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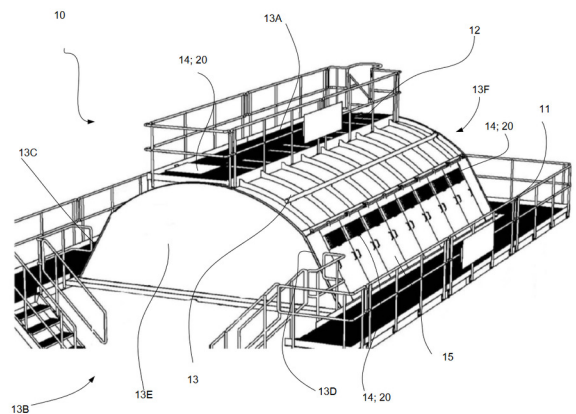
(54) Keksinnön nimitys - Uppfinningens benämning - Title of the invention
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CN 215804162 U, TW M560944 U, CN 214808998 U, US 2018369724 A1

(57) Tiivistelmä - Sammandrag - Abstract

Keksinnön kohteena on kiekkosuodatin, joka kiekkosuodatin (10) käsittää huuvan (13), joka käsittää seinämiä (13A, 13C, 13D, 13E, 13F), joka huuva (13) käsittää ainakin yhden tarkastusaukon (14) ainakin yhdessä seinämistä (13A, 13C, 13D, 13E, 13F), joka kiekkosuodatin (10) käsittää ainakin yhden tarkastusluukkukokoonpanon (20), joka käsittää kannen (21) ja turvallisuuselementin (22), joka tarkastusluukkukokoonpano (20) on konfiguroitu avattavasti peittämään tarkastusaukon (14). Kansi (21) on siirrettävä liukuvalla liikkeellä tarkastusaukon (14) avaamiseksi kiekkosuodattimen (10) sisäpuolen visuaaliseksi tarkastamiseksi. Turvallisuuselementti (22) on läpinäkyvä turvallisuuselementti (22) ja turvallisuuselementti (22) on sijoitettu kiekkosuodattimen (10) huuvan (13) vastaavalla seinämällä (13A, 13C, 13D, 13E, 13F) ulompaan positioon suhteessa tarkastuskanteen (21).

The invention relates to a disc, which disc filter (10) comprises a hood (13) comprising walls (13A, 13C, 13D, 13E, 13F), which hood (13) comprises at least one inspection opening (14) in at least one of the walls (13A, 13C, 13D, 13E, 13F), which disc filter (10) comprises at least one inspection cover assembly (20) comprising a cover (21) and a safety element (22), which inspection cover assembly (20) is openably configured to cover the inspection opening (14). The cover (21) is movable in a sliding movement to open the inspection opening (14) for visual inspection of inside of the disc filter (10). The safety element (22) is a see-through safety element (22) and the safety element (22) is located in an outer position in relation of the inspection cover (21) on the respective wall (13A, 13C, 13D, 13E, 13F) of the hood (13) of the disc filter (10).



Disc filterTechnical field

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The present invention relates to filter sectors for filtering fluid and solid mixtures, especially in connection with pulp and fiber web production. More especially the invention relates to a disc filter according to the preamble part of claim 1.

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Background

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As known from the prior art in fiber web machines, especially in paper and board machines, the fiber web is produced and treated in an assembly formed by a number of apparatuses arranged consecutively in a process line. A typical production and treatment line comprises a forming section comprising a head box and a forming unit and a press section as well as a subsequent drying section and a reel-up. The production and treatment line can further comprise other devices and sections for finishing the fiber web, for example, a size press, a calender, a coating section. The production and treatment line also comprises typically at least one winder for forming customer rolls as well as a roll packaging apparatus.

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Before the head box fiber suspensions comprising recycled and/or virgin fibers are treated to be fed into the head box to be used to produce the fiber webs. A treatment system of the pulp suspensions for example comprises a pulping section, a deashing system, a detashing system, a coarse filtering section, a centrifugal cleaning section, a fractionation section, a fine filtering system, a fiber thickening system and fiber refining systems.

