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(54) **SWIMMING POOL AND MOVABLE SUBFLOOR SYSTEM FOR USE IN A SWIMMING POOL**

(57) The present invention is related to a swimming pool, in particular a swimming pool having an adjustable depth, comprising one or more side walls and a bottom wall, the one or more side walls and the bottom wall together defining a retaining space for holding a predefined level of water, a movable subfloor accommodated in the retaining space, comprising at least one floating body providing a buoyancy to the movable subfloor, an actuating system, wherein the actuating system is directly or indirectly attached to a bottom side of the movable subfloor via at least one cable and/or at least one belt, wherein the actuating system is configured for moving the movable subfloor. The invention is further related to a movable subfloor system for use in a swimming pool.

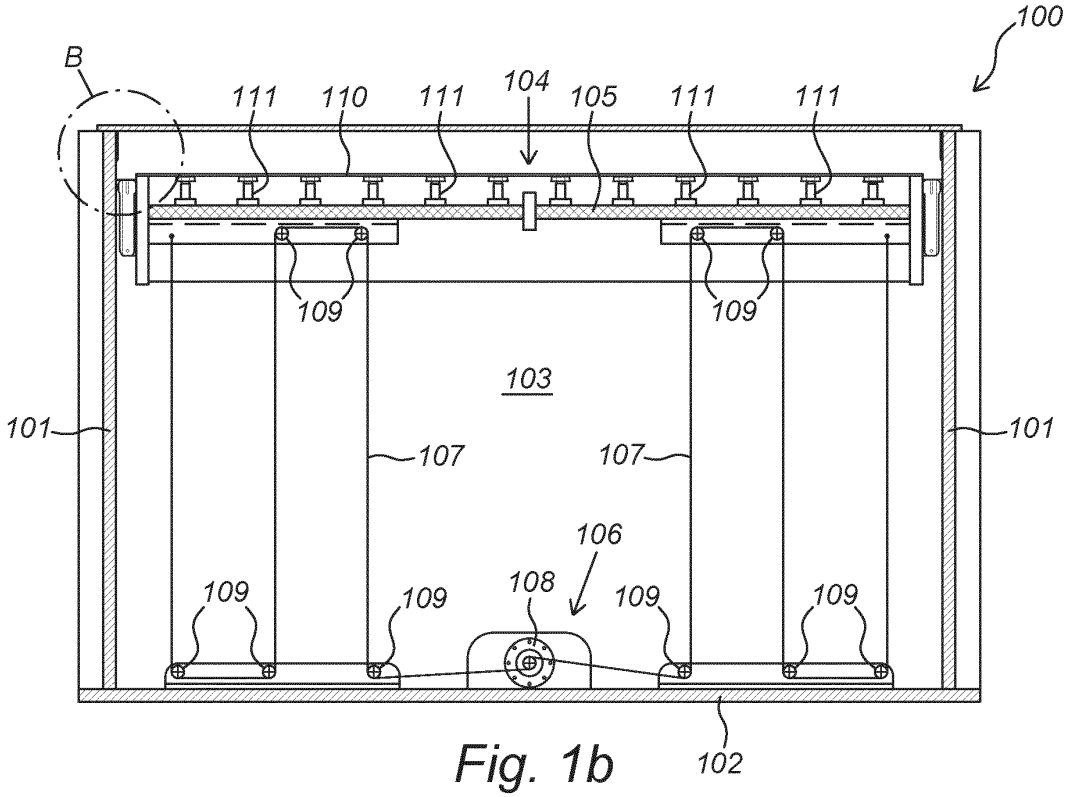

Fig. 1b

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Description

[0001] The present invention is related to a swimming pool, in particular a swimming pool having an adjustable depth. The present invention is further related to a movable subfloor system for use in a swimming pool.

[0002] Over the past years there has been an increasing demand for swimming pools. For long, swimming pools were luxury products which were essentially only available for the rich. However, over the course of time, improved technologies and methods render this luxury within the reach of an enlarged group of people. Swimming pools come in all kinds of sizes and shapes. Various types of swimming pools are available, wherein some are installed on top of the ground surface level, and some are installed in the ground, such that for example an edge of the swimming pool is substantially flush with a ground surface level. The latter are typically more expensive and tend to have a more permanent nature. Some swimming pools remain outside all year round, which exposes those swimming pool to the, sometimes harsh, weather conditions. Especially during the fall, the swimming pool may collect e.g., leaves, which need to be removed. Although swimming pool vacuum cleaners are available, these need to be manually deployed and retracted, leaving the user with undue burden. It is known to provide for swimming pools having a movable floor, which allows the swimming pool to be closed when not in use. Often a separate floor is located inside the swimming pool, which is pushed upwardly by means of hydraulics. When the floor is raised, it may extend above the water surface level. However, due to the hydraulic systems raising the floor it may not allow for support high loads. That is, these floors are generally not sufficiently safe to allow people to walk over the moving floor when it is fully raised. In addition, the moving floors typically to require a large amount of energy for allowing the system to move the floor.

[0003] A first objective of the present invention is to provide for a swimming pool which is easier in daily maintenance.

[0004] It is a second objective of the present invention to provide for a swimming pool having a safer movable floor.

[0005] It is a third objective of the present invention to provide for a swimming pool having a more efficient movable floor.

[0006] To this end, the present invention provides a swimming pool, in particular a swimming pool having an adjustable depth, comprising one or more side walls and a bottom wall, the one or more side walls and the bottom wall together defining a retaining space for holding a predefined level of liquid, such as water, a movable subfloor, at least partially accommodated in the retaining space, comprising at least one floating body providing a buoyancy to the movable subfloor, an actuating system, wherein the actuating system is directly or indirectly attached to a bottom side of the movable subfloor, preferably via at least one cable and/or at least one belt, wherein the actuating system is configured for moving the movable subfloor between a submerged position, wherein at least a part of the movable subfloor is at least partially submerged below a water surface level in the retaining space, and a raised position, wherein at least a part the movable subfloor is situated above a water surface level in the retaining space.

[0007] The swimming pool according to the present invention therefore provides an improved movable subfloor. Allowing the movable subfloor to be at least partially submerged below a water surface level may define a usable swimming space. That is, the swimming pool as such, i.e., the bottom wall and one or more side walls define a retaining space for holding water. The space defined by an upper surface of the movable subfloor, a part of the one or more side walls, and the water surface level defines a usable swimming space. The usable swimming space, in particular a depth, may be increased by moving, in particular pulling, the movable subfloor downwardly. By moving the movable subfloor upwardly, the usable swimming space, in particular a depth thereof, may be reduced. Since the movable subfloor comprises at least one floating body, moving the movable subfloor upwardly will typically require less force, since the buoyancy of the movable subfloor may be utilized. By utilizing said buoyancy of the floating body of the movable subfloor when moving the movable subfloor upwardly a more efficient movable subfloor may be established by the present invention. It is imaginable that the movable subfloor is essentially entirely formed by the floating body. Preferably, said floating body defines a walking surface, at least in a raised position, allowing people to walk on top of the floating body, or the movable subfloor.

[0008] In this respect, buoyancy may be understood as the force of the floating body in upward direction. Buoyancy may be defined by the volume of liquid, in particular water, that is displaced by the floating body multiplied by the density of the liquid further multiplied with the gravitational constant. The movable subfloor, in particular the floating body, is may as such be configured for exerting a force having at least an upwardly directed component on the movable subfloor, in particular wherein said force is exerted directly on the movable subfloor. Preferably, the floating body comprises at least one cavity, such as an air compartment, preferably a plurality of air compartments. The floating body may be at least partially composed out of a polymer material, preferably a weldable polymer material. It is further conceivable that the bottom wall and the one or more side walls are composed out of the same weldable polymer material. It is conceivable that said at least one floating body is composed out of at least two, preferably a plurality of, mutually attached floating sub bodies, wherein each floating sub body has a predefined buoyancy.

[0009] Preferably the raised position is a rest position, wherein essentially no force is actively applied to the movable subfloor. In said raised position, preferably the

at least one cable and/or at least one belt retains the floating body. That is, the at least one cable and/or at least one belt may prevent the floating body or movable subfloor from moving further upward due to its buoyancy. Hence, a length of the at least one cable and/or at least one belt may define the depth of the movable subfloor. It is also imaginable that said raised position is a resp position which is at least partially defined by a blocking element which prevents the movable subfloor from moving further upward.

[0010] According to a preferred embodiment, the actuating system comprises at least one motor, preferably an electric motor, for moving the movable subfloor between the submerged position and the raised position, wherein the at least one motor is preferably situated at least partially below the water surface level. Preferably, the at least one motor comprises a brake and/or lock function, for retaining the movable subfloor in a position without actively exerting force. To this end, preferably the at least one cable and/or the at least one belt is locked or kept in place by the at least one motor, thereby fixing the stretch of cable and/or belt extending between the bottom side of the movable subfloor and the brake. The at least one motor is preferably mounted below the water surface level. Preferably, the swimming pool comprises an equipment space, which is preferably situated between the bottom side of the movable subfloor and the bottom wall of the swimming pool. Preferably, said at least one motor is mounted, directly or indirectly, to the bottom wall of the swimming pool. It is conceivable that said at least one motor has a torque situated between 400 Nm and 600 Nm, preferably 500 Nm. Preferably, the at least one motor is configured for rotating between 2 and 3, preferably 2.5, rotations per minute at maximum power. According to an embodiment of the present invention the actuating system comprises at least two motors, preferably each having a torque situated between 400 Nm and 600 Nm, preferably 500 Nm. The number of motors may be dependent on the size of the movable subfloor and/or the buoyancy of said movable subfloor.

