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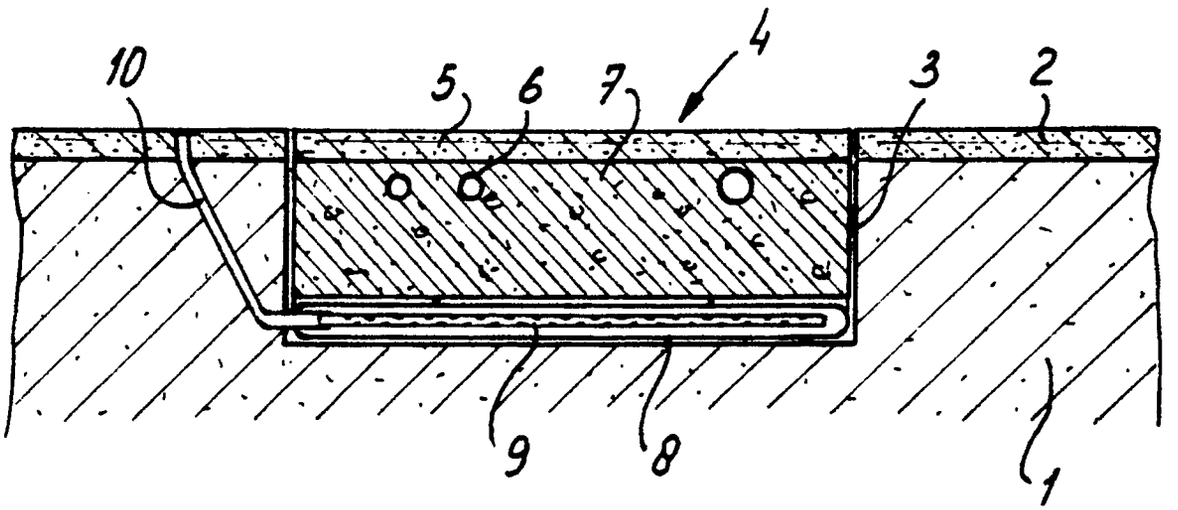
(54) Process for laying a foundation, and foundation.

(57) Process for compensating for subsidence of foundations with relatively large surface area. During the making of the foundation a closed bag (8) provided with feed means (10) is placed so that it lies directly on the excavated piece of ground. Following the occurrence of a subsidence through, these feed means (10), which are provided at various points, setting material in a proportioned way is provided, so that the foundation situated above is moved upwards.

fig - 1



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PROCESS FOR LAYING A FOUNDATION, AND FOUNDATION.

The present invention relates to a process for laying a foundation, comprising the excavation of a piece of ground, placing thereon a closed bag provided with feed means for the subsequent introduction of setting material, and the subsequent laying of the remaining foundation. Such a process is known from British Patent Specification 1,304,763. In this case a foundation girder is provided with a bag so that, in the event of subsidence, "inflation" can take place through subsequently introducing material into the bag. The bag here is accommodated in a U-shaped tube with the free side facing the piece of ground, and the body of which bears the remaining foundation. The bag is placed against the body resting against the bottom side, and a large quantity of gravel-type material is placed underneath it. Through the inflation the U-shaped part moves upwards and the gravel introduced earlier will fall, fed from the side, into the space becoming free. This means that the bearing function is in fact taken over by the gravel after completion of the introduction operation.

According to a special embodiment of this British patent, a rigid plinth is first produced in the ground. This plinth is locally in the form of a piston around which the U-shaped part acts as a cylinder. Through the injection of material into the space above the piston, the cylinder will displace upwards. In this embodiment also gravel falls below the cylinder walls. Provision is also made for the injected material to be setting, so that it also will exert a certain supporting function.

Although such a device can be used for the foundation of, for example, buildings, it cannot be used for foundations with a relative large surface area, such as a road or railway bed or a part of a car park. For a piston/cylinder structure of such large size is not readily imaginable. There is also the need for supplying a large quantity of gravel from the side beforehand.

From US Patent Specification 3,756,507 it is known in the case of a railway bed to place the plate bearing the rails on two spaced slopes. The space between the slopes is partially filled with gravel. In order to protect the space between this gravel and the bottom side of the plate against frost damage, a bag filled with a setting plastic material is inserted before the plate is fitted. There is no intention with this construction of subsequently moving the plate upwards if subsidence has occurred. For the bag filled with setting material has no supporting function.

