PATENT SPECIFICATION

DRAWINGS ATTACHED

Inventor: CHRISTOPHER SYDNEY COCKERELL

854211

Date of filing Complete Specification: Dec. 11, 1956.

Application Date: Dec. 12, 1955. No. 35656/55.

Complete Specification Published: Nov. 16, 1960.

ERRATA

SPECIFICATION NO. 854,211

Page 1, line 13, *for* "Nespect" *read* "aspect"

Page 2, line 63, *for* "periphery" *read* "pheripherally"

Page 3, line 23, *for* "fushion" *read* "cushion"

Page 3, line 116, *for* "assymetrical" *read* "asymmetrical"

Page 4, line 23, *for* "if" *read* "of"

Page 4, line 42, *for* "rise" *read* "arise"

Page 4, line 81, *insert* a comma *after* "to"

Page 4, line 95, *insert* a comma *after* "and" in the second occurrence.

Page 5, line 17, *for* "last" *read* "least"

Page 5, line 108, *for* "jet" *read* "jets"

Page 6, line 57, *insert* a comma *after* "case"

Page 6, line 88, *insert* a comma *after* "course"

THE PATENT OFFICE,
18th June 1963

DS 74841/1(3)/R.109 200 6/63 PL

that in cruising conditions the thrust due to the stream of fluid finally leaving the vehicle is substantially less than the weight of the vehicle when loaded.

The invention in another aspect consists in a vehicle which comprises means for causing at least one stream of fluid to issue from the lower part of the vehicle to form at least one curtain of moving fluid which travels across the gap that in operation exists between the surface over which the vehicle is to hover or gas other than the said fluid, flows so as to result in the formation of a pressurised cushion or cushions by which the vehicle is wholly or partly supported, the pressure of the cushion causing, and in its turn being contained due to, a change of direction of the moving fluid which results in a curvature of the curtain, and in which the plan area of the said pressurised cushion or cushions is a number of times larger than the total cross-sectional area through which the fluid is taken in, and the means for

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Index at acceptance:—Class 4, FXX.

International Classification:—B64d.

COMPLETE SPECIFICATION

Improvements in or relating to Vehicles for Travelling Over Land and/or Water

We, HOVERCRAFT DEVELOPMENT LIMITED, a British Company of 7, Tilney Street, London, W.1, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to vehicles for travelling over land and/or water and may be applied to ships or aircraft or land-going vehicles or to vehicles which represent a combination thereof.

The invention in one respect consists in a vehicle which comprises means for causing a fluid to issue from the lower part of the vehicle in such a way as to result in the formation and maintenance of at least one curtain of moving fluid which travels across the gap that in operation exists between the surface over which the vehicle is to hover or travel and the structure of the vehicle and, together with the said structure and surface, encloses a space into which the said fluid, or a gas other than the said fluid, flows so as to result in the formation of a pressurised cushion or cushions by which the vehicle is wholly or partly supported, the pressure of the cushion causing, and in its turn being contained due to, a change of direction of the moving fluid which results in a curvature of the curtain, and in which the means for forming the curtain are such that in cruising conditions the thrust due to the stream of fluid finally leaving the vehicle is substantially less than the weight of the vehicle when loaded.

The invention in another aspect consists in a vehicle which comprises means for causing at least one stream of fluid to issue from the lower part of the vehicle to form at least one curtain of moving fluid which travels across the gap that in operation exists between the surface over which the vehicle is to hover or travel and the structure of the vehicle and, together with the said structure and surface, encloses a space into which the said fluid, or a gas other than the said fluid, flows so as to result in the formation of a pressurised cushion or cushions by which the vehicle is wholly or partly supported, the pressure of the cushion causing, and in its turn being contained due to, a change of direction of the moving fluid which results in a curvature of the curtain, the plan area enclosed by the said stream of fluid, the said surface and the structure of the vehicle being a number of times larger than the cross-sectional area of the stream of fluid, and in which the means for forming the curtain are such that in cruising conditions the thrust due to the stream of fluid finally leaving the vehicle is substantially less than the weight of the vehicle when loaded.

