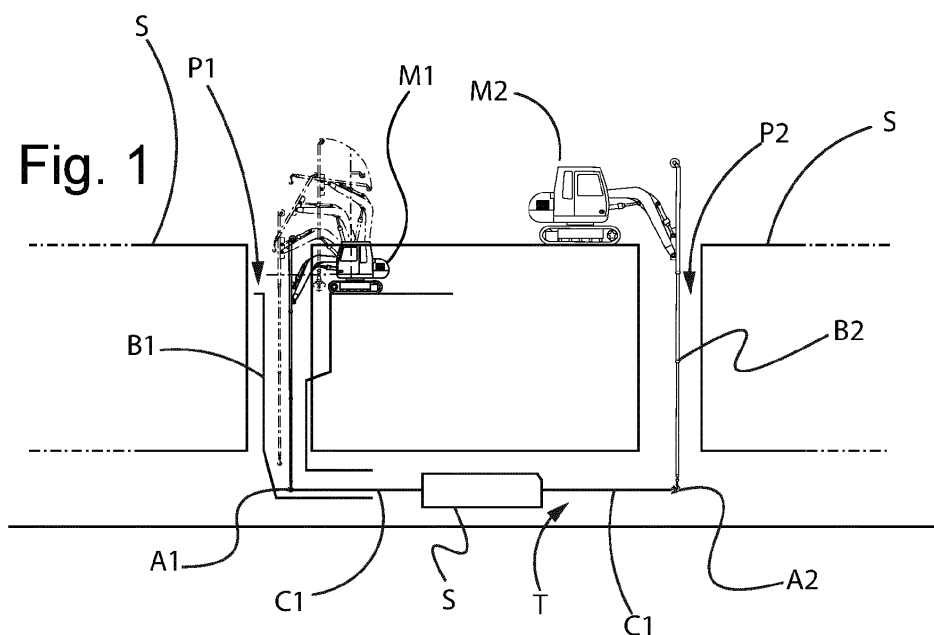
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(54) **METHOD AND SYSTEM OF DREDGING OF A CHANNEL OR DUCT**

(57) Dredging system of a conduit (T), accessible through at least a first (P1) and a second (P2) inspection channel or access passage, which connect and delimit this section of conduit to the surface (S), said system comprising machinery (M1, M2) for positioning a respective winch (A1, A2) along each inspection duct on the junction between each inspection well and said duct. These means are arranged on the surface above the

section of duct and each winch is connected with a cable or rope (C1, C2) which at its free end is connected with a sediment collection container (S) sliding along the section of duct through these winches and which collects the sediments. These machines (M1, M2) comprise means for moving the winches along the inspection channel and positioning them on the bottom of it substantially at the same level as the section of duct to be dredged.



Description

[0001] The present invention relates to a method and system of dredging a channel or duct, for example underground, such as a channel belonging to a sewage system, or drains, spillways, etc....

[0002] It is well known that the municipal sewage networks, which comprise large channels, are in need of maintenance cleaning as a result of the continuous urban expansion and subsequent restorations of the road surface. In fact, often with the arrival of the increasingly heavy summer rains, the central municipal sewers fail to cope with the flow of water, causing flooding and backflow into people's homes.

[0003] It is therefore necessary to clean these medium to large sewage pipes periodically, even in the presence of running water, i.e. without having to interrupt the function of the sewer. It is necessary to extract large quantities of sediment from pipes buried even several dozen metres underground without running any risk. Normally the machinery performing these operations operates from outside the sewer and from the surface.

[0004] Several methods are known for cleaning up such ducts. A first type provides for the insertion of water jet nozzles, as illustrated, for example, in patent application US20110308552, which describes a first nozzle head inserted along the duct that sprays jets of water directly along the duct. The first head is exchanged for a second head connected to a cable and is pulled back to the first position. The nozzle is then pulled back to the second position by pulling the cable while the nozzles directed along the pipe towards the second position push the solids forward to the second position for extraction.

[0005] In a second *modus operandi*, a sediment collection container is used which is made to slide along the canal. The operations are usually carried out by accessing the underground channel through pairs of inspection wells that delimit the section of channel to be cleaned. From the first of these wells, a sediment collection container hooked to a first holding cable is lowered into the duct, this container is towed into the duct in the direction of the second well by means of a second cable hooked to the container which is lowered from this second well. Once the container has travelled the full section of channel to be cleaned, it is removed from the second well and emptied into a special collection tank.

