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BE - A - 414 100
DE - B - 1 209 067
DE - C - 561 822
FR - A - 339 355
FR - A - 737 124

TRAVAUX, no. 512, October 1977, Paris, FR, A.
HOUY: "Les palplanches en acier dans les
ouvrages maritimes" pages 38-48

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Ground retaining wall

The invention relates to a ground retaining wall as described in the preamble of claim 1.

Such a ground retaining wall is known from NL—B—6514655 or the article of Travaux no. 512, October 1977, particularly page 42, Fig. 13. In each of these known ground retaining walls the screen is formed by a series of adjacent dam wall profiles. These dam wall profiles are of a heavy structure, because the level of the ground anchors is frequently high, for example, because the ground anchors have to be arranged above a high-tide level or else above an obstruction present in the ground. The screen may, as an alternative, consist of a concrete retaining wall, which has then to be resistant to high bending load.

The invention provides a ground retaining wall having a less heavy and hence cheaper screen. For this purpose the ground retaining wall according to the invention is characterized according to at least one ground retaining wall standing at a distance from the screen at the back side thereof, that an at least partly ground-free space is left between the standing wall and the screen such that the groundspace is left between the standing wall and the screen such that the ground level at the side of the wall facing the screen is at a substantially lower level than that its other side, and that the ground level difference acting on the wall is transmitted as a force acting against the top end of the screen by the aid of pressure transmitting means interposed between the top end of the screen and the wall.

Thus the bulging moment below the level of application of the ground anchors is reduced owing to the exertion of a horizontal effort on the top part of the screen located above the level of engagement of the anchors.

It is noted that a retaining wall prestressed by a bending moment is disclosed in DE—B—1209067, wherein a weight of ground and is supported by a support element arranged at the front side of the retaining wall. This support element pulls at the top end of the retaining wall in the direction towards the front side and pressed backwards against the retaining wall at lower level. The screen of this retaining wall is loaded by a great vertical load. The combination of vertical load with bending load results in the requirement of strong profiles at the screen.

The above mentioned article also discloses a ground retaining wall in which is provided a second screen bearing at its top an element bridging the two screens. As the second screen is not considerably loaded by a ground level difference said bridging element does not transmit a pressure from the second screen onto the first. No ground anchors are provided in this prior art construction.

It is noted that in Fig. 22 and 23 of said

article a ground-free space is provided at the back side of the screen which ground-free space is bridged by a horizontal construction element. Particularly Fig. 23 teaches that the horizontal ground pressure in the direction of the screen should be prevented e.g. by inclined piles. The teaching of said Fig. 23 is also given in FR—A—380 552 and FR—A—737124.

When the space between the standing wall and the screen is substantially free of ground, the pressure of the ground bearing on the screen is reduced, which permits of using a still lighter screen.

When the supporting means are formed by concrete cover plates, they may, in addition, serve as a road pavement or a quay.

A simple construction is obtained when the supporting means together with the standing wall are formed by concrete angular profiles.

The invention will be described more fully with reference to some embodiments shown in the drawing.

The drawing shows schematically in:

Fig. 1 a cross-sectional view of a known ground retaining wall,

Fig. 2 the line of moments of this known ground retaining wall,

Figs. 3, 5, 7, 9, 11 and 13 each a sectional view of specific ground retaining walls in accordance with the invention,

Figs. 4, 6, 8, 10, 12 and 14 the lines of moments associated with Figs. 3, 5, 7, 9, 11 and 13 respectively.

Fig. 15 is a perspective view of the ground retaining wall of Fig. 7.

Fig. 1 shows a ground retaining wall 1 comprising a screen 4 formed by a series of contiguous dam wall profiles 3 standing in the ground 2 and a plurality of ground anchors 6 fixed in the ground, which engage the screen 4 at the level A by means of anchor heads 51 and which are connected with the anchor heads 51 by means of anchor cables 5.

The ground 2 exerts a pressure on the screen 4 opposite the pressure of the water 8, whereas the screen is retained by ground anchors 6 having a tractive force P.

Fig. 2 illustrates the line of moments due to the forces exerted on the screen 4, the line of moments being designated at the area of the anchor heads 51 by M_a , the maximum potential moment being designated by M_{max} . The weight of the dam wall profiles 3 is a function of M_{max} .

The ground retaining wall according to the invention is distinguished from the known ground retaining wall described above as follows.

