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(71) Applicant: **Sjorstechniek B.V.**
1353 LV Almere (NL)

(72) Inventor: **TOETER, George**
1353 LV Almere (NL)

(74) Representative: **Plaggenborg, Menko Bernard**
Octrooibureau Novopatent
Top Tower, 6th Floor
Busplein 36
1315 KV Almere (NL)

(54) **A STORM DRAIN AND A CONTAINER FOR USE THEREIN**

(57) The invention relates to a storm drain comprising a box-like construction (2) with walls (3), a top side of said box-like construction comprising an opening for receiving rain water and a bottom side comprising a connection to a sewer (16) for discharging said rain water. The storm drain further comprises a container (5) inside said box-like construction, said container having a bottom (6) and walls (7) extending from said bottom towards an at least partly open upper side, and said container having coupling means for coupling said container to said box-like construction; wherein the wall at the container's upper side is positioned near the box-like construction so as to receive rain water in said container; and said container further having an opening (14) in its wall at a position between the bottom and the upper side for discharging rain water to the sewer.

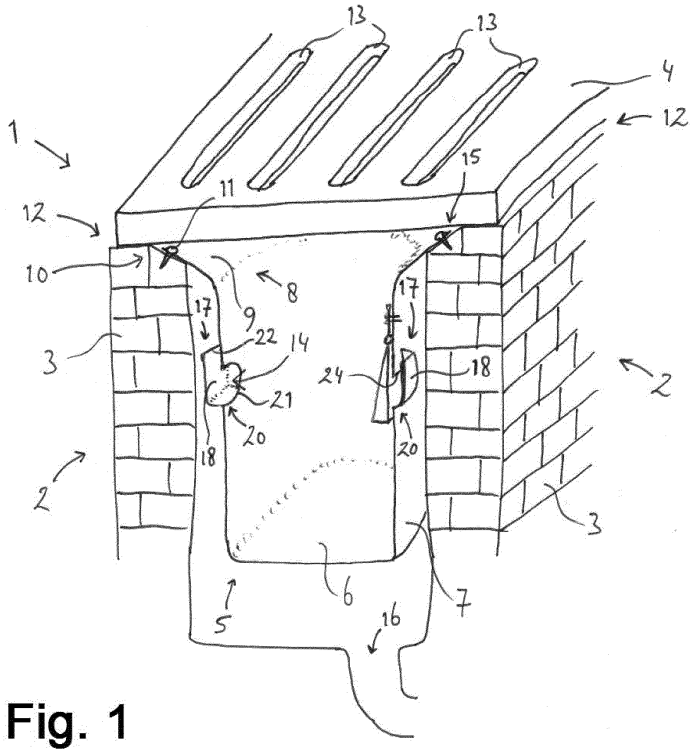

Fig. 1

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Description

[0001] The present invention relates to a renovated storm drain according to the preamble of claim 1. The invention furthermore relates to an add-on for use in such renovated storm drain.

[0002] It is known in the art to drain water from streets through so-called storm drains, which are usually provided at the sides of the streets. These storm drains end up in sewers so as to ensure a proper discharge of water.

[0003] Known storm drains mainly consist of a box-like construction with a connection at its bottom side providing a connection with the sewer and with an open top side, covered by an apertured lid allowing water to enter the said construction. When it is raining the water will enter the box-like construction and head straight for the sewer. A disadvantage of this construction is that debris entering the storm drain with the rain water directly flows to the sewer, leading to obstructions. As a consequence, the sewer becomes clogged leading to flooded streets.

[0004] Due to the storm drain's construction, there is no solution at present.

[0005] The invention aims at providing an improvement in re storm drains.

[0006] The invention further aims at providing a solution for the problems mentioned above.

[0007] The invention further aims at providing an improved storm drain that prevents clogging of the sewer.

[0008] So as to obtain at least one of the above mentioned aims, the invention provides a renovated storm drain as mentioned in claim 1. This storm drain has the advantage that debris cannot reach the sewer such that clogging thereof is efficiently prevented.

[0009] It has also shown that the renovated storm drain according to the present invention increases useful life of the original storm drain immensely. Since most part of the original box-like construction, after placing the add-on, is not anymore in contact with rain water, light and debris, there will be substantially no further deterioration of the original box-like construction, commonly a brick wall. Such synergistic effect is a surprising and advantageous effect.

