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(54) **AERODYNAMICALLY EFFICIENT SURFACE**

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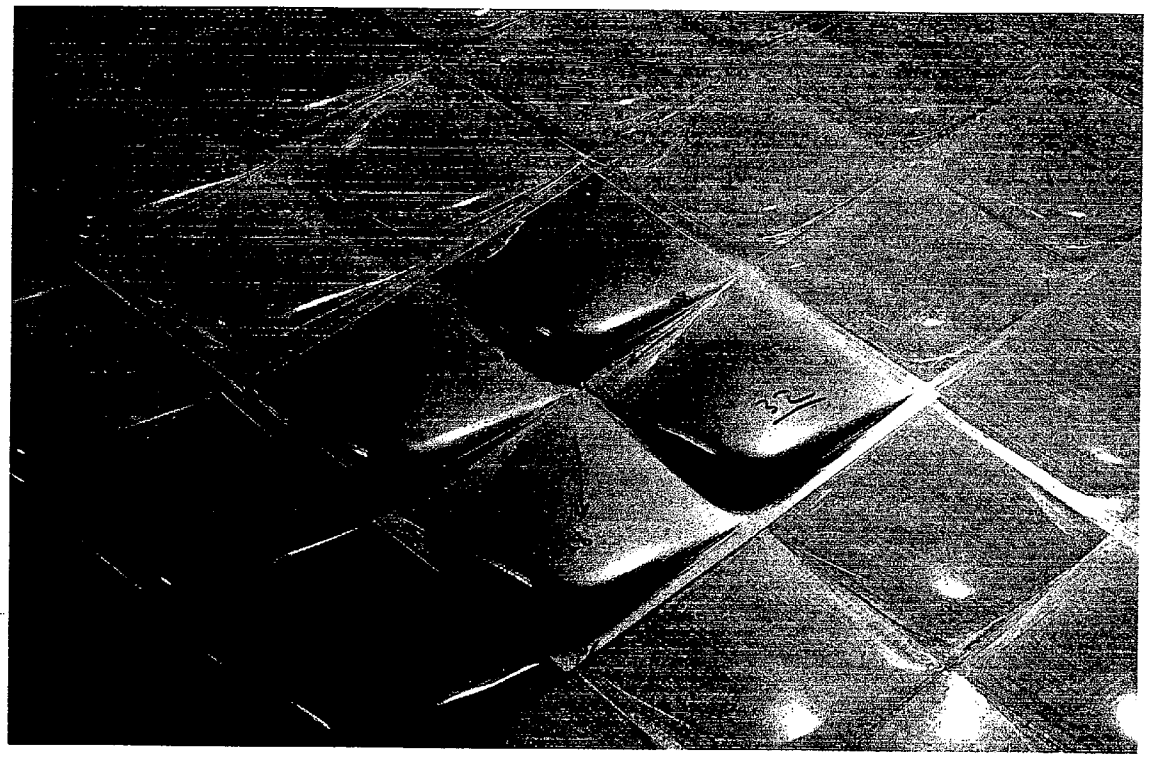
(52) **U.S. Cl.** **244/200**

(57) **ABSTRACT**

A Tile, in the form of a natural wave, is provided to replace traditionally smooth surfaces to aid in more efficient shedding of a fluid medium.