[0011] According to an advantageous embodiment the at least one cable and/or the at least one belt runs over one or more pulleys, wherein at least one of the pulleys is directly or indirectly mounted on a bottom side of the movable subfloor or wherein at least one of the pulleys is mounted directly or indirectly on the bottom wall of the swimming pool. By providing one or more pulleys the at least one belt and/or the at least one cable may be routed towards e.g., a bottom side of the floating body efficiently. Preferably, the at least one cable runs over at least one fixed pulley, and at least one movable pulley. In this respect, the at least one fixed pulley may be mounted onto the bottom wall, in particular in the equipment space, of the swimming pool. Preferably, at least two pulleys are mounted, directly or indirectly, to the bottom wall of the swimming pool, and at least one pulley is mounted, directly or indirectly, to the bottom side of the movable subfloor. Where in this respect pulley is mentioned, this may also be understood as a guiding member, such as a rotating wheel, for guiding the at least one cable and/or the at least one belt. It is in particular preferred that three guiding wheels are mounted directly or indirectly to the bottom wall of the swimming pool, and at least two guiding wheels are mounted to a bottom side of the movable subfloor. Preferably, the pulleys and/or guiding wheels are preferably mounted at a mutual distance with respect to each other for providing improved stability. Each of the at least one cable and/or at least one belt may be routed such as to form a gun tackle, and/or luff tackle, and/or double tackle, and/or gyn tackle, and/or threefold tackle.

[0012] It is imaginable that the actuating system comprises at least two cables and/or at least two belts. In this respect it is conceivable that each of said at least two cables and/or at least two belts run over one or more pulleys, wherein at least one of the pulleys is directly or indirectly mounted on a bottom side of the movable subfloor or wherein at least one of the pulleys is mounted directly or indirectly on the bottom wall of the swimming pool. In this case, it is in particular preferred that six guiding wheels are mounted directly or indirectly to the bottom wall of the swimming pool, and at least four guiding wheels are mounted to a bottom side of the movable subfloor, wherein each of the at least two cables or the at least two belts runs over said three guiding wheels that are mounted to the bottom wall of the swimming pool, and over said two guiding wheels that are mounted to a bottom side of the movable subfloor. It is preferred that at least one of the motor or the at least one pulley is substantially entirely submerged in all positions of the movable subfloor. Preferably, the at least one cable and/or the at least one belt is attached at one end to the at least one motor, which is preferably mounted on the bottom wall of the swimming pool, and runs via the at least one pulley and/or guiding wheel to be attached to a bottom side of the movable subfloor on the other end. It is imaginable that the actuating system, preferably a, preferably electric, motor, is configured for exerting a force having at least a downwardly directed component, via the at least one cable and/or the at least one belt, on the movable subfloor. Hence, said at least one motor may, upon activating said motor, be configured for exerting a pulling force onto the movable floating body. It is preferred to configure the actuating system such that the motor is arranged to exert a pulling force onto the movable subfloor. By actuating the motor, hence by applying a torque, the buoyancy force may be overruled by the downward pulling force applied via the at least one cable and/or at least one belt onto the movable subfloor. If the desired position, in particular depth of the movable subfloor is reached, the motor may be blocked, or a brake may be applied. Hence, the movable subfloor may be positioned in any position between the upward position and a bottom position. In this respect, bottom position may be understood as the lowest position reachable by the movable subfloor. Said lowest position may be as low as until the bottom side of the movable subfloor touch-

es the motor and/or bottom wall of the swimming pool. In any rest position, that is, when the motor is in a brake mode or a lock mode, no force needs to be applied and hence a more efficient movable subfloor may be provided for. Additionally, the movable subfloor may, preferably in any rest position, allow for people to walk over said movable subfloor. In this respect, the buoyancy of said movable subfloor is preferably sufficient to carry one or more people.

[0013] It is imaginable that the movable subfloor comprises one or more covering elements, such as tiles, wherein said one or more covering elements preferably at least partially form or define an upper side of the movable subfloor. Preferably, the movable subfloor comprises at least one support structure for supporting the one or more covering elements at a distance of an upper surface of the at least one floating body. The one or more covering elements may be configured for carrying and/or supporting people. It is imaginable that each of the one or more covering elements is supported by a single support element, wherein all support elements form the support structure. It is, however, also conceivable that the support structure comprises at least one crate, preferably a plurality of crates. Said at least one crate and/or said plurality of crates, may form a substantially continuous support surface for supporting one or more covering elements. Although crate is mentioned, it is alternatively conceivable that the same functionality is achieved by at least one, preferably a plurality of, box and/or block, which at least one box and/or block defines at least one support surface for supporting one or more covering elements. The crate and/or box and/or block may at least partially be composed out of plastic, in particular polypropylene (PP). The crate and/or box and/or block may yield an improved stability with respect to the support elements since it provides for a larger support surface. Preferably, the crate and/or box and/or block is attached onto the movable subfloor by means of welding or screwing, yet alternative attachment elements are also conceivable. This is in particular of benefit to provide for a substantially rigid support for people to walk on. The one or more covering elements may be attached e.g., by means of a glue to the support structure. A top surface of the support structure may comprise a textured and/or rough upper surface. Said textured and/or roughened uppers surface may increase the bonding strength for a glue to attach thereto. Said textured and/or rough surface may also be provided on a plastic or polymer layer in particular PP. Said plastic or polymer layer may be provided on top of the support structure and function as a bonding substrate for the one or more covering elements. Said plastic or polymer layer may in particular be a polypropylene stretch layer. Preferably wherein one side of said polypropylene stretch layer comprises a rough or textured surface. Said rough or textured surface may be formed during manufacturing of said stretch layer. Preferably, the thickness of the plastic or polymer layer is situated between 1 mm and 10 mm, more preferably between 2 mm and 5 mm, in particular 3 mm. It is conceivable that a glue may be provided onto the plastic or polymer layer, in particular a tile glue, onto which glue the one or more covering elements may be provided. As such, a substantially dimensionally stable floor may be provided. By arranging the one or more covering elements at a distance of the floating body an intermediate space is defined between the floating body and the covering elements. Since the movable subfloor may slightly move under the load of people walking on the movable subfloor, in closed position that is, the support structure may prevent that water gushes over the floor. In this respect, when the movable subfloor, in particular the floating body, slightly tilts under the load of the people or object standing thereon, the water will gush over the floating body, and not the covering elements since these are arranged at a distance of the upper surface of said floating body. Hence, the covering elements in this case may remain essentially dry. In a raised position, the covering elements are substantially flush with a ground surface level and/or covering element adjacent to the swimming pool. According to a preferred embodiment, the at least one floating body of the movable subfloor is essentially entirely submerged, in particular below a water surface level in the retaining space, in the raised position, and wherein preferably the covering elements or the support structure are at partially situated above the water surface level in raised position. That is, the floating body remains submerged in all positions. This is in particular beneficial since the buoyancy of the movable subfloor may remain unaffected. When the floating body is not entirely submerged, the buoyancy, and hence the upward force which allows people to walk on said movable subfloor, is reduced. This is caused by the fact that the floating body displaces less water, and hence may provide less buoyancy. To this end, the present invention allows the floating body to remain entirely submerged, preferably such that the covering elements remain unsubmerged in at least the raised position. This allows people or heavy objects to walk on the covering elements whilst the buoyancy force may be such that the covering elements are not submerged. Said support structure may, at least in a raised position, be at most partially submerged, such that covering elements on top of said support structure remain unsubmerged.

[0014] According to yet another embodiment, the movable subfloor, in particular the floating body, comprises an air space, wherein said air space is at least partially bounded by a bottom side of the floating body and one or more peripheral side walls of the movable subfloor, in particular said floating body, wherein the air space is arranged to be filled with air for providing, preferably additional, buoyancy to the subfloor. As an alternative to air in the air space, a gas or liquid having a lower density compared to water may be used for filling the space in the subfloor. Preferably, the volume of the air space is adjustable via at least one adjusting body, such as a tube, the adjusting body comprising at least one through hole

having a first opening and a second opening, wherein the first opening is situated at a distance from the bottom side of the floating body, and wherein the second opening is in open connection an environment, in particular air, at a side of the floating body facing away from the bottom side of the floating body, wherein the adjusting body is at least partially adjustable in a vertical direction, wherein in particular the distance of the first opening with respect to the bottom side of the adjusting body is adjustable. Preferably, said second opening is in situated above the water surface level. In particular, the height of the air space may be adapted via the adjusting body. Said height of the air space may adapt the volume of said air space, and as a consequence also the displaced volume of the movable subfloor and thus the buoyancy. It is in particular the highest point of the first opening to the bottom side of the floating body or movable subfloor that determines the height of the air space. Preferably, at least a bottom side of the floating body is substantially flat. It is conceivable that the adjusting body essentially entirely extends through the floating body, wherein said adjusting body is sealed, preferably impermeably sealed, with respect to the floating body. Preferably, said adjusting body is slidably adjustable.

