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J. H. BERTIN

3,140,753

SUPPORTING DEVICE USING A LAYER OF FLUID UNDER PRESSURE

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Fig. 1

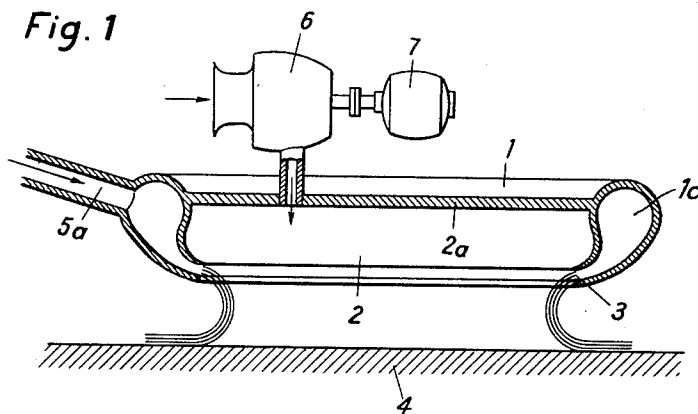


Fig. 2

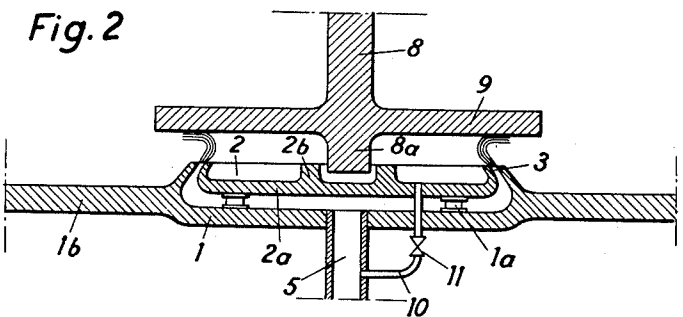
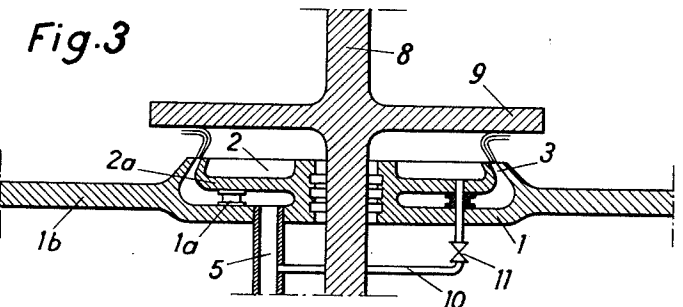


Fig. 3



1

2

3,140,753 SUPPORTING DEVICE USING A LAYER OF FLUID UNDER PRESSURE

Jean Henri Bertin, Neuilly-sur-Seine, France, assignor to Societe Bertin & Cie, Paris, France, a company of France

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2 Claims. (Cl. 180—7)

The present invention relates to a device for effecting the support of a surface on another by means of a layer of fluid under pressure produced at the desired moment between these two surfaces and consequently tending to separate them from each other by a certain amount against loads which tend to bring them into contact. In certain conditions, therefore, this device operates like a jack, but it is capable of other applications, as will be indicated hereinafter.

This device utilizes the properties of fluid jets (gaseous or liquid) in the form of sheets produced by the discharge of fluids under pressure through a nozzle. The nozzle is provided on one of the surfaces so as to surround a sufficient area and to direct the emitted fluid towards the opposite surface, preferably with a component of velocity directed towards the interior of said area. On the latter and on the part of the other surface facing it, that is to say in the interior of a sort of chamber confined between these two surfaces by the fluid sheet and fed by the fluid sheet or by a duct opening into said chamber, or in both these ways, a certain pressure is thus created.

The following description with reference to the accompanying drawings, given by way of example, will enable the various features of the invention and the manner of realizing them to be well understood.

FIGURE 1 is a vertical section of an embodiment of the invention as a fluid jack a lifting platform,

FIGURE 2 is an axial section of a footing bearing embodying the invention,

FIGURE 3 is an axial section of a bearing traversed by a shaft.