[0010] It is preferred in the renovated storm drain according to the invention that said it comprises a box-like construction with straight or curved walls, a top side of said box-like construction comprising an opening for receiving rain water and a bottom side comprising a connection to a sewer for discharging said rain water; wherein the renovated storm drain is characterized in that it comprises a container inside said box-like construction, said container having a bottom and walls extending from said bottom towards an at least partly open upper side, and said container having coupling means for coupling said container to said box-like construction; wherein the wall at the container's upper side is positioned near the box-like construction so as to receive rain water in said container; said container further having an opening in its wall at a position between the bottom and the upper side for discharging rain water to the sewer. Commonly, the box-like construction is made of a couple of brick walls or concrete preforms. The box-like construction is open at its upper side so as to allow rain water to enter the storm drain and has a connection to a sewer at its bottom. As a consequence, the box-like construction only serves as receptacle for rainwater and debris that is carried along with the rainwater. The container efficiently prevents debris entering the sewer.

[0011] Preferably, the box-like construction has a shoulder and said container is embodied for being carried on said shoulder. The shoulder provides an efficient and strong carrying member. The shoulder may be embodied by the walls of the box-like construction, for example the brick wall. In that respect, the wall of the box-like construction may be provided with a recess or a bevelled upper edge. The shoulder may be provided at a position near the top side of the storm drain, close to or substantially at street level, but may be closer to the connection to the sewer. However, a more stable embodiment is obtained when the shoulder is at a position close to or substantially at street level. The term "street level" relates to a position of the street of ground the storm drain is installed.

[0012] Therefore, according to a preferred embodiment, said box-like construction has a shoulder near its top side for carrying the container, the container further having a flange protruding sideways with respect to the container's wall for being carried on said shoulder. The flange may be provided continuously around the container's circumference, but the flange may alternatively be embodied as a series of separate lugs projecting from the container's wall.

[0013] A more secure installation is obtained when said container, preferably said container's upper side, has coupling means for rigidly coupling said container to said box-like construction. These may for example consist of self-tapping screws.

[0014] So as to optimally guide rainwater from the street, or other surroundings of the storm drain, into the container, it is preferred that the container has an opening at its upper side that substantially coincides with the opening of said box-like construction. From the outside of the storm drain, the insertion of the container in the original storm drain then is virtually invisible which provides aesthetic advantage.

[0015] On the other hand, it may be advantageous to indicate from the outside, i.e. for people passing by on street level, that a storm drain has been renovated. A very efficient way to indicate that a storm drain had been renovated is to provide the container with a lid at its top side. The said lid replaces the original lid of the original storm drain and most preferably has a characterizing appearance. Therefore the invention also relates to a renovated storm drain wherein an apertured lid is provided at the container's upper side for closing off the opening to the storm drain against debris and allowing rain water to pass. The lid provided at the container's top side is at

the same level as the original storm drain's lid.

[0016] In this respect and more in particular, it is preferred that a part of the container's upper side substantially abuts the box-like construction so as to receive rain water in said container.

[0017] An optimum drainage of rainwater is obtained when the opening in the container's side wall has a throughput of at least 20 l/min, preferably at least 30 l/min, more preferably at least 40 l/min. If such would not be sufficient, for example in hilly regions, two openings may be provided in the container's side wall so as to increase maximum throughput.

[0018] A disadvantage of the original storm drain is the direct link with the sewer. As a consequence, malodors from the sewer may reach street level through the storm drain. The renovated storm drain according to the present invention may provide an easy solution by installing a water trap at the opening in the container's side wall. To that end, in a preferred embodiment, the renovated storm drain according to the present invention is characterized by the opening in the container's wall having a bottom edge substantially directed towards the container's bottom, circumferential edges substantially directed in a circumferential direction and an upper edge substantially directed towards the container's upper side; wherein the opening in the container's wall is covered by a cover plate at at least an outside of the wall, said cover plate being positioned at a distance from said wall for allowing water to flow through said opening and wherein a gap between said cover plate and said wall is sealed by a spacer wall at the bottom edge and at the circumferential edges, with the proviso that the upper edge of the cover plate is positioned closer to the upper side of the container than the upper edge of the opening. An advantage of such embodiment is that only little space is required for obtaining a high throughput.

