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Watercraft

This invention relates to a watercraft with a hull which has a support in the region of a deck, on which a user can partially rest his/her upper body and hold on to handles preferably arranged in the bow area, wherein a flow channel is associated with the hull or the hull has a flow channel, wherein a propelling screw is arranged in the flow channel, wherein the flow channel has an intake port and a jet outlet in the stern area downstream of the propelling screw in the flow direction, and wherein a support body is arranged on the stern area such that the support is extended by a support surface of the support body.
Such a watercraft is known from DE 10 2018 104 431. This watercraft forms a towing vehicle to which a floating board is connected to the stern area via an articulated joint. The floating board extends the support surface of the watercraft. Accordingly, the user's upper body rests partly on the watercraft and the remaining body rests on the floating board. The flow resistance that the user's body exerts against the flowing water is thus at least partially eliminated.
Further references of the latest technological advancements can be found in the documents JP 2003 024470 A, US 2015/232160 A1, CN 1 955 069 A and DE 10 2015 100497 A1.
The task of this invention is to provide a watercraft of the type mentioned at the beginning, with which the travel speed can be significantly increased. This task is solved in that the support body has at least one sliding surface on its underside and in that the support body is rigidly connected to the hull.
The rigid connection prevents the support body from moving relative to the watercraft in such a way that the support body can no longer bend in the connection area to the watercraft. It has been shown that such a rigid connection can significantly reduce flow resistance, particularly during dynamic water travel. In this way, a sliding surface provided on the underside of the support body can be used to transfer the watercraft from a displacement run to a gliding run in a flow-optimized manner. This leads to significantly increased travel speeds.
The support body is preferably designed such that when attached to the watercraft, its extension in the direction of the central longitudinal axis of the watercraft oriented in the direction of travel is at least 30% to 50%, preferably at least 50% to 70%, particularly preferably at least 70% of the length of the watercraft. Good maneuverability of the watercraft is maintained at a minimum of 30% to 50%. Significant increases in speed are already possible with at least 50% to 70%. Significant increases in speed are possible

above 70%. Tests carried out by the inventors have shown that in some cases the travel speed can be more than doubled compared to the basic speed of the watercraft without a support body.

According to the invention, the support body can be connected to the hull in a replaceable manner.

The watercraft can thus be operated in two ways. In the first type of use, without an attached support body, a reduced travel speed goes hand-in-hand with good dynamic maneuverability. In the second type of use, with an attached support body, fast overwater travel can be achieved in particular. The user thus has the option of preparing the watercraft according to the intended use. This measure can also improve transportation, since the support body can be removed for transport purposes to save space.

If a detachable connection is provided between the watercraft and the support body, it has been shown that it is particularly advantageous if an interchangeable coupling is effective between the hull and the support body. By means of the interchangeable coupling, the support body can be connected to the hull in an interchangeable manner. This coupling connection allows the user to easily attach or detach the support body in order to switch between the individual operating modes.

It is advantageous if the interchangeable coupling also has one or more projections that are inserted into one or more mounts retaining mounts of the other connecting partner (hull or support body). This enables a particularly rigid and stiff connection between the watercraft and the support body. The projections, which engage in the retaining mounts, allow the bending stresses to be reliably absorbed in the connection area.

If, according to the invention, two spaced-apart profile sections are provided on the support body, which are inserted into plug-in receptacles on the hull, then the support body can simply be plugged onto the watercraft. The spacing of the hollow profile sections allows lateral forces to be reliably absorbed.

If the hollow profile sections are provided on the support body, they do not interfere with the use of the watercraft when the support body is removed. Additionally or alternatively, it may also be provided that the profile sections can be removed or that a swivel connection or sliding connection is provided between the watercraft or the support body and the profile section so that the profile sections can be stowed away to save space. However, this should not impair the rigid connection between the watercraft and the support body.

According to the invention, it is provided that the profile sections protrude from the support body and are firmly connected to it. They then do not interfere with the watercraft when

the support body is removed. The profile sections firmly connected with the support body enable a particularly rigid coupling to the watercraft.

Within the scope of this invention, it should especially also be possible to design the rigid connection between the hull and the support body such that, apart from production-related tolerances, no rotational movements and/or no translational movements occur between the hull and the support body. In particular, the rigid connection should be such that no degrees of freedom are permitted between the watercraft and the support body in the connection area.

According to a preferred variant of this invention, it may be provided that the jet outlet of the flow channel is arranged such that the water jet generated by the propelling screw is guided past the underside of the support body, in particular on the underside of the support body. This enables a particularly flow-optimized design, with which the travel speed can be further increased.

One conceivable alternative invention is for the support body to provide a recess on its underside, which is designed such that it partially receives and guides the water jet during vehicle operation. A low overall height can thus be achieved for the support body. It has also been shown that guiding the water jet in the recess can lead to a further increase in performance. It also proves to be advantageous if it is provided that the recess extends from the connection area of the support body to the stern area of the hull in the direction of the end facing away from the bow area and ends in the area of the underside of the support body.

If it is provided that sliding surfaces are arranged on both sides of the central longitudinal axis of the support body, which are preferably aligned with each other and which are particularly preferably designed as concave surfaces at least in some areas or as flat surfaces at least in some areas, then a quick change from displacement run to gliding run can be realized. The sliding surfaces extend in the direction of the central longitudinal axis of the support body. Preferably, the sliding surfaces are arranged such that they merge directly or indirectly into the flow surfaces of the watercraft. The design should be such that the sliding surfaces either merge into the flow surfaces of the watercraft without a step or that a descending step is created in the direction of travel. This means that the water flow is not hindered by any flow resistance. The fact that the sliding surfaces are positioned in relation to each other makes it possible to stabilize the driving operation.