[0015] In a preferred embodiment, the swimming pool further comprises at least one positioning system, for positioning the movable subfloor, at least in a raised position, in a lateral direction with respect to the one or more side walls. Preferably, said positioning system is configured to at least partially restrict a movement of the movable subfloor in at least a horizontal direction. The movable subfloor may preferably be freely movable in a downward direction, whereas in an upward direction along at least a part of the upward movement sideward movement is restricted. Preferably, the movable subfloor is freely movable in the retaining space, wherein in an upper portion of the retaining space, the retaining space is smaller, in particular in a width direction. It is conceivable that the movable subfloor is continuously adjustable between the submerged position and the raised position. Preferably, the positioning system comprises at least one, preferably resilient, positioning element provided on at least one edge, preferably on at least two opposing edges, of the movable subfloor. Preferably, said positioning element is configured to co-act with a smaller portion of the retaining space. In particular said smaller portion of the retaining space and said positioning element mutually restrict a lateral movement of the movable subfloor, at least in the upper portion of the retaining space. In this respect, it is imaginable that each edge of the movable subfloor is provided with at least one positioning element. This may allow to accurately define the raised position of the movable subfloor. In particular if one or more covering elements this is beneficial, since said covering elements may as such be accurately aligned with covering elements of the floor adjacent to the swimming pool.

[0016] It is conceivable that the swimming pools comprises at least one guiding body, such as a wedge, preferably provided on an upper part of at least one of the one or more side walls, configured to force, at least in a lateral direction, the movable subfloor in a laterally fixed position. According to a particular embodiment, said guiding body is configured to co-act with the positioning element of the present invention, wherein said positioning element is configured to abut resiliently against said guiding body to restrict lateral movement of the movable subfloor. Said guiding body may be shaped as a stepped body, and does not necessarily have to be wedge shaped. A block comprising a downwardly facing chamfer may for example also be suitable. Said downwardly facing chamfer may gradually force the resilient positioning element further away from the one or more side walls. If each of the one or more side walls is provided with such a guiding body, the movable subfloor may be guided to a predetermined, preferably central, position within the retaining space, at least in raised position. Yet, the chamfer or wedge function may also be only provided to the resilient positioning element, in which case the guiding body may be an inwardly protruding block.

[0017] Preferably, the swimming pool comprises an abutment structure, such as a plate, wherein said abutment structure defining an extreme position of the movable subfloor, preferably wherein at least a part of the movable subfloor abuts against the abutment plate in the raised position. Said abutment structure may at least be partially formed by a plate, wherein said plate protrudes inwardly with respect to at least one side wall of the swimming pool. Said abutment structure preferably defines the height of the raised position of the movable subfloor. Preferably, the positioning system, in particular the positioning element abuts against the abutment structure in the raised position, restricting a further upward movement of the movable subfloor. It is imaginable that the one or more covering elements in said raised position are substantially flush with the at least one plat of the abutment structure. Preferably, the plate of the abutment structure extends along at least a part of the perimeter of the one or more side walls, preferably along the entire perimeter. Said plate may also cover the guiding body of the present invention from sight when the movable subfloor is in a submerged position.

[0018] According to an advantageous embodiment the movable subfloor comprises at least two, preferably a plurality of, subfloor segments, wherein each subfloor segment comprises a respective floating body segment, the floating body segment providing a buoyancy to the respective subfloor segment. Preferably, wherein the submerged position of the at least two subfloor segments is mutually deviating, preferably forming a stepped configuration. By defining a plurality of floating body segments, each of said floating body segments may be designed such that the buoyancy is in correspondence with a function of said floating body segment. It may for example be conceivable that a subfloor segment functions, in submerged position, as a step for entering the swimming pool, it could be of benefit if such a step has an

increased buoyancy. Also, by providing a plurality of subfloor segments, the swimming pool may be divided into independent swimming pool segments, wherein a first segment may be deeper with respect to an adjacent segment. Preferably, between at least two adjacent subfloor segments an extendable wall portion is arranged. Said extendable wall portion may define a substantially vertical wall segment between two adjacent subfloor segments, in particular if said adjacent subfloor segments are submerged to different depths. This may prevent objects from falling or people from swimming or ending up below a subfloor segment.

[0019] Preferably, a bottom side of each subfloor segment, in particular a bottom side of each floating body segment is directly or indirectly attached to the actuating system via at least one cable and/or at least one belt. In this respect, the actuating system according to any embodiment as defined in the present invention as described may be applied to each movable subfloor segment. In this respect, also the same advantages apply. Preferably, each at least one cable and/or each at least one belt of the independent subfloor segments is directly or indirectly connected to a single motor, preferably and electric motor. In this respect, said motor may be configured to drive at least one shaft, wherein the at least one belt and/or the at least one cable of the subfloor segments may be attached to said shaft. By rotating said shaft, the at least one belt and/or the at least one cable may be winded around the shaft and therewith moving the floating subfloor segments.

[0020] It is imaginable that each subfloor segment is movable between a submerged position, wherein at least a part of at least one subfloor segment is submerged below a water surface level in the retaining space, and a raised position, wherein at least a part at least one subfloor segment is situated above a water surface level in the retaining space. Preferably, wherein at least two subfloor segments comprise a different lowest submerged position, preferably mutually forming a stepped configuration. To this end, a number of preferably consecutive subfloor segments may form in their lowest submerged position a stair. In order to establish said deviating submerged positions, a computer system may be configured to arrange the maximum submerging depth of at least one subfloor segment. A controller may be configured to control the at least one motor for actuating the respective subfloor segment towards said configured position. It is also conceivable that said consecutive subfloor segments forming the stair each comprise a stopper, for blocking a further downward movement of a subfloor segment. Said stopper may be attached to a wall of the swimming pool. When moving a subfloor segment downwardly from the raised position, the subfloor segment will at a certain depth abut said stopper and will stop moving downward.

[0021] It is preferred that when multiple subfloor segments are provided, at least one, preferably each, of said subfloor segments comprises at least one positioning system as described in the present invention. This allows each of the subfloor segments to be, at least in a raised position, laterally restricted in movement. Preferably, at least one, preferably each, of said subfloor segments comprises at least one abutment system as described according to the present invention. As such, the independent subfloor segments may all be raised to substantially the same raised position. That is, in said raised position, an uppers surface of each subfloor segment, in particular of the covering elements thereof, may be substantially flush.

[0022] The present invention is further related to a movable subfloor mechanism for use in a pool, such as a swimming pool, preferably according to any of the preceding claims, comprising: a movable subfloor comprising at least one floating body, said floating body configured providing a buoyancy to the movable subfloor, an actuating system, wherein the actuating system is directly or indirectly attached to a bottom side of the movable subfloor, preferably via at least one cable and/or at least one belt, wherein the actuating system is configured for moving the movable subfloor between a first position, wherein, in installed condition, at least a part of the movable subfloor is submerged below a water surface level, and a second position, wherein, in installed condition, a part the movable subfloor is situated above a water surface level. Preferably, wherein the actuating system comprises at least one motor, preferably an electric motor, for moving the movable subfloor between the first position and the second position. Preferably, the at least one motor comprises a brake and/or lock function, for retaining the movable subfloor in a position without actively exerting force. To this end, preferably the at least one cable and/or the at least one belt is locked or kept in place by the at least one motor, thereby fixing the stretch of cable and/or belt extending between the bottom side of the movable subfloor and the brake. It is conceivable that the subfloor mechanism comprises at least one, preferably a plurality of pulleys, wherein the at least one cable and/or the at least one belt is configured to run over one or more pulleys. The movable subfloor may further comprise at least one positioning system, for positioning the movable subfloor in a lateral direction with respect to one or more side walls of a swimming pool, preferably wherein the positioning system comprises at least one, preferably resilient, positioning element provided on at least one edge, preferably on at least two opposing edges, of the movable subfloor. It is imaginable that the movable subfloor comprises an air space, wherein said air space is bounded by a bottom side of the floating body and peripheral side walls of the movable subfloor, wherein the air space is arranged to be filled with air for providing buoyancy to the subfloor, preferably wherein the volume of the air space is adjustable via at least one adjusting body, such as a tube, wherein the adjusting body is at least partially adjustable in a direction perpendicular to the floating body, wherein in particular the distance of the first opening with respect to the bottom side of the

adjusting body is adjustable. As an alternative to air in the air space, a gas or liquid having a lower density compared to water may be used for filling the space in the subfloor. Preferably, the adjusting body comprising at least one through hole having a first opening and a second opening, wherein the first opening is situated at a distance from the bottom side of the floating body, and wherein the second opening is, at least in installed condition, in open connection an environment, in particular air, at a side of the floating body facing away from the bottom side of the floating body.

