Title: FOUNDATION, AND ALSO METHOD FOR ITS PRODUCTION

Abstract: Foundation, and method for the production of such a foundation. It is proposed that it be based on prefabricated concrete elements. The elements consist of base elements (2) and end elements (4). Each element is provided with two sockets for receiving pretensioning cables (6), which sockets are situated at a distance from each other, viewed in the vertical direction, and extend over the full length of the element. End elements are provided with further sockets relating to the other direction in which such end elements extend. After the elements have been placed against each other in the form of a closed curve, the tensioning cables are fitted in the sockets concerned and pretensioning is applied by means of pretensioning anchors comprising pretensioning nuts. Thereafter, the pretensioning anchors are sealed off relative to the environment, and the foundation is ready for use.
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Foundation, and also method for its production

The present invention relates to a foundation comprising a concrete member which extends in the form of a closed curve, which member is provided with a reinforcement, which member is composed of a number of base elements and end elements, each of which, viewed in the vertical direction, is provided with at least two first sockets for receiving tensioning devices, which sockets extend substantially parallel over the full length of that element, and in which tensioning devices are provided, at least the end elements being provided with at least two further sockets which, viewed in the vertical direction, are spaced from each other and extend substantially parallel over the full length of that element, for receiving tensioning devices, and in which tensioning devices are fitted, said further sockets extending at an angle relative to said first sockets, and means fitted on said tensioning devices being present and acting externally upon said elements. Such a foundation is known from Japanese Patent Application 5-306526. After the fitting of supports such as driven piles, a number of blocks are placed in the foundation, on the heads of said piles, in order to act as formwork. The blocks are held together by means of tensioning bars on which tensioning nuts are fitted. Diagonal bars extend in the blocks, which are fitted in a rectangular shape. After such a construction has been produced, the unit is filled up with concrete. The tensioning force exerted upon the bars is relatively small and serves only to hold together the blocks acting as formwork during pouring of the concrete. With tensioning bars it is not possible to transmit great tensioning forces. Given the high cost of removing formwork, in the prior art such formwork is left integral with the foundation that has been poured.

Japanese patent publication 622696016 discloses a corresponding combination, which serves as subsequent formwork.

In the case of large buildings which primarily serve as protection against the environment, such as storage sheds and factory buildings, the costs of the foundation are often extremely high in relation to the other costs of the building. This is due to the fact that construction techniques which are typical for its use are used for the building, while conventional techniques also used in the case of dwellings, offices and the like are used for the foundation. This means that in many cases piles will first be driven, a
reinforcement structure will subsequently be fitted on the ends of the driven piles, and a concrete beam will then be poured in situ.

In practice, such a foundation need not be heavy. After all, since the building serves mainly as protection against the weather, it is made of relatively light material. In general, the building consists solely of a light inside wall and outside wall, for example a metal section between which an insulating layer is placed. The floor often rests on the existing ground, and is not supported on piles.

The object of the present invention is to be able to make the foundation of buildings lighter and simpler, also with the possibility of being able to reuse such a foundation.

This object is achieved in the case of the foundation described above by the fact that said pretensioning members comprise pretensioning cables and that a permanent free space is defined within said elements.

Such a foundation is extremely simple to produce, since it is based on prefabricated elements provided with sockets situated at the same level during the assembly. After the elements have been put in position and the pretensioning cables or pretensioning bars have been fitted and tensioned, the foundation in principle is ready for use. This means that such a foundation can be laid in poor weather conditions and there is no need to wait for concrete to set. It has already done so in the factory.

Furthermore, the concrete mix can be produced in factory conditions, which is much better than production on site. Unlike the constructions described in the abovementioned Japanese applications, the foundation is ready immediately after the pretensioning of the pretensioning cables. With the pretensioning cables it is possible to apply great pretensioning forces, for example between 60 and 120 tonnes between adjoining elements. The construction according to the invention in principle does not have to be supported on piles. The great pretensioning forces ensure that a stable unit is obtained. The space inside elements erected, for example, in the form of a square is empty after the foundation is complete. In other words, no diagonal tensioning bars or the like extend in it. This is not permissible in any case. Such objects are acceptable only if they are subsequently surrounded by concrete material, and it is actually one of the features of the present invention that such pouring of concrete material is not carried out.
If the element has a substantially T-shaped profile, in which the flange of the T is designed to rest on the bottom of the foundation, in many cases it is no longer necessary to support the construction on piles. After all, such a large bearing face is produced by the flange of the “T” that, possibly after pre-compacting of the ground by laying a reinforcement layer consisting of sand, gravel or the like, sufficient bearing power in the ground can be obtained.