According to the invention, it can also be provided that the hull has water guide surfaces in the area of the lower hull, which extend along the central longitudinal axis, which runs from the bow area in the direction of the stern area, and that the water guide surfaces in

the stern area have transition areas, which are transferred to the sliding surfaces of the support body. The transition areas are preferably streamlined, for example in the form of convex curves.

If it is provided that the hull has projections on both sides, which are arranged in the stern area, that the support body is bounded by side edges in the direction of the central longitudinal axis, and that the projections protrude transversely to the central longitudinal axis of the hull over the side edges, at least in the connection area, then the lateral connection areas of the support body to the watercraft are designed to optimize the flow and disruptive flow resistances, which can generate splash water in particular, are avoided in this area.

It may also be particularly preferable that the projections at least partially form the water guide surfaces. In this way, the water guide surfaces can be widened by means of the projections, which supports the gliding properties.

A conceivable alternative invention is such that, in addition to the flow channel, a flooding chamber is arranged in the hull, which can be filled with water during water travel via water inlet openings by means of the surrounding water. When the watercraft is placed in the water, the flooding chamber fills with water. This can be used to influence the buoyancy of the watercraft. When the watercraft is removed from the water, the water flows out of the flooding chamber through the water inlet openings. This reduces the transportation weight of the watercraft. This results in a simple system with which the buoyancy of the watercraft can be easily adjusted.

If, in addition to the water inlet openings, the flooding chamber is also connected to the environment via water outlet openings such that water is directed through the flooding chamber during the water travel and an electrical assembly unit held in it is cooled, then the flooding chamber can be used to effectively cool the electrical assembly unit. The flowing water is available in unlimited quantities for cooling purposes.

Within the scope of this invention, the watercraft is to be understood in particular as having an electric motor that drives the propelling screw directly or indirectly. The electric motor is driven by one or more accumulators. A control unit is also provided. It controls the functions of the watercraft.

One or more of the aforementioned components (electric motor, accumulator, control unit) can be accommodated at least in certain areas in the flooding chamber for cooling purposes.

One possible embodiment of the invention is such that a bulge is provided on the lower hull, which forms the flow channel or covers it, and that the water guide surfaces are

arranged on both sides of this bulge. This results in a space-saving design and a particularly favorable flow to the water guide surfaces.

Additionally or alternatively, one or more stabilizing fins may also be provided in the bulge area. These stabilizing fins help to stabilize the driving operation. At the bulge, they are arranged at a large distance from the central longitudinal axis of the watercraft. As a result, their stabilizing properties are properly developed.

According to the invention, it can also be provided that the support body is formed from a molded body, the core of which consists of foamed plastic material, and that this core is coated with a hard plastic layer. For example, the core can be made of PU foam. The coated plastic layer can, for example, be made of PUR.

The invention is explained in more detail below with reference to an embodiment example shown in the drawings. Among the figures, we see:

Figure 1 is a rear perspective view of a watercraft with a support body,

Figure 2 shows the watercraft with an attached support body as per Figure 1 in a perspective view from bottom,

Figure 3 shows a top view of the assembly unit as shown in Figures 1 and 2,

Figure 4 shows a bottom view of the assembly unit as shown in Figures 1 and 2,

Figure 5 shows a side view of the assembly unit as shown in Figures 1 and 2,

Figure 6 shows a rear view of the assembly unit as shown in Figures 1 to 5.

Figure 1 shows a watercraft 10 which, within the scope of the invention, can be used for both submersible and overwater travel.

The watercraft 10 has a hull with a bow area 11 and a stern area 12. An electric motor and one or more accumulators are accommodated in the hull of the watercraft 10. The accumulators supply power to the electric motor.

As Figure 1 shows, the watercraft 10 has a deck 13. The deck 13 forms a support surface. A user can rest an area of his/her upper body on this. Handles 20 are provided at the sides in the deck area 13. The user can hold on to these handles 20.

Control elements 21 can be assigned to the handles 20. These control elements 21 can be used to control the functions of the watercraft 10. For example, the control elements 21 can be designed such that the power output of the electric motor can be regulated. Further functionalities can also be assigned to the control elements 21. For example, they can be used to program a controller of the watercraft 10. It is also conceivable to control other functions of the watercraft 10 using the control elements 21.

Armrests 15 are provided next to the handles 20. The users can rest their forearms comfortably on these. Carrying handles 15.1 can also be provided on both sides of the

watercraft 10 in the area of the armrests 15. However, this is not absolutely necessary. Rather, it is also conceivable not to use such carrying handles 15.1, in which case water guide surfaces can be arranged or continued in the area of the lower hull 30 of the watercraft 10 in the area under the armrests 15.

As Figure 1 shows, the handles 20 can be arranged in a streamlined manner in the area of a recessed grip 16 behind a nose 17 of the watercraft 10.

The nose 17 is arranged in the bow area 11 of the watercraft and can be designed independently of the recessed grip 16. The nose 17 tapers in a streamlined manner towards the front of the watercraft. As the drawings show, it is conceivable that a headlight 17.1 is integrated into the front of the hull of the watercraft in the nose area 17. Additionally or alternatively, a camera can also be provided on the nose 17. The camera can be used to make video recordings, which is particularly advantageous for underwater travel.

A flooding chamber is integrated into the hull of the watercraft 10. This flooding chamber is connected to the surroundings via water inlet openings 17.2 and further water inlet openings 31, which are arranged in the area of the lower hull and which are clearly visible in Figures 2, 4 and 5.

One or more of the aforementioned electrical assembly units can be installed in the flooding chamber for cooling purposes. The flooding chamber can also continue to be connected to the surroundings via a water outlet opening 14.