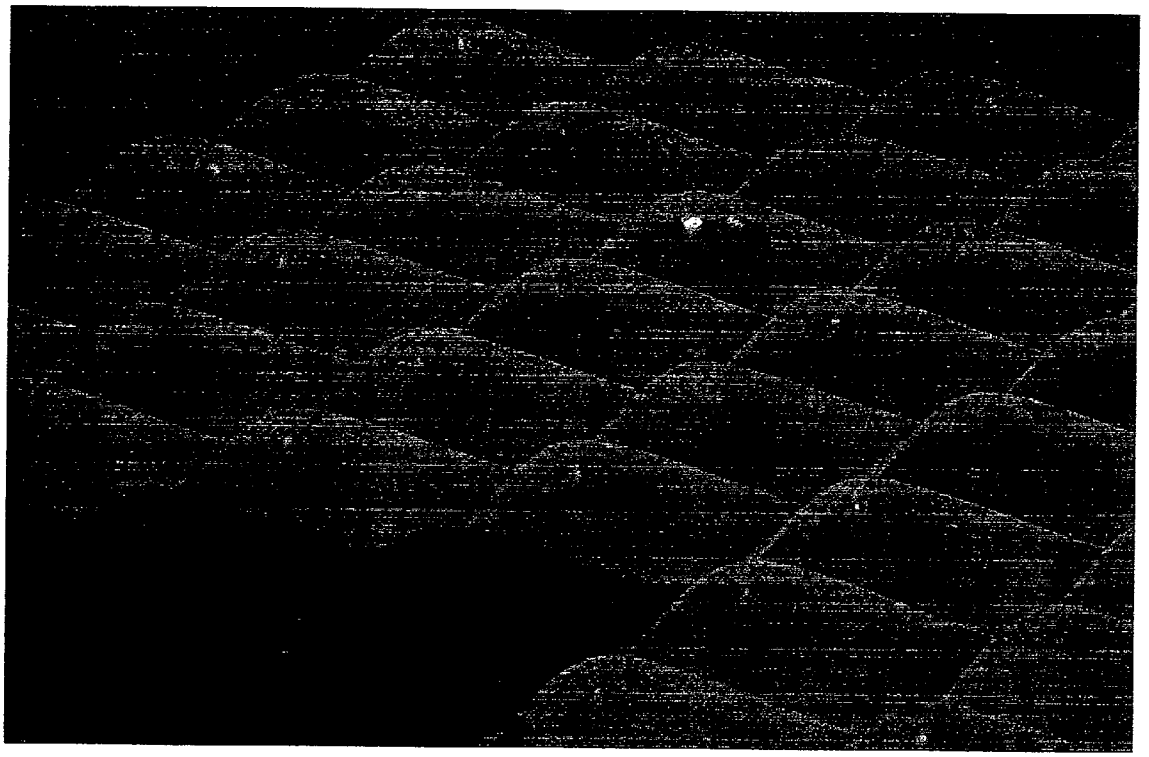


FIGURE 1

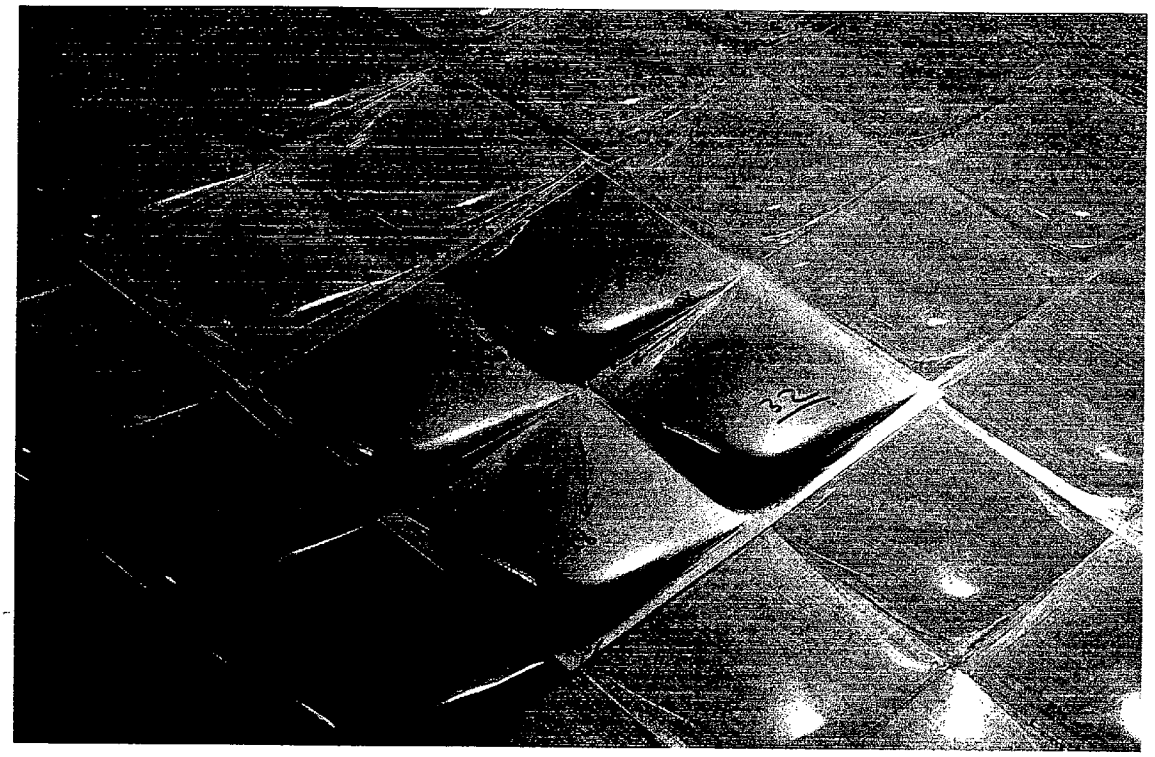


FIGURE 2