[0023] The same benefits apply with respect to the movable subfloor system as have been elaborated with respect to the movable subfloor of the swimming pool according to the invention. The advantages discussed in respect of the movable subfloor of the swimming pool of the invention are therefore incorporated by reference with respect to the movable subfloor system according to the invention. It is furthermore conceivable that the movable subfloor system according to the present invention is applied in different applications which require submerging and raising of a subfloor.

[0024] The present invention will be described in more details based on the following drawings, wherein:

- Figure 1a-1c show a cross section of a swimming pool according to the invention with a movable subfloor in different positions;
- Figure 2 shows a cross section swimming pool according to the invention in a raised position;
- Figure 3 shows a cross section of a detail of the swimming pool according to the present invention;
- Figures 4a and 4b show another detail of the swimming pool according to the present invention;
- Figure 5a shows a different embodiment according to the present invention; and
- Figure 5b shows a detail according to the embodiment of figure 5a.

[0025] Figures 1a-1c show a non-limitative embodiment of the swimming pool 100 according to the present invention. The swimming pool 100 comprises one or more side walls 101, and a bottom wall 102. Said one or more side walls 101 and bottom wall 102 mutually defining a retaining space 103 for holding a predefined level of water or liquid. A movable subfloor 104 is at least partially accommodated inside said retaining space 103. The three figures 1a-1c depict the swimming pool 100 wherein the movable subfloor 104 is in different positions. Figure 1 a depicts the swimming pool 100 wherein the movable subfloor 104 is in a raised position. In said raised position an upper side 110 of said movable subfloor 104 is substantially flush with a surface 123 adjacent to the swimming pool 100. In the raised position as shown in figure 1a a user may be able to walk over the movable subfloor 104. The movable subfloor 104 may be moved by means of an actuating system 106. Said actuating system 106 according to this non-limitative embodiment comprises a motor 103, wherein said motor 108 is connected, via at least one cable 107 and a number of pulleys 109 or guide wheels 109, to a bottom side of the movable subfloor 104, in particular to a bottom side of a floating body 105 of the movable subfloor 104. By actuating the motor said movable subfloor 104 may be pulled downward, towards the bottom wall 102 of the swimming pool 100. This will define a usable swimming space, bounded by a part of the side walls 101 and the upper side of the movable subfloor 104. Figure 1b depicts an intermediate submerged position, wherein the movable subfloor 104 is only partially lowered with respect to the raised position as shown in figure 1a. Figure 1c depicts a final submerged position, wherein a maximum depth of the swimming pool 10 is reached. In these figures, the actuating system comprises two cables 107. Said two cables 107 are attached to the bottom side of the movable subfloor 104, in particular the bottom side of the floating body 105 at opposing sides thereof, which may allow the motor 108 to pull said movable subfloor 104 downwardly in a leveled manner. To said bottom side of the floating body 105 two guiding wheels are mounted. Said guiding wheels 109 are mounted at a mutual distance with respect to each other, in a width direction. This may allow for increased stability when actuating the movable subfloor 104. Similarly, on the bottom wall 102 three guiding wheels 109 are mounted at a mutual distance. Besides increasing stability during actuation of the motor 108, the guiding wheels may reduce the required force to pull down the movable subfloor 102. The movable subfloor comprises at least one floating body 105, which comprises at least one, preferably a plurality of cavities (not shown), providing a buoyancy to the movable subfloor 104. Preferably, said floating body 105 is submerged in all positions of the movable subfloor 104. This allows the movable subfloor to maintain an upwardly directed force, being the buoyancy, also in the raised position. As such, people may be able to walk on top of the movable subfloor 104 since the buoyancy of the movable subfloor 104 is maintained even in raised position. This may be achieved by means of a support structure 111, which is in this non-limitative embodiment formed by support elements 111. Said support elements 111 are mounted on an upper side of the floating body 105 and are configured for holding one or more covering elements 110. Said covering elements as such defined or form an upper surface of the movable subfloor 104. Preferably, said one or more cover elements 110 are substantially flush, at least in raised position with a surface adjacent to the swimming pool 100. It may be conceivable that said cover elements 110 are identical to the floor covering elements adjacent to the swimming pool. Hence, in raised position one may not distinguish the swimming pool 100 floor 110 from the floor adjacent to the swimming pool 100. In order to provide for a fixated raised position, the swimming pool 100 comprises a positioning system 118, which is shown in more detail in figures 4a and 4b.

[0026] Figure 2 shows the swimming pool 100 accord-

ing to the present invention, wherein the swimming pool 100 is filled with water, defining a water surface level 117. In this figure, the movable subfloor 104 is shown in a raised position, wherein the covering elements 110 of the movable subfloor 104 are substantially flush with covering elements 123 of a surface adjacent to the swimming pool 100. The figure indicates that the floating body 105 of the movable subfloor 104 is substantially entirely submerged in the raised position. That is, the water surface level 117 is situated above an upper side of said floating body 105. This ensures that the floating body 105 maintains its full buoyancy, and hence may provide for a stable and safer movable subfloor 104, at least in raised position. If an increased buoyancy is nonetheless preferred, the present invention allows for adjusting the buoyancy of the movable subfloor by means of an adjustable air space 112. By increasing or decreasing the amount of air in said air space 112, hence by increasing or decreasing a height 115 of said air space 112, the buoyancy of the movable floating body 104 may be raised and/or lowered respectively. Said air space 112 is at least partially bounded by a bottom side of the floating body 105, and one or more peripheral walls of the movable subfloor 104, in particular peripheral walls of the floating body 105. At least one adjustable body 114 is provided in the movable subfloor 104, in particular the floating body 105, for adjusting the volume air space 112. Said adjustable body 114 is in this non-limitative embodiment formed by a tube having a first opening and a second opening. Said first opening is located at a distance from the bottom side of the floating body 105, and said second opening is in situated above the water surface level 117. By sliding the adjusting body 114 downwardly, the second opening will be positioned further away from the bottom side of the floating body 105, which will increase the height 115 of the air space 112 and hence increase the buoyancy. The adjusting body is shown in more detail in figure 3.

[0027] In figure 3, the circle A as shown in figure 2 is enlarged for the purpose of the adjusting body 114. The figure shows a cross section of the adjusting body 114. The water surface level 117 is indicated as well. The figure shows the presence of the first opening 124 and the second opening 125, which define the air passage of the adjusting body 114. The adjusting body may be movable, in particular slidable in order to adjust the distance between the first opening and the bottom side of the floating body 105. The adjusting body 114 may extend entirely through the floating body 105 and comprises a sealing member 106, such that the connection between the adjusting body 114 and the floating body 105 is essentially impermeable to water and/or gas. By sliding the adjusting body 114 upwardly, the first opening 124 is moved closer towards the bottom side of the floating body 105. Therefore, the air in the air space 112 will partially be moved upwards through the air passage towards the second opening 124. This yields that the height 115 of the air space 115 is reduced, and hence the buoyancy may be reduced.

[0028] Figures 4a and 4b show a different detail according to the present invention. The swimming pool may comprise a positioning system 118 and an abutment structure 122. These details will be elaborated in more detailed based on these non-limitative drawings. The details in figure 4a and 4b are an enlarged view of the circles B and C as shown in figure 1b and 1a respectively. Figure 4a shows the swimming pool 100 according to the present invention wherein the movable subfloor 104 is almost in its raised position. The positioning system 118 is configured for positioning the movable subfloor 104, at least in a raised position, in a lateral direction. In this respect, a resilient positioning element 119 is mounted on the movable subfloor 104, in particular on an outer side of the peripheral wall 113 of the movable subfloor 104. Said resilient positioning element 119 comprises a widened upper part, wherein a, preferably vertical, cut 121 is provided in said widened upper part, for establishing a resilient widened upper part. Said resilient positioning member 119 is in particular configured to co-act with a guiding body 120. Said guiding body 120 is provided on an upper part of at least one side wall 101 of the swimming pool 100. When the movable subfloor 104 is moving in an upward direction, the resilient positioning element 119 will at one point touch the guiding body 120, which will guide the positioning element 119 into a fixed lateral position. To this end, a downward facing edge 126 of the guiding body 120 may comprise a chamfer or rounded edge, for controllably sliding the positioning element 119 in a lateral direction. It is also conceivable that said positioning element 119 comprises, at an upward facing edge or side 127, a chamfer for allowing a smooth lateral positioning of the movable subfloor 104. Preferably, each edge of the movable subfloor 104 comprises such a positioning system 118 and preferably also a guiding body 120. As such, the movable floating body 104 is, at least in its raised position, clamped or defined, via the positioning system 118, in lateral direction. In addition to the positioning system 118, the swimming pool may comprise an abutment structure 122. Said abutment structure may provide for defining a maximum height pf the movable subfloor 104. Preferably, said abutment structure 120 is a covering element or plate 122 which protrudes inwardly with respect to at least one side wall 101 of the swimming pool 100. Said abutment structure 122 preferably covers the guiding body 120 from sight. It is imaginable that the positioning element 119 abuts the abutment structure 122 at least in the raised position, such that the positioning element 119 prevents a further upward movement. This may further allow the floating body 105 to remain submerged in the raised position, which allows to maintain the buoyancy of the movable subfloor 104 even in the raised position.