When the watercraft 10 is placed in the water, the water flows from the surroundings into the flooding chamber via the water inlet openings 17.2, 31 and also initially via the water outlet opening 14. When the watercraft 10 is in driving operation, the water flows into the flooding chamber via the water inlet openings 17.2, 31. The water then flows through the flooding chamber and leaves the flooding chamber through the water outlet opening 14.

A water flow is thus generated in the flooding chamber during driving operation. This water flow can be used for continuous cooling of the electrical assembly unit or electrical assembly units held therein.

If water inlet openings 17.2 are provided in the area of the deck 13, these can be used to ensure that the air in the flooding chamber is displaced therefrom when the water flows in through other water inlet openings 17.2, 31.

If the water inlet openings 31 are provided in the area of the lower hull 30, a continuous water supply is guaranteed during driving operation.

Figure 1 also shows that there is a recess 18 in the area of the deck 13. This recess 18 is arranged between the handles 20. The recess 18 accommodates a display 18.1. The user can check operating parameters during water travel on this display 18.1. The

aforementioned control elements 21 can also be used to switch between different display states of the display 18.1.

Additionally or alternatively, further control elements 18.2 can also be provided on the deck 13, preferably in the area of the recess 18. These control elements 18.2 can also be used to control functionalities of the watercraft 10. Preferably, these control elements 18.2 can also be used to control the function of the display and its display states.

A charging plug is provided in the area of the deck 13. This charging plug can be sealed watertight with a cover element 18.3. The charging plug can be used to connect the batteries to a power supply for charging.

Figures 2 and 4 show the construction of the lower hull 30. The water inlet openings 31 on the underside of the watercraft 10 can be clearly seen in these illustrations.

A flow channel 40 is arranged inside the hull of the watercraft 10. A propelling screw 41 is arranged in this flow channel 40. The propelling screw 41 is driven by the electric motor that is also housed in the hull.

The flow channel 40 has an intake port 33. This intake port 33 is arranged in the area of the underside of the watercraft 10 and preferably in the area of the mid-ship, as can be seen in Figure 5. The intake port 33 has large dimensions. In order to mechanically stabilize this intake port, a stabilizing element 34 is used, which supports the radially outer area of the flow channel 40 relative to the hull in the form of a daggerboard. As Figure 2 shows, inflow areas of the intake port 33 are formed to the side of the stabilizing element 34.

The watercraft 10 has a bulge 32 in the area of its lower hull 30, which can be clearly seen in the drawings. This bulge 32 accommodates the flow channel 40.

Figure 2 shows that the watercraft 10 has water guide surfaces 35 to the side of the bulge 32. The water guide surfaces thus run on both sides of the flow channel 40.

As shown in the drawings, the water guide surfaces 35 can extend continuously into guide surfaces of the lower hull 30, which extend in front of the intake port 33. Preferably, these guide surfaces merge continuously into the water guide surfaces 35.

Lateral projections 35.1 are provided on the hull to ensure that the water guide surfaces 35 are as large as possible. The water guide surfaces 35 extend over these lateral projections 35.1.

Towards the rear, the water guide surfaces 35 merge into transition areas 36. These transition areas 36 can be formed, for example, in the form of convex curvatures.

As can be seen from the drawings, a support body 50 can be attached to the watercraft 10. The support body 50 can be rigidly connected to the watercraft 10. This means that

the support body 50 cannot be bent relative to the watercraft in the direction of the image plane shown in Figure 5. It is especially preferred that the connection of the support body 50 to the watercraft 10 is such that the support body cannot be displaced relative to the watercraft 10 either translationally or rotationally in the connection area to the watercraft 10 (within the scope of production-related tolerances).

The support body 50 can either be replaceable or permanently connected to the watercraft 10.

The support body 50 forms a support surface 51 on its upper side. This support surface 51 is directly adjacent to the deck 13 of the watercraft 10. The support surface of the watercraft 10, on which the user can lie, is thus extended and results from the sum of the support surfaces of the deck 13 and the support surface 51 of the support body 50.

Figure 6 shows the design of the support surface 51 more clearly. As this drawing shows, the support surface 51 is curved upwards. For this purpose, it may be provided, for example, that the support surface 51 has a raised central area 51.1. This central area 51.1 is adjoined by side sections 51.3 via transition sections 51.2. The transition sections 51.2 can be designed, for example, as convex curvatures, so that comfortable contact is possible. The side sections 51.3 reduce the cross-section of the support body 50 to the side areas of the support body 50 extending transversely to the central longitudinal axis ML.

The hull of the watercraft 10 has a fastening section 19 in the stern area 12. This fastening section 19 has, for example, a plug-in receptacle 19.1. A support body 50 can be attached to the fastening section 19.

The support body has a connection area 52 in which it is coupled with the watercraft 10. Two profile sections, for example two pipe sections, protrude from the support body 50 in the connection area 52 in order to connect the support body 50 to the watercraft. The longitudinal axes of these profile sections lie in the direction of the central longitudinal axis ML of the watercraft 10. The profile sections can be inserted into plug-in receptacles of the watercraft 10. The plug-in receptacles also extend in the direction of the central longitudinal axis ML of the watercraft 10.

For example, the plug-in receptacles can extend in the area of the lateral projections 35.1. This creates a large support spacing transverse to the central longitudinal axis ML.

To mount the support body 50, it is inserted with its profile sections into the plug-in receptacles. A suitable detachable locking mechanism can then be used to prevent the support body 50 from being unintentionally removed from the watercraft 10.

