

EARTH RETAINING METHOD AND SUPPORTING SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

5 [0001]

The present invention relates to an earth retaining method and a supporting system.

Priority is claimed on Japanese Patent Application No. 2016-019051, filed on February 3, 2016, the content of which is incorporated herein by reference.

10

Description of Related Art

[0002]

Conventionally, when an underground structure such as a tunnel is constructed underground, supports such as struts are installed on earth retaining walls in an underground space for the duration of the construction of the underground structure, and an inner circumference of the underground space is earth-retained by the supports.

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[0003]

For example, a method of installing a plurality of supports between earth retaining walls facing each other in an underground space, constructing a bottom foundation, moving a mobile form on the bottom foundation, and constructing standing walls and a top foundation of an underground structure has been proposed (see Patent Document 1).

20

[Citation List]

[Patent Literature]

25 [0004]

[Patent Document 1]

Japanese Unexamined Patent Application, First Publication No. 2000-145370

SUMMARY OF THE INVENTION

5 [Technical Problem]

[0005]

Meanwhile, in Patent Document 1, since the supports are installed over an entire surface of the underground space before the underground structure is constructed, there is a problem that numerous temporary members such as supports are required. When the
10 earth retaining walls are not arranged so as to face each other in an inconstant distance in an entire underground space, there is a problem that, there is need to adjust the supports when supporting the earth retaining walls by the supports, and takes time.

When the supports are reasonably installed only at portions at which they are required according to the excavation situation, movement of the supports is required
15 from the aspect of effective use of materials. However, processes of removing the supports and replacing the supports at another place, and of installing suspension facilities are need to much effort and increases the construction period.

[0006]

Therefore, the present invention was made in view of the above problems, and is
20 intended to provide an earth retaining method and a supporting system capable of reducing the number of temporary members used such as supports and reducing the construction period.

[Solution to Problem]

[0007]

25 (1) According to a first aspect of the present invention, an earth retaining

method includes a roller installing process, a support installing process, an earth retaining wall supporting process, and a concrete placing process. The roller installing process includes installing rollers between earth retaining walls facing each other in a given region of an excavated space, the rollers guiding supports in an excavating direction.

- 5 The support installing process includes guiding supports forward in the excavating direction by the rollers, and installing the supports. The earth retaining wall supporting process includes supporting the earth retaining walls which are adjacent to ends of the support. The concrete placing process includes placing concrete on the ground of the given region. The processes from the roller installing process to the concrete placing
- 10 process are repeated toward a front region in front of the given region from the given region in the excavating direction, and the supports used in the given region are used in the support installing process in the front region.

[0008]

- According to the above constitution, since the supports for supporting the earth
- 15 retaining walls are used in common in the given region of the excavated space and in the front region in front of the given region in the excavating direction, the number of temporary members used is possible to be reduced, and construction expenses is possible to be reduced in comparison with a case in which the supports are installed at whole of the excavated space.

- 20 When the supports are moved from the given region to the front region, the supports may be respectively guided by the rollers. Therefore, according to the aforementioned constitution, since the supports are possible to be used and installed with no change, the construction period is possible to be reduced in comparison with a case in which the supports are removed from other portions and are reassembled at the portions.

25 [0009]

(2) In the earth retaining method of the constitution (1), the supports have a first support and a second support, and the rollers have first rollers and second rollers. The earth retaining method includes a first roller installing process, a first support installing process, a second roller installing process, and a second support installing process. The

5 first roller installing process includes installing the first rollers at a first space where is one side of a direction perpendicular to the excavating direction, the first roller guiding the first support in the excavating direction. The first support installing process includes guiding the first support forward in the excavating direction by the first rollers, and installing the first support. The second roller installing process includes installing

10 the second rollers at a second space where is the other side of the direction perpendicular to the excavating direction, the second roller guiding the second support in the excavating direction. The second support installing process includes guiding the second support forward in the excavating direction by the second rollers, and installing the second support. The earth retaining wall supporting process includes processes of

15 coupling facing ends of the first and second supports by an extendable jack which is contractible or expandable in a direction in which the ends faces each other, and supporting the earth retaining walls which are adjacent to each other by the other end of the first support and the other end of the second support. After the concrete placing process is performed in the given region, a process of contracting the extendable jack at

20 the given region and decoupling the first support and the second support are performed. The processes from the first roller installing process to the concrete placing process are repeated toward the front region in front of the given region from the given region in the excavating direction. The first and second supports used in the given region are used in the first and second support installing processes in the front region.

According to the above constitution, since the first and second supports for supporting the earth retaining walls are used in common in the given region of the excavated space and in the front region in front of the given region in the excavating direction relative, the number of temporary members used is possible to be reduced, and construction expenses is possible to be reduced in comparison with a case in which the supports are installed at whole of the excavated space.

When the supports are moved from the given region to the front region, the first and second supports may be respectively guided by the first and second rollers. Therefore, according to in the aforementioned constitution, since the supports are possible to be used and installed with no change, the construction period is possible to be reduced in comparison with a case in which the supports are removed from other portions and are reassembled at the portions.

[0011]

(3) In the earth retaining method of the constitution (2), a pile installing process of installing a plurality of piles between the earth retaining walls facing each other in the excavating direction is performed in the given region of the excavated space before the first roller installing process. The processes from the pile installing process to the concrete placing process are repeated toward the front region from the given region in front of the given region in the excavating direction.

[0012]

According to the above constitution, the plurality of piles is possible to be installed between the earth retaining walls in the given region and the front region.

[0013]

(4) In the earth retaining method of the constitution (3), the extendable jack is preferably arranged on a line connecting the neighboring piles.

[0014]

According to the above constitution, since the extendable jack is arranged on the line connecting the neighboring piles, when the first support and the second support are moved forward in the excavating direction, the piles do not interfere with the movement.

5 [0015]

(5) In the earth retaining method of any one the constitutions (2) to (4), in the first roller installing process, a process of installing the first rollers along both one sides of the piles in the direction perpendicular to the excavating direction and the earth retaining wall side of the first space side are performed. In the second roller installing
10 process, a process of installing the second rollers along both the other sides of the piles in the direction perpendicular to the excavating direction and the earth retaining wall side of the second space side are performed.

[0016]

According to the above constitution, the ends of the first support at both the pile
15 side and a side adjacent to the earth retaining walls are supported by the first rollers. The ends of the second support at both the pile side and a side adjacent to the earth retaining walls are supported by the second rollers. Therefore, the first rollers and the second rollers are possible to stably guide the first support and the second support.

[0017]

20 (6) According to a second aspect of the present invention, a supporting system includes rollers and supports. The rollers between earth retaining walls facing each other in a given region of an excavated space guide supports in an excavating direction. The supports are configured to be guidable by the rollers in the excavating direction and to support the earth retaining walls.

25 [0018]

According to the above constitution, the supports are guidable by the rollers installed along the excavating direction. Therefore, when the supporting of the earth retaining walls by the supports in the given region is completed once, the supports may be guided by the rollers to the front region in the front relative to the given region.

5 Therefore, according to the aforementioned constitution, since the supports are possible to be used and installed with no change, the construction period is possible to be reduced in comparison with a case in which the supports are removed from other portions and are reassembled at the portions. Since the supports are used in common in the given region and the front region, the number of temporary members used is possible to be reduced,
10 and construction expenses is possible to be reduced in comparison with a case in which the supports are installed at whole of the excavated space.

[Advantageous Effects of Invention]

[0019]

According to the earth retaining method and the supporting system, the number
15 of temporary members used such as the supports is possible to be reduced, and the earth retaining process is possible to perform with good workability.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

20 Fig. 1 is a top view showing a schematic constitution of a supporting system according to an embodiment of the present invention.

Fig. 2 is a perspective view of the supporting system according to the embodiment of the present invention from above.

Fig. 3 is a vertical sectional view taken by cutting surroundings of a coupling
25 portion between a first support and a second support of the supporting system according

to the embodiment of the present invention.

Fig. 4 is a vertical sectional view taken by cutting surroundings of a coupling portion between the first support (or the second support) and an earth retaining wall of the supporting system according to the embodiment of the present invention.

5 Fig. 5 is a schematic top view for showing an earth retaining method according to an embodiment of the present invention.

Fig. 6 is a schematic top view for showing the earth retaining method according to the embodiment of the present invention, and shows the process following Fig. 5.

Fig. 7 is a schematic top view for showing the earth retaining method according
10 to the embodiment of the present invention, and shows the process following Fig. 6.

Fig. 8 is a schematic top view for showing the earth retaining method according to the embodiment of the present invention, and shows the process following Fig. 7.

Fig. 9 is a schematic top view for showing the earth retaining method according to the embodiment of the present invention, and shows the process following Fig. 8.

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DETAILED DESCRIPTION OF THE INVENTION

[0021]

An earth retaining method and a supporting system according to an embodiment of the present invention will be described using the drawings. For example, the
20 supporting system supports earth retaining walls of an underground space (an excavated space) such as, for example, a station, a road, or a railroad provided underground.

[0022]

First, a constitution of the supporting system will be described.

Fig. 1 is a top view showing a schematic constitution of the supporting system
25 according to the embodiment of the present invention. Fig. 2 is a perspective view of

the supporting system according to the embodiment of the present invention from above. In Fig. 1, the front and the rear of the supporting system in an excavating direction are not shown. In Fig. 2, an upper constitution and earth retaining walls of the supporting system are omitted.

5 As shown in Figs. 1 and 2, the supporting system 100 is installed between earth retaining walls W1 and W2 which face each other in an underground space K excavated by, for example, an excavator. An excavating direction in which excavation proceeds is defined as an X direction (a downward direction in the figure) shown in Fig. 1.

[0023]

10 The supporting system 100 has piles 1, first rollers 2A (rollers), second rollers 2B (rollers), a first supporting unit (a support, a first support) 3A, a second supporting unit (a support, a second support) 3B, and an extendable jack 4.

[0024]

 The plurality of piles 1 is arranged approximately in the middle between the
15 earth retaining walls W1 and W2 facing each other. The plurality of piles 1 is arranged along the excavating direction. Each of the piles 1 is configured such that a lower end thereof is supported on the ground G in the excavated space and an upper end thereof is restricted to a top portion (not shown; the same hereinafter) facing the ground G of the underground space K by, for example, a road decking beam (not shown; the same
20 hereinafter). The top portion is not necessarily restricted by the road decking beam or the like. In the present embodiment, the piles 1 are formed of steel such as H-section steel.

 Note that one side (the earth retaining wall W1 side) across the piles 1 is referred to as a first space S1 and the other side (the earth retaining wall W2 side) across
25 the piles 1 is referred to as a second space S2.

[0025]

Fig. 3 is a vertical sectional view taken by cutting surroundings of a coupling portion between the first supporting unit 3A and the second supporting unit 3B. Fig. 4 is a vertical sectional view taken by cutting surroundings of a coupling portion between the first supporting unit 3A (the second supporting unit 3B) and the earth retaining wall W1 (W2).

As shown in Figs. 1 to 4, brackets 10 are provided at the first space S1 side and the second space S2 side of the piles 1. In the present embodiment, the brackets 10 are fixed to the both sides of flanges 1F (see Fig. 2; the same hereinafter) of the piles 1.

The brackets 10 are provided for inner circumferential surfaces WS (see Fig. 1; the same hereinafter) of the earth retaining walls W1 and W2.

[0026]

As shown in Figs. 3 and 4, each of the brackets 10 has a fixing plate part 11, a backing plate part 12, and a diagonal bracing part 13. The fixing plate part 11 is arranged along a vertical surface. The backing plate part 12 extends from an upper end of the fixing plate part 11 to be perpendicular to the fixing plate part 11. The diagonal bracing part 13 obliquely couples the fixing plate part 11 and the backing plate part 12.

[0027]

As shown in Fig. 3, in the brackets 10 provided for the piles 1, the fixing plate parts 11 are fixed to the flanges 1F. In the brackets 10 provided for the earth retaining walls W1 and W2, the fixing plate parts 11 are fixed to the inner circumferential surfaces WS of the earth retaining walls W1 and W2.

[0028]

As shown in Figs. 3 and 4, the first rollers 2A are installed on the backing plate parts 12 of the brackets 10 at the first space S1 side. The first rollers 2A are configured

to be rotatable around a horizontal direction perpendicular to the excavating direction which is set to be an axial direction. That is, the first rollers 2A are possible to guide the first supporting unit 3A (to be described below) in the excavating direction.

[0029]

5 The second rollers 2B are installed on the backing plate parts 12 of the brackets 10 at the second space S2 side. The second rollers 2B are configured to be rotatable around the horizontal direction perpendicular to the excavating direction which is set to be an axial direction. That is, the second rollers 2B are possible to guide the second supporting unit 3B (to be described below) in the excavating direction.

10 [0030]

The first supporting unit 3A is arranged in the first space S1. As shown in Fig. 2, the first supporting unit 3A has guide beams 31, struts 32, a wale 33, and angle braces 34.

[0031]

15 The guide beams 31 extend in the excavating direction. The guide beams 31 are supported by the respective first rollers 2A, and are possible to be guided in the excavating direction. In the present embodiment, the guide beams 31 are formed of a steel part such as H-section steel.

[0032]

20 The struts 32 extend in a direction perpendicular to the excavating direction. In the present embodiment, six struts 32 (some of which are shown in Fig. 1) are provided for the first supporting unit 3A, but the number of struts 32 may be appropriately set. In the present embodiment, the struts 32 are configured such that steel parts 36 such as H-section steels are coupled to each other by a coupler plate 37.

25 [0033]

Ends 32A of the struts 32 at the pile 1 side are fixed to the guide beams 31 which is supported by the first rollers 2A on the brackets 10 being fixed to the piles 1.

[0034]

The wale 33 extends in the excavating direction. The wale 33 couples the ends
5 32Z of the struts 32 at the earth retaining wall W1 side.

[0035]

The wale 33 is fixed to the guide beams 31 which is supported by the first rollers 2A on the brackets 10 being fixed to the earth retaining wall W1 (see Fig. 1; the same hereinafter). As shown in Fig. 4, mortar M is filled between the wale 33 and the earth
10 retaining wall W1. In the present embodiment, the wale 33 is formed of a steel part.

The wales 33 may be configured to be in contact with the inner circumferential surfaces WS of the earth retaining walls W1 and W2 without being filled with the mortar M. Alternatively, sandbags (not shown; the same hereinafter) may be configured to be installed between the wales 33 and the inner circumferential surfaces WS of the earth
15 retaining walls W1 and W2.

[0036]

As shown in Fig. 2, each of the angle braces 34 obliquely couples the strut 32 and the wale 33, and prevents deformation of a coupling portion between the strut 32 and the wale 33. In the present embodiment, the angle braces 34 are configured by coupling
20 a plurality of steel parts.

[0037]

The neighboring struts 32 may be coupled by a coupler member (not shown) extending in the excavating direction.

[0038]

25 The second supporting unit 3B is arranged in the second space S2. The second

supporting unit 3B is configured to be identical to the first supporting unit 3A except that guide beams 31 are supported by second rollers 2B; ends 32A of struts 32 at the pile 1 side are supported by the guide beams 31 which is supported by the second rollers 2B on the brackets 10 being fixed to the piles 1; and a wale 33 is fixed to the guide beams 31 which is supported by the second rollers 2B on the brackets 10 being fixed to the earth retaining wall W2, and thus a description thereof will be omitted.

[0039]

The extendable jack 4 couples an end 32A of the strut 32 of the first supporting unit 3A at the pile 1 side and an end 32A of the strut 32 of the second supporting unit 3B at the pile 1 side. The extendable jack 4 is possible to be contracted or expanded in the horizontal direction perpendicular to the excavating direction. The extendable jack 4 is arranged on a line that connects the neighboring piles 1. In the present embodiment, a hydraulic jack is adopted as the extendable jack 4.

[0040]

Next, an earth retaining method using the above supporting system 100 will be described mainly using Figs. 5 to 9.

[0041]

(Process of installing piles in the first and second blocks B1 and B2)

Fig. 5 is a schematic top view for showing an earth retaining method. In Figs. 5 to 9, the first supporting unit 3A and the second supporting unit 3B are shown with each made up of two struts 32 for the sake of convenience.

In the present embodiment, the underground space K is divided into blocks, for example, in units of about 20 to 30 m in the excavating direction, and work proceeds on a block-by-block basis. As shown in Fig. 5, the work proceeds in the order of a first block B1 (a given region), a second block B2 (a front region), and a third block B3.

In the first and second blocks B1 and B2, a plurality of piles 1 is installed approximately in the middle between the earth retaining walls W1 and W2 facing each other in the excavating direction. A lower end of each of the piles 1 is supported by the ground G (see Fig. 2; the same hereinafter), and an upper end thereof is restricted by a lining girder.

[0042]

(Process of installing first rollers in the first space S1 of the first block B1 and the first space S1 of the second block B2)

Next, in the first space S1 of the first block B1 and the first space S1 of the second block B2, the fixing plate parts 11 (see Fig. 2; the same hereinafter) of the brackets 10 are fixed to the flanges 1F (see Fig. 2; the same hereinafter) of the piles 1 at the first space S1 side and the inner circumferential surface WS of the earth retaining wall W1. The first rollers 2A are installed on the backing plate parts 12 (see Fig. 2; the same hereinafter) of the brackets 10. Here, the brackets 10 may be installed at the second space S2 side of the piles 1 and the inner circumferential surface of the earth retaining wall W2 in advance.

[0043]

(Process of installing a first support in the first space S1 of the first block B1)

The guide beams 31 of the pre-assembled first supporting unit 3A are guided forward in the excavating direction by the first rollers 2A. In the present embodiment, a traction pulley 38 is installed on an end 31A which is located in front of the guide beam 31 of the first supporting unit 3A in the excavating direction. A wire rope 39 wound around the traction pulley 38 is pulled. When the wire rope 39 sags greatly when pulled, if the wire rope 39 is supported by the first rollers 2A of the second block B2, the pulling is possible to be smoothly performed. The first supporting unit 3A is installed at a

position at which the strut 32 is arranged between the piles 1.

The support means of the wire rope 39 is not limited to the first rollers 2A, but may be performed by other members. For example, the wire rope 39 may be supported by the brackets 10. Alternatively, the plurality of brackets 10 may be coupled by diagonal braces (not shown; the same hereinafter), and the wire rope 39 may be supported by the diagonal braces.

[0044]

(Process of installing second rollers in the second space S2 of the first block B1 and the second space S2 of the second block B2)

Fig. 6 is a schematic top view for showing the earth retaining method, and shows the process following Fig. 5.

As shown in Fig. 6, in the second space S2 of the first block B1 and the second space S2 of the second block B2, the fixing plate parts 11 of the brackets 10 are fixed to the flanges 1F of the piles 1 at the second space S2 side and the inner circumferential surface WS of the earth retaining wall W2. The second rollers 2B are installed on the respective backing plate parts 12 of the brackets 10.

[0045]

(Process of installing a second support in the second space S2 of the first block B1)

The guide beams 31 of the pre-assembled second supporting unit 3B are guided forward in the excavating direction by the second rollers 2B. In the present embodiment, a traction pulley 38 is installed on an end 31A which is located in front of the guide beam 31 of the second supporting unit 3B in the excavating direction. A wire rope 39 wound around the traction pulley 38 is pulled. When the wire rope 39 sags greatly when pulled, if the wire rope 39 is supported by the second rollers 2B of the

second block B2, the pulling is possible to be smoothly performed. The second supporting unit 3B is installed at a position at which the strut 32 of the second supporting unit 3B faces the strut 32 of the first supporting unit 3A.

As in the case of the first space S1, the support means of the wire rope 39 is not limited to the second rollers 2B, but may be performed by other members. For example, the wire rope 39 may be supported by the brackets 10. Alternatively, the plurality of brackets 10 may be coupled by diagonal braces (not shown; the same hereinafter), and the wire rope 39 may be supported by the diagonal braces.

[0046]

10 (Process of supporting earth retaining walls in the first block B1)

Fig. 7 is a schematic top view for showing the earth retaining method, and shows the process following Fig. 6.

As shown in Fig. 7, mortar M (see Fig. 4; the same hereinafter) may be filled between the wale 33 of the first supporting unit 3A and the earth retaining wall W1 and between the wale 33 of the second supporting unit 3B and the earth retaining wall W2. The end 32A of the strut 32 of the first supporting unit 3A at the pile 1 side and the end 32A of the strut 32 of the second supporting unit 3B at the pile 1 side are coupled by the extendable jack 4. The extendable jack 4 is adjusted such that the first supporting unit 3A and the second supporting unit 3B support the respective earth retaining walls W1 and W2 with a desired force.

If the extendable jack 4 has a sufficient stroke, the wales 33 may be brought into contact with the inner circumferential surfaces WS of the earth retaining walls W1 and W2 without filling the mortar M. Alternatively, sandbags (not shown; the same hereinafter) may be installed between the wale 33 and the inner circumferential surface WS of the earth retaining wall W1 and between the wale 33 and the inner circumferential

surface WS of the earth retaining wall W2.

[0047]

(Process of placing concrete in the first block B1)

Concrete 5 is uniformly placed and cured on the ground G of the first block B1.

5 [0048]

(Process of installing piles in the third block B3)

Fig. 8 is a schematic top view for showing the earth retaining method, and shows the process following Fig. 7.

As shown in Fig. 8, a plurality of piles 1 is installed approximately in the middle
10 between the earth retaining walls W1 and W2 facing each other in the third block B3 in the excavating direction.

The piles 1 may be installed in advance. For example, when the piles 1 of the first and second blocks B1 and B2 are installed, the piles 1 of the third block B3 may also be installed.

15 [0049]

(Process of installing first rollers in the first space S1 of the third block B3)

Next, as in the case of the second block B2, the brackets 10 and the first rollers 2A are installed in the first space S1 of the third block B3.

[0050]

20 (Process of installing a first support in the first space S1 of the second block B2)

Next, the extendable jack 4 (see Fig. 7; the same hereinafter) for coupling the first supporting unit 3A and the second supporting unit 3B is contracted, and the mutual coupling is released. The wire rope 39 connected to the guide beam 31 of the first supporting unit 3A is pulled, and the first supporting unit 3A is installed at a position at

25 which the strut 32 is arranged between the piles 1. In this way, the first supporting unit

3A used in the first block B1 is moved to and installed in the second block B2.

[0051]

(Process of installing second rollers in the second space S2 of the third block B3)

5 Fig. 9 is a schematic top view for showing the earth retaining method, and shows the process following Fig. 8.

As shown in Fig. 9, as in the case of the second block B2, the brackets 10 and the second rollers 2B are installed in the second space S2 of the third block B3.

[0052]

10 (Process of installing a second support in the second space S2 of the second block B2)

Next, the wire rope 39 connected to the guide beam 31 of the second supporting unit 3B is pulled, and the second supporting unit 3B is installed at a position at which the strut 32 of the second supporting unit 3B faces the strut 32 of the first supporting unit 3A.

15 In this way, the second supporting unit 3B used in the first block B1 is moved to and installed in the second block B2.

[0053]

(Process of supporting earth retaining walls in the second block B2)

20 Next, as in the case of the first block B1, mortar M may be filled between the wale 33 of the first supporting unit 3A and the earth retaining wall W1 and between the wale 33 of the second supporting unit 3B and the earth retaining wall W2. The end 32A of the strut 32 of the first supporting unit 3A at the pile 1 side and the end 32A of the strut 32 of the second supporting unit 3B at the pile 1 side are coupled by the extendable jack 4 while being adjusted.

25 As in the case of the first block B1, if the extendable jack 4 has a sufficient

stroke, the wales 33 may be brought into contact with the inner circumferential surfaces WS of the earth retaining walls W1 and W2 without filling the mortar M. Alternatively, sandbags (not shown; the same hereinafter) may be installed between the wale 33 and the inner circumferential surface WS of the earth retaining wall W1 and between the wale 33 and the inner circumferential surface WS of the earth retaining wall W2.

[0054]

(Process of placing concrete in the second block B2)

Concrete 5 is uniformly placed and cured on the ground G of the second block B2.

10 In this way, work sequentially proceeds forward in the excavating direction.

[0055]

In the earth retaining method and the supporting system 100 configured in this way, since the first supporting unit 3A and the second supporting unit 3B supporting the earth retaining walls W1 and W2 are used in common in the first and second blocks B1 and B2 of the underground space K, the number of temporary members used is possible to be reduced, and construction expenses is possible to be reduced in comparison with a case in which the supports are installed at whole of the excavated space.

[0056]

When the supports are moved from the first block B1 to the second block B2, the first supporting unit 3A and the second supporting unit 3B may be respectively guided by the first rollers 2A and the second rollers 2B. Therefore, according to the present invention, since the first supporting unit 3A and the second supporting unit 3B are possible to be used and installed with no change in the construction period is possible to be reduced, and there is less labor than in reassembly in comparison with a case in which the supports are removed from other portions and are reassembled at the portions.

[0057]

Since the extendable jack 4 is arranged on the line connecting the neighboring piles 1, when the first supporting unit 3A and the second supporting unit 3B are moved forward in the excavating direction, the piles 1 do not interfere with the movement.

5 [0058]

The ends of the first supporting unit 3A at both the pile 1 side and the side the earth retaining wall W1 are supported by the first rollers 2A via the guide beams 31. In addition, the ends of the second supporting unit 3A at both the pile 1 side and at the side the earth retaining wall W2 are supported by the second rollers 2B via the guide beams 31. Therefore, the first rollers 2A and the second rollers 2B are possible to stably guide the first supporting unit 3A and the second supporting unit 3B.

[0059]

All the shapes and combinations of the components shown in the aforementioned embodiment are only examples and can be variously modified based on design requirements without departing from the spirit and scope of the present invention.

[0060]

For example, in the embodiment shown above, the pile installing process and the first roller installing process in the second block B2 are performed earlier than the first support installing process in the first space S1 of the first block B1 in order to guide the wire rope 39 on the first rollers 2A, but the present invention is not limited thereto. For example, as long as the first supporting unit 3A can be pressed from the rear in the excavating direction, the pile installing process and the first roller installing process in the second block B2 may be performed after the concrete placing process in the first block B1. This is also possible to be applied to the second space S2.

25 [0061]

In the embodiment shown above, the excavated space is divided into the first space S1 and the second space S2, the first supporting unit 3A is installed in the first space S1, and the second supporting unit 3B is installed in the second space S2, but the present invention is not limited thereto. The support extending from the earth retaining wall W1 to the earth retaining wall W2 may be installed. The support used in a given region may be moved to a front region by the rollers, and may be used in the front region.

[0062]

According to the earth retaining method and the supporting system, the number of temporary members used such as the supports is possible to be reduced, and the earth retaining process is possible to perform with good workability.

[Reference Signs List]

[0063]

100 Supporting system

1 Pile

15 1F Flange

2A First roller

2B Second roller

3A First supporting unit (a support, a first support)

3B Second supporting unit (a support, a second support)

20 4 Extendable jack

5 Concrete

10 Bracket

31 Guide beam

32 Strut

25 33 Wale

- 34 Angle brace
- B1 First block (given region)
- B2 Second block (front region)
- B3 Third block
- 5 K Underground space (excavated space)
 - S1 First space
 - S2 Second space
 - W1 and W2 Earth retaining walls

CLAIMS

What is claimed is:

1. An earth retaining method comprising:

- 5 a roller installing process of installing rollers between earth retaining walls facing each other in a given region of an excavated space, the rollers guiding supports in an excavating direction;
- a support installing process of guiding supports forward in the excavating direction by the rollers and installing the supports;
- 10 an earth retaining wall supporting process of supporting the earth retaining walls which are adjacent to ends of the support; and
- a concrete placing process of placing concrete on the ground of the given region, wherein the processes from the roller installing process to the concrete placing process are repeated toward a front region in front of the given region from the given
- 15 region in the excavating direction, and
- the supports used in the given region are used in the support installing process in the front region.

2. The earth retaining method according to claim 1, wherein

- 20 the supports have a first support and a second support,
- the rollers have first rollers and second rollers,
- the earth retaining method includes:
- a first roller installing process of installing the first rollers at a first space where is one side of a direction perpendicular to the excavating direction, the first
- 25 roller guiding the first support in the excavating direction,

a first support installing process of guiding the first support forward in the excavating direction by the first rollers and installing the first support,

a second roller installing process of installing the second rollers at a second space where is the other side of the direction perpendicular to the excavating direction, the second roller guiding the second support in the excavating direction, and

a second support installing process of guiding the second support forward in the excavating direction by the second rollers and installing the second support,

the earth retaining wall supporting process includes processes of coupling facing ends of the first and second supports by an extendable jack which is contractible or expandable in a direction in which the ends faces each other, and supporting the earth retaining walls which are adjacent to each other by the other end of the first support and the other end of the second support,

after the concrete placing process is performed in the given region, a process of contracting the extendable jack at the given region and decoupling the first support and the second support are performed; ;

the processes from the first roller installing process to the concrete placing process are repeated toward the front region in front of the given region from the given region in the excavating direction; and

the first and second supports used in the given region are used in the first and second support installing processes in the front region.

3. The earth retaining method according to claim 2, wherein

a pile installing process of installing a plurality of piles between the earth retaining walls facing each other in the excavating direction is performed in the given

region of the excavated space before the first roller installing process; and

the processes from the pile installing process to the concrete placing process are repeated toward the front region in front of the given region from the given region in the excavating direction.

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4. The earth retaining method according to claim 3, wherein the extendable jack is arranged on a line connecting the neighboring piles.

5. The earth retaining method according to any one of claims 2 to 4, wherein:

10 in the first roller installing process, a process of installing the first rollers along both one sides of the piles in the direction perpendicular to the excavating direction and the earth retaining wall side of the first space side are performed; and

in the second roller installing process, a process of installing the second rollers along both the other sides of the piles in the direction perpendicular to the excavating
15 direction and the earth retaining wall side of the second space side are performed.

6. A supporting system comprising:

rollers between earth retaining walls facing each other in a given region of an excavated space, the rollers guiding supports in an excavating direction; and

20 supports which are configured to be guidable by the rollers in the excavating direction and to support the earth retaining walls.