May 3, 1966 R. W. TIBBETTS 3,249,167

AIR-LIFT VEHICLE AND FILAMENT SKIRT THEREFOR

Filed May 1, 1964 2 Sheets-Sheet 1

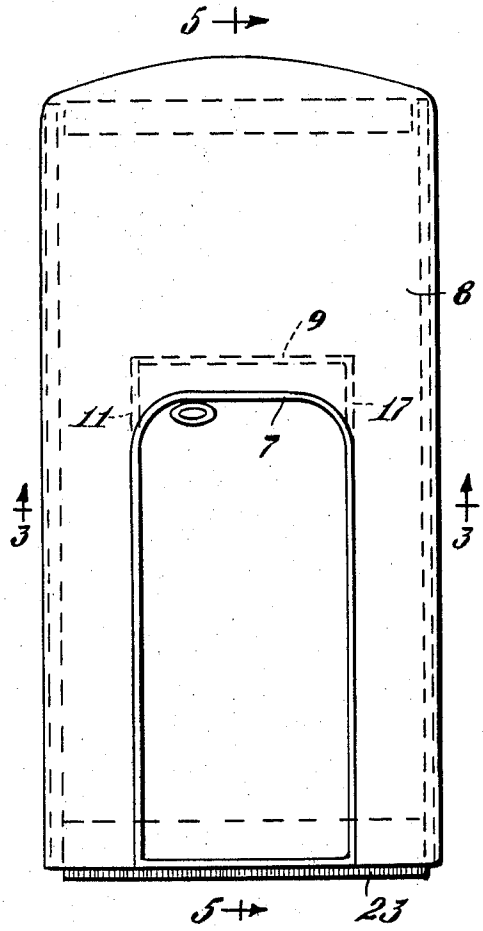


Fig. 1

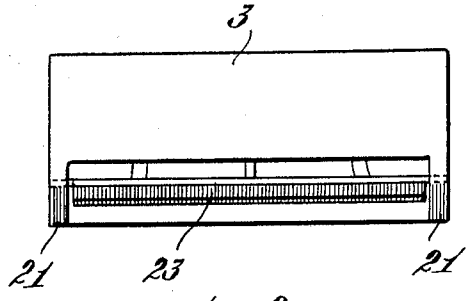


Fig. 2

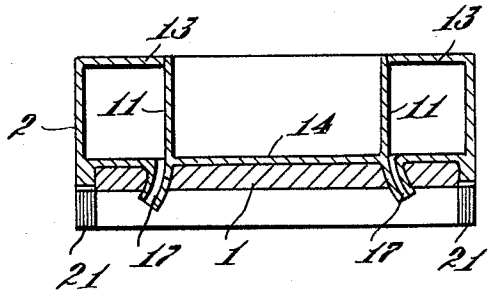


Fig. 3

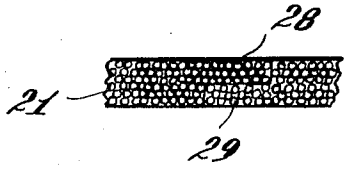


Fig. 4

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May 3, 1966 R. W. TIBBETTS 3,249,167