FIGURE 3

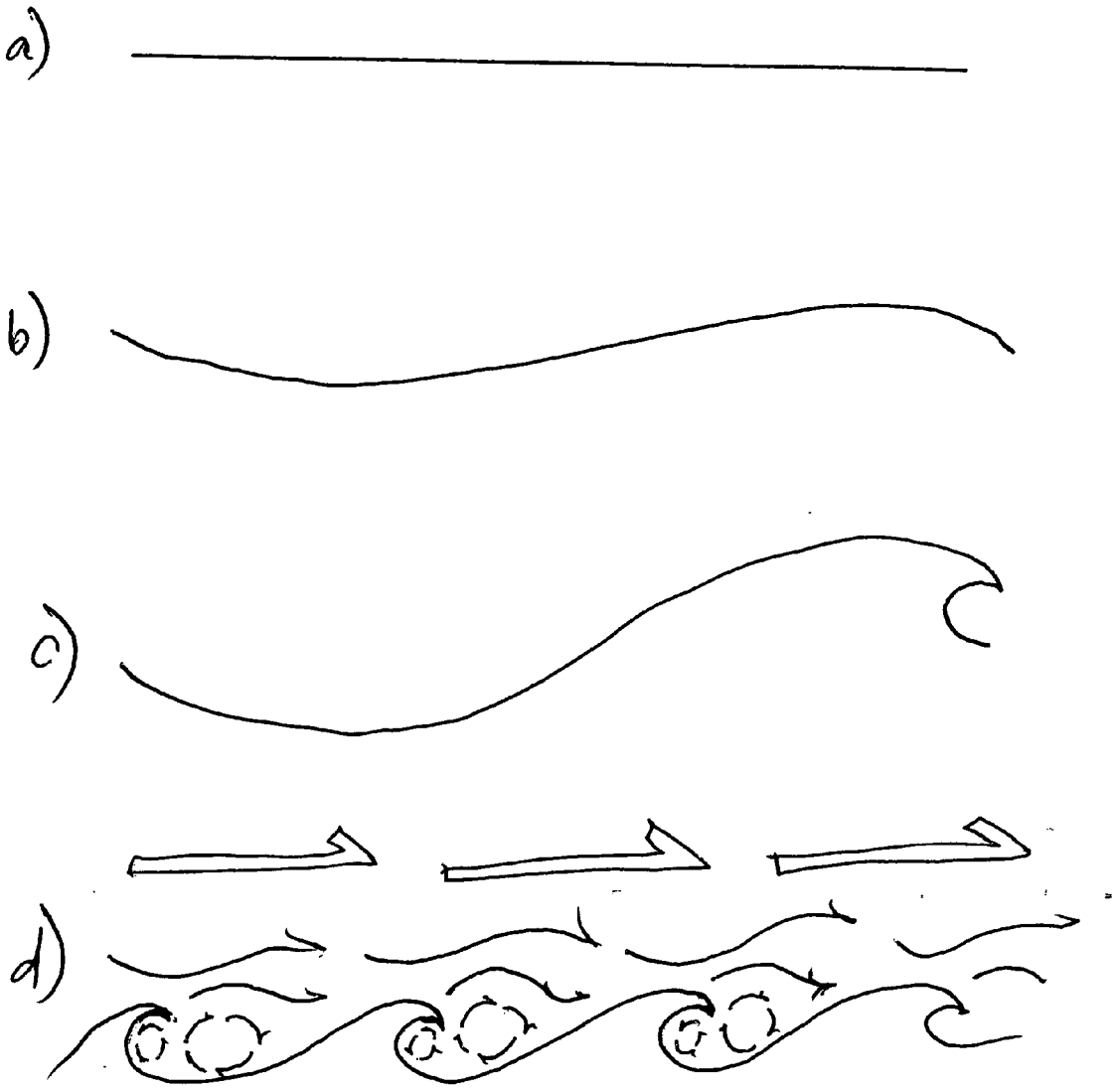


FIGURE 4

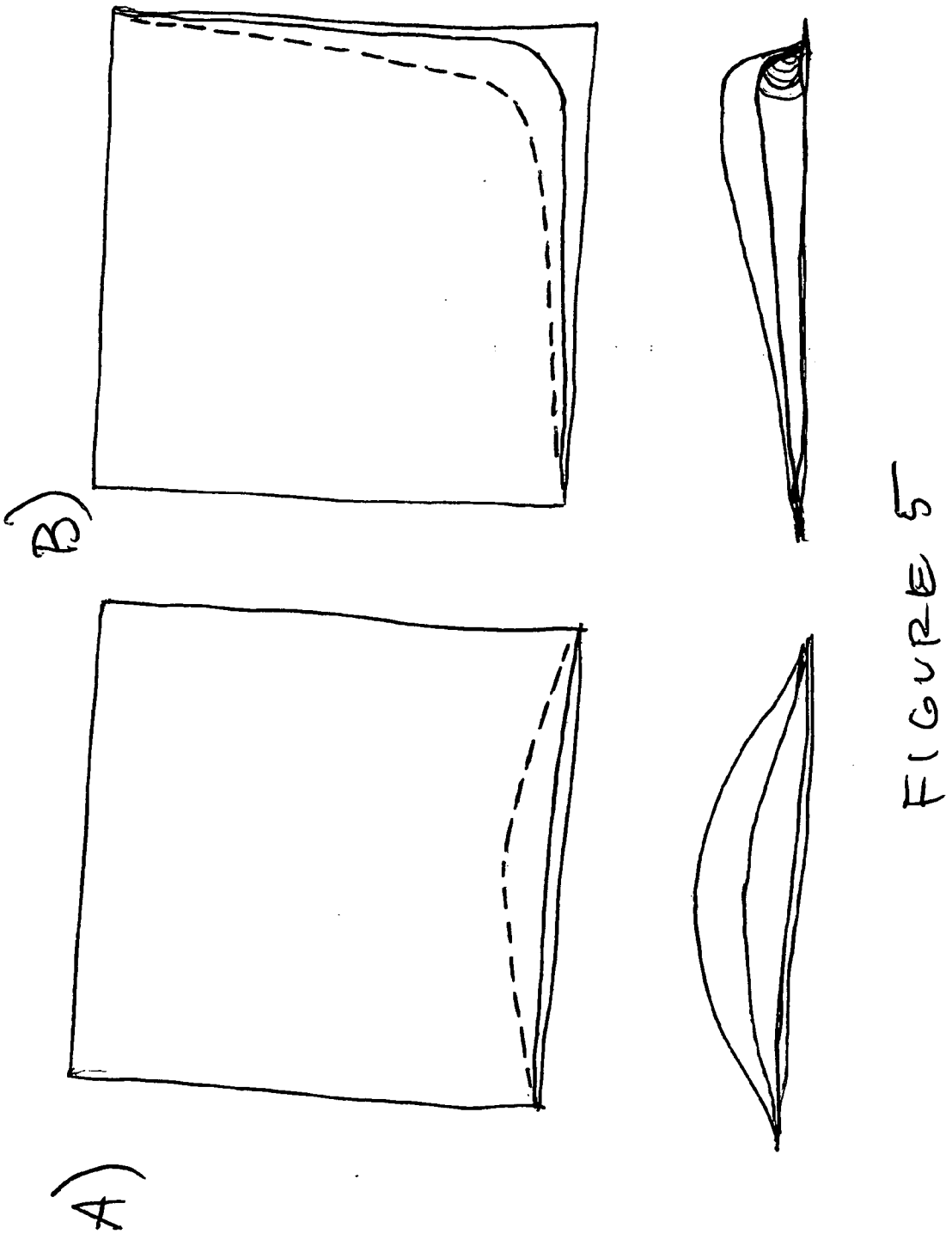