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It is known from prior art that different types of disc filters are used to separate liquid from the fiber suspensions. A disc filter typically comprises a hood, inside of which the disc filter comprises, in a vat, a fiber suspension containing a bath, and a rotatable horizontal axis, and a plurality of filter discs, spaced along the axis, supported on the axis or on a core assembly constructed on the axis.

The disc filters are well-known in the art. In view of operation of a fiber web production line operation of the disc filter as desired, is one of the key factors, the disc filter being one of the most important equipment for producing the pulp to the head box of the fiber web production line. In case the disc filter does not operate as required significant losses in production of the fiber web may be caused. During operation of the disc filters disturbances and/or malfunctions in operation of the disc filter may occur, for example some filter discs might get plugged or fibers of the fiber suspension may accumulate on the inner surfaces of the vat or fiber suspension flow inside may not be as desired. Thus, for purposes of checking, whether disturbances and/or malfunctions occur in the disc filter, as well as for checking if any maintenance is needed, the hood of the disc filter is in present day constructions provided with openable inspection covers for allowing visual inspecting of the filter discs and of the operation of the disc filter. The inspection covers are typically located on longitudinal sides of the hood, as well as on top of the hood. The inspection cover is typically constructed as a hinged door, which provide the openability of the inspection cover, when inspection needed. During other times, the inspection covers are closed to prevent process steams and/or suspensions to splash outside the disc filter. Now a days, for safety reasons the inspection cover assembly also typically, comprises a grid provided to cover the opening behind the inspection cover. Thus, the grid is located inside the hood surface, in respect of the inspection cover located on the hood surface. This grid provides safety of the inspecting person preventing the person performing the inspection to put hand or any other part of the body inside the hood via the inspection opening when the inspection cover is open for inspection. Thus, safety is provided, but it has turned out that the grid provides a structure on which the fibers of the fiber suspension easily attach and accumulate and thus, create fiber accumulations. These fiber accumulations may cause disturbances in the operation of the disc filter, as well as in following treatments of the fiber web production line and/or equipment preceding it, for example when the fiber accumulations detach and drop into the fiber suspension. In particular, the fiber accumulations may provide a non-wanted substrate for bacteria growth. In particular in cases, where the fiber suspension treated in the disc filter will be used for production of food boards, even an eventual health risk for consumers is to be prevented.

In utility model publication CN215804162U is disclosed a filter with an inspection cover assembly. The filter comprises a rotary filter screen and a

hood having walls, which hood comprises at least one inspection opening in at least one of the walls. The inspection opening is covered openably with an inspection cover assembly comprising an inspection cover and a see-through safety element.

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In utility model publication TWM560944U is disclosed a filter with an inspection cover assembly. The filter comprises a hood comprising walls, which hood comprises at least one inspection opening in at least one of the walls. The filter comprises at least one inspection cover assembly comprising a cover and a safety element transparent, which inspection cover assembly is openably configured to cover the inspection opening.

In utility model publication CN214808998U is disclosed a filter with an inspection cover assembly. The filter comprises a hood comprising walls, which hood comprises at least one inspection opening in at least one of the walls. The filter comprises at least one inspection cover assembly comprising a cover and a safety element, which inspection cover assembly is openably configured to cover the inspection opening.

In patent application publication US2018369724A1 is disclosed a disc filter comprising one or more openable hatches.

An object of the present invention is to create a disc filter, in which the above explained problems are solved or at least minimized.

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In particular, an object of the present invention is to provide a disc filter in which the contradiction between the safety and the on the grid adhering fiber accumulation disadvantages is eliminated or at least minimized.

In particular, an object of the present invention is to provide an improved disc filter with safe inspection covers but without fiber accumulation problems.

Summary

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In order to achieve the above objects and those that will come apparent later the disc filter according to the invention is mainly characterized by the features

of the characterizing part of the independent claim 1. Advantageous aspects and features of the invention are presented in the dependent claims.

5 According to the invention the disc filter comprises a hood comprising walls, which hood comprises at least one inspection opening in at least one of the walls, which disc filter comprises at least one inspection cover assembly comprising a cover and a safety element, which inspection cover assembly is openably configured to cover the inspection opening, wherein the cover is movable in a sliding movement to open the inspection opening for visual
10 inspection of inside of the disc filter, the safety element is a see-through safety element and the safety element is located in an outer position in relation of the cover on the respective wall of the hood of the disc filter.

