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54 A fin for a buoyant support.

57 A fin suitable for a surf board, dinghy or wind sailing board or the like is formed of a resiliently flexible material such as a solid urethane and reinforced with a stiffening insert (11) which incorporates means (16, 17, 18) for attachment to the surf board or the like.

Interconnection of the fin with the reinforcing stiffener (11) is provided by means of openings (30 to 33) in the stiffener (11) to which the fin material extends, and projections (34, 35) extending from the side wall of the stiffener (11) which are exposed by the fin material and lie flush with its surface.

A substantial trailing edge portion (24) and the tip (28) of the fin are unsupported by the stiffener (11) so that these can flex to reduce vortices in use and potential damage which might be caused upon impact of the fin against a solid object or another person.

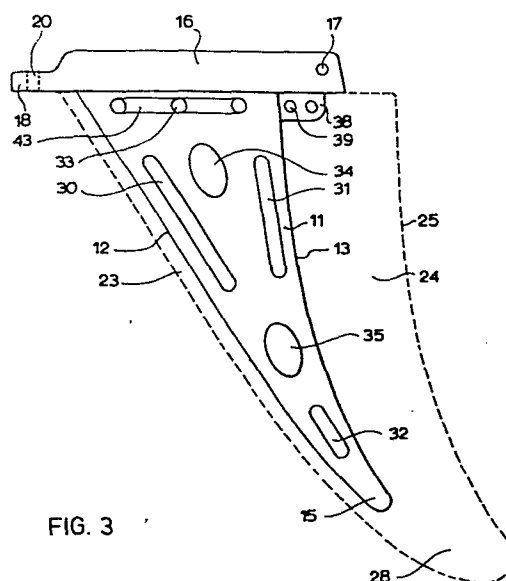


FIG. 3

A Fin for a buoyant support

The present invention relates to a fin for a buoyant support. The term "buoyant support" as used in this
5 Specification is intended to include any form of floating guided vessel or board, and in particular is intended to include surfboards, surf sailing boards (the so-called "wind surfers") surf canoes as well as more conventional vessels which may have a fin or keel for guidance purposes, for example sailing dinghys and the like.
10 In this respect the term "fin" will be understood to refer to any guide surface introduced from a buoyant support into the water, and includes not only a fixed fin or skeg, but also a keel (with a fixed keel or a
15 drop keel) a dagger board, barge board or even a rudder. All of these guide fins have a common function in providing a reaction surface against which water pressure acts to maintain a buoyant support on a selected course, or in some cases to vary the course
20 in a selected manner. Such guide veins have a leading edge and a trailing edge and are constituted by a generally flat plate-like element usually with a stream line cross section.

25 The conventional construction for such fins involves the formation thereof in a rigid and solid manner, for example by the use of marine plywood or, more commonly, a plastics, which may be a moulded plastics or grp (glass reinforced plastics - the so-called
30 fibre glass). The main design criteria of such fins has until now been to provide a maximum lateral resistance to movement whilst obtaining a minimum forward resistance to movement in consideration of the underwater flow pattern experienced by the fin at its particular location. Although this differs for a fin

- 2 -

keel or drop keel from the conditions experienced by a fin located more or less at the rear end of the buoyant support, such as a rudder or the fin of a surfboard or surf sailing board, the general considerations involved in their design, and their structural formation, have been substantially identical.

From the point of view of performance, there are two conflicting requirements for such fins: the first criterion is that of providing maximum lateral resistance in order adequately to obtain the guiding effect with the minimum surface area. This implies the provision of a long flow line (that is the fin should have a relatively high aspect ratio which means the dimension in the direction of travel is relatively high with respect to the dimension transverse the direction of travel. However, for the purpose of obtaining the greatest degree of manoeuvrability, enabling the buoyant support to turn rapidly, a low aspect ratio is required, that is one in which the fin is relatively short from front to back and relatively wide or deep in the transverse dimension. Such conflicting requirements have resulted in the shape and formation of fins being a somewhat uneasy compromise. In general the requirement for adequate lateral resistance is of paramount importance and this means that the manoeuvrability is reduced with respect to potential manoeuvrability; this results largely from the formation of a vortex on the downstream face of the fin when executing a sharp turn. Such a vortex increases the drag on the support applied through the fin thereby slowing the support and further detracting from its manoeuvrability (it being appreciated that the maximum potential for changing

- 3 -

course, and hence gaining maximum manoeuvrability, is obtained at maximum speeds when the greatest lateral forces can be exerted).