The invention in yet another aspect consists in a vehicle which comprises an intake for a fluid, means for drawing fluid through the intake and causing it to issue from the lower part of the vehicle in such a way as to result in the formation and maintenance of at least one curtain of moving fluid which travels across the gap that in operation exists between the surface over which the vehicle is to hover or travel and the structure of the vehicle and, together with the said structure and surface, encloses a space into which the said fluid, or a gas other than the said fluid, flows so as to result in the formation of a pressurised cushion or cushions by which the vehicle is wholly or partly supported, the pressure of the cushion causing, and in its turn being contained due to, a change of direction of the moving fluid which results in a curvature of the curtain, and in which the plan area of the said pressurised cushion or cushions is a number of times larger than the total cross-sectional area through which the fluid is taken in, and the means for

forming the curtain are such that in cruising conditions the thrust due to the stream of fluid finally leaving the vehicle is substantially less than the weight of the vehicle when loaded.

The curtain of fluid acts as an envelope which encloses a cushion of air beneath the vehicle, and, where the fluid is air, the air pressure in the cushion can build up to an extent which is necessary to raise the vehicle out of contact with the surface. Where the fluid is not air, but is, for instance, water, the vehicle is provided with means for pumping air into the space beneath the vehicle to build up the pressure in such space to the required value. In either case, the curtain of fluid acts after the manner of the walls of a pneumatic tyre and serves to contain the necessary pressure for supporting the vehicle.

Since the total thrust of the jet of fluid forming the curtain is less than the weight of the vehicle, the vehicle of the invention is distinct from vertical take-off craft in which the total downward thrust of the jets employed must be at least equal to the total weight that they support. The cushion enclosed in the curtain of fluid is not able to support the vehicle of the invention at great and indefinite heights above the ground, but can only raise it to a height which depends upon inter-relationships between the weight of the vehicle, the plan area enclosed by the curtain and the power of the means for discharging the fluid.

For a better understanding of the invention, and to show how the same may be carried into effect, reference will now be made to the accompanying diagrammatic drawings in which:—

Fig. 1 is a side elevation of a vehicle for travelling over land and/or water,

Fig. 2 is a top plan view of the vehicle shown in Fig. 1,

Fig. 3 is a bottom plan view of the vehicle shown in Fig. 1,

Fig. 4 is a front elevation of a modified form of the vehicle,

Fig. 5 is a cross-sectional detail of part of the vehicle shown in Fig. 1, and

Fig. 6 is a cross-sectional view of part of a modification of the vehicle shown in Fig. 1.

Referring now to Figs. 1 to 5 of the drawings, there is shown a vehicle 1 for travelling over land and/or water. The vehicle is streamlined and generally egg-shaped in plan view, being narrower at the rear end than at the front end, and has a flat bottom. At its front end, the vehicle has an air intake 2 in which a double, four-bladed fan 3 is mounted, there being a motor 4 for rotating the fan 3 which is connected to the motor 4 by means of a driving shaft 5. The intake 2 leads into a chamber 6 formed in the vehicle, and the chamber 6 in turn communicates with a periphery extending tunnel 7 leading to a peripherally extending mouth 8 formed around the bottom of the vehicle, i.e., below its centre of gravity. The mouth 8 is subdivided by a plurality of vanes 9 which are so arranged that, when a jet of air is forced through the mouth, the jet is directed with a velocity component which is inwards and with a mean resultant velocity component which is rearwards of the vehicle.

Located above the chamber 6 is a cockpit 10 for the pilot of the vehicle, from whence the pilot can control the vehicle. A hold, or bay 11 is formed behind the chamber 6, the hold 11 being adapted for the reception of the load the vehicle is to carry. There are doors 12 which lead into the hold 11 and the vehicle can be loaded by conveying the goods up a ramp. The hold 11 may, however, be adapted for the reception of passengers, in which case the walls of the hold will be provided with windows (not shown). The vehicle has, at its rear end, a tailplane 14 which may be used to assist in steering the vehicle.

In the operation of the vehicle, the motor 4 rotates the fan 3 which induces a large volume of air into the chamber 6 from whence the air passes through the tunnel 7 and out of the mouth 8. Assuming for the moment that the vanes 9 do not direct the air with a velocity component which is rearwards of the vehicle, i.e., the vanes are effectively omitted, then the air forms a curtain extending peripherally from and enclosing the bottom of the vehicle. The curtain initially extends almost horizontally beneath the vehicle and soon sufficient pressure builds up beneath the vehicle to deflect the curtain so that it impinges upon the ground. As the pressure rises in the space enclosed between the curtain, the bottom of the vehicle and the ground, the pressure will act upon the bottom of the vehicle and will lift the vehicle. The pressure will also act upon the curtain and will further deflect the same to a position where, when seen in vertical section, the curtain will follow a curved path with a mean radius of curvature equal to about half the height of the bottom of the vehicle from the ground and with centres of curvature disposed outside the envelope and substantially vertically beneath the peripheral edge of the bottom of the vehicle, as shown in Fig. 1 where the curtain is shown in chain-dotted lines. Thus the curtain-forming jet while emerging from the mouth in an inward direction is caused by the cushion pressure to change its direction to such an extent that it ultimately flows outwards. The pressure within the envelope can build up rapidly to the point where the vehicle is supported upon the air trapped within the envelope so that the vehicle is sustained over the ground upon an air cushion just as effectively as though the vehicle were resting upon a balloon tyre.