[0006] The container for sediment collection is generally shaped like a slide, and the cables are towed by special winches placed on the surface near these inspection wells.

[0007] This second *modus operandi* has the drawback that, having positioned the winches on the surface, the sliding of the towing and holding cables from the wells to the duct can be difficult, since they have to overcome an almost right angle formed between the axis of the well (usually substantially vertical) and that of the channel (usually almost horizontal or slightly inclined). This sliding is even more difficult when, during the dredging step, the

container or slide loaded with sediment has to be towed and when this angle has to be overcome between the bottom of the well and the end of the section of the duct by the container.

[0008] The applicant has solved these drawbacks by realising a system and a method of dredging underground ducts accessible through inspection wells according to the present invention having the characteristics of the appended claims.

[0009] Further objects, characteristics and advantages of the present invention will become clear from the following detailed description and the appended figures, provided solely by way of non-limiting example, wherein:

- figure 1 is a schematic view of the system of dredging underground ducts accessible through inspection wells according to the present invention;
- figure 2 is a schematic view of the step of inserting a winch into the inspection well according to the present invention. Referring to the above figures, the system of dredging a duct T (or a section of it), accessible through at least a first P1 and a second P2 inspection channel or access passage, which connect and delimit this section of conduit to the surface S; said system comprises machinery M1 or M2 for positioning a respective winch A1 and A2 along each inspection duct on the junction between each inspection well or inspection channel and said duct.

[0010] The duct may be an underground duct and the inspection wells are vertical channels for access to the indicated section, or it may be an open duct such as a ditch or a canal that is difficult to access through banks that delimit it equivalent to inspection channels. These means are arranged on the surface above the section of duct. Each winch is connected with a cable C1 or C2 which at its free end (the one not engaged with the respective winch) is connected with a sediment collection container S sliding along the section of duct through these winches and which collects the sediments. These machines M1 and M2 comprise means for moving the winches along the inspection channel or well and positioning them on the bottom of it substantially at the same level as the section of duct to be dredged. Such movement means are advantageously realised by means of a telescopic or articulated arm. Such machines are preferably excavators.

[0011] Preferably, the sediment collection container is shaped like a slide or like a bucket provided with a mouth for the collection during the dragging of the sediments and a closed bottom to form a "bag". The method and the system of the present invention are equally applicable in an environmental situation in which the first inspection channel well P1 is an open channel and allows a means to be brought to the level of the quote of the duct to be dredged (fig. 3a) or allows the first winch to be lowered more easily to the level of this duct (fig. 3b).

[0012] The method for removing or dredging a section

of channel T according to the present invention accessible through at least a first P1 and a second P2 inspection channel which connect and delimit this section of duct to the surface S essentially comprises the steps of:

- a) preparing a first and a second machinery (M1 and M2) for positioning the respective first and second winches (A1 and A2) proximate to the respective first and second inspection channels (C1 and C2),
- b) lowering the cable (C1 or C2) of the first or second winch (A1 or A2) into the respective inspection channel (P1 or P2) until it crosses the entire section of duct to be dredged (T) and lifting its end from the other inspection channel (P2 or P1),
- c) hooking a sediment collection container (S) to this end of this cable and also hooking it to the cable of the second or first winch (A2 or A1),
- d) lowering the two winches (A1 and A2) in the inspection channels (P1 and P2) until they reach substantially the same quote or level as the section of duct to be dredged, so that the container (S) is located at one of the ends of the channel near the respective winch (A1 or A2),
- e) towing the container through these winches to the opposite end of this section of duct near the other winch (A2 or A1),
- f) lifting the winch that has the container close to itself on the surface (S) for emptying it.

[0013] After emptying, if the dredging operation must always be carried out in the same direction, i.e. always moving the container in the same direction for dredging (for example from P2 to P1 only), for reasons of slope of the channel or for other reasons, the container itself is brought back, making it cross again the duct to be dredged, near the other winch (A2 or A1) to repeat the steps e), f) above.

[0014] If, on the other hand, the dredging operations can be carried out in both directions (indifferently from P1 to P2 or from P2 to P1), in order to carry out a subsequent dredging operation it will be sufficient to rotate the container and lower again the winch that lifted the filled container (after it had been emptied) up to the level of the section of duct to be dredged, and tow the container in the opposite direction until it is near the other winch.