15 According to an advantageous feature of the invention the hood of the disc filter comprises at least one door on at least one of the walls of the hood and the inspection opening and the respective inspection cover assembly is located on the door. The hood of the disc filter is provided with at least one door, typically several doors, providing access for replacing filter discs and/or filter segments of filter discs, for example in cases where one or more filter
20 discs are damaged.

According to an advantageous feature of the invention the disc filter comprises several inspection openings and respective inspection cover assemblies.

25 According to an advantageous feature of the invention the walls of the hood of the disc filter comprise a top wall and two side walls and the top wall and the side walls comprise several inspection openings and respective inspection cover assemblies.

30 According to an advantageous feature of the invention the walls of the hood of the disc filter comprise a top wall and two side walls, the side walls comprise doors and at least one of the doors comprises an inspection opening and a respective inspection cover assembly.

35 According to the invention the see-through safety element is made of a grid.

According to an advantageous feature of the invention for the sliding movement of the cover the respective wall of the hood of the disc filter is provided with a sliding groove or rail.

- 5 According to an advantageous feature of the invention the sliding movement of the cover the door is provided with a sliding groove or rail.

According to an advantageous feature of the invention the wall comprising the inspection opening is provided with a recess for closed position of the cover of
10 the inspection cover assembly.

According to an advantageous feature of the invention around the hood of the disc filter (and/or on top of the hood of the disc filter maintenance platforms are provided.
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The term "fiber suspensions" means liquids and suspensions, which contain at least fibers and liquid and possible other occurring ingredients. The fibers mean cellulose fibers, recycled and/or newly produced, i.e. virgin, cellulose fibers. In this description and the claims terms "top", "bottom", "side" etc. are
20 to be interpreted in view of the disc filter in its typical operating position.

By the disc filter according to the invention and its advantageous features many advantages are achieved: the inspection cover assembly provides safety of the inspecting personnel as well as eliminates or at least minimizes the
25 adherence and accumulation fibers inside the inspection cover assembly and thus, prevents bacteria growth inside the disc filter providing safe production of food boards and thus, safety of consumers. The inspection cover assembly is simple and unique.

30 The exemplifying embodiments of the invention presented in this patent application are not to be interpreted to pose limitations to the applicability of the appended claims. The verb "to comprise" and its derivatives are used in this patent application as an open limitation that does not exclude the existence of also unrecited features. The features described hereinafter are mutually
35 freely combinable unless explicitly stated otherwise.

Brief description of the drawings

Aspects of the invention, however, together with additional objects and advantages thereof, will be best understood from the following description of some example embodiments when read in connection with the accompanying drawings and in the following the invention is described in more detail referring to the accompanying drawing, in which

In figure 1 is schematically shown an advantageous example of a disc filter as an outside view, and

In figures 2A-2B is very schematically shown an advantageous example of an inspection cover assembly of a disc filter according to the invention.

Detailed description

During the course of this description like numbers and signs will be used to identify like elements according to the different views which illustrate the invention. Repetition of some reference signs may have been omitted in the figures for clarity reasons.

In figure 1 is shown a disc filter 10 seen from the outside. A disc filter 10 comprises a hood 13, inside of which the disc filter 10 comprises, in a vat formed by the hood 13, a fiber suspension containing a bath, and a horizontal axis, and a plurality of filter discs, spaced along the axis and supported thereon. The hood 13 has a cylindrical shape with two longitudinal side walls 13C, 13D and a top wall 13A and a bottom structure 13B. The hood 13 also has end walls 13E, 13F closing the inner space of the disc filter 10. Around the hood 13 of the disc filter 10 and on top of the hood 13 of the disc filter 10 maintenance platforms 11, 12 are provided to ease access of the operating and/or maintenance personnel to the disc filter 10. The disc filter 10 comprises openable and typically lockable doors 15 at least on longitudinal sides of the disc filter 10 to provide access inside the disc filter 10 during maintenance breaks, for example for replacing filter discs and/or filter segments of filter discs, when one or more filter discs are damaged.