FIGURE 5

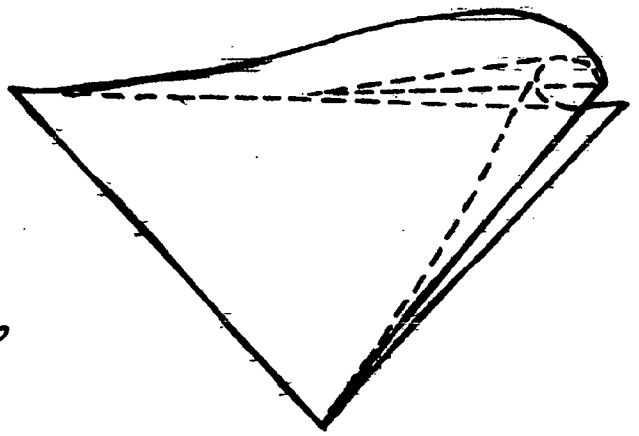


FIGURE 6

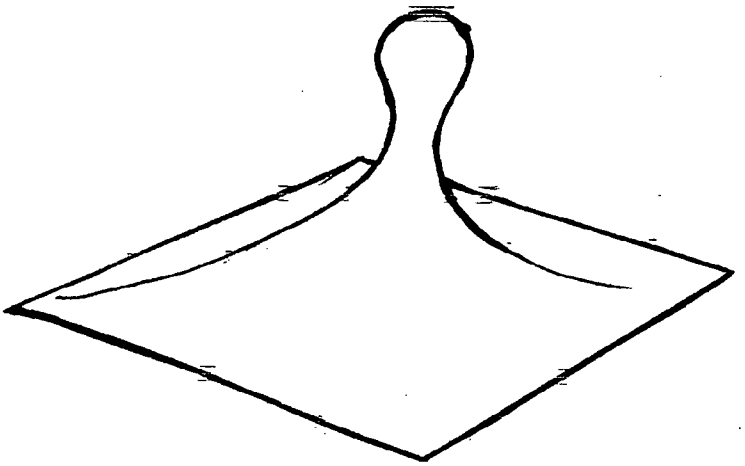