AIR-LIFT VEHICLE AND FILAMENT SKIRT THEREFOR

Filed May 1, 1964 2 Sheets-Sheet 2

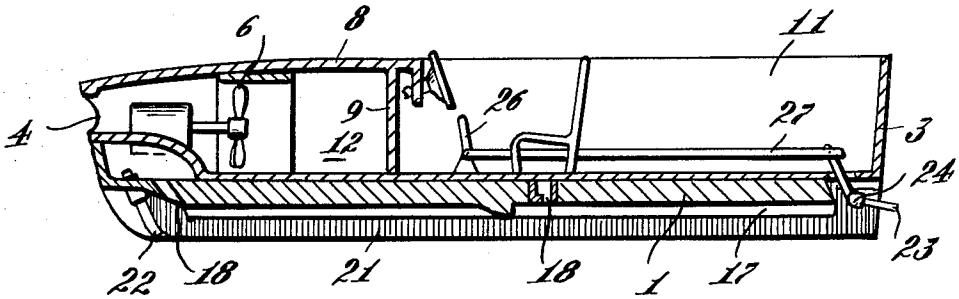


Fig. 5

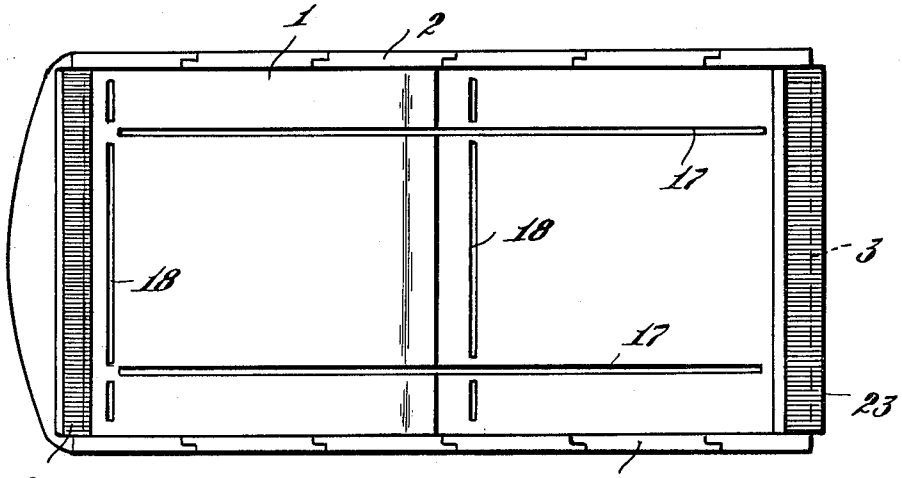


Fig. 6

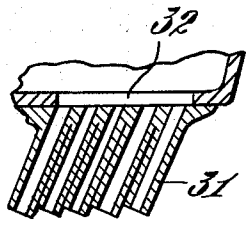


Fig. 7

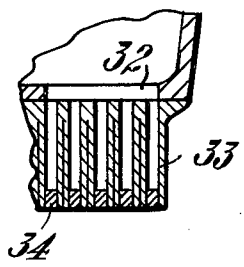


Fig. 8

United States Patent Office 3,249,167 Patented May 3, 1966

3,249,167

AIR-LIFT VEHICLE AND FILAMENT SKIRT THEREFOR

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Filed May 1, 1964, Ser. No. 364,247
2 Claims. (Cl. 180—7)

This invention relates to the skirt construction of a boat or other vehicle, and more particularly relates to an improvement over the structure shown in the copending application for Air-Lift Boat, Serial No. 59,560, now Patent No. 3,137,262, filed September 30, 1960, of which applicant is a co-inventor.

An object of the invention is to provide a skirt for a boat or other vehicle which has minimum friction with the underlying water or other medium, which is simple and economical in construction and which is durable and reliable in use.

In particular it is an object of this invention to provide a peripheral skirt for the hull of a boat or other ground effect machine, the skirt being in the form of a brush comprising a multiplicity of substantially vertical filaments or bristles associated closely together to provide a sufficient barrier for the air pressure under the hull of the vehicle, while being resilient enough to bend inward in response to the pressure exerted by waves, rocks or other obstacles while the vehicle is in forward motion.

For the purpose of illustration of a typical embodiment of the invention is shown in the accompanying drawings in which:

FIG. 1 is a plan view of a boat embodying the present invention;

FIG. 2 is a rear view of the boat;

FIG. 3 is a section on line 3—3 of FIG. 1;

FIG. 4 is a bottom view of two adjacent brush sections showing how they overlap, and showing the labyrinth arrangement of the filaments;

FIG. 5 is a section on line 5—5 of FIG. 1;

FIG. 6 is a bottom plan view of the boat;

FIG. 7 is a transverse detailed section showing a modification; and

FIG. 8 is a similar section showing another modification.