- 5 The present invention seeks to provide a fin as hereinabove defined in which the conflicting requirements for guidance and manoeuvrability can be accommodated by virtue of its particular structure.
- 10 According to one aspect of the present invention a fin for a buoyant support as hereinbefore defined comprises a generally flat body having a leading edge and a trailing edge, in which a trailing edge portion of the fin, including the trailing edge itself, is resiliently
- 15 flexible. The proportion of the area of the fin constituted by the said trailing edge portion may, in fact, exceed 50% in some cases, although in a preferred embodiment of the invention the trailing edge portion amounts to between 20% and 30% of the area
- 20 of the fin.

Although referred to as a generally flat body the fin preferably has a stream lined cross section tapering towards the leading and trailing edges.

25

- As a safety feature, particularly when the fin is used on surfboards which occasionally become separated from the surfer and are carried by the waves at relatively high speed, perhaps into contact with
- 30 other surfers, the leading edge portion of the fin is also made resilient. The area of the leading edge portion will, of course, be rather smaller than that of the trailing edge portion since it is not required for this to be resiliently flexible but merely resilient, the degree of resilience offering a cushioned

- 4 -

impact in the event that the fin strikes a non moving object.

5 In a preferred embodiment of the invention the said trailing edge portion is further provided with a plurality of ribs extending in the direction of travel, these ribs extending outwardly from the trailing edge portion and defining between them a plurality of channels for guiding the water flow.

10

For use on a surfboard or like board, the fin body may be provided with means for removably attaching the fin to the said board such means may incorporate fittings for a fin box of known construction.

15

In another aspect of the present invention a fin suitable for a buoyant support as hereinbefore defined comprises a generally flat (including stream lined) body portion and a resiliently flexible portion attached or integrally formed therewith. The manner in which the resiliently flexible portion is attached to the rigid portion may include adhesives, or may include moulding or casting one or other of the two portions in a mould into which the other said portion has
20 been fitted or previously cast. For this purpose the interengagement between the two portions may include form engagement in the form of dovetails or other re-entrant channels, apertures in the core body and/or projections on the core body.

30

The present invention also comprehends a fin suitable for a buoyant support as hereinbefore defined, comprising a generally flat (including stream lined) body having a leading edge and a trailing edge, the body con-
35 stituting a core of the fin which is entirely or sub-

stantially entirely covered with a coating of a resiliently flexible material which extends beyond the leading and trailing edges of the core to define, on its own, at least a trailing edge portion of the fin which is resiliently flexible with respect to the remainder of the fin. Such cover also preferably includes a resilient leading edge portion extending a short distance in advance of the leading edge of the core.

10 One embodiment of the present invention will be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a side view of a fin formed as an embodiment of the present invention;

Figure 2 is a sectional view taken on the line II-II of Figure 1;

20 Figure 3 is a side view of a body constituting a core of a second embodiment;

Figure 4 is an end view of the embodiment of Figure 4, and

25 Figure 5 is a sectional view of a fin box suitable for receiving a modified fin according to the invention.

Referring now to the drawings, the embodiment shown comprises a generally rigid reinforcing core member 11 having a conventional curved "sharks fin" shape including a curved leading edge 12, a curved trailing edge 13 and a substantially straight root edge 14. The leading and trailing edges 12,13 respectively meet at a curved tip portion 15.

