# United States Patent [19]

**Bertin**

[11] **3,841,223**

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[54] **TRACKS ALONG WHICH GROUND-EFFECT MACHINES IN PARTICULAR TRAVEL**


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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ............. **104/23 FS,** 104/134, 104/120, 238/10 R, 104/124

[51] **Int. Cl.** ............................................ **B61b 13/08**

[58] **Field of Search** ......... 238/10 R; 104/23 FS, 89, 104/91, 106, 107, 109, 118, 120, 123, 124, 125, 126, 134, 138, 139, 140



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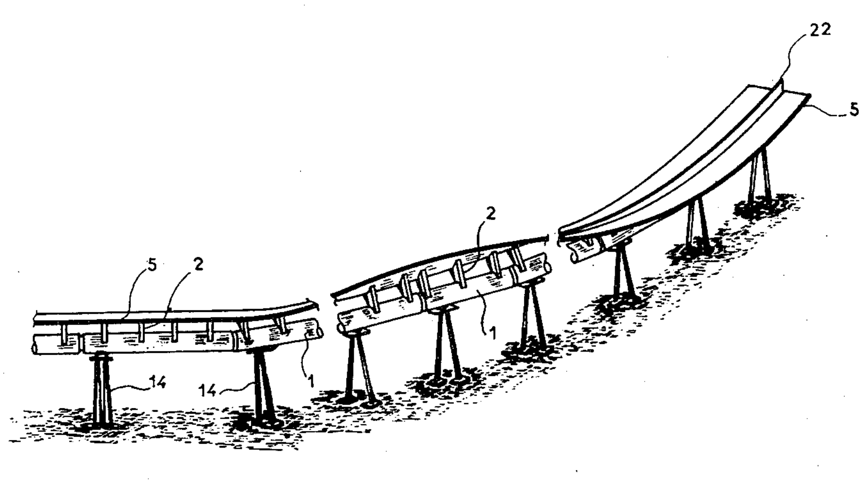
[57] **ABSTRACT**

In a guided ground-effect transportation system, the vehicles are supported by a track of a particular construction, including a supporting portion having a substantially horizontal flat surface fast with bracket members which are fixed to a web consisting of tubular members connected end to end.