In the ground retaining wall 53 shown in Fig. 3 according to the invention a wall 54 is standing at a distance b from the screen 4, said wall bearing on the part of the screen 4 located above the level A with the aid of pressure-

transmitting supporting means 60. The space 14 between the standing wall 54 and the screen 4 is substantially free of ground and only contains air. The supporting means 60 may consist of a plurality of pressure bars of a framework, but preferably they are formed by reinforced concrete cover plates 10 having longitudinal ribs 57 engaging the top edges 58 and 59 of the dam wall profiles 3 and of the wall 54 respectively. The wall 54 is standing on a concrete foundation 13 and retains the top layer 55 of the ground 2. The pressure q exerted by the top layer 55 on the wall 54 is balanced out by the pressure force K of the supporting means 60 and the tensile force S of the anchor cables 9, which connect anchor heads 61 with the ground anchors 6. Owing to the application of the force K the line of moments of Fig. 4 is obtained, where M_{\max} is considerably lower than that of Fig. 3. Moreover, owing to the ground-free space 14 the overall pressure of the ground 2 to be retained is appreciably reduced. As a result the dam wall profiles 3 of the screen 4 in Fig. 3 may be of considerably lighter weight than those of Fig. 1.

The ground retaining wall 15 of Fig. 5 is distinguished from that of Fig. 3 in that the standing wall 63, the cover plates 64 as well as the foundation slabs 65 of the wall 63 form part of reinforced concrete longitudinal profiles 66, which are deposited on the dam wall profiles 3 and engage by a rib 67 the top edges 58. The cover slabs 64 are located in this example at a lower level than the top surface 68 of the ground 2, so that the dam wall profiles are shorter.

The ground retaining wall 17 of Fig. 7 is distinguished from the ground retaining wall 15 in that the longitudinal profiles 18 are substantially L-shaped and the foundation of the standing wall 70 is formed by piles 20.

The ground retaining wall 19 of Fig. 9 is distinguished from that of Fig. 7 in that the ground-free space 14 is enlarged by leaving out ground in a space 71 below the water level 72, as a result of which the ground pressure to be retained is further reduced.

The same effect — but to an even higher extent — is obtained with the ground retaining wall 22 of Fig. 11, in which the distance b of the standing wall 70 from the screen 4 is chosen to be additionally large, whilst the long cover slabs 73 are supported *inter alia* by piles 74.

The ground retaining wall 30 of Fig. 13, which is not the most preferable embodiment of the ground retaining wall according to the invention, has a small ground-free space 31 for the standing wall 32 consisting of short, lightweight dam wall profiles driven into the ground 2. Again the pressure q of the retained top layer 34 is absorbed by the screen 4 through supporting means 35.

In all embodiments shown the anchor means 51, 5 and 6 are arranged above the level of the

water 8, which is usually required for these anchor means.

Instead of consisting of steel dam wall profiles the screen 4 may, as an alternative, consist of a reinforced concrete wall or concrete wall elements.

Claims

1. A ground retaining wall (53, 15, 17, 19, 22, 30) comprising a screen (4) retaining ground as the ground level is higher at its back side than at its front side, said screen (4) standing in the ground (2), and a series of ground-anchored anchors (6) engaging the screen (4) at an anchorage level lying lower than the top end (58) of the screen (4) characterized by at least one ground retaining wall (54, 63, 70) standing at a distance (b) from the screen (4) at the back side thereof, that an at least partly ground-free space (14, 31) is left between the standing wall (54, 63, 70) and the screen (4) such that the ground level at the side of the wall facing the screen (4) is at a substantially lower level than at its other side, and that the ground level difference acting on the wall is transmitted as a force acting against the top end (58) of the screen (4) by the aid of pressure transmitting means (60) interposed between the top end (58) of the screen (4) and the wall (54, 63, 70).

2. A ground retaining wall (53, 15, 17, 19, 22) as claimed in claim 1, characterized in that the space (14) between the standing wall (54) and the screen (4) is substantially free of ground (2).

3. A ground retaining wall (53, 15, 11, 19, 22, 30) as claimed in claim 1 or 2, characterized in that the pressure transmitting means (60) are formed by concrete cover slabs (10, 64, 18, 73, 35).

4. A ground retaining wall as claimed in claim 1, 2 or 3, characterized in that the pressure transmitting means (60) together with the standing wall (63, 70) are formed by a concrete angular profile (66, 18, 73).