It will be understood that with the currently proposed construction, which has a very limited number of elements, any desired foundation can be obtained. The base elements, i.e. the “longitudinal elements”, can be made in a number of lengths, such as 4 and 8 metres. Using corner elements and T-elements, virtually any desired foundation can be obtained. It is advantageous here that in the art buildings generally consist of walls positioned at a right angle.

After the pretensioning cables or pretensioning bars are fitted in the sockets under pretension, it is possible to inject the sockets in some way with, for example, a plastic. It is possible to close off the pretensioning means such as the pretensioning anchors in the same way relative to the environment.

If the sockets are not injected, it is possible simply to remove the foundation after use and reuse it. After all, many sheds and the like have a relatively limited life span (typically 10 years) and if the foundation can subsequently be used for another useful purpose or adapted in a simple manner and extended, this will have a cost-saving effect.

The invention also relates to a constructional structure such as a building, comprising a foundation and parts such as walls extending therefrom, said foundation being a foundation such as described above, and said parts which extend therefrom being fitted directly connecting thereto.

The invention will be explained in greater detail below with reference to an exemplary embodiment illustrated in the drawing, in which:

Fig. 1 shows diagrammatically in a view from above a foundation according to the invention;

Figs. 2-4 show the various elements from which the foundation according to Fig. 1 is constructed; and

Fig. 5 shows formwork in which a foundation element according to the invention can be produced.
A foundation such as can be produced with the elements according to the invention is indicated in its entirety by 1 in Fig. 1. It consists of a number of base elements 2, a number of corner elements 4, and a number of T-elements 3. As can be seen from Fig. 1, substantially any construction can be obtained with it. A further element which might be important is an element which permits the crossing of two directions, i.e. an element 3 provided with a further projecting part.

Details of each of the elements are seen in Figs. 2-4. The elements are all made T-shaped, i.e. provided with a flange 8 with a member 9 placed thereon. The required height is obtained by means of member 9. Sockets 5 for receiving reinforcement bars are provided near the ends of member 9 (viewed in the vertical direction). End elements 3 and 4 are also provided with further sockets 7 for receiving reinforcement bars in a direction at an angle thereto. Sufficient bending stiffness is provided by the height of the members 9.

Flanges 8 must be sufficiently extended in the horizontal direction to give good bearing power to the foundation. This makes it possible to erect this foundation even on relatively soft ground without driving piles. It is possible to excavate the ground in advance and place a reinforcing material such as sand, gravel or another bed in it.

The foundation described above is constructed by laying elements in the ultimately desired pattern. Driving piles beforehand is not necessary in principle in this case. In a manner not shown in any further detail, interacting elements can be provided with a locating system, for example a male-female system. Pretensioning cables 6 are subsequently inserted through the sockets 5 and 7 respectively situated opposite each other, and after fitting nuts 11 on pretensioning cables and the nuts are tightened using a screw jack, the various elements are pressed against each other. In this process the number of pretensioning cables used is such and the force applied to each cable is such that the adjoining elements are pressed against each other with a force lying between 60 and 120 tonnes and over, preferably approximately 100 tonnes. This means preferably a force of approximately 20 tonnes per cable. Such forces can be applied only by using aids such as screw jacks. A sealing compound may, if desired, be placed between the elements, and more particularly between the adjoining sockets 5 and 7 respectively, in order to provide sealing of the sockets 5 and 7 respectively, thus impeding the penetration of moisture and the like. Of course, a protective agent can also be placed around the ends of the pretensioning cables 6 and the pretensioning anchors 7 fitted
thereon. It can be cast in or poured in if desired. The foundation can be placed under pretensioning in a controlled manner by means of the pretensioning anchors. Since the construction is a closed curve, particularly great stability is obtained. After the measures described above, the foundation is in principle ready and a further constructional structure can be placed on it immediately. In other words, it is not necessary to complete the foundation by pouring.