35 Along the root edge 14 the reinforcing body 11 is

- 6 -

entirely encased in a layer 29 of resilient flexible material which coats the two faces 21, 22 of the core body 11 between the leading edge 12 and the trailing edge 13 thereof, and extends forwardly to form the leading edge 23 of the fin itself, and rearwardly to constitute the trailing edge portion 24 and form the trailing edge 25 itself. This trailing edge portion 24 tapers, as can be seen in Figure 2, from a thickness slightly greater than that of the trailing edge 13 of the core body 11 to a further edge at the trailing edge 25 itself. Spaced along this trailing edge portion 24 are a plurality of ribs 26 which extend from the feathered trailing edge 25 itself to a point approximately coincident with the trailing edge 13 of the core body 11. These ribs 26 define between them a plurality of channels 27 which serve to increase the guiding effect of the fin. The ribs 26, on the other hand, act as additional flexural reinforcement of the trailing edge portion 24 of the fin.

20

As can be seen in Figure 1 the trailing edge portion 24 also extends beyond the tip portion 15 of the core body 11 to form a resilient fin tip portion 28 which has adequate resistance to provide guidance for the flow of water during use, but is safely flexible in the event of contact with another surfer or with a fixed object such as a rock or the ground.

In an alternative construction, not illustrated, the trailing edge portion of the fin is not integrally moulded as part of an outer casing as in the case of the embodiment illustrated, but rather is separately formed and interlocked at the trailing edge of the core body 11 by means of adhesive and/or form engage-

- 7 -

ment such as dovetails or t slots in this non illustrated embodiment the outer faces of the core body 11, corresponding to the faces 21, 22 constitute the outer surface of the forward portion of the fin and are flush
5 with the lateral surfaces of the trailing edge portion.

When the fin is travelling through water the core body 11 provides sufficient rigidity for adequate guidance in a straight line, and the trailing edge portion 24
10 flexes to one side or the other to provide a curved stream line avoiding the formation of cavitation which would detract from the performance of the fin and increase the drag of the surfboard or other buoyant support on which the fin is fitted. Although the
15 core body 11 is substantially rigid, it preferably has a degree of flexural resilience sufficient to accommodate hard shocks such as on ground contact without breakage.

20 The fin illustrated in Figures 1 and 2 can be made in a two-part process comprising the casting or moulding of the core body 11 (or alternatively, this may be shaped by cutting or grinding down from a blank) and the attachment support 16 may be integrally formed
25 with the core body 11 or attached thereto and reinforced by one or more reinforcing strips (not shown). After the core body 11 has been formed it is inserted into a mould having the final shape of the desired fin and a urethane material injected into the mould to form
30 the outer covering including the leading edge portion 23 and trailing edge portion 24 and the ribs 26. The coating may also cover the attachment block 16 or may finish flush or square with the surface of this. The flexible urethane coating need not, of course,

- 8 -

be transparent, but may be opaque and suitably coloured by inclusion in the moulding material of a suitable pigment. Externally, therefore, the fin of the present invention will look no different from conventional fins, but will have the improved performance and added safety features discussed.

Although the fin illustrated in the drawings is shown as a symmetrical fin, the present invention also comprehends an asymmetrical fin. Some surfboards are fitted with twin fins, and for such boards asymmetrical fins have substantial advantages from the point of view of obtaining directional stability.

Referring now to Figures 3 to 5 the second embodiment of the invention shown is largely similar to that of Figures 1 and 2, with a number of significant differences. In all the drawings, the same reference numerals have been used to identify the same or corresponding components

The fin structure illustrated in Figures 3 and 4 comprise a core body 11 having a leading edge 12 and trailing edge 13, and extending from a root edge 14 to which is integrally moulded a suitably shaped attachment block 16 for attachment of the finished fin to a fin box in a manner which will be described in more detail below, and a tip 15. The shape of the completed fin is shown in broken outline in Figure 3, the fin being completed as in the embodiment of Figures 1 and 2 by an outer covering 29 of flexible resilient urethane material moulded over the core body 11.