The doors 15 and/or the walls 13A, 13C, 13D, 13E, 13F, typically the top wall 13A and the side walls 13C, 13D, of the disc filter 10 have inspection openings 14 with inspection cover assemblies 20 for operating and/or maintenance personnel to check, whether disturbances and/or malfunctions occur in the operation of the disc filter.

In figures 2A-2B is shown in more detail an advantageous example of an inspection cover assembly 20 to cover an inspection opening 14, located on a door 15 of a disc filter 10 (fig. 1). Inspection cover assemblies 20 can also be located on any wall 13A, 13C, 13D, 13E, 13F of the hood 13 (fig. 1) of the disc filter 10, typically on the top wall 13A and the side walls 13C, 13D. Typically, several inspection cover assemblies 20 are located on the doors 15 located on the longitudinal sides of the hood 13 of the disc filter 10 and on the top wall 13A of the hood 13 of the disc filter 10, as shown in figure 1. The inspection cover assembly 20 comprises a cover 21, which is slidable, to reveal the inspection opening 14 to provide possibility of visual inspection. The cover 21 is thus opened in a sliding manner. The cover 21 in the example of the figures 2A-2B is opened by a downward sliding movement but the cover 21 can also have the sliding movement upwards or sideways as desired in view of space requirements and location of the inspection cover assembly 20. In the figure 2A the cover 21 is in closed position and in the figure 2B the cover 21 is in opened position. Thus, the cover 21 has the sliding movement between the closed and the opened position or vice versa and it can also be stopped in a position between the closed and the opened position. For the sliding movement of the cover the respective wall 13A, 13C, 13D, 13E, 13F or door 15 of the hood 13 of the disc filter 10 can be provided with a sliding groove or rail. Further, the inspection opening 14 in the respective wall 13A, 13C, 13D, 13E, 13F or door 15 of the hood 13 of the disc filter 10 can be provided with a recess for closed position of the cover 21 of the inspection cover assembly 20 to locate the cover 21 tightly closing the inspection opening 14. The cover 21 may also comprise a handle 23 to ease the opening and the closing of the cover 21.

The inspection cover assembly 20 further comprises a see-through safety element 22 to provide safety for the inspecting person preventing the person performing the inspection to put hand or any other part of the body inside the hood 13 of the disc filter 10 via the inspection opening 14, when the cover 21

is in the opened position for inspection. In the inspection cover assembly 20 the safety element 22 is located in front of the cover 21 in closed position of the cover 21. Thus, in the inspection cover assembly 20 in its position on the door or on the wall 13A, 13C, 13D, 13E, 13F of the hood 13 of the disc filter 10, from inside of the hood 13 first the cover 21 is located and outside therefrom the safety element 22 is located. This also provides additional distance between the safety element 22 and the rotating discs of the disc filter. The safety element 22 can be made of any see-through material, of transparent glass material or of transparent plastic material or of transparent composite material or of a grid-type material. Preferably, the safety element 22 is a grid, more preferably a metal grid, as shown in the figures 2A-2B. This provides further that occasionally when inside of the disc filter 10 needs cleansing, a hose can be put through a grid hole of the safety element grid to provide cleansing fluid inside the hood 13 of the disc filter 10. The inspection cover assembly 20 according to the invention provides openability for purposes of visual checking, whether disturbances and/or malfunctions occur in the disc filter 10, as well as for checking if any maintenance is needed. The cover 21 is constructed as a slidable cover, which provides the openability of the cover 21, when inspection needed. During other operational times, the cover 21 is closed to prevent process steams and/or suspensions to splash outside the disc filter 10 and onto the safety element 22. For safety reasons the inspection cover assembly also comprises the safety element 22, advantageously the safety element grid 22 provided to cover the inspection opening 14 and located in front of i.e. in the outer position in view of, the cover 21. The safety element 22, advantageously the safety element grid 22, provides safety of the inspecting person preventing the person performing the inspection to put hand or any other part of the body inside the hood 13 via the inspection opening 14, when the cover 21 is open for inspection. Thus, safety is provided. The safety element 22, advantageously the safety element grid 22 located in front of i.e. in the outer position in view of, the cover 21 prevents any fibers of the fiber suspension to attach and accumulate and to create fiber accumulations on the safety element 22. Thus, the operation of the disc filter 10, as well as in following treatments of the fiber web production line and/or equipment preceding it, is secured from the disturbing fiber accumulations. In particular, the substrate for bacteria growth is avoided and safe production of food boards is provided and further, health risks of consumers are prevented.