[0029] Figure 5a and 5b show a different embodiment according to the present invention. The same reference numbers are used with respect to the similar features. This embodiment differs with respect to the previously described embodiments in that the support structure 111

is not composed out of a plurality of support elements 111, but instead comprises a plurality of crates 131. Although a plurality of crates 131 is shown in this figure, it is imaginable that instead of crates 131 boxes or blocks are used. Said crates 131 may be welded, and/or screwed, onto the movable floor. The crates 131 define for a continuous support surface for the covering elements 122. Since the crates 131 define a substantially continuous support surface, the covering elements 122 may be attached thereto in a more stable manner. This improves the overall stability, in particular for people walking over the covering elements 122. Figure 5b shows an enlarged portion as indicated with the circle D in figure 5a. This figure indicates some details according to this embodiment. The crates 131 shown in this detailed view are at least partially, preferably substantially entirely composed out of plastic, in particular polypropylene. This material is substantially rigid for providing a stable support. Between the support structure 111 that is composed out of a plurality of crates 131 and the covering elements 122 an intermediate layer is provided. Said intermediate layer 128 is in particular a plastic or polymer layer 128. This layer allows for a better attachment of the covering elements 122 to the support structure 111. To this end, it is preferred that one side, preferably the side of the plastic or polymer layer 128 facing towards the covering elements 122 comprises a rough and/or textured surface. The rough and/or textured surface may provide for a better adherence between the covering elements 122 and the plastic or polymer layer via a glue.

[0030] The above-described inventive concepts are illustrated by several illustrative embodiments. It is conceivable that individual inventive concepts, including inventive details, may be applied without, in so doing, also applying other details of the described example. It is not necessary to elaborate on examples of all conceivable combinations of the above-described inventive concepts, as a person skilled in the art will understand numerous inventive concepts can be (re)combined in order to arrive at a specific application and/or alternative embodiment.

[0031] The ordinal numbers used in this document, like "first", "second", and "third" are used only for identification purposes. Hence, the use of expressions like a "second" component, does therefore not necessarily require the co-presence of a "first" component. By "complementary" components is meant that these components are configured to co-act with each other. However, to this end, these components do not necessarily have to have complementary forms. The verb "comprise" and conjugations thereof used in this patent publication are understood to mean not only "comprise", but are also understood to mean the phrases "contain", "substantially consist of", "formed by" and conjugations thereof.

Claims

1. Swimming pool, in particular a swimming pool having an adjustable depth, comprising:

- one or more side walls and a bottom wall, the one or more side walls and the bottom wall together defining a retaining space for holding a predefined level of water,
- a movable subfloor accommodated in the retaining space, comprising at least one floating body providing a buoyancy to the movable subfloor,
- an actuating system, wherein the actuating system is directly or indirectly attached to a bottom side of the movable subfloor via at least one cable and/or at least one belt,

wherein the actuating system is configured for moving the movable subfloor between a submerged position, wherein at least a part of the movable subfloor is submerged below a water surface level in the retaining space, and a raised position, wherein at least a part the movable subfloor is situated above a water surface level in the retaining space.

2. Swimming pool according to claim 1, wherein the actuating system comprises at least one motor, preferably an electric motor, for moving the movable subfloor between the submerged position and the raised position, wherein the at least one motor is preferably situated below the water surface level.

3. Swimming pool according to claim 1 or 2, wherein the at least one cable and/or the at least one belt runs over one or more pulleys, wherein at least one of the pulleys is mounted on a bottom side of the movable subfloor or wherein at least one of the pulleys is mounted on the bottom wall of the swimming pool.

4. Swimming pool according to any of the preceding claims, wherein the movable subfloor comprises one or more covering elements, such as tiles, wherein said one or more covering elements preferably at least partially form (or define) an upper side of the movable subfloor.

5. Swimming pool according to claim 4, wherein the movable subfloor comprises at least one support structure for supporting the one or more covering elements at a distance of an upper surface of the at least one floating body.

6. Swimming pool according to any of the preceding claims, wherein the at least one floating body of the movable subfloor is essentially entirely submerged, in particular below a water surface level in the retaining space, in the raised position, and wherein preferably the covering elements or the support structure are at partially situated above the water surface level

in raised position.

7. Swimming pool according to any of the preceding claims, wherein the actuating system, preferably an electric motor, is configured for exerting a force having at least a downwardly directed component, via the at least one cable and/or the at least one belt, on the movable subfloor.

8. Swimming pool according to any of the preceding claims, wherein the subfloor comprises an air space, wherein said air space is bounded by a bottom side of the floating body and peripheral side walls of the movable subfloor, wherein the air space is arranged to be filled with air for providing buoyancy to the subfloor.

9. Swimming pool according to claim 8, wherein the volume of the air space is adjustable via at least one adjusting body, such as a tube, the adjusting body comprising at least one through hole having a first opening and a second opening, wherein the first opening is situated at a distance from the bottom side of the floating body, and wherein the second opening is in open connection an environment, in particular air, at a side of the floating body facing away from the bottom side of the floating body, wherein the adjusting body is at least partially adjustable in a vertical direction, wherein in particular the distance of the first opening with respect to the bottom side of the adjusting body is adjustable.

10. Swimming pool according to claim 9, wherein the adjusting body essentially entirely extends through the floating body, wherein said adjusting body is sealed, preferably impermeably sealed, with respect to the floating body.

11. Swimming pool according to any of the preceding claims, wherein the swimming pool further comprises at least one positioning system, for positioning the movable subfloor, at least in a raised position, in a lateral direction with respect to the one or more side walls.

12. Swimming pool according to claim 11, wherein the positioning system comprises at least one, preferably resilient, positioning element provided on at least one edge, preferably on at least two opposing edges, of the movable subfloor.

13. Swimming pool according to claim 12, wherein each edge of the movable subfloor is provided with at least one positioning element.

14. Swimming pool according to any of the preceding claims, wherein the swimming pools comprises at least one guiding body, such as a wedge, preferably provided on an upper part of at least one of the one or more side walls, configured to force, at least in a lateral direction, the movable subfloor in a laterally fixed position.

15. Swimming pool according to any of the preceding claims, wherein the swimming pool comprises an abutment structure, such as a plate, said abutment structure defining an extreme position of the movable subfloor, preferably wherein at least a part of the movable subfloor abuts against the abutment plate in the raised position.

16. Swimming pool according to any of the preceding claims, wherein the floating body is at least partially composed out of polymer material, said polymer material comprising at least one, preferably a plurality of cavities.

17. Swimming pool according to any of the preceding claims, wherein the movable subfloor comprises at least two, preferably a plurality of, subfloor segments, wherein each subfloor segment comprises a respective floating body segment, the floating body segment providing a buoyancy to the respective subfloor segment.

18. Swimming pool according to claim 17, wherein the submerged position of the at least two subfloor segments are mutually deviating, preferably forming a stepped configuration.

19. Swimming pool according to one of the claims 17 or 18, wherein a bottom side of each subfloor segment, in particular a bottom side of each floating body segment is directly or indirectly attached to the actuating system via at least one cable and/or at least one belt.

20. Swimming pool according to claim 19, wherein each at least one cable and/or each at least one belt is directly or indirectly connected to a single motor, preferably and electric motor.

21. Swimming pool according to any of the claims 17-20, wherein each subfloor segment is movable between a submerged position, wherein at least a part of at least one subfloor segment is submerged below a water surface level in the retaining space, and a raised position, wherein at least a part at least one subfloor segment is situated above a water surface level in the retaining space.

22. Swimming pool according to any of the preceding claims, wherein the movable subfloor is continuously adjustable between the submerged position and the raised position.

23. Movable subfloor mechanism for use in a pool, such

as a swimming pool, preferably according to any of the preceding claims, comprising:

- a movable subfloor comprising at least one floating body, said floating body configured providing a buoyancy to the movable subfloor,
- an actuating system, wherein the actuating system is directly or indirectly attached to a bottom side of the movable subfloor via at least one cable and/or at least one belt,

wherein the actuating system is configured for moving the movable subfloor between a first position, wherein, in installed condition, at least a part of the movable subfloor is submerged below a water surface level, and a second position, wherein, in installed condition, a part the movable subfloor is situated above a water surface level.

24. Movable subfloor mechanism according to claim 23, wherein the actuating system comprises at least one motor, preferably an electric motor, for moving the movable subfloor between the first position and the second position.

25. Movable subfloor mechanism according to claim 23 or 24, wherein the subfloor mechanism comprises at least one, preferably a plurality of pulleys, wherein the at least one cable and/or the at least one belt is configured to run over one or more pulleys.

26. Movable subfloor mechanism according to any of the claims 23-25, wherein the movable subfloor further comprises at least one positioning system, for positioning the movable subfloor in a lateral direction with respect to one or more side walls of a swimming pool, preferably wherein the positioning system comprises at least one, preferably resilient, positioning element provided on at least one edge, preferably on at least two opposing edges, of the movable subfloor.

27. Movable subfloor mechanism according to any of the claims 23-26, wherein the movable subfloor comprises an air space, wherein said air space is bounded by a bottom side of the floating body and peripheral side walls of the movable subfloor, wherein the air space is arranged to be filled with air for providing buoyancy to the subfloor, preferably wherein the volume of the air space is adjustable via at least one adjusting body, such as a tube, wherein the adjusting body is at least partially adjustable in a direction perpendicular to the floating body, wherein in particular the distance of the first opening with respect to the bottom side of the adjusting body is adjustable.