[0019] A further protection against dirt and debris entering the sewer is obtained by positioning a valve at the opening in the container's side wall. Preferably, the renovated storm drain, more in particular the container, is embodied wherein the opening in the container's wall at the inside of the container is covered by a closing valve, said closing valve being rotatable around an axis for providing access to the opening and substantially closing of said opening.

[0020] Therefore, according to another aspect, the present invention also relates to a container for use in a renovated storm drain with a box-like construction according to the invention, said container having a bottom and walls extending from said bottom towards an at least partly open upper side, and said container having coupling means for coupling said container to said box-like construction; said container further having an opening in its wall at a position between the bottom and the upper side for discharging rain water from said container. Such container may be positioned in an existing storm drain, providing the advantages and reaching the goals that were mentioned above.

[0021] Hereafter, preferred embodiments are given, providing the advantages as mentioned above with respect to the renovated storm drain according to the invention and comprising analogous features.

[0022] Preferably, in the container an apertured lid is provided at the container's upper side for closing off the container against debris and allowing rain water to pass into said container.

[0023] According to a further preferred embodiment, the opening in the container's wall having a bottom edge substantially directed towards the container's bottom, circumferential edges substantially directed in a circumferential direction and an upper edge substantially directed towards the container's upper side; wherein the opening in the container's wall is covered by a cover plate at at least an outside of the wall, said cover plate being positioned at a distance from said wall for allowing water to flow through said opening and wherein a gap between said cover plate and said wall is sealed by a spacer wall at the bottom edge and at the circumferential edges, with the proviso that the upper edge of the cover plate is positioned closer to the upper side of the container than the upper edge of the opening.

[0024] According to a still further preferred embodiment, the opening in the container's wall at the inside of the container is covered by a closing valve, said closing valve being rotatable around an axis for providing access to the opening and substantially closing of said opening.

[0025] An example of such valve for incorporation in the present renovated storm drain or container is described in European patent applications EP16175363 and EP16175361.

[0026] The renovated storm drain and container according to the present invention may also be provided with a device for the release of amphibians from the container, as mentioned in European patent application EP16175362.

[0027] Hereafter, the invention will be further described by means of a drawing. The drawing shows in:

Fig. 1 a perspective schematic cross section through a renovated storm drain according to the invention,
Fig. 2 a schematic cross section of a container for use in the present invention, and
Fig. 3 another schematic cross section of a container for use in the present invention.

[0028] The same and similar parts and features have been denoted by the same reference numerals in the figures. However, for ease of understanding the figures, not all parts that are required for a practical embodiment have been shown in the figures.

[0029] Fig. 1 shows a perspective schematic cross section through a renovated storm drain 1 according to the invention. The renovated storm drain 1 comprises a box-like construction 2, made of brick walls 3. A lid 4 or other type of cover is positioned on top of the box-like construction 2 and covers the box-like construction 2,

preventing people, animals and large parts of debris of falling into the said storm drain 1. A container 5 is placed inside the box-like construction 2. The container 5 has a bottom 6 and a wall 7 extending from said bottom 6. At a top side 8 of the container 5, a protruding element 9 is provided, such that the container 5 suspends from an upper edge 10 of the brick wall 3. As a precautionary measure, screws 11 may be provided for securing the container 5 to the box-like construction 2. As can be seen from the figure, the top side 8 of the container 5, at its circumference 15, substantially coincides with the top side 12 of the box-like construction 2, and therefore any rainwater flowing through openings 13 in the cover 4 will end up in the container 5 instead of directly flowing into a gap between the container 5 and the walls 3.

[0030] Rainwater will be gathered in the container 5. Discharge of the rainwater is provided by means of an opening 14 in the wall 7 of the container 5. Preferably, the opening 14 is substantially identical to or larger than a connection 16 leading to a sewer for discharging the rain water. For then, no obstruction in the water flow is obtained in the container 5.