**5 Claims, 10 Drawing Figures**



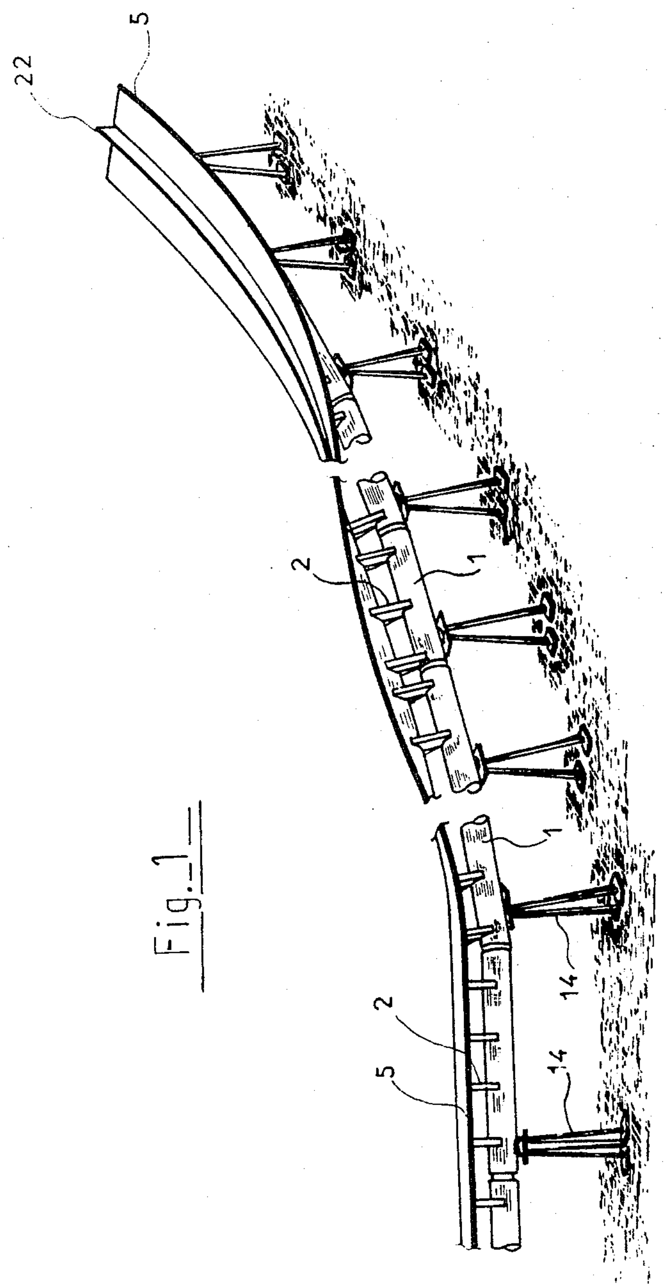



Fig._1_

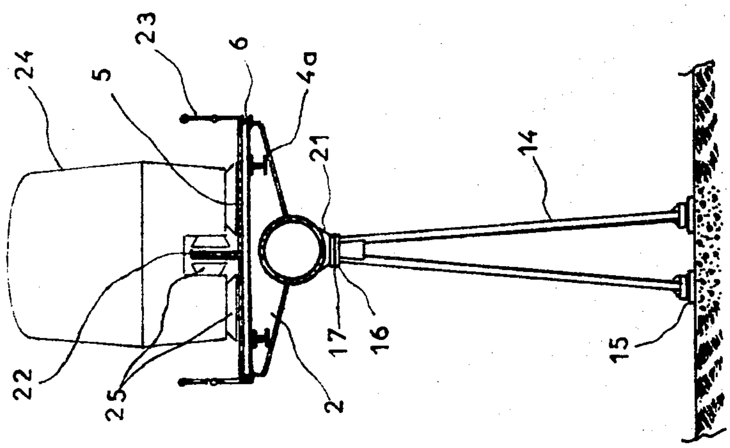



Fig._3_

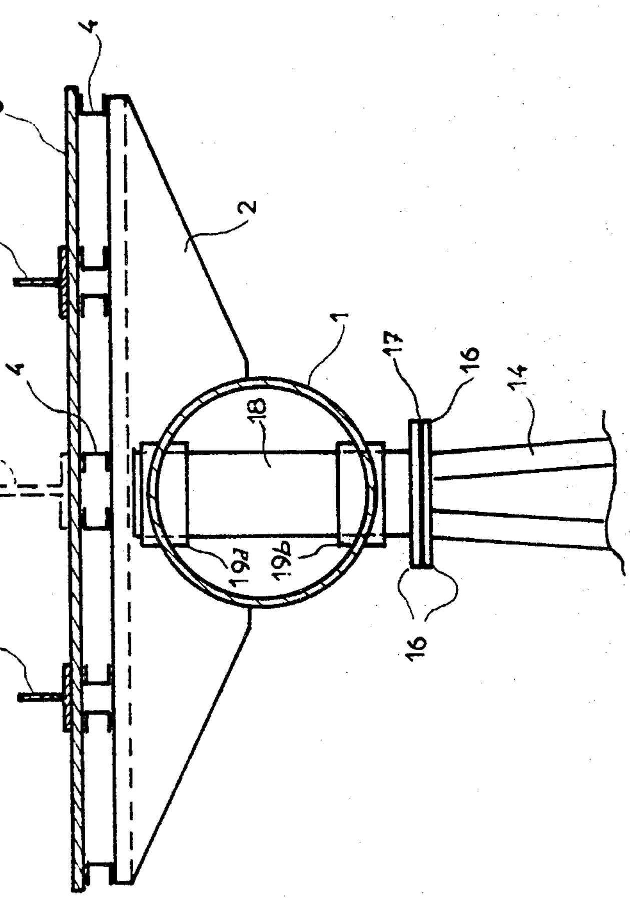



Fig._2_

Fig._4_

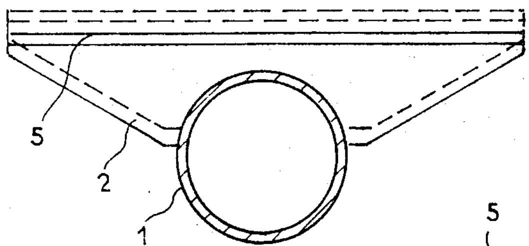



Fig._5_

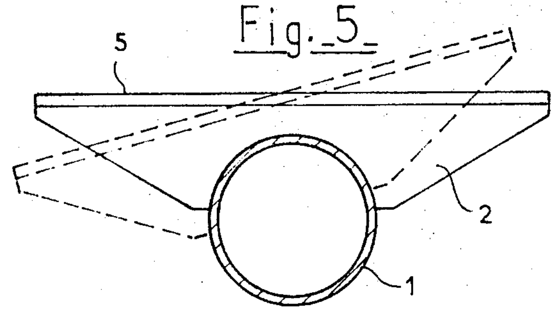



Fig._6_

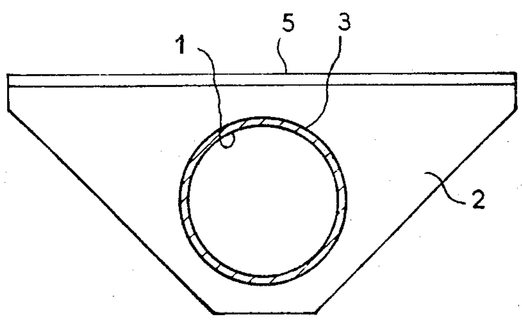
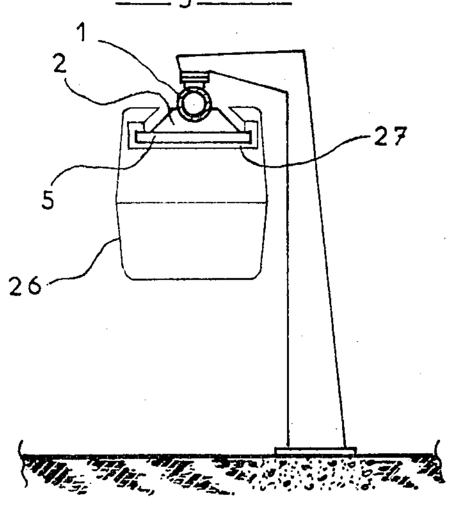



Fig._10_



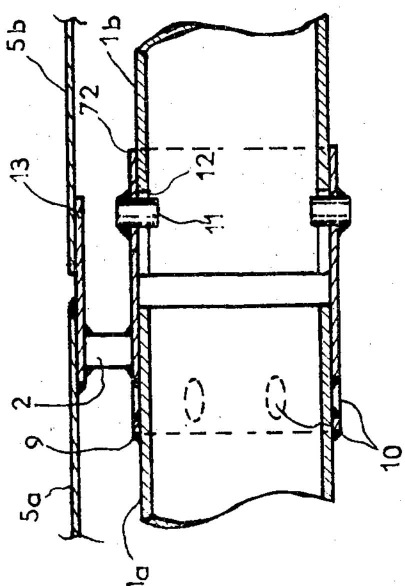



Fig. 8

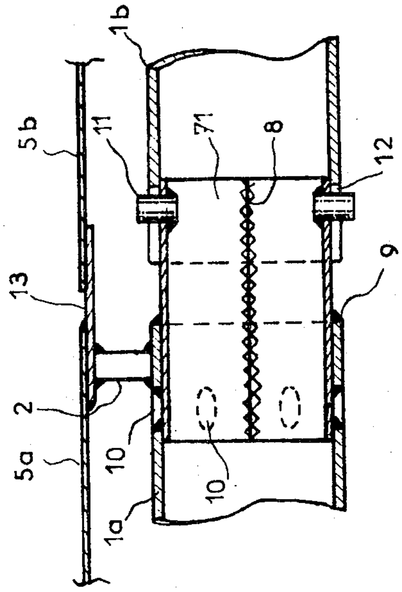



Fig. 7

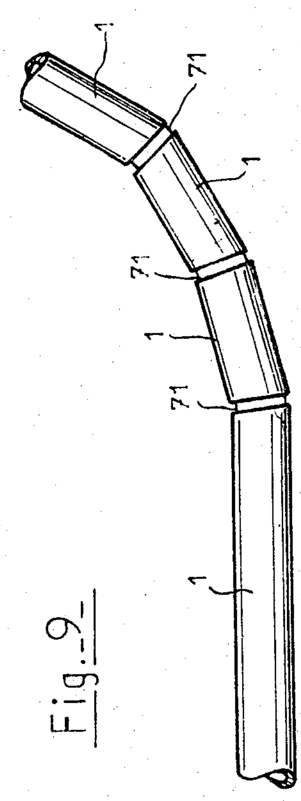



Fig. 9

# TRACKS ALONG WHICH GROUND-EFFECT MACHINES IN PARTICULAR TRAVEL

It is well-known that in a guided ground-effect transportation system, all direct contact between the vehicle and the surface along which it travels is eliminated since the vehicle is supported by fluid cushions which distribute its weight over the surface with light loading values per unit area. This makes it possible to build a track which is not called upon to withstand high punctual loads, thereby enabling the track infrastructure to be lightened.

The present invention relates to the construction of tracks along which moving bodies, and more particularly though not exclusively ground-effect machines, travel.

A supporting and/or guiding track according to this invention includes a supporting portion consisting of a substantially horizontal flat surface fast with bracket members which are fixed to a web consisting of tubular elements connected end to end to form a continuous tubular member.