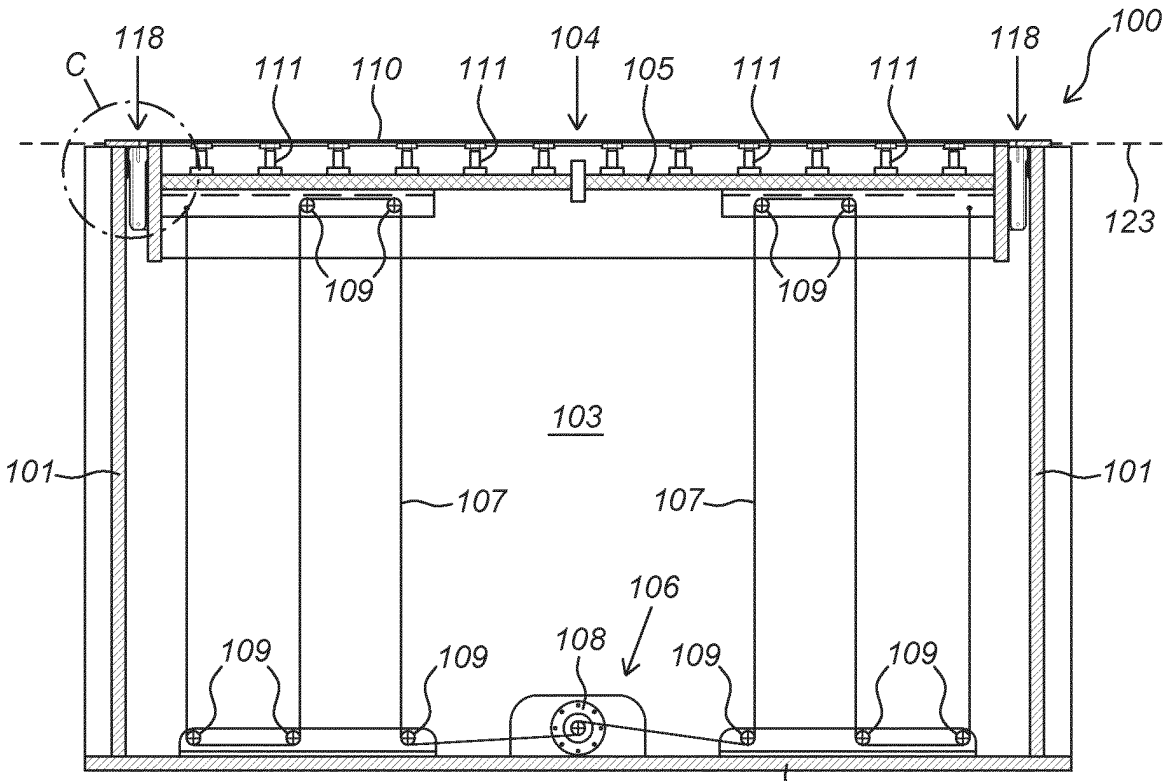
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Fig. 1a

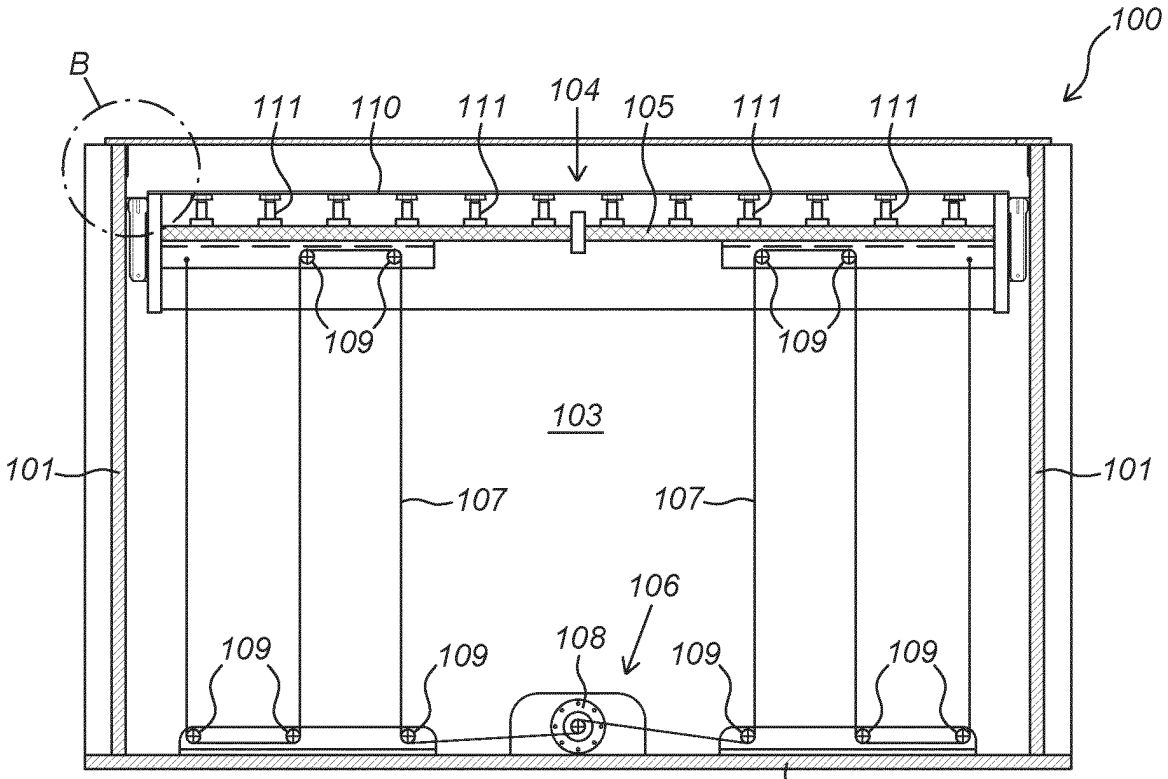
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Fig. 1b

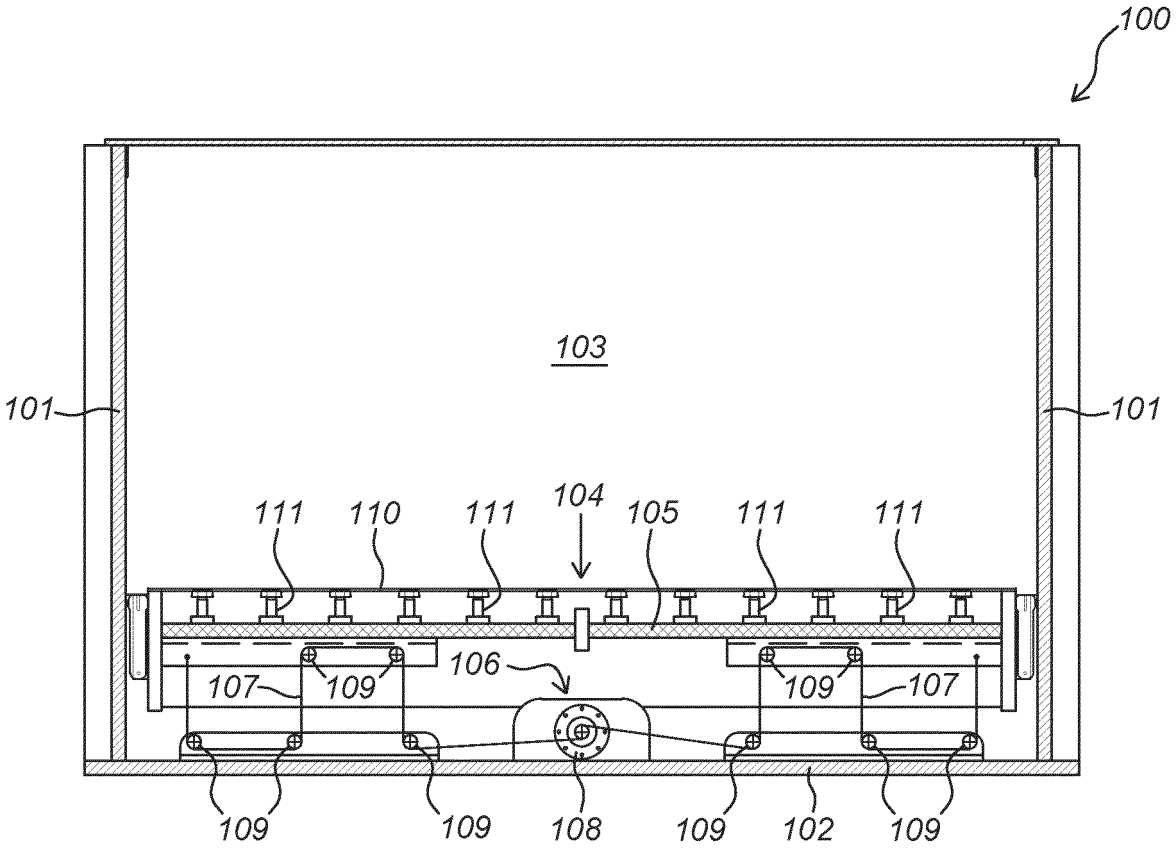
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Fig. 1c