[0031] Fig. 2 indicates an exemplary embodiment of a container 5. A water trap 17 is provided at opening 14, so as to prevent any malodors from the sewer to reach street level. The water trap 17 comprises a cover plate 18 at a distance from the wall 7, said cover plate 18 being positioned at a distance from said wall 7 for allowing rain water to flow through said opening and wherein a gap between said cover plate 18 and said wall 7 is sealed by a spacer wall 19 at a bottom edge 20 and at circumferential edges 21. As a matter of fact, an upper edge 22 of the cover plate 18 is positioned closer to an upper side 23 of the container 5 than an upper edge 24 of the opening 14.

[0032] In Fig. 3 another embodiment of the container 5 is provided. A valve 25 is provided (also shown in Fig. 2) comprising an odor protection as described in European patent application EP 16175363. Such valve also provides the advantage that no debris will reach the opening 14, efficiently providing protection against clogging of the sewer. A continuous flow path is obtained through a valve opening 26 at a bottom side 27 of said valve 25. Said valve opening 26 is positioned below water level 28, efficiently closing off the opening 14 in the container's wall 7 against malodor from the sewer.

[0033] The invention is not limited to the embodiments as mentioned above and as shown in the drawings. The invention is limited by the claims only.

[0034] The invention also relates to all combinations of features described here independently of each other.

Claims

1. A renovated storm drain comprising a box-like construction with straight or curved walls, a top side of said box-like construction comprising an opening for receiving rain water and a bottom side comprising a connection to a sewer for discharging said rain water; **characterized in that** the renovated storm drain comprises a container inside said box-like construction, said container having a bottom and walls extending from said bottom towards an at least partly open upper side, and said container having coupling means for coupling said container to said box-like construction; wherein the wall at the container's upper side is positioned near the box-like construction so as to receive rain water in said container;
said container further having an opening in its wall at a position between the bottom and the upper side for discharging rain water to the sewer.

2. A renovated storm drain according to claim 1, wherein said box-like construction has a shoulder and said container is embodied for being carried on said shoulder.

3. A renovated storm drain according to claim 2, said box-like construction having a shoulder near its top side for carrying the container, the container having a flange protruding sideways with respect to the container's wall for being carried on said shoulder.

4. A renovated storm drain according to claim 1, wherein said container has coupling means for rigidly coupling said container to said box-like construction.

5. A renovated storm drain according to claim 1, wherein said container has an opening at its upper side that substantially coincides with the opening of said box-like construction.

6. A renovated storm drain according to claim 1, wherein an apertured lid is provided at the container's upper side for closing off the opening to the storm drain against debris and allowing rain water to pass.

7. A renovated storm drain according to claim 1, wherein a part of the container's upper side substantially abuts the box-like construction so as to receive rain water in said container.

8. A renovated storm drain according to claim 1, wherein the opening in the container's side wall has a throughput of at least 20 l/min, preferably at least 30 l/min, more preferably at least 40 l/min.

9. A renovated storm drain according to claim 1, the opening in the container's wall having a bottom edge substantially directed towards the container's bottom, circumferential edges substantially directed in a circumferential direction and an upper edge substantially directed towards the container's upper side;
wherein the opening in the container's wall is cov-

ered by a cover plate at at least an outside of the wall, said cover plate being positioned at a distance from said wall for allowing water to flow through said opening and wherein a gap between said cover plate and said wall is sealed by a spacer wall at the bottom edge and at the circumferential edges, with the proviso that the upper edge of the cover plate is positioned closer to the upper side of the container than the upper edge of the opening.

10. A renovated storm drain according to claim 1, wherein the opening in the container's wall at the inside of the container is covered by a closing valve, said closing valve being rotatable around an axis for providing access to the opening and substantially closing of said opening.

11. A container for use in a renovated storm drain with a box-like construction according to claim 1, said container having a bottom and walls extending from said bottom towards an at least partly open upper side, and said container having coupling means for coupling said container to said box-like construction; said container further having an opening in its wall at a position between the bottom and the upper side for discharging rain water from said container.

12. A container according to claim 11, wherein an apertured lid is provided at the container's upper side for closing off the container against debris and allowing rain water to pass into said container.