Claims

1. Dredging system of a conduit (T), or a section of it, accessible through at least a first (P1) and a second (P2) inspection channel or access passage, which connect and delimit this section of conduit to the surface (S), such a system comprising:

- machinery (M1, M2) for positioning a respective winch (A1, A2) along each inspection duct on the junction between each inspection well

and said duct,

- said machinery being arranged on the surface above the section of duct,
- each winch being connected with a cable (C1, C2) which at its free end is connected with a sediment collection container (S) sliding along the section of duct through these winches and which collects the sediments,
- these machines (M1, M2) comprising means for moving the winches along the inspection channel and positioning them on the bottom of it substantially at the same level as the section of duct to be dredged.

2. System according to claim 1, wherein said moving means (M1, M2) comprising a telescopic or articulated arm.
3. System according to claim 1, wherein said machines are excavators.
4. System according to claim 1, wherein the sediment collection container is shaped like a slide or like a bucket provided with a mouth for the collection during the dragging of the sediments and a closed bottom to form a "bag".
5. Method for removing or dredging a section of channel (T) accessible through at least a first (P1) and a second (P2) inspection channel or access passage that connect and delimit this section of duct to the surface (S) essentially includes the steps of:

- a) a) preparing a first and a second machinery (M1, M2) for positioning the respective first and second winches (A1, A2) proximate to the respective first and second inspection channels (C1, C2),
- b) b) lower the cable (C1, C2) of the first or second winch (A1, A2) into the respective inspection channel (P1, P2) until it crosses the entire section of duct to be dredged (T) and lift its end from the other inspection channel (P2, P1),
- c) c) hook a sediment collection container (S) to this end of this cable and also hook it to the cable of the second or first winch (A2, A1),
- d) d) lowering or positioning the two winches (A1, A2) in the inspection channels (P1, P2) until they reach substantially the same quote or level as the section of duct to be dredged, so that the container (S) is located at one of the ends of the channel near the respective winch (A1, A2),
- e) e) towing the container through these winches to the opposite end of this section of duct near the other winch (A2, A1),
- f) f) lift the winch that has the container close to itself on the surface (S) for emptying it.

6. Method according to claim 5, wherein when the dredging operation is to be carried out by moving the container always in the same direction, after the step f) the container itself is returned, causing it to cross again in the duct to be dredged, near the other winch (A2 or A1) to replicate the steps e), f) above. 5
7. Method according to claim 5, in which the dredging operations can be carried out by moving the container (S) in both directions to carry out a subsequent dredging operation, it will be sufficient to rotate the container and trace the winch that raised the stuffing container up to the level of the section of duct to be dredged, and tow the container in the opposite direction up to the other winch. 10 15