FIGURE 7

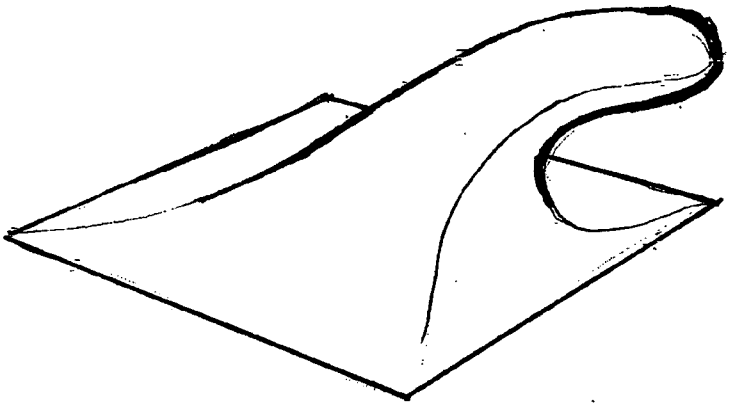
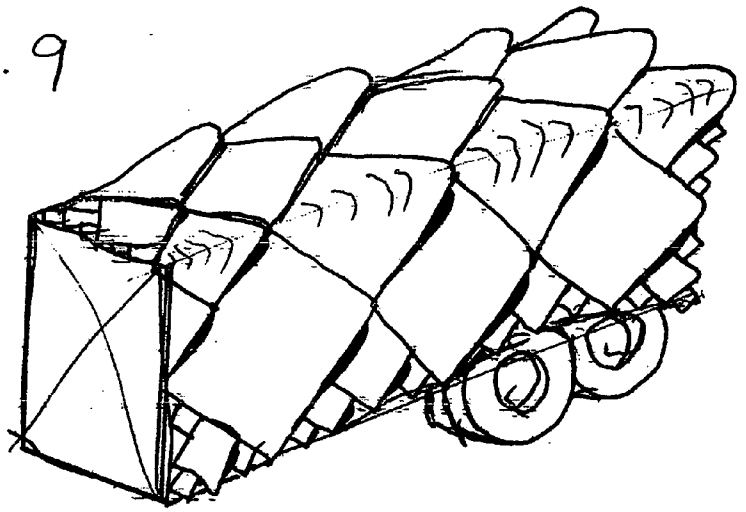