Figure 4 clearly shows that the support body 50 is bounded by side edges 53 on its side areas extending in the direction of the central longitudinal axis ML. The side edges 53 extend in the direction of the central longitudinal axis ML such that the width of the support body 50 is reduced starting from the connection area to the watercraft 10. Preferably, it is provided that the width of the support body 50 is thereby continuously reduced. It may also be provided that the width of the support body 50 is reduced continuously and/or only in certain areas.

The side edges 53 merge into a rear edge 55 of the support body 50 via a rounding section 54.

In the connection area 52, for example, a retraction 52.1 can be provided, which reduces the width of the support body 50 in the direction of the bow area 11.

It is especially preferred that the arrangement of the support body 50 in the connection area to the hull is such that the lateral projections 35.1 cover the connection area 52 of the support body 52 transversely to the central longitudinal axis ML and thus transversely to the direction of travel of the watercraft 10.

Figures 2, 4 and 6 show that one or more sliding surfaces 56 can be provided on the underside of the support body 50. In the present embodiment example, two sliding surfaces 56 are provided in particular, which are positioned at an angle to one another. This can be clearly seen in Figure 6 in particular. This illustration shows the V-shaped adjustment of surface areas 56.1 of the sliding surfaces 56. The surface areas 56.1 can be designed as flat surfaces or as concave surfaces.

Starting from the connection area 52, a recess 57 is recessed into the underside of the support body 50. This recess 57 extends from the connection area 52 in the direction of the free end of the support body 50. The recess 57 is arranged adjacent to the jet outlet 43 of the flow channel 40. Accordingly, the water jet generated by the propelling screw 41 is directed past the underside of the support body 50. If the recess 57 optionally shown in the drawings is used, this water jet is guided in the area of the recess 57 in a streamlined manner.

Figure 2 shows that a flow stabilizer 42 is provided in the flow channel 40 downstream of the propelling screw 51 in the flow direction. This flow stabilizer 42 serves to straighten the rotating flow of the water jet generated by the propelling screw 41 (in particular the propeller) to at least the maximum possible extent. This results in a considerable increase in performance.

FARTØJ

Patentkrav

1. Fartøj (10) med et skrog, der i området af et overskib (13) har et sæde, hvorpå en bruger kan lægge sig delvist med sin overkrop og kan holde fast i holdegreb (20), der fortrinsvist er anbragt i bovområdet (11), hvorved skroget er tildelt en strømningskanal (40) eller skroget har en strømningskanal (40), hvorved der i strømningskanalen (40) er anbragt en vandskrue (41), hvorved strømningskanalen (40) har en indsugningsåbning (33) og i strømningsretningen efter vandskruen (41) et stråleudløb (43) hækområdet (12) og hvorved et bærelegeme (50) er anbragt på hækområdet (12) således, at sædet er forlænget ved hjælp af en sædeflade (51) på bærelegemet (50),
hvorved bærelegemet (50) på sin underside har mindst en glideflade (56), hvorved bærelegemet (50) er stift forbundet med skroget, hvorved bærelegemet (50) kan forbindes udskifteligt med skroget,
kendetegnet ved, at der på bærelegemet (50) rager to anbragte profilafsnit ud med afstand til hinanden, der er indsat i stikholdere på skroget,
og at profilafsnittene rager ud på bærelegemet (50) og er fast forbundet til dette.

2. Fartøj ifølge krav 1, kendetegnet ved, at en skiftekobling fungerer mellem skroget og bærelegemet (50), ved hjælp af hvilken bærelegemet (50) er forbundet udskifteligt med skroget.

3. Fartøj ifølge krav 1 eller 2, kendetegnet ved, at skiftekoblingen har et eller flere fremspring, der er indsat i en eller flere holdere på den anden del af forbindelsen (skrog eller bærelegeme (50)).

4. Fartøj ifølge et af kravene 1 til 3, kendetegnet ved, at den stive forbindelse mellem skroget og bærelegemet (50) er konstrueret således, at der, bortset fa produktionsbetingede tolerancer, ikke opstår nogen rotatorisk bevægelse og/eller nogen translatorisk bevægelse mellem skroget og bærelegemet (50).

5. Fartøj ifølge et af kravene 1 til 4, kendetegnet ved, at stråleudløbet (43) på strømningskanalen (40) er anbragt, så vandstrålen, der genereres af vandskruen (41)

ledes forbi undersiden af bærelegemet (50), og i særdeleshed føres på undersiden af bærelegemet (50).

6. Fartøj ifølge et af kravene 1 til 5, kendetegnet ved, at bærelegemet (50) på sin under side har en fordybning (57), der er udformet således, at den delvist optager og fører vandstrålen under driften af fartøjet.

7. Fartøj ifølge krav 6, kendetegnet ved, at fordybningen (57) strækker sig med udgangspunkt i tilslutningsområdet (52) for bærelegemet (50) til hækområdet på skroget i retning mod enden, der vender mod bovområdet (11) og fortrinsvist udløber i området ved undersiden af bærelegemet (50).

8. Fartøj ifølge et af kravene 1 til 7, kendetegnet ved, at der på begge sider af den midterste langsgående akse (ML) af bærelegemet (50) er anbragt glideflader (56), der fortrinsvist er opstillet i forhold til hinanden og som især fortrinsvist mindst i en del af området er udformet som konkave flader eller mindst i en del af området som plane flader.

9. Fartøj ifølge et af kravene 1 til 8, kendetegnet ved, at skroget i området ved underskibet (30) har vandføringsflader (35), der strækker sig langs den midterste langsgående akse (ML), der forløber fra bovområdet (11) i retning mod hækområdet (12), og at vandføringsfladerne (35) i hækområdet (12) har overførselsområder (36), der føres over i glidefladerne på bærelegemet (50).