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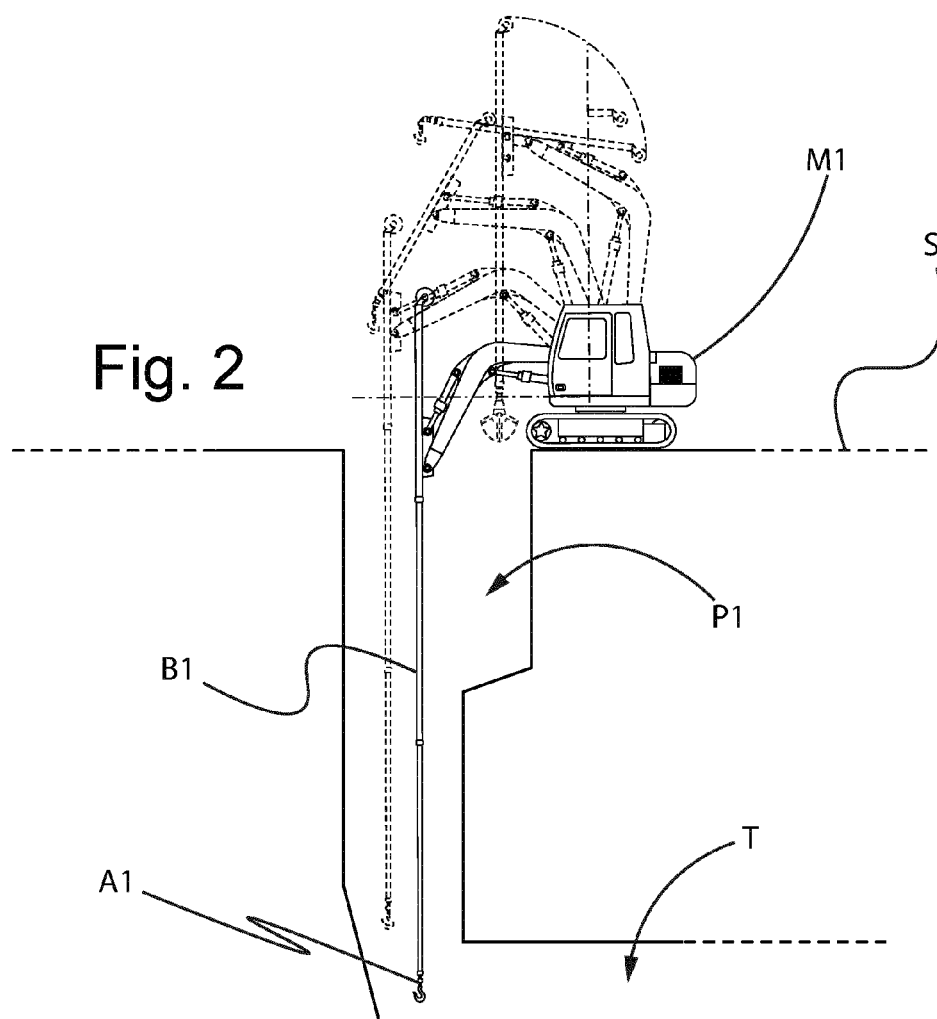
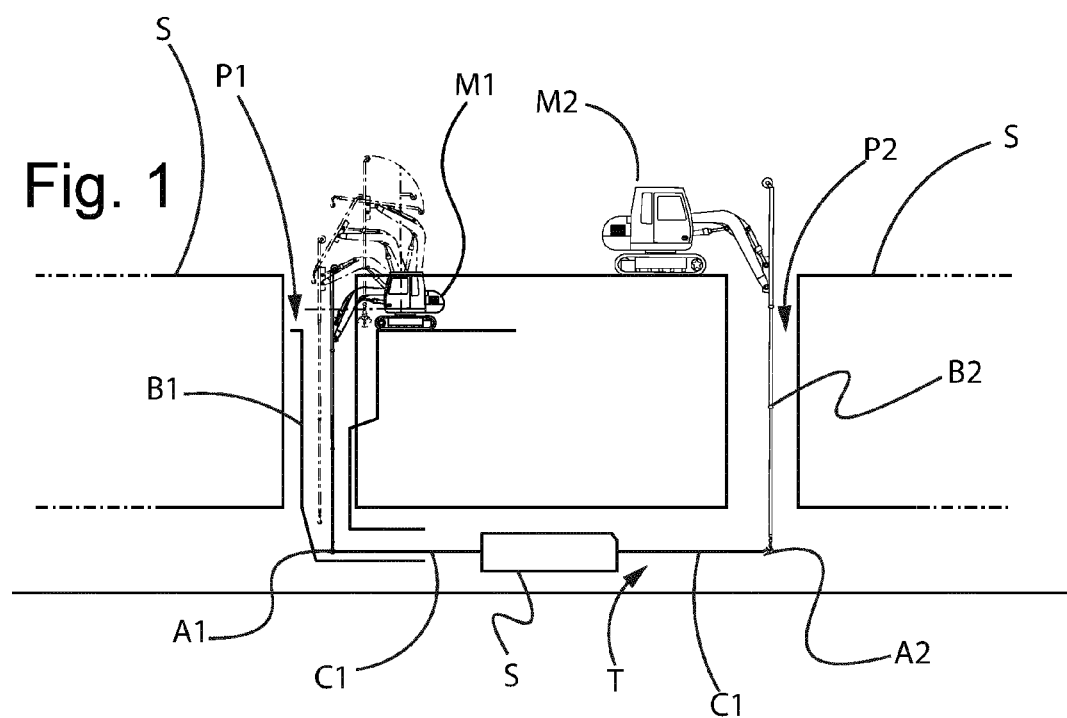