In the description in the foregoing, although some have been described with reference to certain features, those functions may be performable by other features whether described or not. Although features have been described with reference to certain embodiments or examples, those features may also be present in other embodiments or examples whether described or not. Above the invention has been described by referring to some advantageous examples only to which the invention is not to be narrowly limited. Many modifications and alterations are possible within the invention as defined in the following claims.

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Claims

1. Disc filter, which disc filter (10) comprises a hood (13) comprising walls (13A, 13C, 13D, 13E, 13F), which hood (13) comprises at least one inspection opening (14) in at least one of the walls (13A, 13C, 13D, 13E, 13F), which disc filter (10) comprises at least one inspection cover assembly (20) comprising a cover (21) and a safety element (22), which inspection cover assembly (20) is openably configured to cover the inspection opening (14), which cover (21) is movable in a sliding movement to open the inspection opening (14) for visual inspection of inside of the disc filter (10), which safety element (22) is a see-through safety element (22) and which safety element (22) is located in an outer position in relation of the cover (21) on the respective wall (13A, 13C, 13D, 13E, 13F) of the hood (13) of the disc filter (10), **characterized** in that the see-through safety element (22) is made of a grid.
2. Disc filter according to claim 1, **characterized** in that the hood (13) of the disc filter (10) comprises at least one door (15) on at least one of the walls (13A, 13C, 13D, 13E, 13F) of the hood (13) and that the inspection opening (14) and the respective inspection cover assembly (20) is located on the door (15).
3. Disc filter according to claim 1 or 2, **characterized** in that the disc filter (10) comprises several inspection openings (14) and respective inspection cover assemblies (20).
4. Disc filter according to any of the previous claims, **characterized** in that the walls (13A, 13C, 13D, 13E, 13F) of the hood (13) of the disc filter (10) comprise a top wall (13A) and two side walls (13C, 13D) and that the top wall (13A) and the side walls (13C, 13D) comprise several inspection openings (14) and respective inspection cover assemblies (20).
5. Disc filter according to any of the previous claims, **characterized** in that the walls (13A, 13C, 13D, 13E, 13F) of the hood (13) of the disc filter (10) comprise a top wall (13A) and two side walls (13C, 13D), that the side walls (13C, 13D) comprise doors (15) and that at least one of the doors (15) comprises an inspection opening (14) and a respective inspection cover assembly (20).

5 6. Disc filter according to any of the previous claims, **characterized** in that for the sliding movement of the cover (21) the respective wall (13A, 13C, 13D, 13E, 13F) of the hood (13) of the disc filter (10) is provided with a sliding groove or rail.

10 7. Disc filter according to any of the claims 2-6, **characterized** in that for the sliding movement of the cover (21) the door (15) is provided with a sliding groove or rail.

15 8. Disc filter according to any of the previous claims, **characterized** in that, the wall (13A, 13C, 13D, 13E, 13F) comprising the inspection opening (14) is provided with a recess for closed position of the cover (21) of the inspection cover assembly (20).

9. Disc filter according to any of the previous claims, **characterized** in that around the hood (13) of the disc filter (10) and/or on top of the hood (13) of the disc filter (10) maintenance platforms (11, 12) are provided.

Patenttivaatimukset

1. Kiekkosuodatin, joka kiekkosuodatin (10) käsittää huuvan (13), joka käsittää seinämiä (13A, 13C, 13D, 13E, 13F), joka huuva (13) käsittää ainakin yhden tarkastusaukon (14) ainakin yhdessä seinämistä (13A, 13C, 13D, 13E, 13F), joka kiekkosuodatin (10) käsittää ainakin yhden tarkastusluukkukokoonpanon (20), joka käsittää kannen (21) ja turvallisuuselementin (22), joka tarkastusluukkukokoonpano (20) on konfiguroitu avattavasti peittämään tarkastusaukon (14), joka kansi (21) on siirrettävä liukuvalla liikkeellä tarkastusaukon (14) avaamiseksi kiekkosuodattimen (10) sisäpuolen visuaaliseksi tarkastamiseksi, joka turvallisuuselementti (22) on läpinäkyvä turvallisuuselementti (22) ja joka turvallisuuselementti (22) on sijoitettu kiekkosuodattimen (10) huuvan (13) vastaavalla seinämällä (13A, 13C, 13D, 13E, 13F) ulompaan positioon suhteessa kanteen (21), **tunnettu** siitä, että läpinäkyvä turvallisuuselementti (21) on tehty verkosta.