The vehicle is supported mainly by the air cushion rather than by the thrust of the curtain jet, and the vertical component of thrust of the jet emerging from the mouth is in fact sub-

stantially less than the weight of the loaded vehicle. The plan area of the cushion is consequently many times greater than the cross-sectional area of the air intake 2, that is to say, in the example shown in Fig. 1, of the order of twelve times the latter area. Likewise the plan area of the cushion is many times greater than the cross-sectional area of the stream of fluid issuing from the mouth 8 to form the curtain, as will be evident from inspection of Fig. 3.

As indicated above, the pressure within the envelope will automatically build up to that required for the support of the vehicle itself. It will, however, be appreciated that once the continuous curtain has been established with the aid of the jet, the envelope may be directly filled by forcing air through an appropriate orifice in the bottom of the vehicle as will be explained hereinafter.

Once the vehicle is in spaced relationship from the ground and supported upon the air fushion within the described envelope, the vehicle is propelled forwardly over the ground by the overall backward inclination of the jet curtain due to the overall backward inclination of the vanes 9, since the jet curtain possesses a component which will react upon the vehicle in a horizontal plane to cause the same to be translated over the ground whilst in spaced relation therefrom. Although for simplicity the movement of the vehicle has been considered in two parts, namely purely vertical movement with the vanes 9 effectively omitted and forward movement due to the backward inclination of the vanes, it will be appreciated that the actual movement of the vehicle is a combination of the two movements and that the curtain of air will have a somewhat different shape from that described.

As the vehicle gathers speed, the head pressure will increase and may well approach the pressure of the air within the envelope on which the vehicle is supported. It will be evident that when the head pressure and the envelope pressure are equal there is no necessity to maintain that part of the curtain at the forward end of the vehicle, although, of course, sufficient of the sides of the curtain and the after end thereof must be preserved as will ensure that the appropriate pressure will be maintained beneath the vehicle for the support thereof.

In the arrangement described above, the mouth 8 through which the jet is projected directs the jet mainly inwards. As an alternative the mouth 8 may be such that the jet is directed vertically downwards so that the curtain strikes the ground with the result that the air will flow both inwardly beneath the bottom of the vehicle and outwardly away from the bottom of the vehicle. Hence, pressure will begin to rise in the space enclosed between the curtain, the underside of the vehicle and the surface beneath the vehicle. The pressure will again act upon the whole of the underside of the vehicle so tending to lift the vehicle and will also act upon the enveloping curtain thereby causing the lower part of the curtain adjacent the ground to become bell-mouthed. Thus as seen in vertical section, as in Figure 4, the curtain will not appear as a vertical jet but will be an arcuately extending jet having a centre of curvature outside the envelope formed by the curtain and a radius of curvature substantially equal to the height of the bottom of the vehicle from the ground. Again the pressure within the envelope can build up rapidly to the point where the vehicle is supported upon the air trapped within the envelope so that the vehicle is sustained over the ground upon an air cushion just as effectively as though the vehicle were resting upon a balloon tyre.

It will be appreciated that because the vehicle is supported upon an air cushion, the vehicle will tend to be unstable in the sense that if one side of the vehicle is moved downwardly there will be no tendency for the vehicle to right itself. One way of overcoming this difficulty is to divide the air cushion by means of further jets of air which are projected through slots 15 (Figure 3) formed in the bottom of the vehicle, the slots 15 being in communication with the chamber 6. By forcing air through the slots 15, there is also obtained the result that the envelope formed by the curtain is directly filled with air as hereinbefore referred to.