Referring to FIGURE 1, a shoe 1 has its lower surface formed with a cavity or recess 2 freely open downwards and surrounded by a nozzle 3 in the form of a slot inclined towards the interior of the cavity. At rest, the shoe is supported on the ground 4 by the edges of the slot. The latter communicates with an annular feed header 1c surrounding the cavity 2. The header can be fed, by means of a duct 5a, with pressurized fluid, gas or liquid, which can come from a source such as a cylinder, compressor group, or gas turbine. When the slot 3 is fed, the laminar fluid jet or sheet escaping from said slot all round the cavity 2 separates the interior of this cavity from the external medium and maintains the pressure in the cavity and the fluid-wall chamber thus formed.

An air compressor 6 is mounted on the shoe and driven by an electric motor 7. This compressor serves to supply air under pressure to the interior of the cavity 2. It could also be used to feed the slot 3 as will be seen hereafter with respect to alternative forms of the embodiment of FIG. 1.

The duct 5a may be fed with liquid under pressure, water for example, and in this case the auxiliary feed by the compressor 6 serves to diminish the volume of water in the cavity 2 and thus the mass to be displaced. In addition, feeding the cavity 2 with air, by means of the compressor 6, reduces the viscosity forces between the medium which fills said cavity and the ground enclosed by the liquid sheet generated by the peripheral nozzle 3. These forces form part of the drag of the

jack 1 and interfere with the formation and development of the liquid sheet.

The slot 3 is sharply inclined with respect to the vertical. This arrangement is possible if the cavity 2 is sufficiently deep to prevent the fluid sheet formed from adhering to the top 2a. In this case, under the effect of the pressure prevailing in the cavity, the sheet is curved outwards, as shown in the figure, and a greater lift of the shoe 1 is obtained for the same expenditure of fluid.

There is thus provided a jack which operates without mechanical parts and which may be used, for example, for the movement or transport of various materials and load. If, in fact, one imagines a number of such jacks operating under the load, the latter will be lifted off the ground by the fluid cushions formed, and it will then be possible to pull the load in order to move it.

Of course, the shoe, seen in plan, does not necessarily have a circular shape. It could, for example, have a rectangular shape with rounded corners.

The device according to the invention may be applied to the construction of a footing bearing suitable, for example, for a hydraulic turbine. This is represented in FIGURE 2 which shows the shoe 1, which is then fixed and forms part of the frame or foundations 1b of the turbine (not shown). The latter exerts a downward thrust parallel to the shaft 8, which is integral with a thrust plate 9. This plate 9 is subjected to the action of the fluid sheet escaping from the slot 3 in the same way as previously described. Fluid is fed to the slot 3 through a duct 5 and a header formed between the shoe 1 and the bottom of the cavity 2 which is spaced from the shoe 1 by spacers 1a.

The shaft 8 is maintained centered due to an extension 8a of said shaft co-operating with an annular shoulder 2b formed by the bottom 2a of the cavity 2. Any other device permitting a certain movement of the shaft parallel to itself could also be used for maintaining the centering of the shaft.

On the other hand, in the case shown in FIG. 3, where the shaft 8 has to pass through the shoe 1, the feed head of the slot 3 can be annular. In other words, the feed head of the slot 3 shown in FIGURE 2 could be replaced by the annular head shown in FIGURE 3.

Finally, the provision of a conduit 10 with a valve 11 for supplying the interior of the cavity 2 with fluid under pressure from the pipeline 5 in particular permits the lift of the plate 9 to be regulated with precision as a function of the opening of the valve 11 and to improve the general hydro- or aerodynamic efficiency of the device.

Among the other applications of the invention, there may be mentioned non-restrictively the support of aircraft in proximity to the ground, in particular for starting or landing, permitting the undercarriage to be dispensed with or simplified, the support and propulsion of craft on water, and the pneumatic or hydraulic control of mechanisms.

What I claim is:

1. A device for providing support between a first member and a second member having a cavity defined between them and being disposed in reciprocal relationship comprising, in combination, a nozzle provided on said first member opposite said second member, a source of fluid under pressure connected to feed said nozzle and to cause issuance of a fluid stream therefrom, said nozzle being formed to direct said stream as a sheet limiting said cavity, and a conduit for discharging fluid into said cavity, said conduit being connected to be fed from said source of fluid under pressure and said conduit including flow-controlling means, whereby said fluid is introduced into said cavity from said conduit and confined by said sheet, and said members are repelled relatively to one another.

2. A device as defined in claim 1, wherein said flow-controlling means is a valve.

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