10. Fartøj ifølge et af kravene 1 til 9, kendetegnet ved, at skroget i begge sider har fremspring (35.1), der er anbragt i hækområdet (12), at bærelegemet er begrænset af sidekanter (53) i retning mod den midterste langsgående akse, og at fremspringene (35.1) rager ud på tværs af den midterste langsgående akse (ML) af skroget over sidekanterne (53), mindst i tilslutningsområdet (52).

11. Fartøj ifølge krav 10, kendetegnet ved, at fremspringene (35.1) mindst delvist danner vandføringsfladerne (35).

12. Fartøj ifølge et af kravene 1 til 11, kendetegnet ved, at der i skroget ud over strømningskanalen (40) er anbragt et fyldningsrum, der kan fyldes med vand ved hjælp af det omgivende vand under sejlads over vandindløbsåbninger (17.2, 31).

13. Fartøj ifølge krav 12, kendetegnet ved, at fyldningsrummet ud over vandindløbsåbningerne (17.2, 31) også via vandudløbsåbninger (14) er i forbindelse med omgivelserne således, at der under sejlads ledes vand gennem fyldningsrummet, og en elektrisk enhed, der er indeholdt deri, afkøles.

14. Fartøj ifølge et af kravene 1 til 13, kendetegnet ved, at holdegrebene (20) er anbragt på begge sider af den midterste langsgående akse (ML), og at holdgrebene (ML) er tildelt betjeningselementer (21).

15. Fartøj ifølge et af kravene 1 til 14, kendetegnet ved, at der på underskibet (30) er fastsat en udbuling (32), der danner strømningskanalen (40) eller overdækker denne, at vandføringsfladerne (31) er anbragt i begge sider af denne udbuling (32) og/eller at der i området ved udbulingen (32) er anbragt en eller flere stabiliseringsfinner (38).

16. Fartøj ifølge et af kravene 1 til 15, kendetegnet ved, at bærelegemet er dannet af et formlegeme, hvis kerne består af opskummet kunststofmateriale, og at denne kerne er omhyllet af et hårdt kunststoflag.

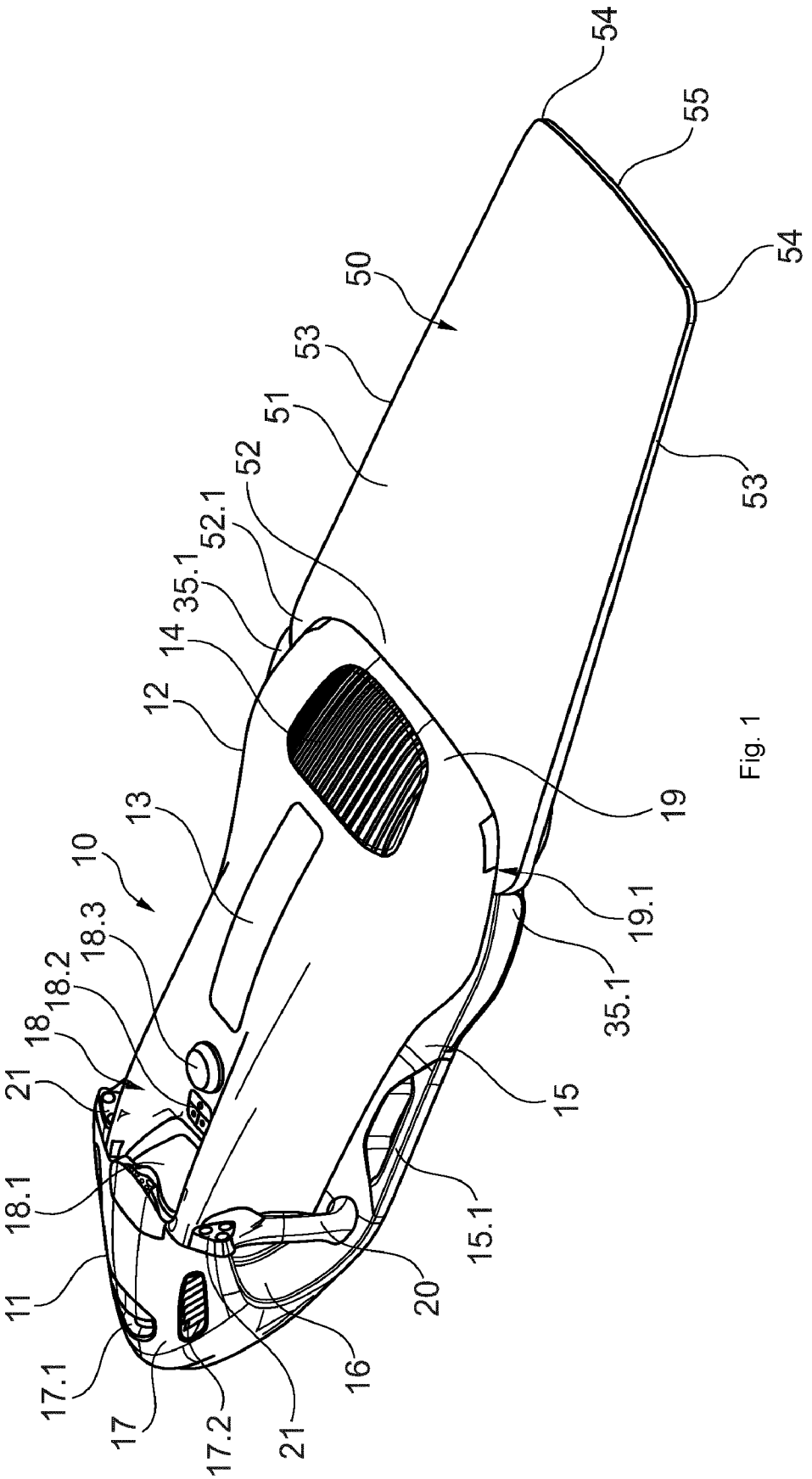
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Fig. 1