The vehicle shown in Figures 1 to 5 is intended for predominantly forward travel and is steered only by the tailplane 14, the forward propulsion being obtained by virtue of the backward inclination of the vanes 9. However, where it is desired to move the vehicle in any direction it becomes necessary either to provide means for altering the inclination of the vanes 9, or to provide means for locally altering the width of the mouth 8 since by making the jet curtain thinner at one side of the vehicle than the other the vehicle will move in the direction of the attenuation of the curtain. This is due to the fact that the vehicle drops at the position at which the curtain is attenuated, with the result that the curtain pressure produces a resultant thrust towards that position. By assymetrical attenuation of the curtain at two points it is possible to produce a turning moment on the vehicle for steering. It will be understood that local attenuation of the curtain alters the trim of the vehicle and conversely a lack of trim can be adjusted by local attenuation of the curtain. Referring now to Figure 6, there is shown an arrangement for attenuating the jet curtain at one or the other side of the vehicle. Two flaps 16 are pivotally secured at 17 in the mouth 8. Each flap 16 is displaceable about its pivot 17 with the aid of a hydraulic motor 19. Thus on one side of the vehicle a flap 16 can be displaced outwardly so as effectively to reduce

the width of the mouth 8, whilst on the other side of the vehicle the flap 16 can remain in its inner position. In this way the vehicle will tend to turn about that side where the flap has been outwardly displaced.

The vehicles so far described are capable of travelling over land or over sea at high speeds, and the body of the vehicle is designed to obtain aerodynamic lift, so as to assist in supporting the vehicle. The invention may also be applied to aircraft for the purpose of safely landing the aircraft. Thus an aircraft may be provided with means for producing a supporting air cushion when the aircraft is near to the land or sea surface, so that in effect the aircraft will land upon the cushion employing the same instead of the conventional undercarriage of land or sea aircraft.

In describing the construction of a vehicle made in accordance with the invention, reference has been made to the employment of air jets. It will be understood that in principle any gaseous medium can be employed instead if air. Moreover, a curtain could also be formed by discharging water through the jet mouth to form a liquid envelope in like manner.

In the above description, reference has been made to the building up of a pressure within the jet curtain sufficient to support the weight of the vehicle. It is convenient to consider that an air cushion of uniform pressure can be established. In practice, the pressure within the cushion will not be uniform, but this is of little consequence provided that the mean pressure, when multiplied by the plan area of the surface on which it acts, is equal to the weight of the vehicle less the, or any, resultant downward thrust which may be obtained from the jet curtain itself, and less any aerodynamic lift that the vehicle may experience during motion. Although the motion of the vehicle may, in the way described above, rise as the result of asymmetry of the jet curtain itself, it is to be understood that the vehicle may be equipped with engines specifically and separately for the purpose of propelling it.

From the description above it would appear that the jet curtain may be directed mainly inwards, i.e., horizontally, or, alternatively, vertically downwards. In practice, the jet curtain will be directed at angles between the horizontal and vertical depending upon the component of downward thrust it is desired to employ for counteracting the weight of the vehicle. This component will in turn be determined by the ratio of the total jet thrust in relation to the weight of the vehicle, and by the locality in the vehicle where the latter is asymmetrical in plan. It will be understood that since the jet is of finite width, the flow therein will not be perfectly parallel throughout the length of the jet, and that reference to the direction of the jet means the mean integrated direction of flow of the fluid forming the jet.

WHAT WE CLAIM IS:—

1. A vehicle which comprises means for causing a fluid to issue from the lower part of the vehicle in such a way as to result in the formation and maintenance of at least one curtain of moving fluid which travels across the gap that in operation exists between the surface over which the vehicle is to hover or travel and the structure of the vehicle and, together with the said structure and surface, encloses a space into which the said fluid, or a gas other than the said fluid, flows so as to result in the formation of a pressurised cushion or cushions by which the vehicle is wholly or partly supported, the pressure of the cushion causing, and in its turn being contained due to a change of direction of the moving fluid which results in a curvature of the curtain, and in which the means for forming the curtain are such that in cruising conditions the thrust due to the stream of fluid finally leaving the vehicle is substantially less than the weight of the vehicle when loaded.

2. A vehicle which comprises means for causing at least one stream of fluid to issue from the lower part of the vehicle to form at least one curtain of moving fluid which travels across the gap that in operation exists between the surface over which the vehicle is to hover or travel and the structure of the vehicle, and together with the said structure and surface, encloses a space into which the said fluid, or a gas other than the said fluid, flows so as to result in the formation of a pressurised cushion or cushions by which the vehicle is wholly or partly supported, the pressure of the cushion causing, and in its turn being contained due to, a change of direction of the moving fluid which results in a curvature of the curtain, the plan area enclosed by the said stream of fluid, the said surface and the structure of the vehicle being a number of times larger than the cross-sectional area of the stream of fluid, and in which the means for forming the curtain are such that in cruising conditions the thrust due to the stream of fluid leaving the vehicle is substantially less than the weight of the vehicle when loaded.