2. Patenttivaatimuksen 1 mukainen kiekkosuodatin, **tunnettu** siitä, että kiekkosuodattimen (10) huuva (13) käsittää ainakin yhden oven (15) ainakin yhdessä huuvan (13) seinämistä (13A, 13C, 13D, 13E, 13F) ja että tarkastusaukko (14) ja vastaava tarkastusluukkukokoonpano (20) on sijoitettu oveen (15).

3. Patenttivaatimuksen 1 tai 2 mukainen kiekkosuodatin, **tunnettu** siitä, että kiekkosuodatin (10) käsittää useita tarkastusaukkoja (14) ja vastaavia tarkastusluukkukokoonpanoja (20).

4. Jonkin edellisen patenttivaatimuksen mukainen kiekkosuodatin, **tunnettu** siitä, että kiekkosuodattimen (10) huuvan (10) seinämät (13A, 13C, 13D, 13E, 13F) käsittävät yläseinämän (13A) ja kaksi sivuseinämää (13C, 13D) ja että yläseinämä (13A) ja sivuseinämät (13C, 13D) käsittävät useita tarkastusaukkoja (14) ja vastaavia tarkastusluukkukokoonpanoja (20).

5. Jonkin edellisen patenttivaatimuksen mukainen kiekkosuodatin, **tunnettu** siitä, että kiekkosuodattimen (10) huuvan (10) seinämät (13A, 13C, 13D, 13E, 13F) käsittävät yläseinämän (13A) ja kaksi sivuseinämää (13C, 13D), ja että

sivuseinämät (13C, 13D) käsittävät ovia (15) ja että ainakin yksi ovista (15) käsittää tarkastusaukon (14) ja vastaavan tarkastusluukkukokoonpanon (20).

6. Jonkin edellisen patenttivaatimuksen mukainen kiekkosuodatin, **tunnettu** siitä, että kannen (21) liukuvaa liikettä varten kiekkosuodattimen (10) huuvan (13) vastaava seinämä (13A, 13C, 13D, 13E, 13F) on varustettu liuku-uralla tai -kiskolla.

7. Jonkin patenttivaatimuksen 2-6 mukainen kiekkosuodatin, **tunnettu** siitä, että kannen (21) liukuvaa liikettä varten ovi (15) on varustettu liuku-uralla tai -kiskolla.

8. Jonkin edellisen patenttivaatimuksen mukainen kiekkosuodatin, **tunnettu** siitä, että seinämä (13A, 13C, 13D, 13E, 13F), joka käsittää tarkastusaukon (14), on varustettu syvennyksellä tarkastusluukkukokoonpanon (20) kannen (21) suljettua asemaa varten.

9. Jonkin edellisen patenttivaatimuksen mukainen kiekkosuodatin, **tunnettu** siitä, että kiekkosuodattimen (10) huuvan (13) ympärille ja/tai yläosaan on järjestetty huoltosiltoja (11, 12).

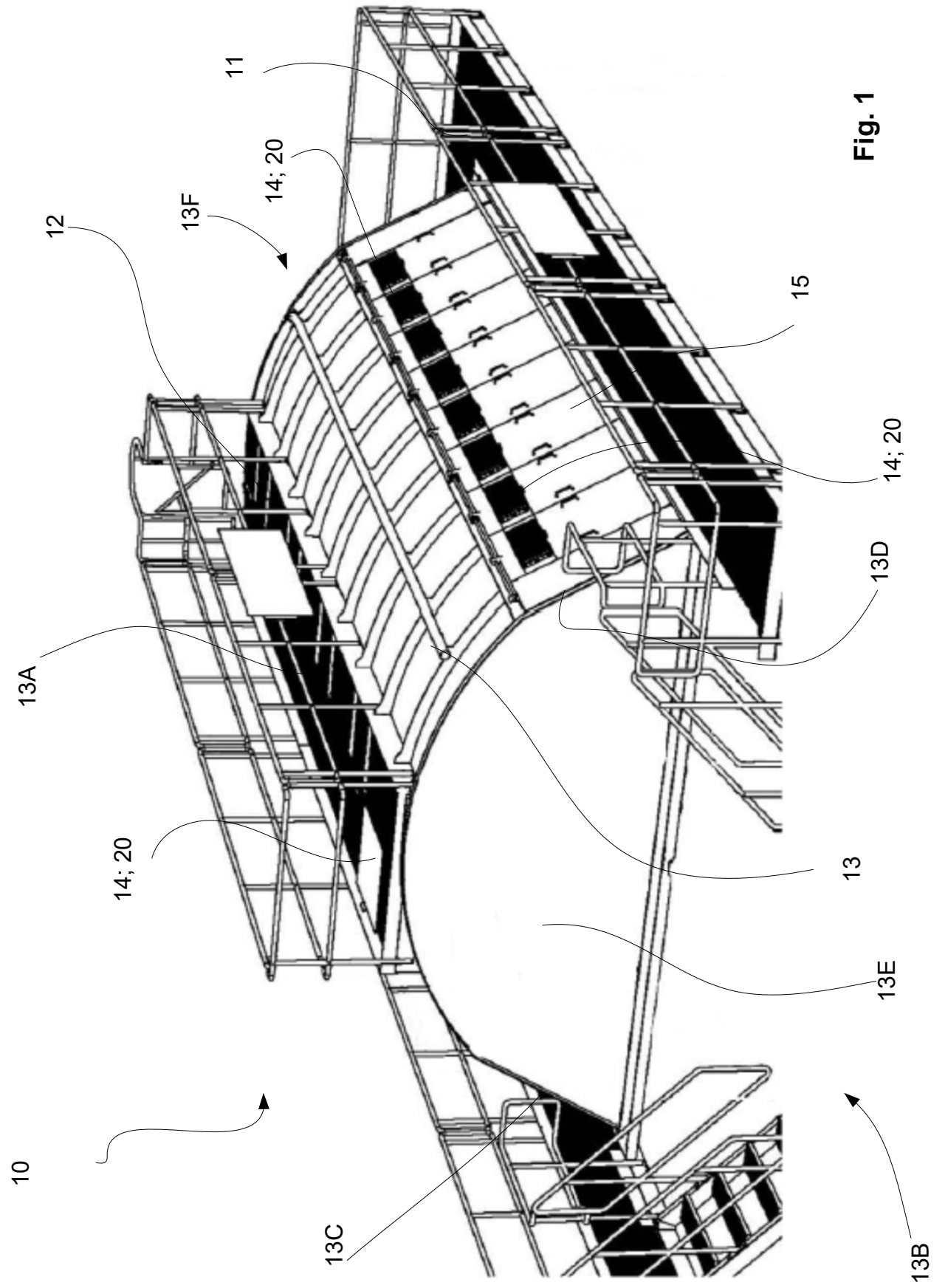


Fig. 1

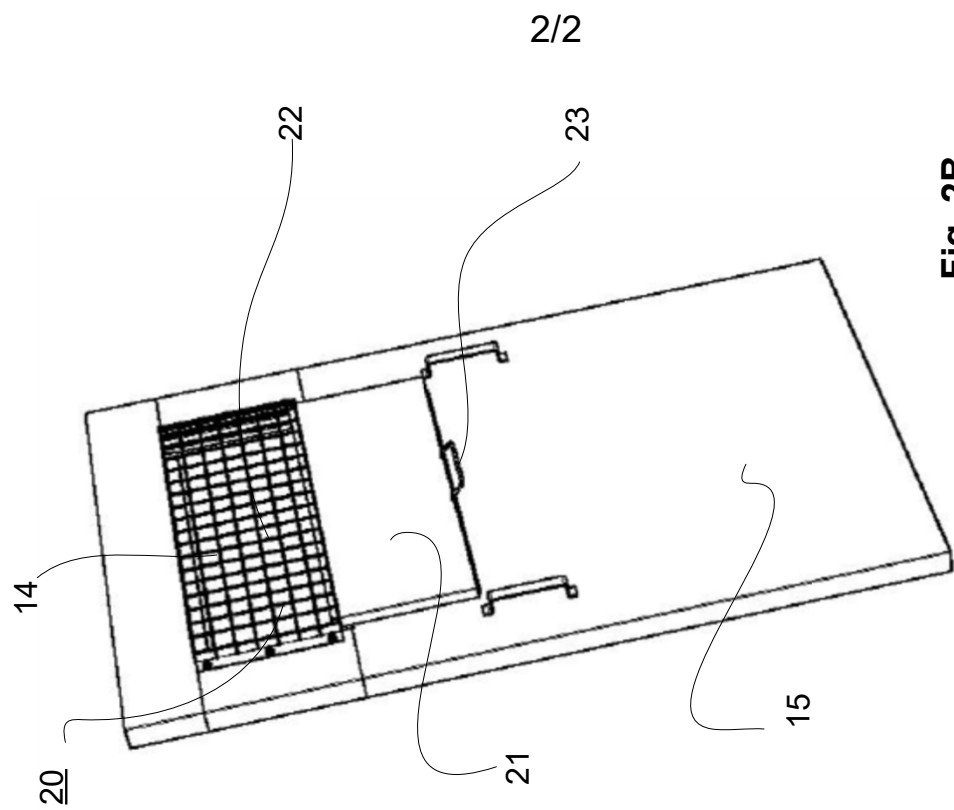