Fig. 3b

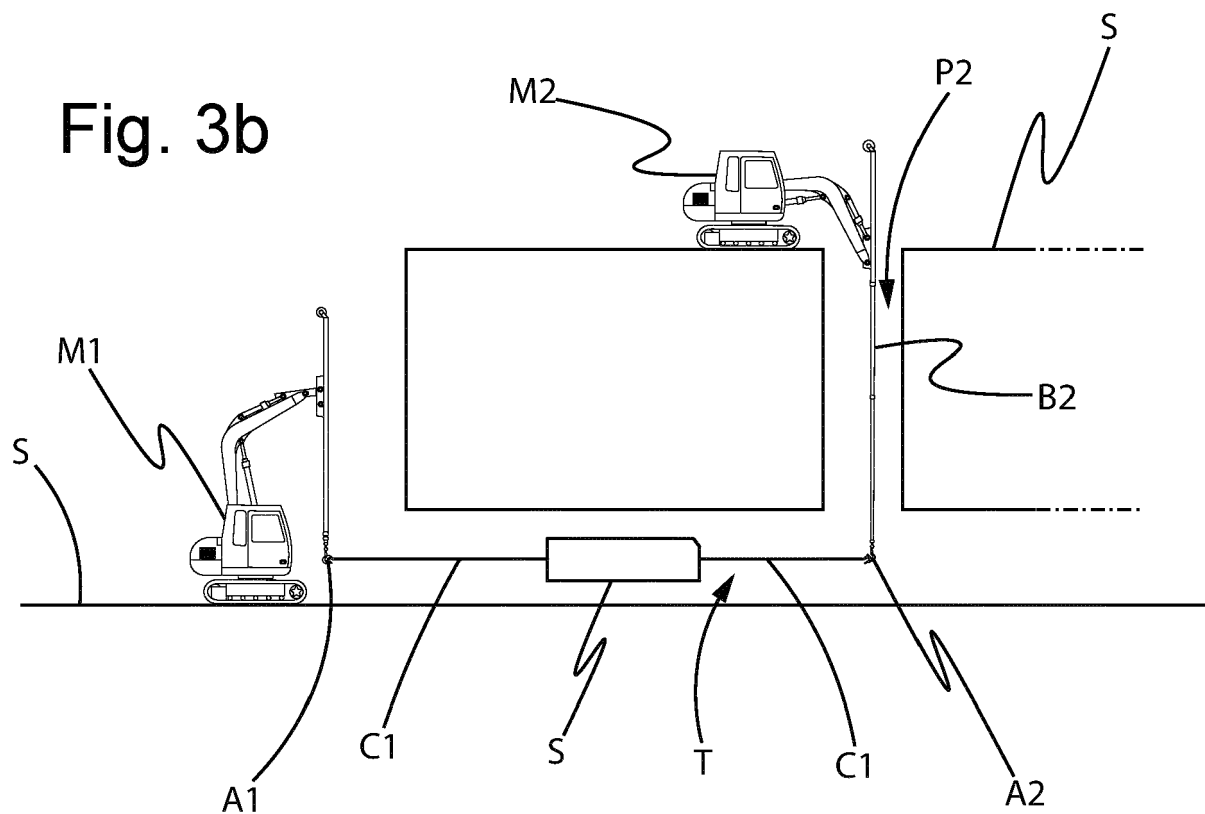
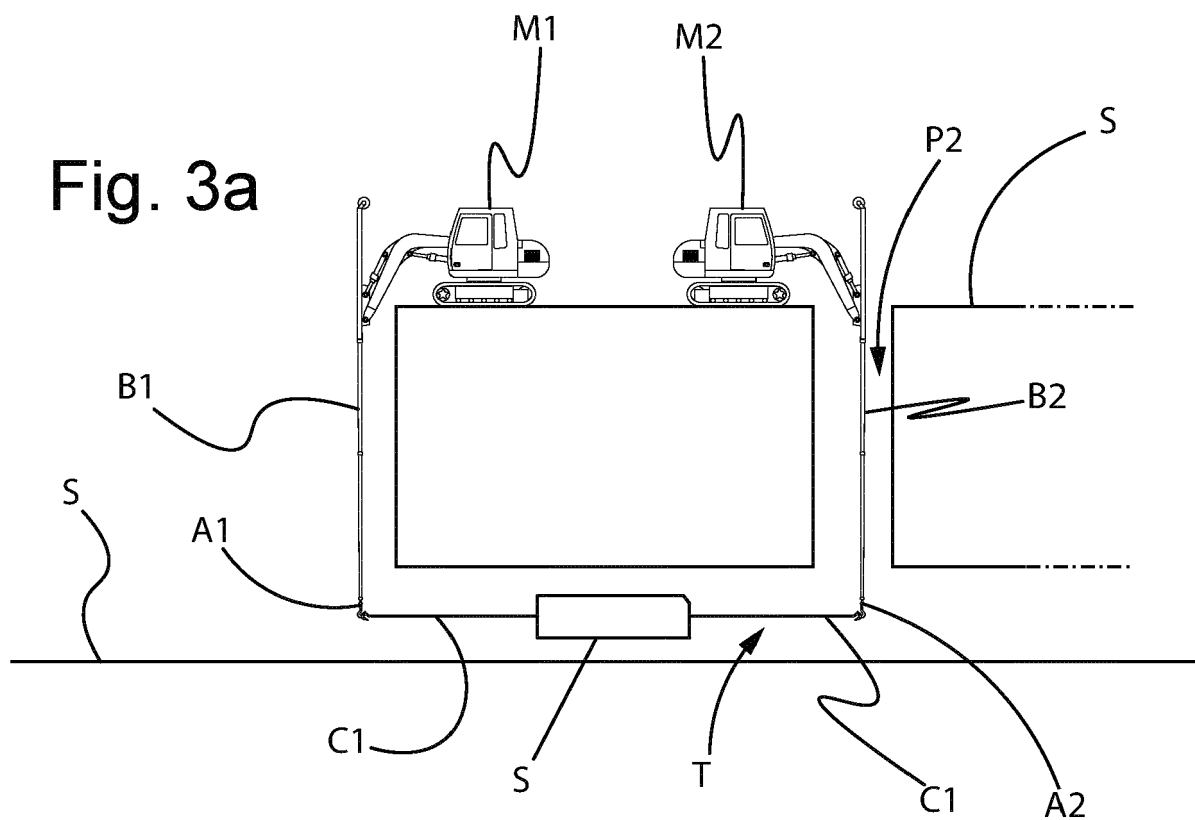