FIGURE 8

FIG. 9



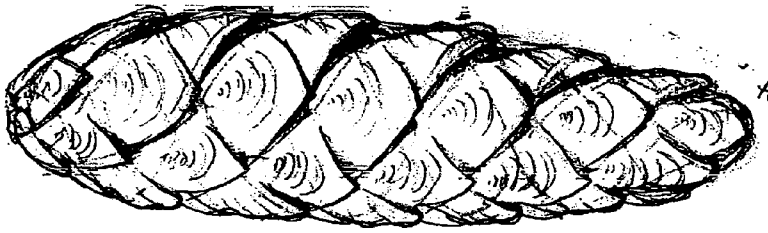


FIGURE 10

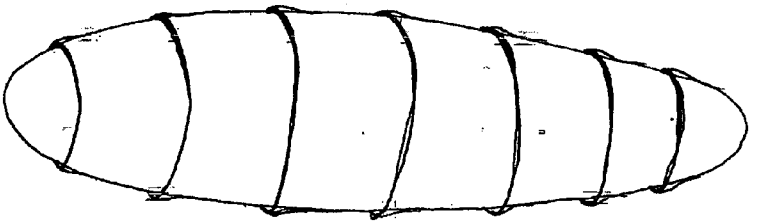


FIGURE 11

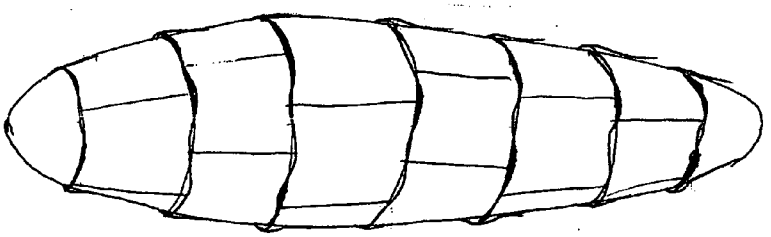
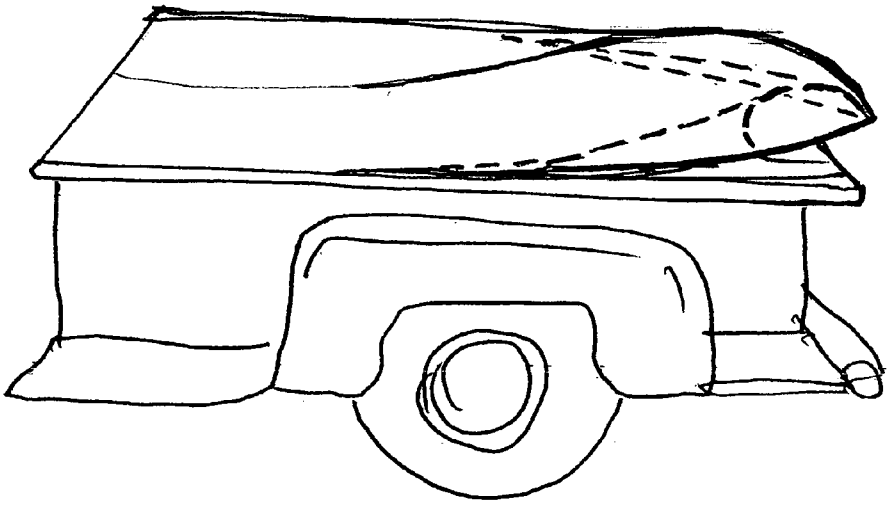