Already known are tracks for ground-effect machines, consisting for example of preferably prestressed prefabricated beams supported on uniformly spaced bases or poles. This type of track is usually somewhat heavy and involves manufacture in immediate proximity to the construction site.

Likewise known are tracks for ground-effect machines, consisting at least partly of tubular beams with which said machines cooperate directly. For instance, the tubular beams may be suspended from poles and the machines hooked onto the beams.

The subject system of this ineention makes it possible to take advantage of the lightness, low cost and mechanical strength of tubular elements for devising a track to allow ground-effect machines to travel therealong.

The tubular elements, which are preferably commercially available tubes such as those used in pipeline construction, can be joined end to end by means of sleeves with which they are made fast by any convenient method well-known per se, such as by welding.

Upon these elements are disposed appropriately spaced bracket members perpendicular to the direction of the track. These brackets are substantially triangular in shape and have one apex fixed to the supporting tubular elements or bases.

The flat track surface (hereinafter called 'deck') is fixed to the brackets either directly or through the medium of stringers.

The track structure may be supported on poles or bases positioned at regular intervals.

Differences in ground level can be attenuated or even compensated for by varying the heights of the poles and/or the brackets.

A prime advantage of such a track is its good rigidity in both the bending and the torsional modes. Now such combined loads (bending and twisting) occur frequently, especially in curves (even when the machine is travelling above the axis of the tubular elements) and in the case of a dual track in which the centre of gravity of the machine is shifted transversely with respect to the axis of the tubular elements. Because of this good rigidity it is possible to construct the track with light elements. Such light elements can therefore be prefabricated and carried to the construction site without difficulty by reason of their lightness.



The description which follows with reference to the accompanying non-limitative exemplary drawings will give a clear understanding of how the invention can be carried into practice.

In the drawings:

FIG. 1 is a perspective view of a track according to the invention;

FIG. 2 is a cross-sectional view of a first embodiment of the invention;

FIG. 3 is a cross-sectional view of an alternative embodiment of the invention;

FIGS. 4 to 6 are diagrammatic showings of different possible methods of fixing the brackets to the tubular elements;

FIG. 7 and 8 show two possible methods of joining the tubular elements by means of an internal and an external sleeve, respectively;

FIG. 9 schematically illustrates the arrangement of the tubular elements in a curving portion of the track; and

FIG. 10 is a front elevation view of a track according to the invention associated to a ground-effect machine utilizing layers of fluid at sub-atmospheric pressure.

The track according to this invention shown in FIGS. 1 and 2 comprises tubular elements 1 of substantially circular section, such as, and preferably by reason of their lower cost, the tube lengths available commercially for building pipelines.

Mounted on tubular elements 1 are suitably spaced substantially triangular brackets 2 having one of their apices fixed to said elements 1.

The brackets 2, which in effect form frames, are devised in any convenient way, such as by means of sections, or bent plates (possibly ribbed or reinforced with sectional members), or else preferably by means of two plates bounded by frames and spacer members.

The brackets 2 may have a truncated apex and be made fast thereby to the tubular elements along a directrix thereof by any convenient method, such as by welding (see also FIGS. 4 and 5).

The brackets 2 may alternatively be formed with an opening 3 therein, whereby tubular element 1 passes therethrough and is fixed along a directrix to the edge of the opening in the bracket (see FIG. 6).

Restrained on the brackets 2 are stringers 4 consisting of U-sections or I-sections upon which the track deck 5 rests. Deck 5 may consist of a waterproof covering of any convenient but preferably light and flexible material such as steel plates, plastic material or film, wood, etc..

Alternatively, the stringers may be dispensed with and the deck 5 mounted directly on brackets 2.

As shown in FIG. 3, stringers 4*a* (I-sections) are fixed to the upper undersurface of brackets 2. Cross-members are fixed to the stringers in such manner that their upper surfaces lie level with the upper surface of brackets 2. Thus the deck 5 rests directly on the brackets and the cross-members.

The tubular elements 1 may be joined together by any convenient means, such as through the agency of a sleeve which engages into (FIG. 7), or over (FIG. 8) the tubular elements. Internal sleeves 71 may consist of a tubular-element section from which a longitudinal strip is cut out, after which the edges are welded together at 8 to the required diameter (less than that of tubular elemtns **1**). If an external sleeve **72** is used, it will suffice to select a tube the diameter of which is naturally larger than that of tubular elements **1**.