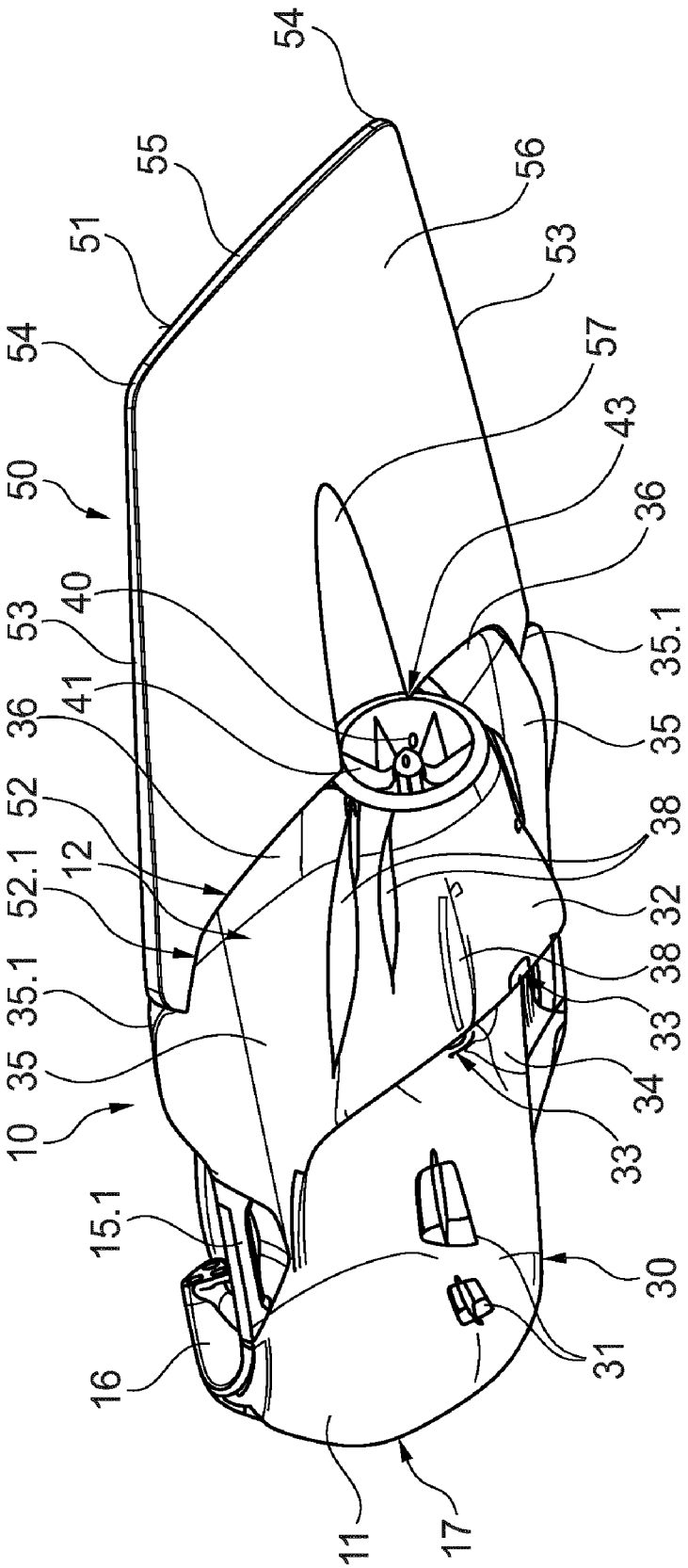
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Fig. 2

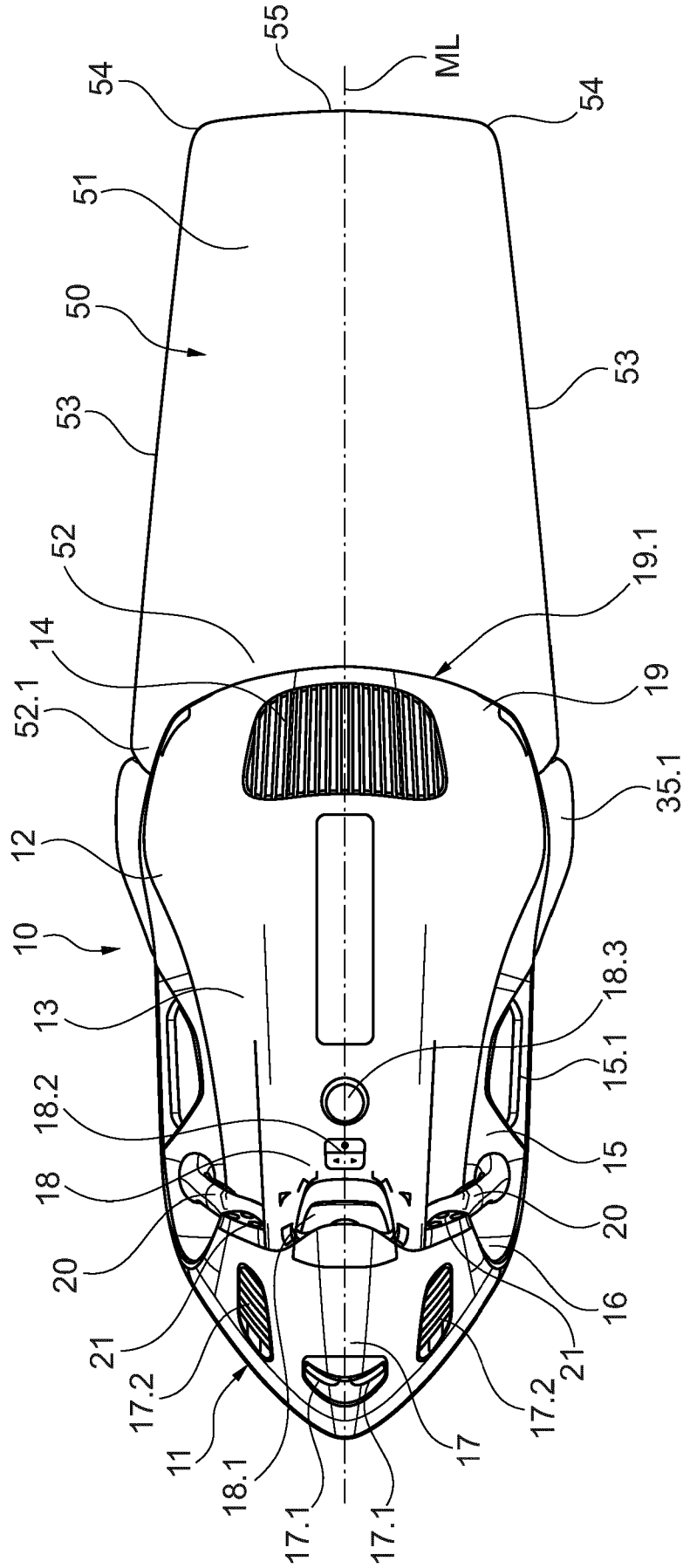
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Fig. 3