3. A vehicle which comprises an intake for a fluid, means for drawing fluid through the intake and causing it to issue from the lower part of the vehicle in such a way as to result in the formation and maintenance of at least one curtain of moving fluid which travels across the gap that in operation exists between the surface over which the vehicle is to hover or travel and the structure of the vehicle and, together with the said structure and surface, encloses a space into which the said fluid, or a gas other than the said fluid, flows so as to result in the formation of a pressurised cushion or cushions by which the vehicle is wholly or partly supported, the pressure of the cushion causing, and in its turn being contained due to, a change of direction of the

moving fluid which results in a curvature of the curtain, and in which the plan area of the said pressurised cushion or cushions is a number of times larger than the total cross-sectional area through which the fluid is taken in, and the means for forming the curtain are such that in cruising conditions the thrust due to the stream of fluid finally leaving the vehicle is substantially less than the weight of the vehicle when loaded.

4. A vehicle as claimed in claim 3 wherein the means for drawing fluid through the intake is a fan mounted on a substantially horizontal axis.

5. A vehicle as claimed in any of the preceding claims wherein the upward cushion pressure acts over an area equal to at last the major part of the bottom of the vehicle.

6. A vehicle as claimed in any of the preceding claims wherein the fluid issues from the vehicle below its centre of gravity.

7. A vehicle as claimed in any of the preceding claims wherein the integrated mean direction of fluid flow at the exit from the vehicle has substantially no outward component and the said change of direction of the curtain causes the mean integrated direction of flow of the fluid to have an outward component, disregarding in each case any superimposed asymmetry which may be used for or to assist in propulsion of the vehicle.

8. A vehicle as claimed in any of claims 1—6 wherein the integrated mean direction of fluid flow at the exit from the vehicle is inwards at a substantial angle to the vertical and the said change of direction of the curtain causes the mean integrated direction of flow of the fluid to have an outward component, disregarding in each case any superimposed asymmetry which may be used for or to assist in propulsion of the vehicle.

9. A vehicle as claimed in any of the preceding claims, wherein the said fluid is water and further means are provided for forcing a gas into the said space at a pressure sufficient to support the vehicle.

10. A vehicle as claimed in any of the preceding claims, wherein more than one curtain of moving fluid is formed.

11. A vehicle as claimed in any of the preceding claims, which comprises control means for acting on the fluid during its discharge so as to produce or eliminate a resultant horizontal thrust or turning moment on the vehicle.

12. A vehicle as claimed in claim 11, wherein the control means comprises vanes in the exit for the fluid which are arranged to impart to the fluid a component of motion in the direction opposite to that in which it is desired to propel or steer the vehicle.

13. A vehicle as claimed in claim 11, wherein the control means are such as to cause attenuation of the curtain at a selected location or locations.

14. A vehicle as claimed in claim 13, wherein the control means control locally the effective area of the exit for the fluid.

15. A vehicle as claimed in any of the preceding claims, comprising additional means for discharging fluid from the lower part of the vehicle to form one or more additional curtains of fluid which form compartments in the aforesaid space.

16. A vehicle as claimed in any of the preceding claims, which further comprises at least one engine for propelling the vehicle.

17. A vehicle substantially as described with reference to Figs. 1, 2, 3 and 5 or Fig. 4 or Fig. 6 of the accompanying drawings.

G. A. BLOXAM,
Agent for the Applicants.

PROVISIONAL SPECIFICATION

Improvements in or relating to Vehicles for Travelling Over Land and/or Water

We, HOVERCRAFT DEVELOPMENT LIMITED, a British Company, of 7, Tilney Street, London, W.1, do hereby declare this invention to be described in the following statement:—

This invention relates to vehicles for travelling over land and/or water and may be applied to ships or aircraft or land-going vehicles or to vehicles which represent a combination thereof.

In accordance with the invention a vehicle is provided with means for downwardly discharging at least one jet of fluid in the form of a curtain which can act as an envelope effectively enclosing a space beneath the underside of the vehicle and a surface over which the vehicle is to hover or travel, whereby the pressure within the envelope may be raised to the extent that is necessary to support the vehicle out of contact with such surface. Thus the curtain of fluid acts after the manner of the walls of a pneumatic tyre and serves to contain the necessary pressure for lifting the vehicle. The total thrust of the jet of fluid forming the curtain does not need to approach the total weight of the vehicle that is supported in spaced relation from the surface. In this sense the invention is distinct from vertical take-off craft in which the total downward thrust of the jet employed must be at least equal to the total weight that they support.