From German Offenlegungsschrift 2,639,792 it is known to inflate the foundation for a building or the like by means of a piston/cylinder system of the type described above. For this the bearing girder of a foundation is laterally bounded by plates. These plates extend in the ground, and the area bounded between them is filled with gravel. Various gravel compartments are bounded by horizontal plates. It is possible to raise the foundation by inserting material into these gravel compartments. The use of compartmentation and gravel in the production of the foundation means that very many steps are necessary to permit the subsequent introduction of setting material. Besides, the weight increases considerably in all of the foundation systems outlined above, so that subsidence is actually promoted. In the systems according to German Offenlegungsschrift 2,639,792 and British Patent Specification 1,304,765 it is not possible to displace a larger surface area because there is no guarantee that the pressure of the injected fluid is applied uniformly distributed over the space to be expanded.

The object of the invention is to avoid the disadvantages of the state of the art described above and to provide for a process by which it is possible when laying foundations with relatively little effort to take measures which later, possibly after subsidence, make it possible to reverse such subsidence, i.e. to move the foundation from the remaining part of the ground.

This object is achieved with the process described above in that the foundation comprises a bed for a road, railway track or other part with large surface area, in that the bag is inserted lying directly on the excavated piece of ground, and in that material is introduced through feed means fitted at various points.

It was surprisingly found that for pressing a foundation with larger surface area upwards even in the case of very soft subsoil it is not necessary to introduce a separate layer of gravel or even a special plinth as described in the state of the art. Moreover, uniform distribution of the pressure is achieved by introducing the setting material at different points. Introducing setting material at different points also makes it possible to compensate for a certain subsidence in a controlled manner. For larger surface areas in particular, more local subsidences can occur than in other places. An example of this are roads becoming wavy after a period of time.

According to a preferred embodiment of the invention, water is introduced before the setting material is introduced. This ensures that the separation between the parts of the bag lying on top of one another will take place without any problems even after a fairly long period when the insertion of

setting material for compensation for subsidence is carried out. After the introduction of setting material, water is preferably also introduced through the feed means, so that said feed means and the bag according to the invention can be used several times in succession to compensate for, for example, subsequent subsidences. By contrast with the state of the art, it is not necessary to produce different compartments with different feed means.

The invention also relates to a foundation comprising a closed bag placed in an excavated piece of ground, said bag being provided with feed means for the subsequent introduction of setting material, and other foundation placed on the closed bag, the foundation forming a bed for a road, railway track or other part with large surface area, and the bag being placed directly on the excavated piece of ground, while the feed means are provided at various points of the bag. The feed means are preferably disposed at the top side of the bag. In this way it is ensured that the feed means as far as possible remain free from setting material, so that they can be used several times. In order to permit optimum expansion of the bag, it is made in the form of bellows in the direction of upward movement. The differences in subsidence can be compensated for by feeding in different quantities of setting material through the feed means at different points. An even more accurate separation of different points can be obtained if the bag is divided into chambers. Distribution means can also be provided. It is preferable to use cellular concrete as the setting material which is introduced. This material can be prepared with such a specific weight that after setting the specific weight differs little from the piece of ground receiving it. The result is that the construction, as it were, "floats" in the body of ground, so that further subsidence is prevented. Of course, it is also possible to select the specific weight at a higher or lower level than that of the body of ground.

The invention will be explained in greater detail below with reference to an example of an embodiment shown in the drawing, in which:

Fig. 1 shows in cross-section the device according to the invention in the non-working installed state;

Fig. 2 shows in longitudinal section the device according to the invention in the installed state;

Fig. 3 shows in cross-section the device according to the invention in the working state; and

Fig. 4 shows in cross-section a further embodiment of the device according to the invention.

In Fig. 1 the ground in which the foundation element according to the invention is to be placed is indicated in its entirety by 1. A layer 2 is placed thereon. A trench 3, in which the foundation element indicated in its entirety by 4 is placed, is made in the ground 1. Said foundation element comprises a covering layer 5, such as asphalt. Pipes 6 are situated underneath it. They lie fully or partially in a layer of cellular concrete 7 which has a voluminal mass equal to or lower than the voluminal mass of the ground. The bag-shaped element 8 according to the invention is placed below the layer of celluar concrete 7. This bag-shaped element 8 contains distribution elements 9, connected to hose 10. Fig. 2 shows a cross-section of the device shown in Fig. 1. It can be seen from this that various hoses 10 are present. Fig. 3 shows the device according to the invention, as in Fig. 2. In this case trench 3 is, however, deepened by a part 11. This deepening has occurred through subsidence. In order, nevertheless, to keep foundation element 4 at the same level relative to layer 2, cellular concrete material is introduced through the hoses 10 into bag-shaped element 8, as indicated by reference number 12. This cellular concrete material sets. This provides for inflation of the element relative to the ground. This will not normally be necessary, because the material introduced extends in a wedge-shaped manner from the introduction point, so that it is possible to compensate for local level differences. Through the introduction of a fluid material, it is aimed to achieve a uniform pressure distribution, so that parts which have sunk further and thus bear less are filled up with material.