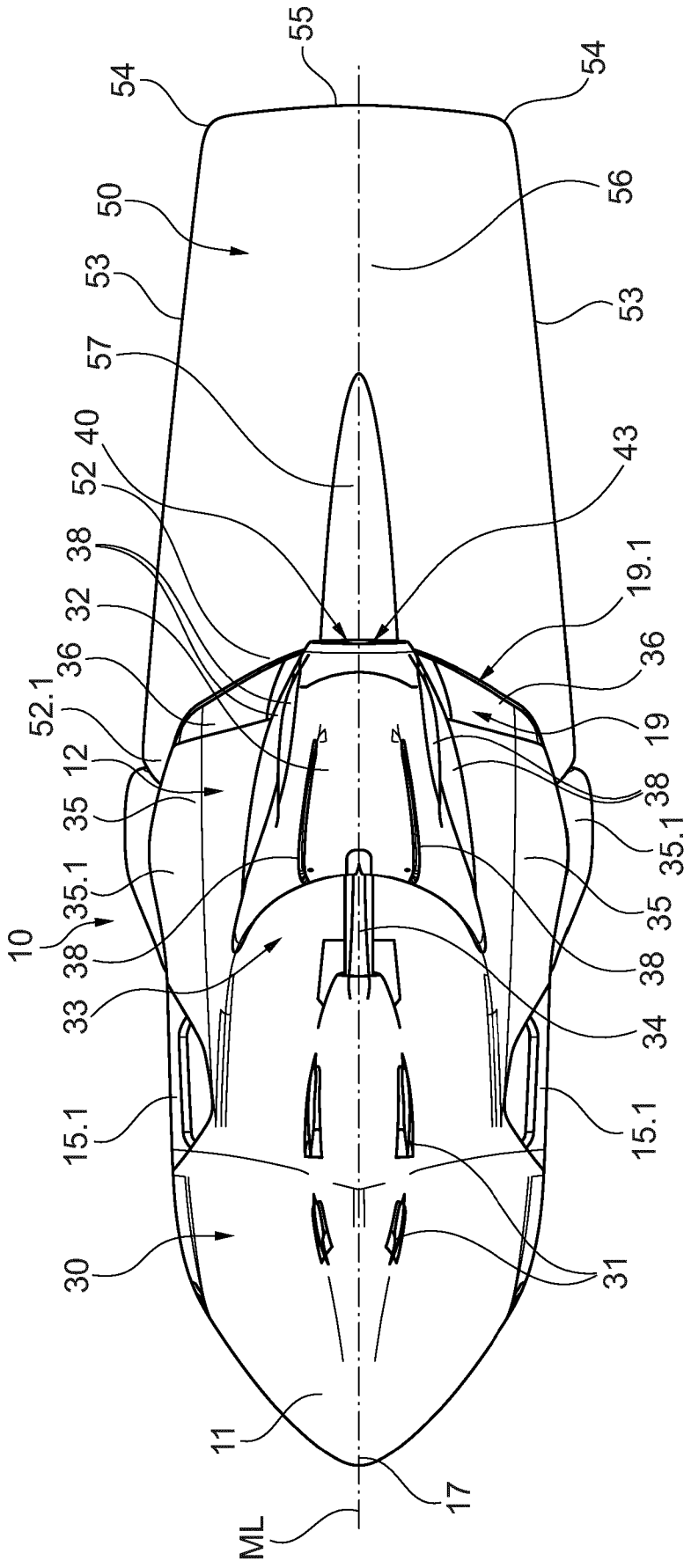
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Fig. 4