Fig. 3a





EUROPEAN SEARCH REPORT

Application Number
EP 21 18 7029

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 494 437 B1 (BOYER MARK L [US]) 17 December 2002 (2002-12-17) * column 4, line 66 - column 5, line 47 * * column 5, line 56 - line 62; figures 7,8,9,12,13 *	1-7	INV. E02F3/90 E02F3/92 E02F5/28 E02F9/00 E03F9/00 B08B9/043
A	US 5 639 312 A (RUFOL PAUL G [US]) 17 June 1997 (1997-06-17) * figure 4 *	1	
A	US 4 309 128 A (WILLIAMS RICHARD L) 5 January 1982 (1982-01-05) * figure 1 *	1	
A	US 4 337 096 A (CLIFFORD JACK R) 29 June 1982 (1982-06-29) * figure 1 *	1	
A	KR 2011 0045793 A (-) 4 May 2011 (2011-05-04) * figures 1,7 *	1	
A	KR 101 387 699 B1 (HANBITTECH ONE CO LTD [KR]) 21 April 2014 (2014-04-21) * figure 1 *	1	TECHNICAL FIELDS SEARCHED (IPC) E02F E03F B08B F16L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 17 November 2021	Examiner Papadimitriou, S
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

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

EP 21 18 7029

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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
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6494437 B1	17-12-2002	NONE	
US 5639312 A	17-06-1997	AT 142914 T CA 2106403 A1 DE 69213927 T2 EP 0570576 A1 US 5444887 A US 5639312 A WO 9310919 A1	15-10-1996 05-06-1993 10-04-1997 24-11-1993 29-08-1995 17-06-1997 10-06-1993
US 4309128 A	05-01-1982	NONE	
US 4337096 A	29-06-1982	CA 1161607 A EP 0044080 A2 US 4337096 A	07-02-1984 20-01-1982 29-06-1982
KR 20110045793 A	04-05-2011	NONE	
KR 101387699 B1	21-04-2014	NONE	

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EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20110308552 A [0004]