13. A container according to claim 11, the opening in the container's wall having a bottom edge substantially directed towards the container's bottom, circumferential edges substantially directed in a circumferential direction and an upper edge substantially directed towards the container's upper side;
wherein the opening in the container's wall is covered by a cover plate at at least an outside of the wall, said cover plate being positioned at a distance from said wall for allowing water to flow through said opening and wherein a gap between said cover plate and said wall is sealed by a spacer wall at the bottom edge and at the circumferential edges, with the proviso that the upper edge of the cover plate is positioned closer to the upper side of the container than the upper edge of the opening.

14. A container according to claim 11, wherein the opening in the container's wall at the inside of the container is covered by a closing valve, said closing valve being rotatable around an axis for providing access to the opening and substantially closing of said opening.

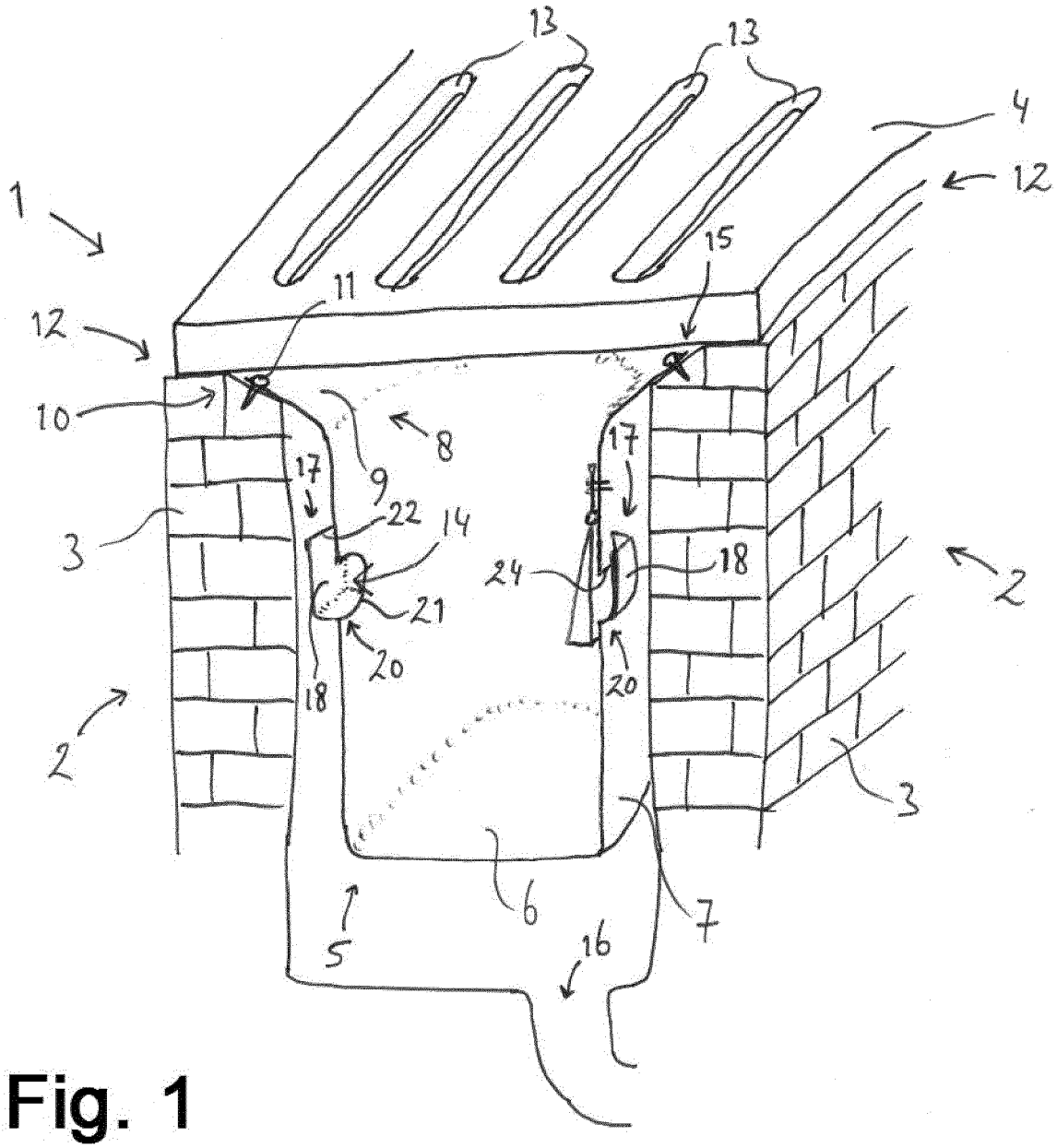

Fig. 1

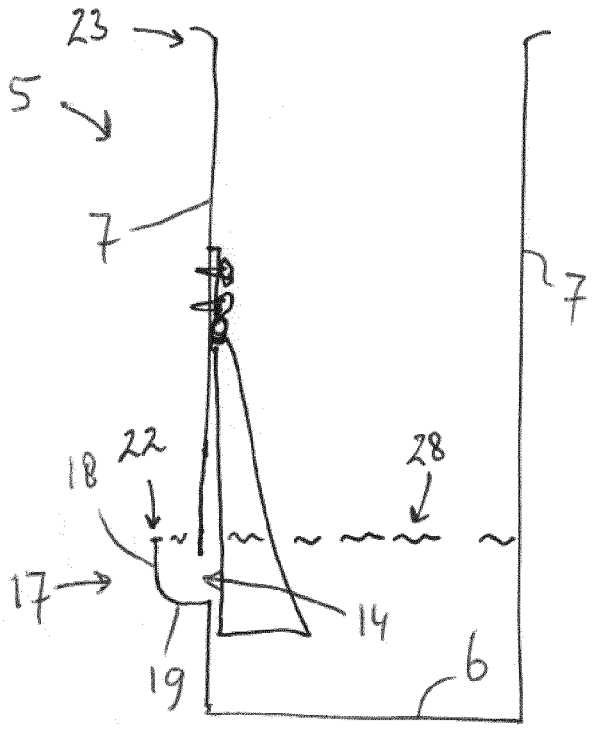