As shown in Fig. 2, folded partitions 13 can be present to provide compartmentation in the bag-shaped element. In the above-mentioned manner a foundation element can be supported by a number of bag-shaped elements 8 according to the invention. The bag-shaped material can be made of any material known in the art, such as AQUATEX film. When the bag-shaped element is being installed, the hoses and the distribution system can be filled with water in order to avoid problems during the subsequent filling up with cellular concrete. The distribution pipe 9 is fixed at the top side of the bag-shaped element. Although the invention is essentially intended for inflation of the foundation element 4 after a long time, the invention is not limited thereto, and the inflating action can already be provided during the production of the foundation element 4.

Fig. 4 shows a further embodiment of the invention. In this case the bag-shaped element is indicated by 15 and is connected at two points indicated by i6, 17 to the cellular concrete element 7. Pipes 18 are used to feed in the material for raising foundation element 4. These pipes are distributed over the foundation element 4, so that locally more material can be fed in than at other points, in order to compensate for local subsidences by raising the foundation element further. The

bag-shaped element 15 according to Fig. 4 is provided with folds 19 on both sides. This makes it possible to regulate the quantity of material introduced as desired. It is also possible to introduce material through the pipes 18 (possibly to open bottom thereof) at intervals in time. In this way subsidences can be compensated for in a regular manner.

Further variations of what has been described above are possible without going beyond the scope of the present application.

Claims

1. Process for laying a foundation, comprising the excavation of a piece of ground, placing thereon a closed bag provided with feed means for the subsequent introduction of setting material, and subsequently laying the remaining foundation, characterized in that the foundation comprises a bed for a road, railway track or other part with large surface area, in that the bag is inserted lying directly on the excavated piece of ground, and in that the material is introduced through feed means fitted at various points.

2.Process according to Claim 1, in which water is introduced before material is placed in the bag.

3.Process according to any of the preceding claims, in which water is introduced after the introduction of setting material into the bag.

4.Foundation, comprising a closed bag placed in an excavated piece of ground and provided with feed means for the subsequent introduction of setting material, and another foundation disposed on the closed bag, characterized in that the foundation forms a bed for a road, railway or other part with large surface area, and in that the bag is placed directly on the excavated piece of ground, while the feed means are provided at various points of the bag.

5.Foundation according to Claim 4, in which the feed means comprise hoses which are connected to the top side of the bag when in use.

6.Foundation according to Claim 4 or 5, in which the bag is divided into chambers.

7.Foundation according to any of Claims 4 - 6, in which the bag is made in the form of bellows in the direction of upward movement.

8.Foundation according to any of Claims 4 - 7, in which during use distribution means, connected to the means for the introduction of material, are provided at the top side of the bag.

9.Foundation according to any of Claims 4 - 8, in which the material to be introduced comprises a cellular concrete material.