In the illustration the boat comprises a bottom **1** comprising closed-cell plastic foam, sides **2** and a rear end **3**. The forward end of the boat has an air inlet **4** and a fan **6** for pumping air in through the inlet. Except over the cockpit **7** the boat has a cover **8**. Extending between the bottom **1** and the cover **8** is a transverse partition **9** and longitudinal partitions **11** to form enclosed air compartments, a transverse compartment **12** at the forward end of the boat and a longitudinal compartment **13** along each side of the boat. The bottom **1** has two longitudinal slots **17** and transverse slots **18** through which air may flow from the compartments **12** and **13**. This construction is described and claimed in the aforesaid application Ser. No. 59,560.

According to this invention the air flowing through the slots **17** and **18** is confined as a cushion by a skirt or row of brushes depending from the bottom of the boat around its periphery, the brushes at each side of the boat being indicated at **21**, the bristles at the forward end being shown at vane **22** and the bristle vane **23** at the rear end being pivotally mounted at **24** to swing about a transverse axis between a depending position and the elevated position shown in FIG. 5 in response to a control lever **26** and linkage **27**, thereby to control the air pressure under the boat at varying speeds. The aforesaid brushes may be continuous throughout the periphery except at the ends of pivoted vane **23**, but preferably they are formed in sections which can be replaced separately. The sections at the sides and rear preferably overlap as shown at **28** and **29** in FIG. 4 to prevent the escape of air. The forward sections **22** do not overlap but are pivoted to swing independently of each other so as to conform to the surfaces over which the vehicle passes, with a forward stop element arranged to limit forward movement of the vane sections. Thus both the forward and rearward brushes constitute adjustable vanes. FIG. 4 also shows the close-pack array of the filaments preventing direct paths for air by establishing a labyrinth of interstitial spaces between the filaments. The filaments may be of hexagonal cross-section rather than circular, to provide an even closer grouping.

In the modification shown in FIG. 7 the filaments **31** of the brushes are hollow, the filaments are inclined inwardly, at least at their lower ends, or throughout their full length as shown, and the bottom of the boat has a slot **32** over each brush so that air can flow from the compartments **12** and **13** through the filaments thereby to help maintain the air cushion under the boat.

The modification shown in FIG. 8 is like that shown in FIG. 7 except in that the hollow filaments **33** are closed at the bottom, as indicated at **34**, whereby the air pressure through slot **32** tends to stiffen the filaments. The brushes may comprise molded plastic and may be secured to the bottom of the boat by any appropriate means such as waterproof cement.

From the foregoing it will be understood that the aforesaid multifilament structure is resilient enough to bend due to the forward motion of the boat over obstacles, yet be returned to normal position by its own spring effect and by the internal air pressures of the compartment. It is not subject to catching and tearing on obstacles, as would be a continuous sheet. Such elasticity is provided by natural bristles, but due to the lengths involved and matters of durability, reliability and economy the filaments are preferably made of steel or of plastic, such as nylon. This will be of required flexibility while being weatherproof and water-impervious, and the filaments will stand much abuse when the vehicle is operated as a ground effect machine over dry land.

The filaments are of whatever length desired, depending upon the height of obstacles to be passed over without contacting the rigid portions of the vehicle. Each filament is of a diameter or thickness consistent with the length, and the overall brush array of filaments is of appropriate thickness, to have desired flexibility for obstacles while maintaining the enclosed air cushion. For example, for relatively smooth terrain a skirt one foot high may utilize bristles one foot long and each approximately one-eighth inch in diameter, with the brush in the range of two or more inches thick. The thickness of brush depends upon the internal pressures involved, which in turn are related to the weight and loading of the vehicle. Also, the brush will be stiffer at the fixed butt than at the free lower edge, further requiring thickness for proper stiffness at the lower edge. For higher objects or rougher seas long and thicker brushes with corresponding larger filaments may be utilized. If the vehicle is to be used only over water, the side brushes **21** may be of rigid construction as in the aforesaid application with only vanes **22** and **23** formed of filaments.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. For maintaining an air cushion under the bottom of a vehicle, a skirt comprising hollow resilient filaments,

the thickness of the skirt exceeding the diameter of the filaments many times and the filaments being closely packed to form a labyrinth of interstitial spaces between the filaments, thereby to minimize the passage of air between the filaments, said hollow filaments being open at their upper ends for communication with pressurized air.

2. A skirt according to claim 1 wherein said hollow filaments are closed at their lower ends.

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