A sleeve **71, 72** is fixed to one of the tubular elements **1***a*, for instance by means of welds made through openings **10**, and to the end **9** of the tubular element **1***a* (FIG. **7**) or of the sleeve **72** (FIG. **8**). Sleeve **71, 72** is free to move longitudinally with respect to the other tubular element **1***b* to permit expansion of elements **1***a*, **1***b*. Preferably, element **1***b* and sleeve **71, 72** are mutually fast in torsion, such loads being absorbed by protrusions **11** provided on sleeve **71, 72** and cooperating with grooves or ports **12** formed at the end of the second tubular element **1***b*. The joints between consecutive decks **5***a*, **5***b* are effected by means of leakproof fish-plate **13** which is fast with deck **5***a* but unrestrained to deck **5***b* in order to absorb expansion.

Curves in the track (or variations in its slope) are obtained by means of a plurality of short tubular elements **1** angularly offset with respect to one another and associated to angled sleeves (FIG. **9**). In an alternative embodiment (not shown), the elements are welded to one another directly, pairs of consecutive tubular elements **1** being sectioned to suit their mutual angular offset and allow them to be butt-welded together.

The track may be supported on single or multiple-legged poles **14** anchored to the ground and possibly provided with adjustment means (not shown) such as those described in U.S. Pat. No. 3,464,365, and expansion joints **15** made of neoprene for example (FIG. **3**).

These poles converge upwardly towards the track and are united on a bed **16** consisting of two separate baseplates separated by a gasket **17** made of an elastic material such as neoprene.

FIGS. **2** and **3** illustrate alternative ways of fixing the poles to the tubular elements.

In one embodiment (FIG. **2**), the upper baseplate is fast with a tube **18** of smaller diameter than that of the tubular elements and having reinforcements **19***a* and **19***b*. This tube engages into openings formed in the tubular elements **1** whereby the reinforcements lie at right angles to the material of the elements. The reinforcements may be welded for example to the edge of the opening in the tubular element.

In the second embodiment shown in FIG. **3**, the upper baseplate is fast with a frame **21** secured directly to the tubular element, being possibly welded thereto.

A further important advantage of a track according to this invention is that it possesses a plurality of adjustment stages.

In addition to the adjustment at the base of the pole, referred to precedingly, differences in ground level can be offset on the one hand by means of different pole lengths and on the other through the agency of the means for securing brackets **2** to tubular elements **1**. As shown in FIG. **4**, the brackets may be provided with different openings therein, whereby to allow adjusting the height of the brackets (solid and dash lines) on the tubular elements and thus provide a further adjustment



stage to compensate for differences in ground level.

As shown in FIG. **5**, sideway inclinations are obtained likewise by means of the brackets, by tilting them or by appropriately configuring their edge facing the deck.

As shown in FIGS. **2** and **3**, such tracks may include one or more guidance extensions **22** lying either along the axis of the tubular elements (FIG. **3**) or offset transversely in relation thereto (FIG. **2**).

FIG. **3** likewise portrays a ground-effect machine **24** cooperating for lift and guidance purposes with the track through the medium of pressure-fluid cushions **25**. The track shown in FIG. **3** includes protective parapets **23**.

Reference to FIG. **10** shows a ground-effect machine **26** cooperating with a track according to this invention through the medium of layers **27** of fluid at sub-atmospheric pressure. In this instance the deck **5** is positioned beneath tubular element **1** and the layers **27** of fluid at sub-atmospheric pressure cooperate thereiwth.

It goes without saying that changes and substitutions may be made in the embodiments hereinbefore described without departing from the scope of the invention as set forth in the appended claims.

I claim:

**1.** A track structure designed for bearing and guiding movable bodies by means of an elevated bearing track surface fast with at least one guiding upright and borne by a web assembly which is formed of a continuous succession of generally cylindrical tubular elements and which is supported on spaced pylons above the ground, wherein the improvement comprises:

a multiplicity of generally planar solid strutting bracket members interposed between said bearing track surface and said web assembly and spaced along the span thereof, said bracket members being of generally triangular shape and having a substantially rectilinear flared end adjacent said bearing track surface and extending crosswise thereof and a substantially circular tapered end adjacent said web assembly and encompassing the same; and

support means for said web assembly on said pylons, spaced from said bracket members and comprising a baseplate fitted on top of each pylon, and a strut section fast with both said baseplate and said web assembly.

**2.** A track structure as claimed in claim **1**, wherein said strut sections comprise pegs threaded through openings formed on said tubular elements.

**3.** A track structure as claimed in claim **2**, wherein said pegs extend diametrically across said tubular elements.

**4.** A track structure as claimed in claim **3**, wherein said pegs comprise a tubular body portion and two reinforcing hoops fitted into said openings.

**5.** A track structure as claimed in claim **1**, wherein said bracket members and said support means are positioned at and project from diametrically opposite portions of said web assembly.

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