Revendications

1. Un mur de soutènement (53, 15, 17, 19, 22, 30) comprenant un rideau (4) retenant le sol, alors que le niveau du sol est plus haut sur sa face arrière que sur sa face avant, ce rideau (4) étant fixé dans le sol (2), et une série de pièces d'ancrage (6) ancrées au sol reliées au rideau (4) à un niveau d'ancrage, se situant plus bas que le sommet (58) du rideau (4), caractérisé par au moins une paroi de retenue du sol (54, 63, 70) se dressant à une distance (b) du rideau (4) à l'arrière de celui-ci, par au moins un espace partiellement vide de terre (14, 31) laissé entre la paroi verticale (54, 63, 70) et le rideau (4) de sorte que le niveau du sol sur le côté de la paroi faisant face au rideau (4) est à

un niveau sensiblement plus bas que de l'autre côté, et en ce que la différence de niveau du sol agissant sur la paroi est transmise comme une force agissant sur le sommet (58) du rideau (4) grâce à des moyens de transmission de pression (60) interposé entre le sommet (58) du rideau (4) et la paroi (54, 63, 70).

2. Mur de soutènement (53, 15, 17, 19, 22) selon la revendication 1, caractérisé en ce que l'espace (14) entre le paroi (54) et le rideau (4) est sensiblement vide de terre (2).

3. Mur de soutènement (53, 15, 11, 19, 22, 30) selon la revendication 1 ou 2, caractérisé en ce que les moyens de transmission de la pression (60) sont des dalles de couverture en béton (10, 64, 18, 73, 35).

4. Mur de soutènement selon la revendication 1, 2 ou 3, caractérisé en ce que les moyens de transmission de pression (60) ainsi que la paroi (63, 70) sont formés par un profil angulaire en béton.

Patentansprüche

1. Rückhaltewand (53, 15, 17, 19, 22, 30) für Erdreich, mit einem das Erdreich zurückhaltenden Schirm (4), an dessen Rückseite das Erdreichniveau höher als an seiner Vorderseite ist, wobei der Schirm (4) auf dem Boden (2) aufsteht, und einer Reihe von im Boden verankerten Ankern (6), die an dem Schirm (4) an einem Verankerungsniveau angreifen, das höher als das obere Ende (58) des Schirmes (4)

liegt, gekennzeichnet durch mindestens eine Erdreich zurückhaltende Wand (54, 63, 70), die in einem Abstand (b) von dem Schirm (4) an dessen Rückseite steht, wobei ein mindestens teilweise erdreichfreier Raum (14, 31) zwischen der stehenden Wand (54, 63, 70) und dem Schirm (4) gelassen wird, derart, daß das Erdreichniveau auf der dem Schirm (4) zugewendeten Seite der Wand auf einem deutlich niedrigeren Niveau als auf ihrer anderen Seite liegt und daß die auf die Wand wirkende Niveaudifferenz des Erdreichs als eine gegen das obere Ende (54) des Schirmes (4) wirkende Kraft übertragen wird mittels Hilfe von druckübertragenden Mitteln (40), die zwischen dem oberen Ende (58) des Schirmes und der Wand (54, 63, 70) angeordnet sind.

2. Rückhaltewand (53, 15, 17, 19, 22) für Erdreich nach Anspruch 1, dadurch gekennzeichnet, daß der Raum (14) zwischen der stehenden Wand (54) und dem Schirm (4) im wesentlichen frei von Erdreich (2) ist.

3. Rückhaltewand (53, 15, 11, 19, 22, 30) für Erdreich gemäß Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Druck übertragenden Mittel (60) von Deckplatten (10, 64, 18, 73, 35) aus Beton gebildet sind.

4. Rückhaltewand für Erdreich nach Anspruch 1, 2 oder 3, dadurch gekennzeichnet, daß die Druck übertragenden Mittel (60) zusammen mit der stehenden Wand (63, 70) von einem Winkelprofil (66, 18, 73) aus Beton gebildet sind.