Fig. 2

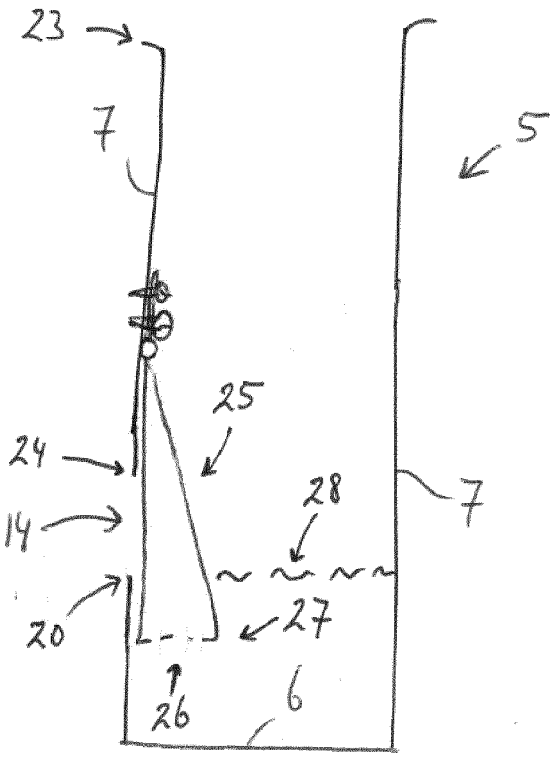

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 16 17 9361

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 Y	DE 20 2013 007533 U1 (WILLMES THEO [DE]) 18 October 2013 (2013-10-18) * the whole document *	1-8,11, 12 9,10,13, 14	INV. E03F5/04
X	US 2 586 967 A (LUNDY SR CHARLES W) 26 February 1952 (1952-02-26) * the whole document *	1-8,11, 12	
Y	DE 81 984 C (C. BEHN) 20 September 1894 (1894-09-20) * figures 2,5 *	9,10,13, 14	
Y	DE 841 575 C (TELLER HANS) 16 June 1952 (1952-06-16) * figure 7 *	10,14	
			TECHNICAL FIELDS SEARCHED (IPC) E03F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	11 January 2017	Geisenhofer, Michael

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 16 17 9361

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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11-01-2017

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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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

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- EP 16175361 A **[0025]**
- EP 16175362 A **[0026]**