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PLENUM CHAMBER CUSHION SYSTEM FOR SURFACE EFFECT MACHINES

Marc De Jean Foure, Saint-Maur-des-Fossés, France, assignor to Bertin & Cie, Plaisir, France, a company of France

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1 Claim

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ABSTRACT OF THE DISCLOSURE

In a ground effect machine, a plenum chamber cushion system with a side-wall device of polygonal cross-section composed of successive flexible panels flaring outwardly towards the bearing surface along which the machine moves and ending with a rectilinear free edge parallel to said surface, adjacent panels having free sides very close to each other, deflection of said panels due to cushion pressure exerted thereon being resiliently counteracted and oscillations being damped. In a preferred embodiment, said panels are made of rubber-like trapezoidal plates with said free edge forming the outer side of the trapezoid.

This is a continuation-in-part of my co-pending application Ser. No. 498,258 filed Oct. 20, 1965, and since abandoned.

The present invention relates to surface effect machines and more particularly to tracked air cushion vehicles equipped with cushion bounding side-walls which are made of yieldable fluidlight material.

An object of the present invention is to improve the stability of the machine in operation by designing the cushion containing plenum chamber with an outline which flares towards the surface along which the machine moves.

Another object of this invention is facilitate manufacture, maintenance and replacement of the side-walls and to protect their free edges against premature wear.

A further object of the invention is to counteract resiliently outward deflection of the side-walls due to cushion pressure and to dampen oscillations thereof.

Other objects and advantages of the present invention will appear in the following description given with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatic sectional elevation of an air cushion vehicle having side-walls designed in accordance with the present invention;

FIG. 2 illustrates one of the side-wall elements;

FIG. 3 is a fragmentary section of such an element;

FIG. 4 is a section taken along line IV—IV of FIG. 3;

FIG. 5 is a view similar to that of FIG. 3, illustrating another embodiment of side-wall element;

FIGS. 6 and 7 are views similar to that of FIG. 1, showing two other embodiments of plenum chambers.

As illustrated in FIG. 1, the ground effect machine comprises basically a platform or body structure 1 on the underside of which a pressure fluid cushion 2 is formed by means of a fan 3 and bears the machine upon a horizontal surface 4 which may be a track. Alternatively, or additionally, surface 4 could be a vertical or inclined track portion and provide a laterally guiding effect for the machine. In any case, cushion 2 is laterally confined by means of side-wall elements 8 of yieldable material secured to the structure 1 along their end strip 5 remote from surface 4 and extend freely from this secured strip to a free edge 6 adjacent this surface 4 and defining thereat with a daylight clearance.

In this embodiment, the plenum chamber 2 is of rectangular cross-section and is bounded by four separate and successive side-wall elements 8 along the four sides of the rectangle.

Each element is constituted, as shown in FIG. 2, by a trapezium-shaped panel of yieldable material which is planar at rest and extends at about 45° with surface 4.

In operation, cushion pressure will deflect outwards each panel 8 about its secured strip 5 and, if the material is flaccid, it will be necessary to use springs 9 to provide a return force urging back each panel inwards. In order to prevent oscillations from setting up, dampers 11 are provided in conjunction with the springs 9. If on the other hand, the yieldable material is not flaccid but resilient like rubber, the springs 9 may become superfluous as well as the dampers 11.

Thus FIGS. 3 and 4 show a side-wall element 8a which is made of a resilient material in which losses by internal friction are great enough to provide damping. The element can be made of butyl and reinforced with reinforcements 20 in filamental or fibre or lamella form which are disposed preferably at mid-thickness and perpendicularly to the free edge 6. The latter edge can have a packing 21 made of a material which is very abrasion-resistant and which has a low coefficient of friction, such as polyvinyl chloride.

Referring to FIG. 5, a side-wall element 8b is formed by insertion of a layer of material 22 having sufficient hysteresis, such as butyl, between two thin sheets 23 made of a material such as metal, having a high modulus of elasticity. A securing section member 24 and a wearing edge 25 complete this particular element.

Of course, articulated or deformable elements 8 can be combined with side-walls of other kinds. For instance, in the case of cushions elongated in the most frequent direction of platform travel, elements 8 according to the invention can be used on the sides of a gas cushion, and at at least one of the front and rear ends a simple lip joint 26 can be used which is made of a plastics material and which has a daylight clearance h equal to the sum of the height at rest of the free edge 6 above surface 4 plus its rise due to deflection in operation. These possibilities are shown in FIGS. 6 and 7. The extra leakage associated with these forms of the invention is permissible because the elements 8 make it possible to elongate the cushion and reduce the leakage height.

Of course, in such cases, it is possible to depart from the twin slant trapezium shape of FIG. 2 and adopt for the side-wall elements 8 a right-angled trapezium shape as in FIG. 6 or a purely rectangular shape as in FIG. 7.

1 Claim:

1. A plenum chamber cushion system for a surface effect machine having a structure movable along a surface in spaced relationship therewith with the interposition of a pressure fluid cushion formed against said surface, said system comprising a sidewall device which includes a polygonal succession of at least three separate and distinct flexible panels of quadrilateral shape for containing said cushion which, when at rest in the absence
of distorting forces exerted thereon, are substantially planar and inclined outwardly from said structure towards said surface at a substantial angle with both said surface and the normal to said surface, each of said panels having a first side rigidly attached to said structure, a second side opposite said first side extending freely adjacent to said surface, a third side and a fourth side opposite each other extending freely between respective ends of said first and second sides, whereby said yieldable panels have three free sides and one attached side about which said yieldable panels are deformable independently of each other, and each of said panels are of generally trapezoidal shape with said first and second sides thereof being respectively the smaller and the larger base of the trapezium and said third and fourth sides thereof being the non-parallel sides of the trapezium whereby said panels, in the absence of distorting forces, form with said movable structure an enclosed plenum chamber open to said surface for containing said fluid cushion.

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A. HARRY LEVY, Primary Examiner