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45

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55

60

65

4

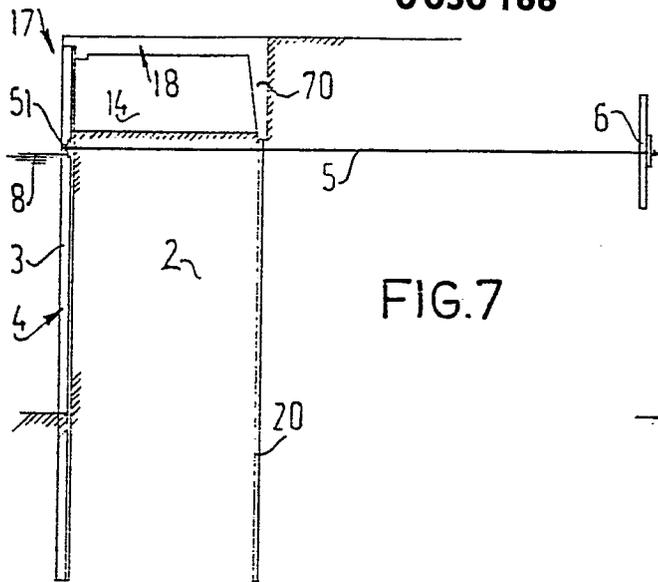


FIG. 7

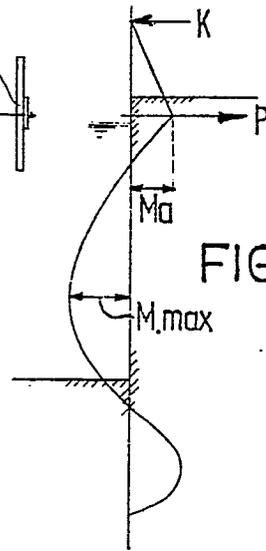


FIG. 8

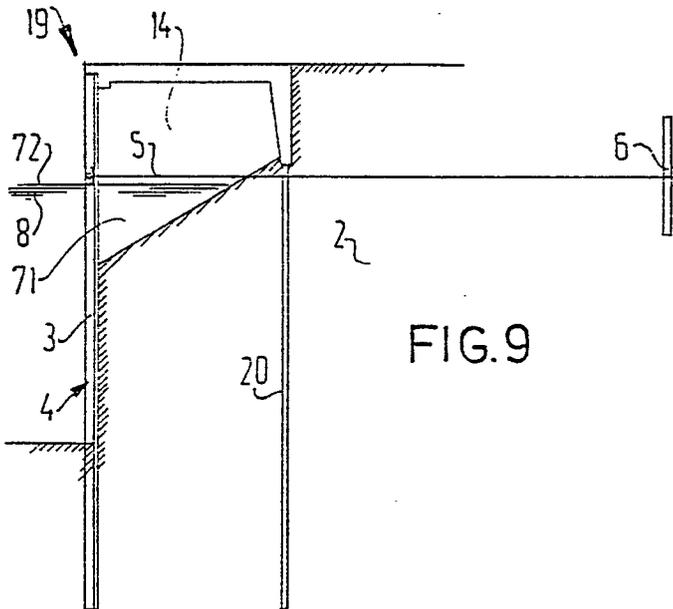


FIG. 9

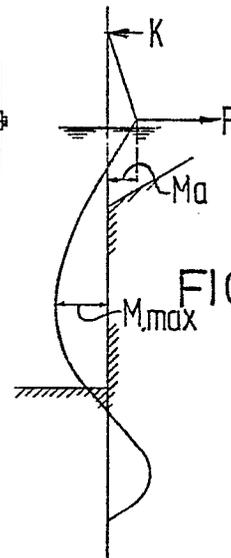


FIG. 10

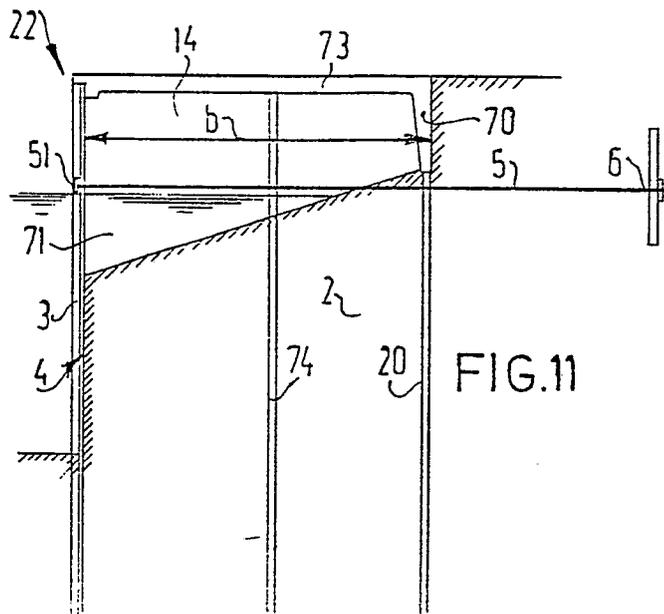


FIG. 11

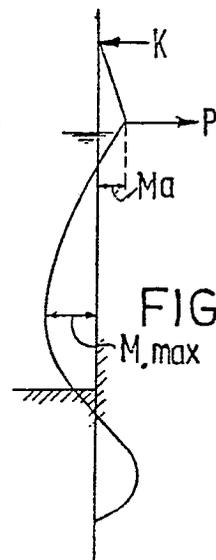


FIG. 12