FIGURE 12

FIGURE 13



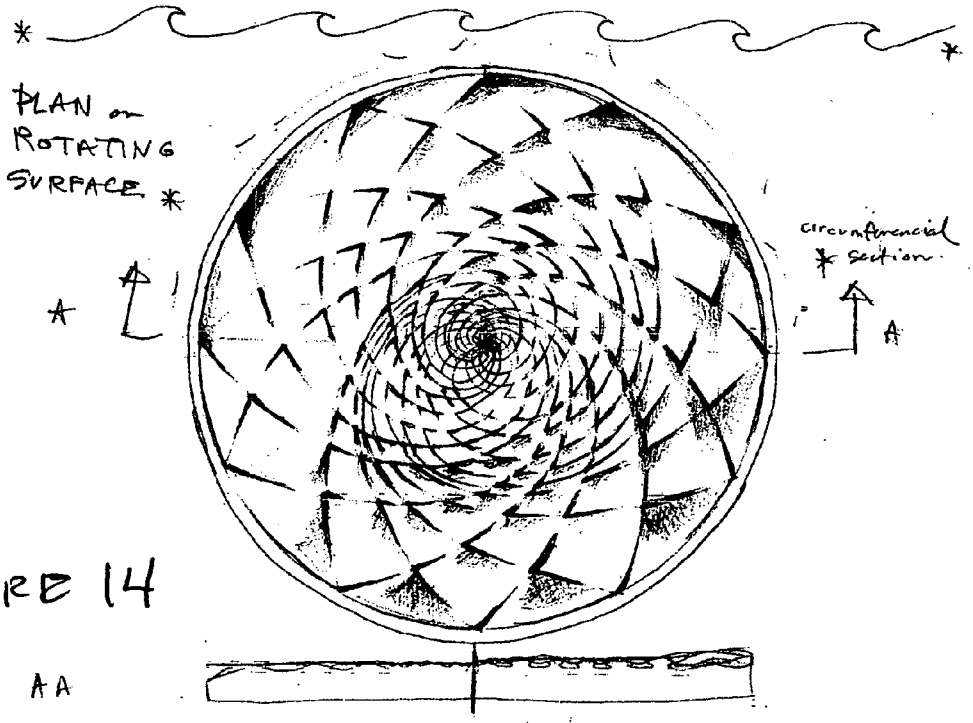


FIGURE 14

AERODYNAMICALLY EFFICIENT SURFACE

Claims benefit of Provisional App. #60/698,454
filed Jul. 11, 2005

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0001] None.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates generally to the field of fluid dynamic drag reduction. More specifically, the present invention pertains to techniques or devices for regulating the flow of air or water passing over a surface to reduce exposure or drag.

[0004] 2. Description of the Related Art

[0005] The invention of the wheel started a movement to seek efficiency through less friction. Elimination of drag in motion is one answer to efficiency U.S. Pat. No. 5,114,099 (Gao et al.) shows a series of wavelets in a diamond pattern with a ridge lengthwise and convex sloping sides from the ridge, however does not teach the use of waves with breaks or tubular cavities. Nor does Gao teach the use of a wave panel the shape of a drip.

[0006] U.S. Pat. No. 2,800,291 (Stephens et.al) claims benefit to an excrescence which is basically triangular vortex generators with a hard edge, in essence produces a square wave which results in distortion or drag. The present invention provides a natural tubular wave on the backside of the wave form tile, allowing for a smoothly orchestrated transition forward to aft.

SUMMARY OF THE INVENTION

[0007] The object of the present invention is to orchestrate and direct the flow between a solid surface and an adjacent fluid medium in relative motion. The present invention has further intention to shed a fluid medium from a solid surface more efficiently, through the use of tiles comprised of wave forms to be applied in both macro and micro levels of organization. The present invention has applications in all areas of fluid management including, but not limited to: vehicular surfaces, wheels of all types, internal combustion intake and exhaust systems, H.V.A.C. systems, and architectural air and water shedding applications.

BRIEF DESCRIPTIONS OF THE DRAWINGS

[0008] FIG. **1** is a view of (photograph) multiple tiles of the devices of the present invention, from the perspective of an approaching air molecule.

[0009] FIG. **2** shows a tile with four wave forms, like those employed in FIG. **1** from a reverse angle perspective view.

[0010] FIG. **3** is a perspective, side angle view of the tiles.

[0011] FIG. **4** a), b) & c) show wave forms of a surface of a body of water at a) no wind speed, b) medium wind speed, and c) high wind speed. FIG. **4** d) shows one scenario of air/water movement over the wave panels of the present invention.

[0012] FIG. **5** shows two embodiments of the present invention.

[0013] FIG. **6** shows an elevation drawing of a wave form tile that would be applied to a 90° corner, like that on a semi-trailer.

[0014] FIG. **7** shows a wave form tile the shape of a drip.

[0015] FIG. **8** shows a wave form tile the shape of a drip bent 90°.

[0016] FIG. **9** shows a semi-trailer covered in wave tile forms.

[0017] FIG. **10**, **11**, and **12** shows three possible wave forms wrapped around a fuselage shape.

[0018] FIG. **13** shows a wave form tile on a pick-up truck bed.

[0019] FIG. **14** shows the wave form tile pattern on a circular wheel shape.

DETAILED DESCRIPTION OF THE INVENTION

[0020] Disclosed is one embodiment for the present invention. It will be clear to one skilled in the art that numerous other embodiments and/or uses for the disclosed technologies are possible which would fall within the scope and spirit of those embodiments specified herein.

[0021] The design of the present invention has many aerodynamic advantages over the prior art surfaces. Especially when used on the exterior surface of a vehicle.