Fig - 1

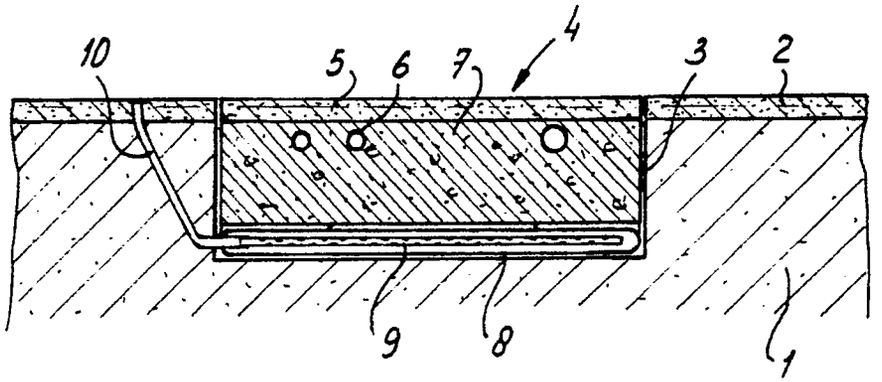


Fig - 2

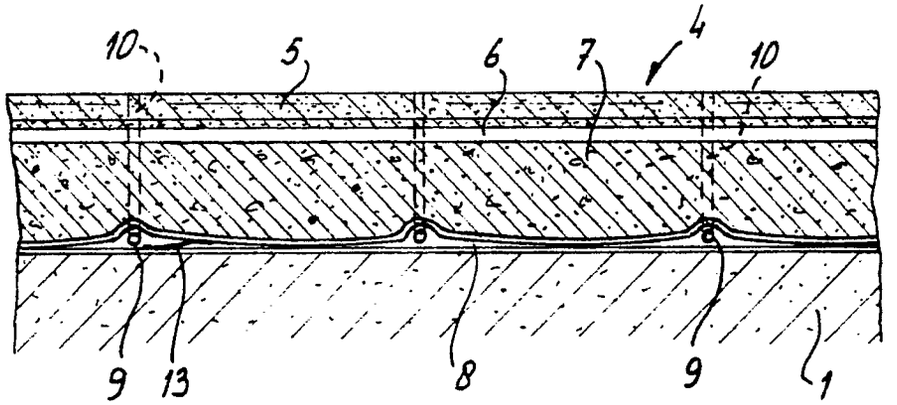


Fig - 3

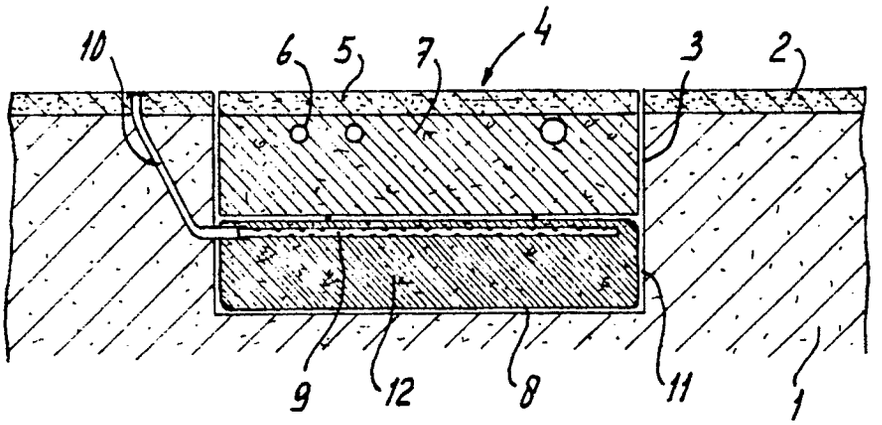
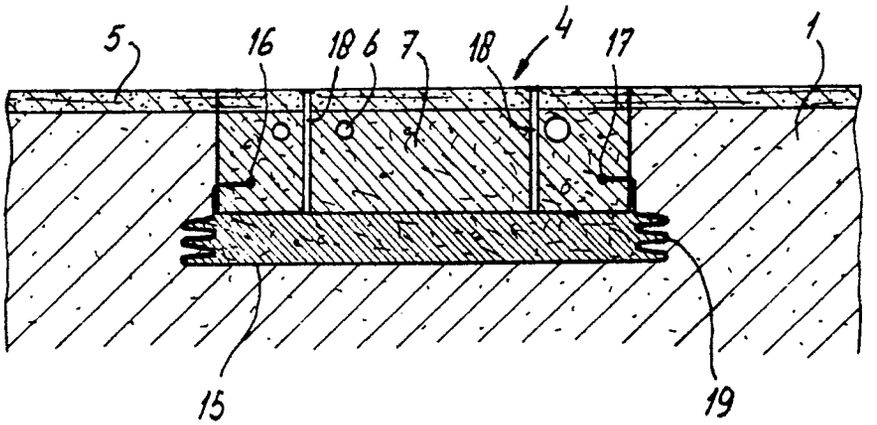


Fig-4



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EUROPEAN SEARCH REPORT

Application Number

EP 90 20 1998

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.5)
X,D	US-A-3 756 507 (HÄNIG) * Whole document *	1,4	E 01 C 23/08 E 01 C 3/06
Y		5,9	
A		3,6	
D,Y	GB-A-1 304 763 (ALGERS) * Whole document *	5	
A		1,4	
Y	NL-A-8 501 116 (VOORBIJ'S BETON) * Whole document *	9	
A		1,4	
A,D	DE-A-2 639 792 (ANDERSON IND.)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)
E 01 C E 02 B E 04 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	11-10-1990	DIJKSTRA G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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