In order to obtain secure interconnection of the core body

- 9 -

11 and the outer cover 29 the core body 11 is provided with a number of apertures 30, 31, 32 extending along its "length" that is in a general direction of the extent of the fin from the root edge of the core body 11 to the tip 15 thereof. In fact, the opening 30 lies substantially parallel to and adjacent the leading edge of the core body 11 where this is substantially straight, and the opening 31 lies parallel to and adjacent the trailing edge 13 of the core body, whilst the opening 32 lies closer to the tip 15 and is equally spaced between the leading edge 12 and the trailing edge 13.

Secure interconnection of the outer layer 29 adjacent the root 14 of the core body 11 is obtained by means of a row of holes 33 and a cooperating elongate recess 43 on each face 21, 22 of the core body 11. The angle between the trailing edge 13 of the core body 11 and the attachment block 16 is reinforced by a web 38 which also has two openings 39 therein aligned with the opening 33, again for improving the interconnection of the trailing edge portion of the outer cover 29 and the core body 11.

Extending along an intermediate line of the core body 11 are a plurality of lateral projections 34, 35 (in the illustrated embodiment two such projections are shown, although they may be provided any number from one upwards) and these projections have generally flat faces 36, 37 which are exposed by the outer cover 29 and lie substantially flush with the surface of this outer layer in the finished fin. This not only provides for complete security of the interconnection between the outer flexible resilient layer of urethane material which defines the outer shape of the fin, and the internal core body 11, but also provides a decorative feature if the urethane material of the outer

- 10 -

cover is substantially opaque and of a different colour from that of the core body 11.

Variations in the degree of longitudinal stiffness (that
5 is stiffness in the direction parallel to the "length" of
the fin that is from root to tip) can be achieved by vary-
ing the length of the core body 11 which, in this embodiment,
has flat parallel faces 21, 22 (although, as in the em-
bodiment of Figures 1 and 2, the faces could be curved to
10 a streamline shape if desired) a longer core body provid-
ing a greater degree of stiffness and a shorter core body
allowing a greater degree of flexural resilience. It is
presently considered that a longer core body 11 coupled
with a relatively low density highly resilient outer layer
15 will provide the best combination of stiffness for guidance
in the water and resilient protection against damage,
particularly by the tip, if an obstruction is struck,
whilst at the same time providing the flexural resilience
of the trailing edge referred to above.

20

The attachment block 16 shown in the embodiment of Figures
3 and 4 is of a conventional type having a transverse pin
17 extending through the end adjacent the trailing edge of
the fin and a forwardly projecting "nose" 18 at the leading
25 edge of the fin, through which passes an aperture 20 for
receiving a fixing screw. Conventional fin boxes with which
surfboards are provided have an elongate slot with an under-
cut lip along which the transverse pin can slide (a suitable
enlarged portion being provided for introducing the pin into
30 the slot. A captive nut also slides in the slot and can
be clamped by means of a screw passing through the aperture
20. The fin box is substantially longer than the attach-
ment block 16 so that adjustments to the longitudinal
position of the fin can be made by slackening the screw

- 11 -

and sliding the attachment box 16 along the slot before retightening the screw.

In Figure 5 there is shown an alternative construction in which the attachment block 16 is provided with a plurality of inclined slots 40 having enlarged inner ends 41, and a fin box has a plurality of transverse rods or bars 19 equally spaced along the length thereof and spanning the slot in the fin box the slots 40 taper gradually from a wider mouth to a narrower throat immediately adjacent the enlarged ends 41, the throat being slightly smaller in transverse dimension than the diameter of the retaining rods 19 in the fin box so that the fin can be snap engaged by pushing the fin with the slots 40 engaged over the cooperating rods 19 until the rods 19 enter the enlarged ends 41. This construction has the advantage of being adjustable along the length of the fin box through a number of predetermined positions and also of being releasable from the fin box upon impact above a predetermined threshold. Thus damage caused by the fin can be totally avoided since it not only has the resilient leading edge, but also is snap releasable from the surf board if the surf board should strike with the fin against any other object with a force sufficiently great to do any damage to the fin or to the object, the snap disengagement absorbing the force of the impact. A suitable releasing tool may also be provided if the snap engagement force required to fit or release the fin is greater than that which can conveniently be applied by a bare hand. The slots 40 are inclined at approximately 45° so that the force applied to fit the fin in the fin box can be applied conveniently in a direction substantially perpendicular to the resilient leading edge which is itself rounded and sufficiently soft to provide a comfortable surface against which a bare hand can press in fitting the fin to the fin box.