[0022] The specifics may best be understood by referencing the attached photographs of one possible variation of a wave form tile.

[0023] FIG. **1** is a perspective view of (photograph) multiple sheets of the devices of the present invention. As you can see the independent sheets are arranged to create an irregular surface of organized waves which are usable on a vehicle or other device that travels through the air (or water), as well as devices used for management of a fluid, such as an air duct.

[0024] FIG. **2** shows a multi-wave tile **10**. The individual tile **10** comprises four waved portions **20**, **30**, **28**, and **32**. Each of waves **20**, **30**, **28**, and **32** act to manage a fluid, e.g. air as it travels across the entire tile on the exterior surfaces of the vehicle or like device. (not shown) The airflow across tile **10** will now be discussed. As it is disposed on the vehicle (or other device) the air will be caused to flow from a forward corner **34** to a rear comer **44** across tiles, **20**, **30**, **28** and **32**. As the air travels across the surface of tile **10**, from corner **34**, it will first engage the upper surfaces of wave **20**. When it engages the upper surfaces of this wave, it will be managed such that it is disbursed from the general area of the forward crest **36** of the wave **20**. The air is guided by linear crest edges **38** and **40** and is then directed towards and is united at some point proximate crest **36** and above a point **22**. The air once focused in this fashion, travels across tile **28** in a more focused relationship, producing channels of air-flow versus sheets of air in a smooth-surface situation.

[0025] When reviewed as a vertical surface, one skilled in the art can visualize water running down wave **20**, clinging to drip edges **38** and **40**, uniting at point **36**, becoming one

solid stream. The solid stream of water will then merge with wave **28** proximate its' mid-point, remaining concentrated, passing over wave **28** and disbursing from wave **28** in a similar fashion as it did wave **20** leaving areas such as **22** untouched by water. Air and water are fluids alike and will react similarly.

[**0026**] Relative motion of the entire device through the air (e.g., on the outside surfaces of a vehicle or airplane) will cause pressures in and around area **22** to be relatively higher than the areas of high wind exposure due to shielding or protection from the faster moving air. This elevation, or pooling, of pressurized air shields the surfaces of the tile from being directly contacted by the air traveling across the tile when the vehicle is in motion. Instead of engaging the tile surfaces, the lower pressure traversing air is repelled by the pressurized air. This air-to-air contact creates less drag than what would be air to vehicle surface contact with a conventionally smooth design. Therefore, drag is decreased and the vehicle travels with more aerodynamic efficiency. Of the numerous embodiments, the tile described in the present invention could easily be inverted and rotated 180 degrees, with area **22** in FIG. **2** becoming the highest point of lowest pressure, and with **36** in FIG. **2** becoming a recessed high pressure zone. High pressure pockets may also be built into a surface by constructing wave forms perpendicular to the flow of encountered fluid, like that of a shelf cloud on the front of a storm, preferably with an alternate undulation as FIG. **1**, **2** and **5***a*. The perpendicular wave form can be simplified to a continuous ring, of repeating wave forms as illustrated in FIG. **11**, also including the recessed tubular wave form.

[**0027**] As relative wind speed increases, so does the surface are of the fluid, as seen in FIG. **4**, w/crest being pulled leeward to the point the tip breaks off and becomes water vapor. This is the physical molecular representation of liquid becoming gas. The point at which the wave begins to break, a cavity, is formed, producing a high-pressure area/zone or cell.

[**0028**] The tubular wave shaped cavity interlocks with adjacent air forming a yin yang situation.

[**0029**] Through mimicking shapes in this naturally occurring relationship between fluids, we are able to achieve a natural; friendly interface between solids and fluids, by shaping the solid to resemble that of a fluid.

What I claim as my invention is:

1. A wave form tile for the use of controlling a fluid while interacting immediately with the tile, comprised of a natural wave form with a crest and a break, forming a tubular wave form cavity extending the length of one side.

2. The wave form in claim 1, with tubular wave cavities extending around two or more sides.

3. A wave form tile with a droplet form 90° to the surface.

4. The wave form in claim 3 with the droplet form oriented parallel to the surface of the tile.

5. The form in claim 1 with the ends of the tubular cavity terminating in a vanishing point.

6. The inverse profile of the wave forms in claims **1** and **2**.

7. The inverse profile of the wave forms mentioned in claims **3** and **4**.

8. The inverse profile of the wave form mentioned in claim 5.

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