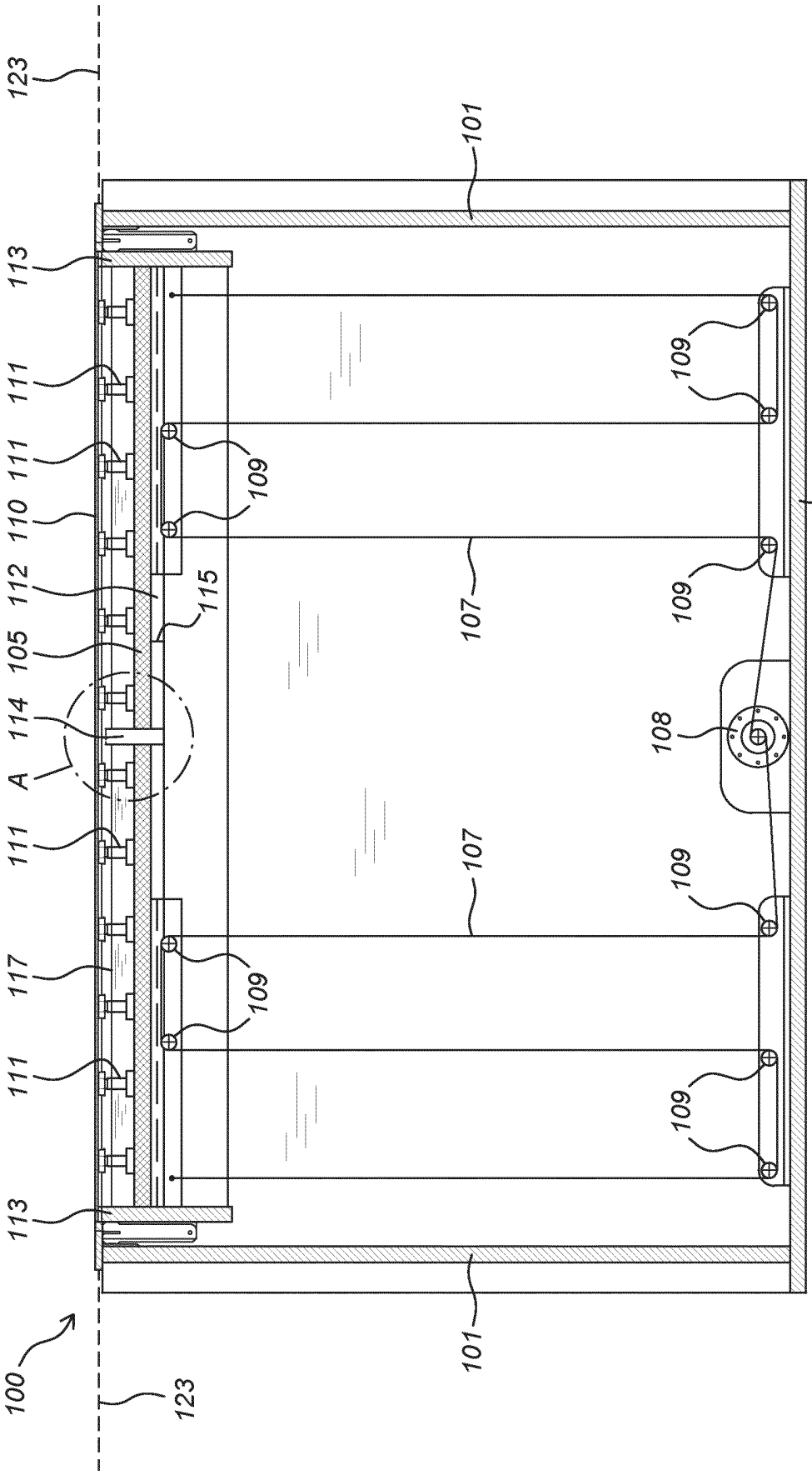
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Fig. 2

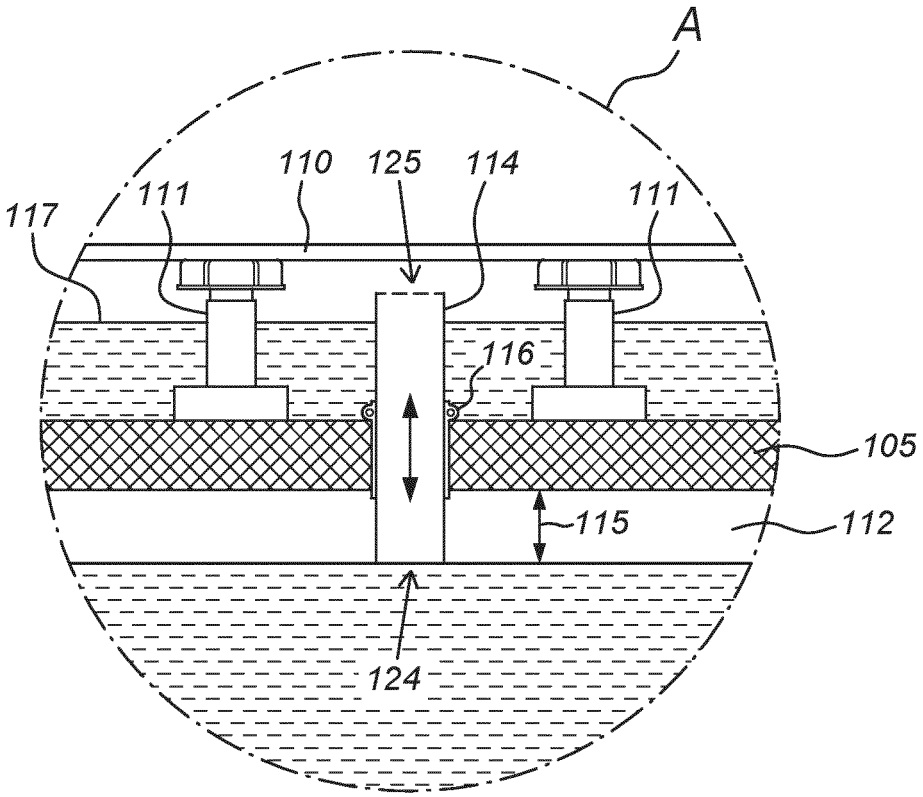

Fig. 3

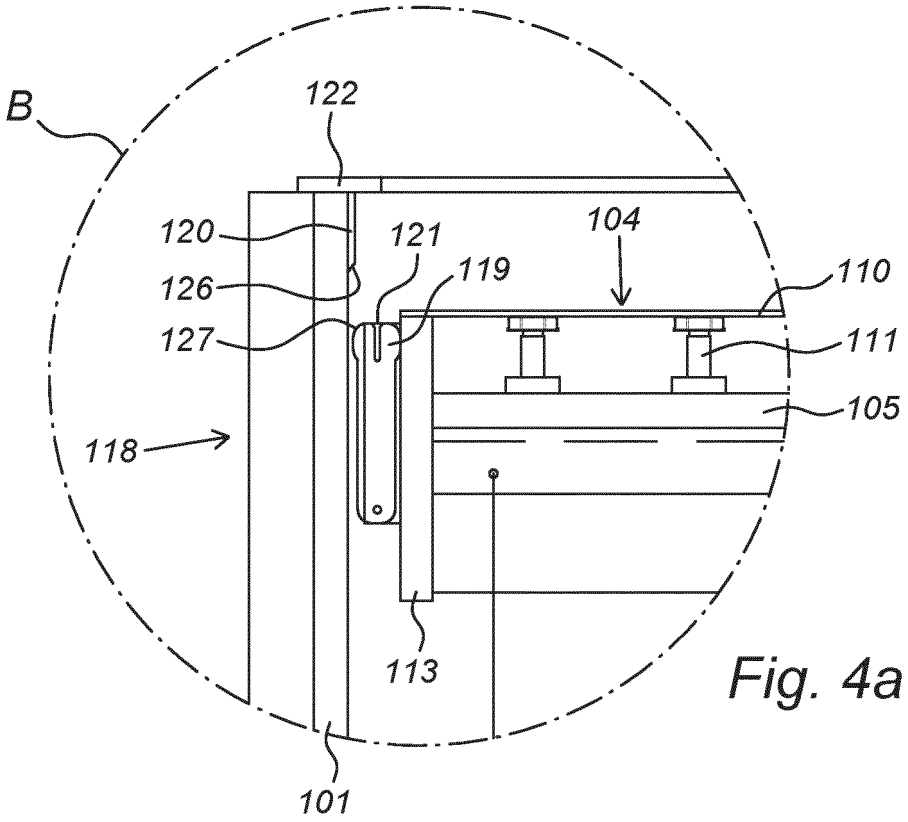
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Fig. 4a

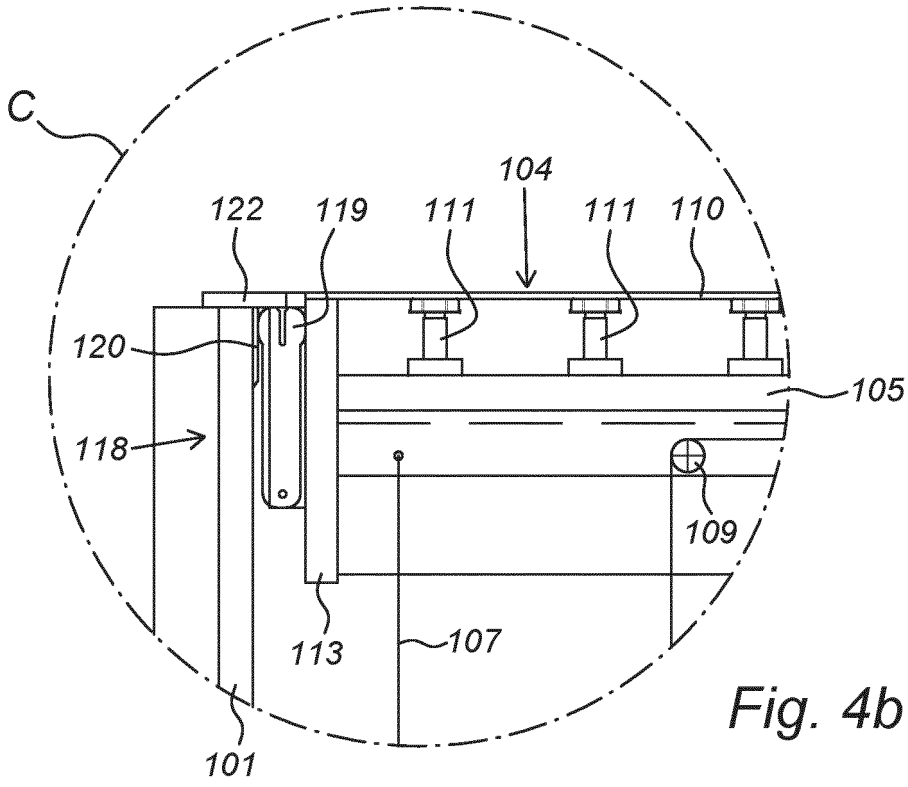
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Fig. 4b

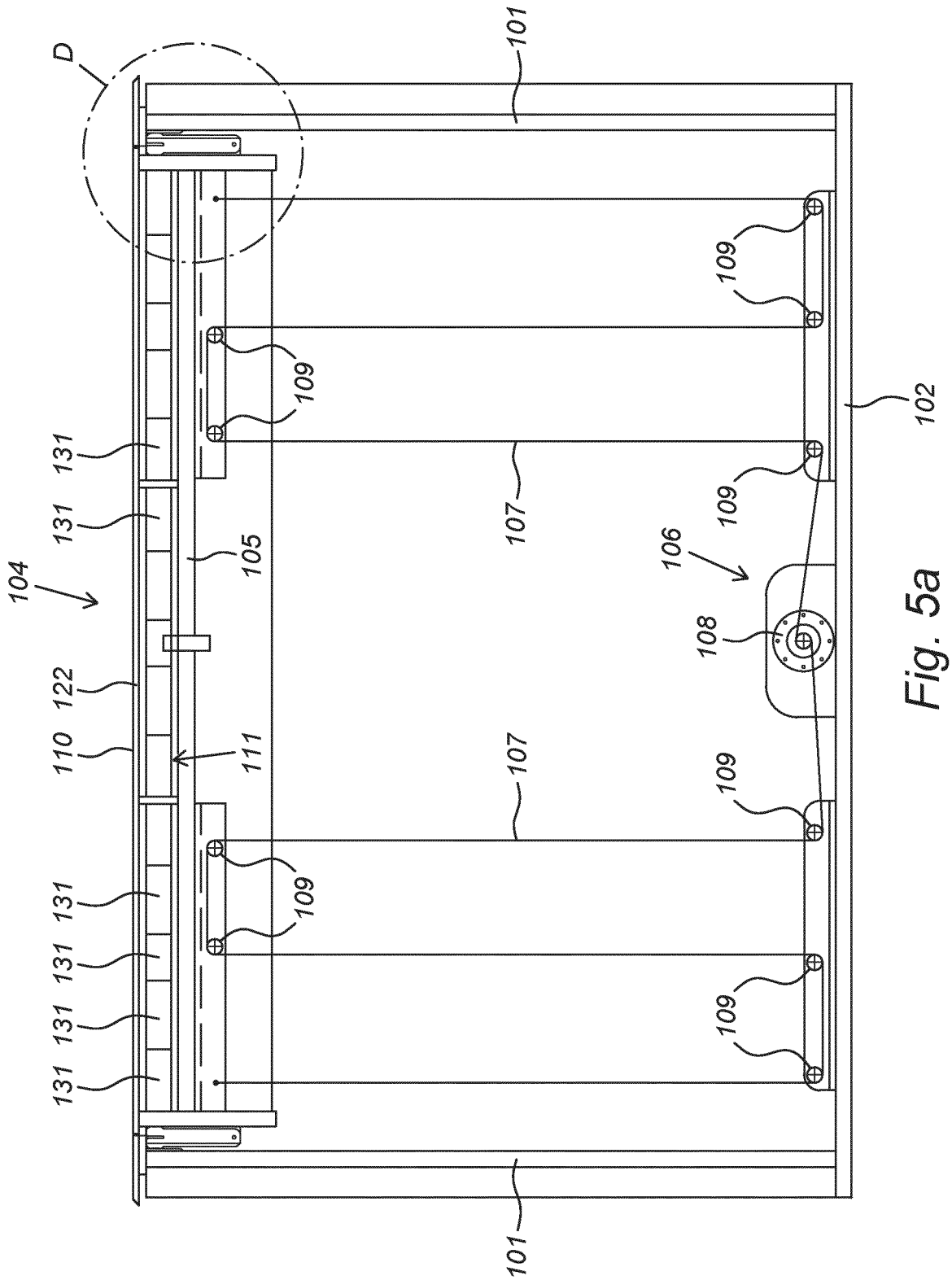

Fig. 5a

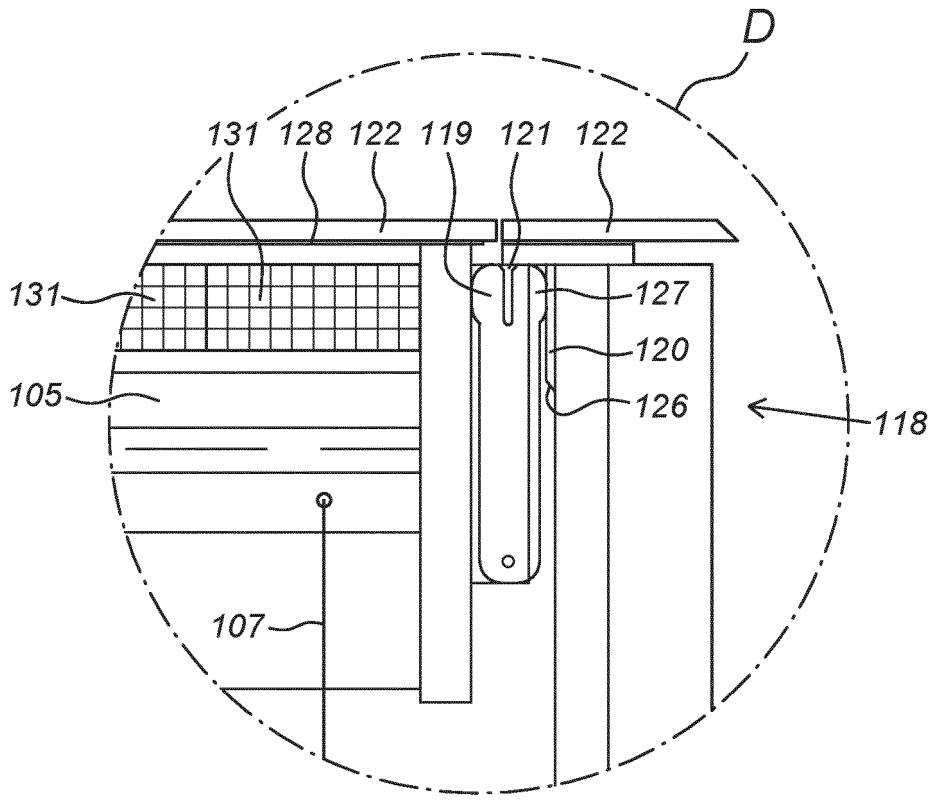

Fig. 5b

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EUROPEAN SEARCH REPORT

Application Number
EP 23 16 3769

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	* column 5, line 27 - column 8, line 8; figures 1-11,21 *	10,14, 15,18	
Y	FR 3 040 410 A1 (ROUMAGNAC MAX [FR]) 3 March 2017 (2017-03-03)	8,9,27	
A	* page 7, line 5 - line 16 * * page 11, line 19 - line 32; figures 1,2,7 *	10, 12-17, 19,26	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 May 2023	Stefanescu, Radu

CATEGORY OF CITED DOCUMENTS

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24-05-2023

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