- 12 -

Claims:

1. A fin suitable for a buoyant support as hereinbefore defined, characterised in that it comprises a fin body (11) having a leading edge (12) and a trailing edge (13), the body (11) constituting a relatively stiff core of the fin and being at least partly covered with an outer layer (29) of resiliently flexible material which extends at least rearwardly beyond the trailing edge (13) of the core (11) to form a fin trailing edge portion (24) which is resiliently flexible with respect to the body (11) of the fin.

2. A fin as claimed in claim 1, characterised in that the said outer layer (29) of resiliently flexible material also extends forwardly of the leading edge of the said core body (11) to form a resilient fin leading edge portion (23).

3. A fin as claimed in claim 2 characterised in that the fin trailing edge portion (24) extends for a distance of up to one half of the overall chord of the fin.

4. A fin as claimed in any of claims 1 to 3, characterised in that the said core body (11) has at least one opening (30,31,32,33) for receiving material of the said outer layer (29) for the purpose of securely interlocking the core body (11) and the outer layer (29).

5. A fin as claimed in Claim 4, characterised in that the said core body (11) has a plurality of such openings (30,31,33,33) passing through the thickness

- 13 -

of the core body (11) and opening into both opposite faces (21,22) thereof, at least one of the said openings (30,32) being elongate and lying generally parallel to and adjacent the leading edge (12) of the core body (11).

6. A fin as claimed in claim 4 or claim 5, characterised in that at least one of the said openings (31) is elongate and lies generally parallel to and adjacent the trailing edge of the core body.

7. A fin as claimed in any preceding claims, characterised in that the said core body (11) has at least one projection (34,35) which extends laterally from a major face (21,22) of the core body (11) and is at least partly surrounded by the material of the said outer layer (29) to assist in securely interlocking the said core body (11) and the said outer layer together.

8. A fin as claimed in claim 7, characterised in that the said lateral projections (34,35) have faces (36,37) which are exposed by the said outer layer (29) and lie substantially flush with the surface thereof.

9. A fin as claimed in any preceding claim, characterised in that the core body (11) itself is made from a material having a limited degree of flexural resilience, such as to impart substantial stiffness to the fin against flexing along a direction extending from the root (14) to the tip (28) apart from a tip portion (28) of the fin where the outer layer (29) extends beyond the tip of the said core body (11).

- 14 -

10. A fin as claimed in any preceding claim, characterised in that the said core body (11) incorporates means (16,17,18,20;19,40,41) for removably attaching the fin to a cooperating part of a buoyant support.

11. A fin as claimed in claim 10, characterised in that the said core body is provided with an attachment body (16) shaped to be received in a fin box of a surfboard having a plurality of transversely extending rods or bars substantially equally spaced along the length thereof, the attachment body (16) having a plurality of recesses (40,41) for receiving the said transverse rods or bars and snap-engaging thereon.

12. A fin for a buoyant support as claimed in any preceding claim characterised in that the outer layer (29) of the fin structure is made of urethane.

13. A method of manufacturing a fin for a buoyant support as hereinbefore described comprising the steps of forming a substantially rigid core body (11) incorporating attachment means (16) for attaching the finished fin to a buoyant support such as a surfboard, introducing the core body into a mould, injecting a urethane material into a mould so as to substantially surround the core body (11) and form an outer layer (29) thereon, removing the moulded fin from the mould and immediately quenching it in water at room temperature to avoid differential shrinkage of the urethane at regions of differing cross sectional thickness.