Fig. 2A

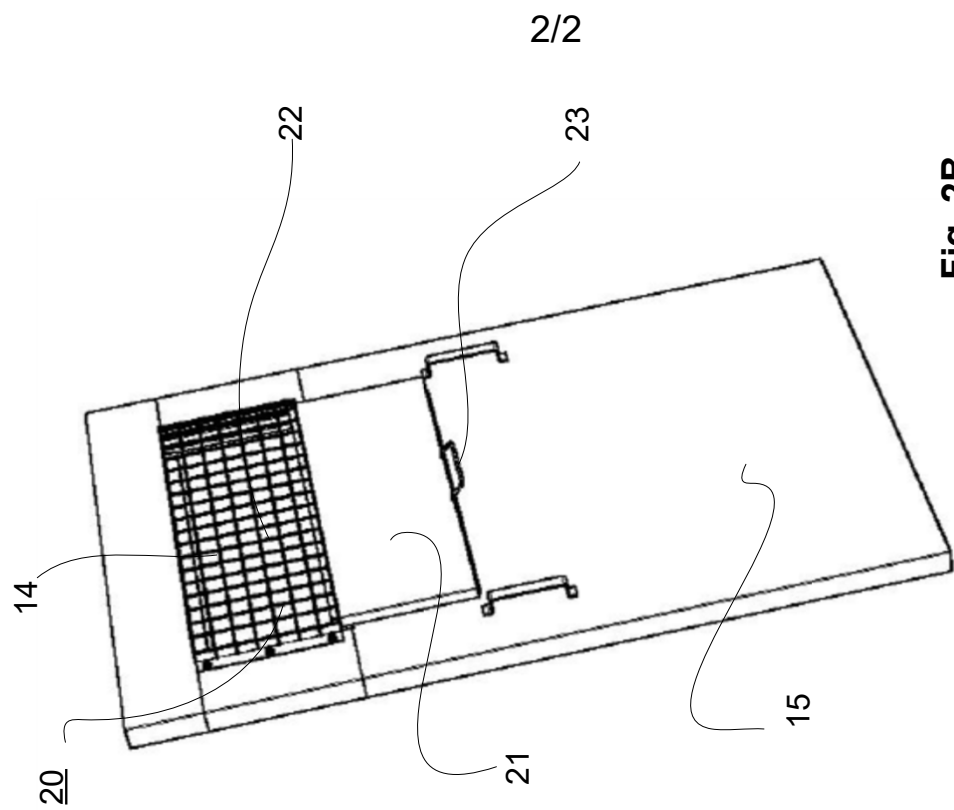


Fig. 2B