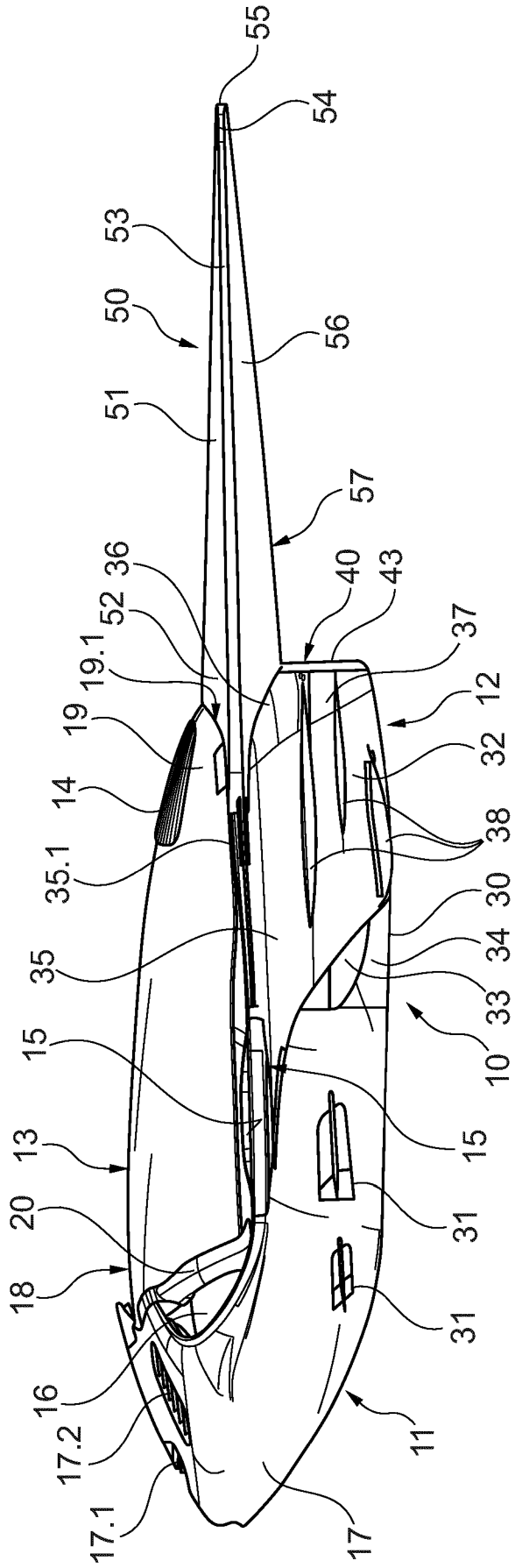
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Fig. 5

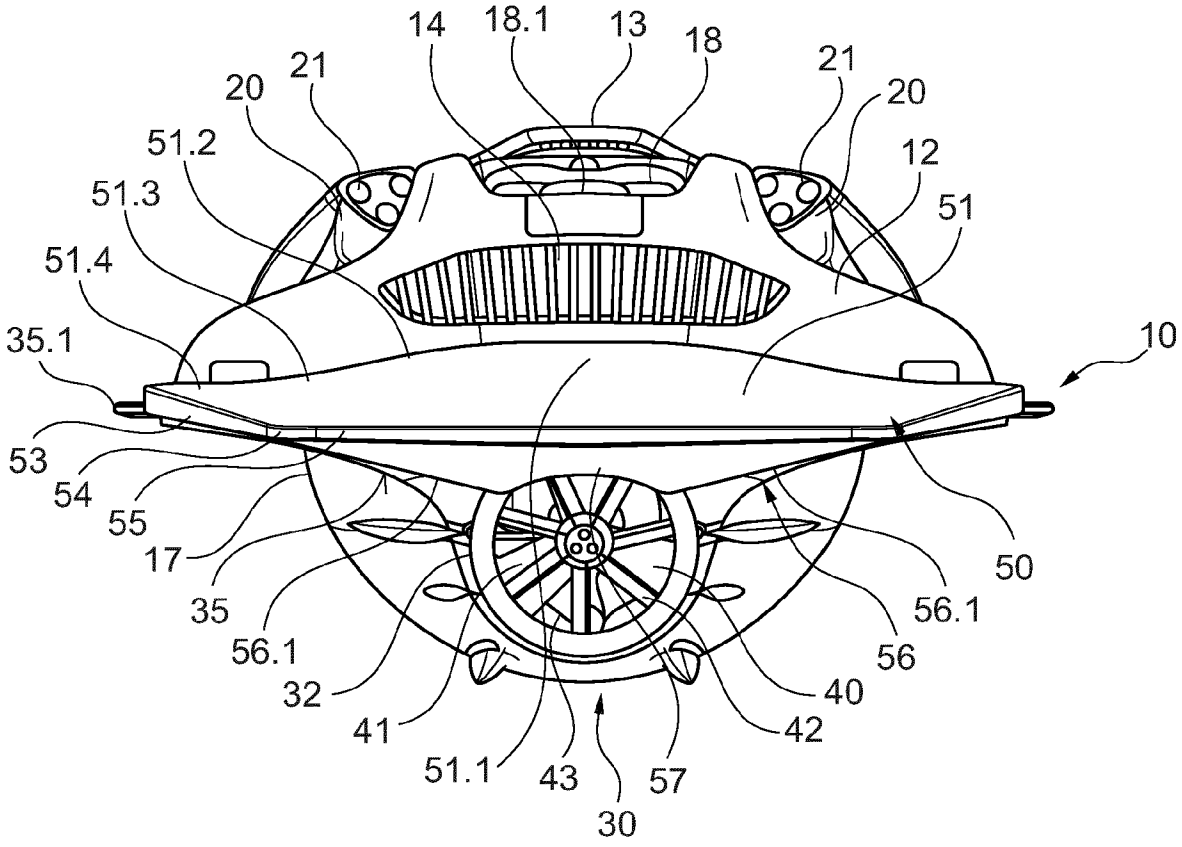
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Fig. 6