Claim(s) Nr 11, 12, 13 deemed to be abandoned
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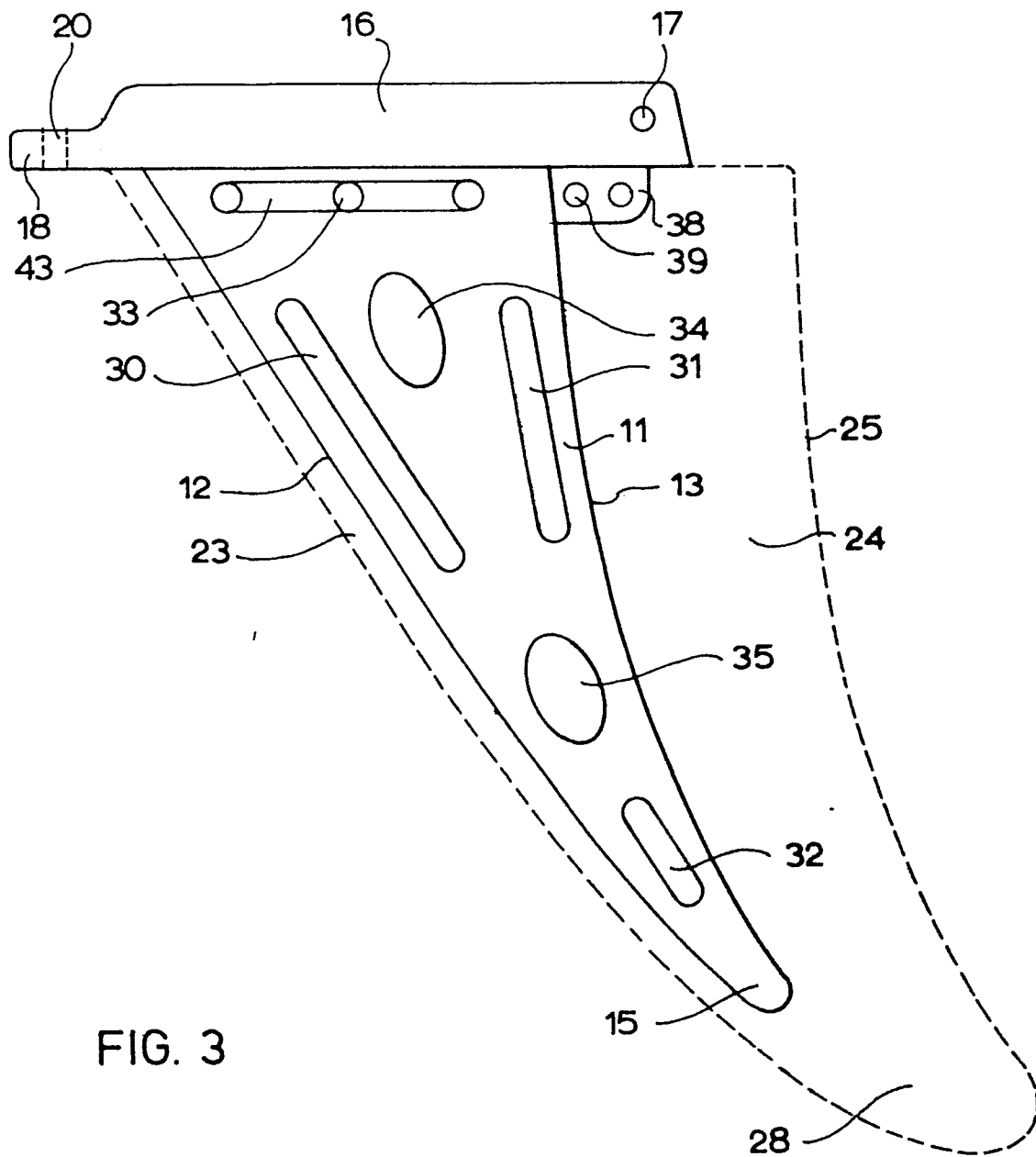