To indicate how the invention may be carried into effect, it will be supposed that the invention is applied to a vehicle having a cir-

cular flat bottom. A peripherally extending mouth is arranged around the circular bottom of the vehicle in such a way that by pumping air at high velocity through the mouth, an annular jet of air issues therefrom such jet being directed vertically downwards. The jet thus forms a circular section curtain extending peripherally from and enclosing the bottom of the vehicle. Assuming that the vehicle is initially supported at a short distance from the ground, the annular curtain will strike the ground with the result that the air will flow both inwardly beneath the bottom of the vehicle and outwardly away from the bottom of the vehicle. As a result, pressure will begin to rise in the space enclosed between the curtain, the vehicle bottom and the ground beneath the bottom. The pressure will act upon the whole of the vehicle bottom, so tending to lift the vehicle, and will also act upon the enveloping curtain thereby causing the lower part of the curtain adjacent the ground to be deflected radially outwards. The vehicle will rise under the action of the pressure in the envelope until a certain height is reached where a state of equilibrium is attained. In the equilibrium condition the curtain, as seen in vertical section, will appear as a semi-circularly extending jet having a centre of curvature outside the envelope formed by the curtain and a radius of curvature substantially equal to the height of the bottom of the vehicle from the ground. With an appropriate jet velocity, the pressure within the envelope can build fairly rapidly to the point where the vehicle is supported upon the air trapped within the envelope so that the vehicle is sustained over the ground upon an air cushion just as effectively as though the vehicle were resting upon a balloon tyre.

As indicated above, the pressure within the envelope will automatically build up to that required for the support of the vehicle itself. It will however be appreciated that once the continuous curtain has been established with the aid of the annular jet, the envelope may be directly filled by pumping air through an appropriate orifice in the bottom of the vehicle.

In the arrangement described above, it will be noted that the annular mouth through which the jet is projected, directs the jet vertically downwards. As an alternative, the mouth may be such that the jet is directed with a component which is mainly radially inwards rather than downwards. A curtain will form as before and will act as an envelope, but in this case after a state of equilibrium has been reached, the curtain when seen in vertical section will follow a substantially semi-circular path with a radius of curvature equal to about half the height of the bottom of the vehicle from the ground and with a centre of curvature disposed outside the envelope and substantially vertically beneath the peripheral edge of the bottom of the vehicle.

Once the vehicle is hovering in spaced relationship from the ground and supported upon the air cushion within the described envelope, the vehicle may be readily propelled over the ground in the desired direction. Propulsion can conveniently be effected by deflecting the jet curtain so that the axis of symmetry thereof is no longer vertical but is inclined to the vertical in the direction in which the vehicle is desired to travel. The jet curtain will then possess a component which will react upon the vehicle in a horizontal plane to cause the same to be translated over the ground whilst in spaced relation therefrom. As the vehicle gathers speed, the head pressure will increase and may well approach the pressure of the air within the envelope on which the vehicle is supported. It will be evident that when the head pressure and the envelope pressure are equal there is no necessity to maintain that part of the curtain at the forward end of the vehicle, although, of course sufficient of the sides of the curtain and the after end thereof must be preserved as will ensure that the appropriate pressure will be maintained beneath the vehicle for the support thereof.

It will be appreciated that because the vehicle is supported upon an air cushion, the vehicle will tend to be unstable in the sense that if one side of the vehicle is moved downwardly the opposite side will rise correspondingly and there will be no or insufficient, tendency for the vehicle to right itself. To overcome this difficulty, the air-cushion must be compartmented. The divisions necessary to form the compartments can be established with the aid of further jets of air extending fore-and-aft and athwartship in relation to the intended direction of travel.

The vehicle so far described, will be capable of travelling over land or over sea at high speeds. The body of the vehicle may be designed to obtain aerodynamic lift, so as to assist in supporting the vehicle. The invention may be applied to aircraft for the purpose of safely landing the aircraft. Thus an aircraft may be provided with means for producing a supporting air cushion when the aircraft is near to the land or sea surface, so that in effect the aircraft will land upon the cushion employing the same instead of the conventional undercarriage of land or sea aircraft.

In describing the construction of a vehicle made in accordance with the invention, reference has been made to the employment of air jets. It will be understood that in principle any gaseous medium may be employed instead of air. Moreover, a curtain could in principle also be formed by discharging water through the jet mouth to form a liquid envelope in like manner.

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Leamington Spa: Printed for Her Majesty's Stationery Office, by the Courier Press.—1960.
Published by The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained.

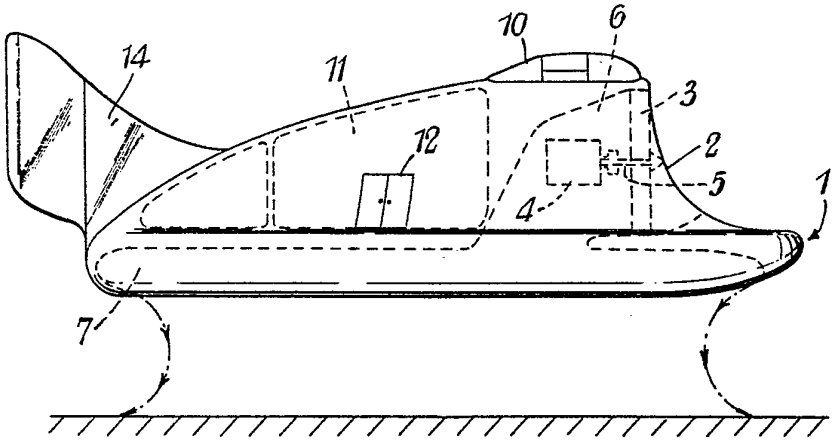

FIG.I.

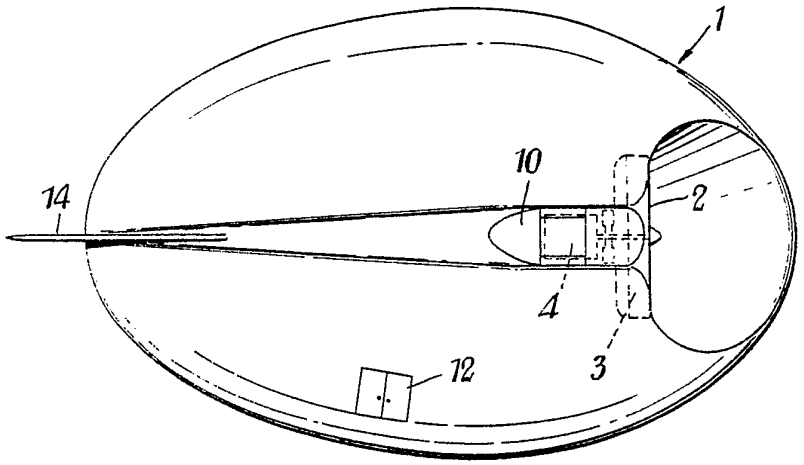

FIG.2.

854,211 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

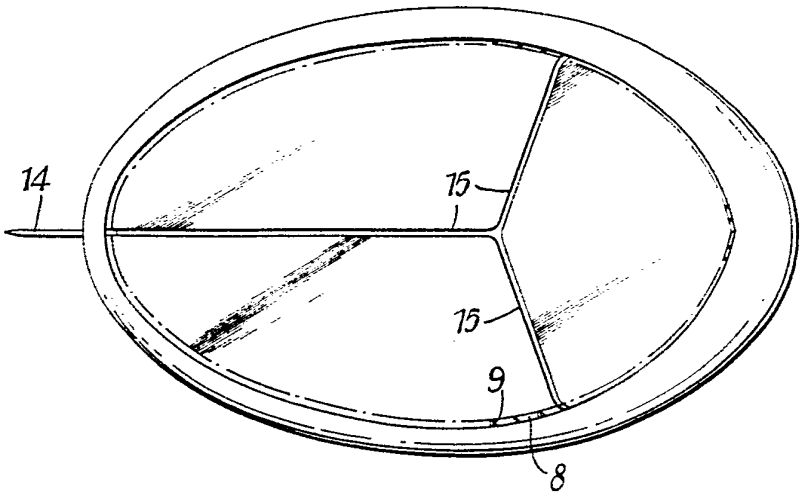

FIG.3.

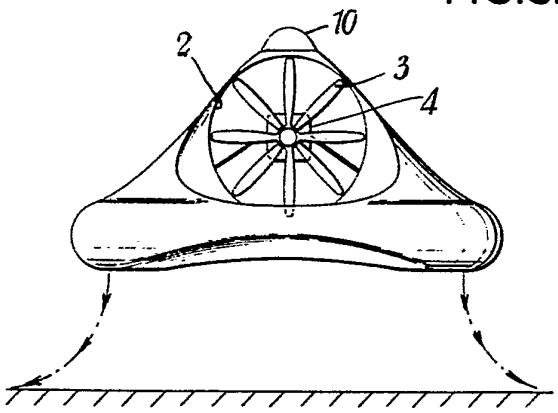

FIG.4.

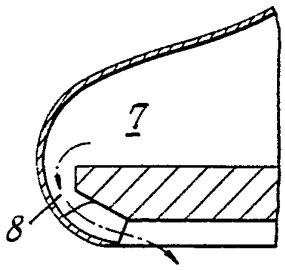

FIG.5.

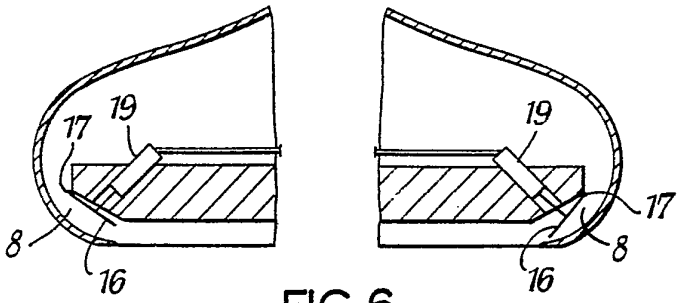

FIG.6.

854,211 COMPLETE SPECIFICATION
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This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

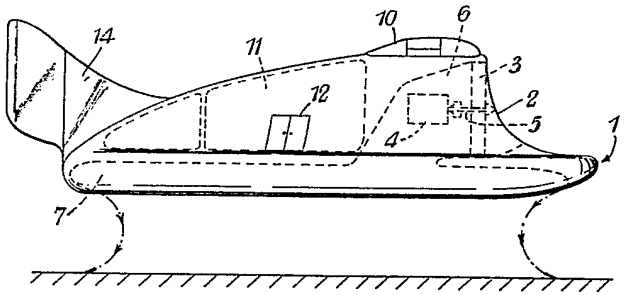

FIG.1.

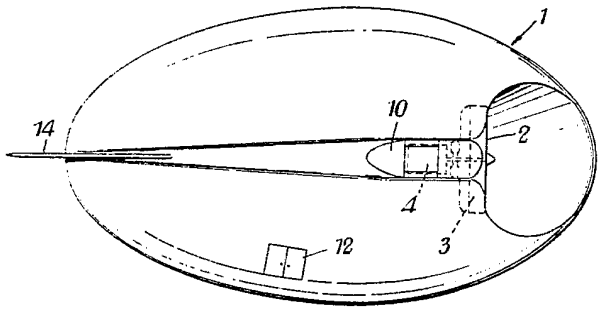

FIG.2.

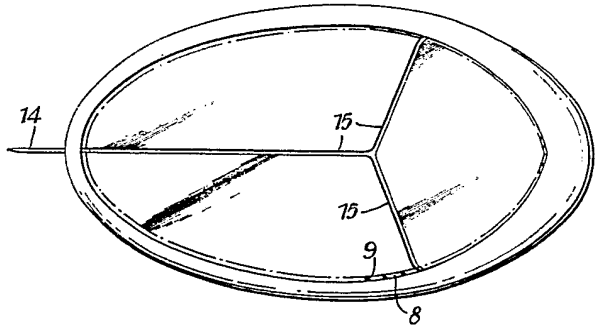

FIG.3.

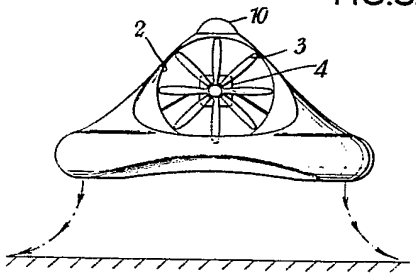

FIG.4.

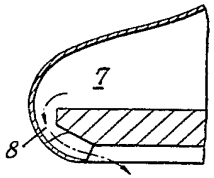

FIG.5.

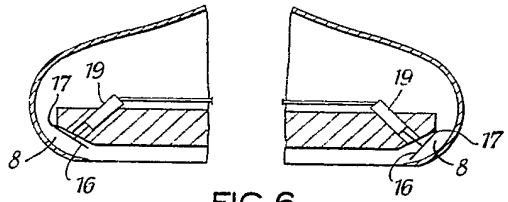

FIG.6.