Of course, it is possible to pour concrete into the space bounded between the elements described above, the concrete acting as a floor. Such a floor is, however, preferably fitted loose relative to the foundation and in any case does not add strength to the foundation. The foundation consequently has strength on all sides, so that tilting effects can be avoided, which makes it possible to obtain a stable support for a building. In other words, according to a preferred embodiment of the invention, it is important for a number of groups of tensioning wires always extending at an angle relative to each other, thus forming a closed curve, to be present.

Fig. 5 shows a possibility for producing an element such as that shown in Figs. 2-4. The formwork necessary for this is indicated by 10. After this formwork has been produced, reinforcement bars 12 are fitted in it. These reinforcement bars serve to strengthen the elements concerned. Tubes 13 or the like are then fitted, after which the concrete material 14 is poured. The presence of the sockets 5 and 7 is guaranteed by the presence of the tubes 13.

It can be seen from Fig. 5 that such elements can be poured in a particularly expedient manner in factory conditions, using particularly simple formwork. It will be understood that production is consequently possible throughout the year, irrespective of the weather conditions. The elements according to the invention, and more particularly the end elements, are relatively compact and can be transported by road. The same applies to the base elements, since their width is not a limiting factor during transportation, nor is it so if their length remains less than 20 metres.

It must be understood that, instead of the T-section shown here for the elements, other elements such as U-sections can be used. These and further variants will be obvious to the person skilled in the art after reading the above description, and lie within the scope of the appended claims.
Claims

1. Foundation (1) comprising a concrete member which extends in the form of a closed curve, which member is provided with a reinforcement, which member is composed of a number of base elements (2) and end elements (3, 4), each of which, viewed in the vertical direction, is provided with at least two first sockets (5) for receiving tensioning devices, which sockets extend substantially parallel over the full length of that element, and in which tensioning devices (6) are provided, at least the end elements being provided with at least two further sockets (7) which, viewed in the vertical direction, are spaced from each other and extend substantially parallel over the full length of that element, for receiving tensioning devices, and in which tensioning devices are fitted, said further sockets (7) extending at an angle relative to said first sockets (5), and means (11) fitted on said tensioning devices being present and acting externally upon said elements (2-4), characterised in that said pretensioning elements comprise pretensioning cables and that a permanent free space is defined within said elements.

2. Foundation according to Claim 1, in which said elements have a substantially T-shaped profile, in which the flange of the “T” is designed to rest on the bottom.

3. Foundation according to Claim 2, in which sockets (5, 7) for the pretensioning cables are fitted at least near the top side and the bottom side of the body of the a“T”.

4. Foundation according to one of the preceding claims, provided with a cover for said pretensioning cables.

5. Constructional structure such as a building, comprising a foundation and parts such as walls extending therefrom, characterised in that said foundation comprises a foundation according to one of the preceding claims, and that said parts extending therefrom are fitted directly connecting thereto.

6. Method for the production of a foundation, comprising the provision of a number of concrete elements (2-4), comprising base elements and end elements, each element, viewed in the vertical direction, being provided with at least two first sockets for receiving tensioning devices, which sockets are situated at a distance from each other and extend substantially parallel over the full length of that element, and at least each end element being provided with two further sockets which, viewed in the vertical direction, are situated at a distance from each other and extend substantially parallel
over the full length of said element, said first and further sockets of said end elements extending at an angle relative to each other, the placing of said elements against each other in the form of a closed curve, while tensioning members are fitted through said sockets and said members are stressed from the external faces of said sockets, characterized in that the tensioning of said tensioning members comprises the tensioning of pretensioning cables with such force that two adjoining elements are pressed against each other with a force of at least 60 tonnes.

7. Method according to Claim 6, in which a screw jack is used for applying the pretensioning force.

8. Method according to Claim 6 or 7, in which said pretensioning cables are fitted in sockets, and plastic is injected into said sockets.

9. Method according to Claims 6-8, in which said elements are fitted in a trench in the ground.

10. Method according to Claim 9, in which the bottom of said trench is reinforced.

11. Method according to one of Claims 6-10, in which two elements are fitted at an angle and a corner element is placed between them.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC 7 E02D27/01 E02D27/26

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E02D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

PAJ, EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

**Date of the actual completion of the international search**

5 December 2000

**Date of mailing of the international search report**

13/12/2000

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk
Tel: (+31-70) 340-0040, Tx: 31 651 epc nl Fax: (+31-70) 340-3016

Authorized officer

Kergueno, J

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