FIG. 3

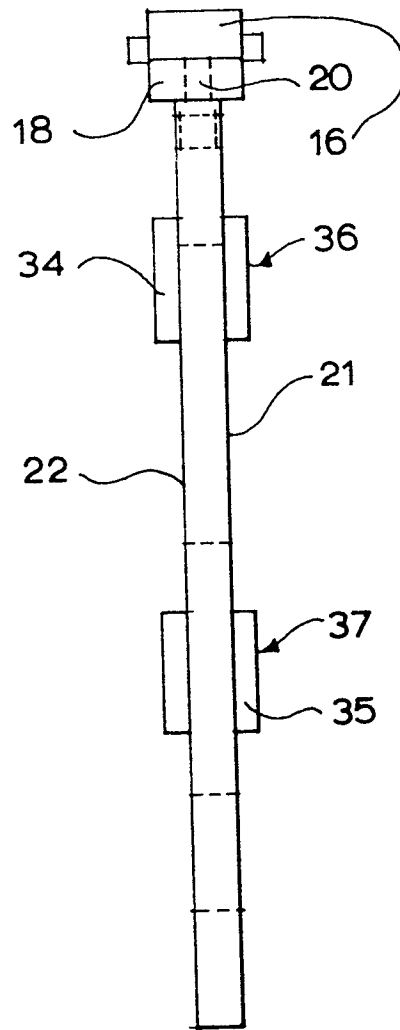


FIG. 4

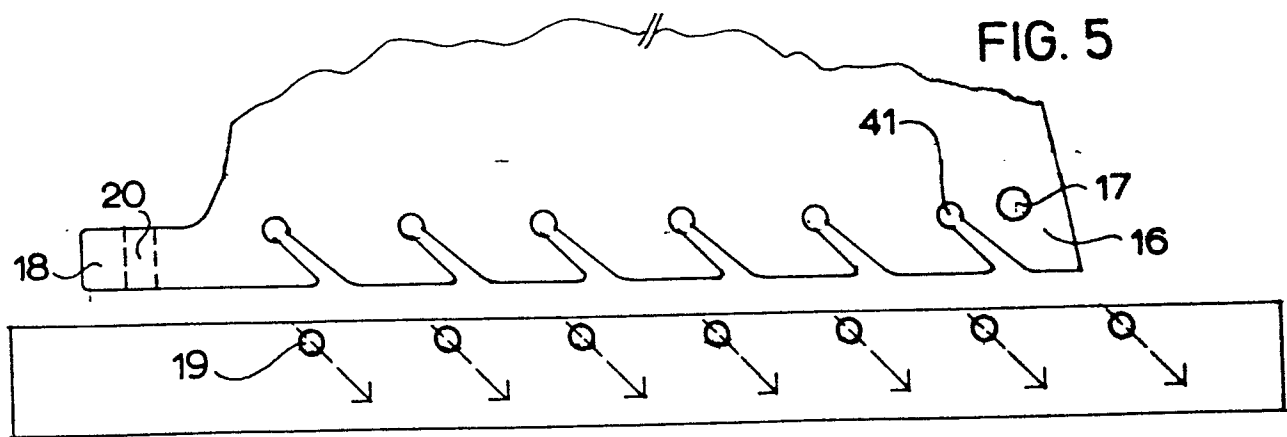


FIG. 5



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EUROPEAN SEARCH REPORT

0079113

Application number

EP 82 30 2693

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
A	US-A-4 209 867 (H.H. ABRAMS) * column 3, lines 35-41; figure 4 *	1	B 63 B 3/38 B 63 B 41/00 A 63 C 15/05
A	DE-A-2 826 117 (H. MARKER) * page 4, second half; figures 1,2 *	1	
A	US-A-3 965 514 (A.B. SHAFER et al.) * column 3, line 54 to column 5, line 2; figures 1 to 4 *	1,10	
A	US-A-3 659 300 (R.K. JOHNSON) * abstract; figures 1,2 *	1,10	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			B 63 B A 63 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 08-09-1982	Examiner PRUSSEN J.R.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			



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☒ CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ All claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claims:
- ☒ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

☐ LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirement of unity of invention and relates to several inventions or groups of inventions, namely:

- ☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees has been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims: