

Coupling Device and Method for Coupling Components

Field of the Invention

- 5 The present application relates to a coupling device and method for coupling components, particularly but not exclusively support apparatus components such as connecting plates, sleeve members and stiffeners.

Background

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Support member systems for supporting walls are known, for example in WO03/102321. In such a system, a vertical stiffener may be used to support a wall and if the wall is constructed from bricks or other building or construction blocks, tie members may be inserted in cement work between the bricks or construction blocks to tie the wall to the vertical stiffener. The support member system may be configured in other ways to support other wall configurations and for example, an arrangement of vertical and horizontal stiffeners may be used to support various wall sections to strengthen the wall sections. However, connectors for such support member systems are not as versatile or adaptable to different applications.

- 15 20 Thus, it is desirable to provide a coupling device and connector which addresses at least one of the disadvantages of the prior art and/or to provide the public with a useful choice.

Summary of the Invention:

- 25 In a first aspect, there is provided a connector for coupling components, comprising a resiliently displaceable mechanism arranged to be inserted into aligned recesses of the components and operable to be flexed outwardly in response to a force and to return to its normal unflexed state in the absence of the force.

- 30 In this way, a key element may be used to be inserted into the connector to create the force and when the key element is withdrawn, the connector may then return to its normal unflexed state, and this enables the connector to be removed from the components.

- The resiliently displaceable mechanism may include two side members arranged to form an opening for receiving a key element, and each side member having at least one resiliently displaceable leg. Preferably, the connector may comprise flange portions extending outwardly from respective side members.

In an embodiment, the at least one of the side members may include a raised protrusion configured to engage the key element. Advantageously, the at least one resiliently displaceable leg may include a raised abutment member configured to engage the key element. Specifically, the raised abutment member is positioned in proximity to a terminal end of the at least one resiliently displaceable leg.

In a second aspect, there is provided a coupling device for coupling components, comprising: a connector including a resiliently displaceable mechanism arranged to be inserted into aligned recesses of the components and operable to be flexed outwardly in response to a force and to return to its normal unflexed state in the absence of the force; and a key element configured to engage the connector to create the force.

Preferably, the key element may comprise an elongate slot. In one embodiment, the resiliently displaceable mechanism may include two side members arranged to form an opening for receiving the key element. Preferably, at least one of the side members includes a raised protrusion for engaging the elongate slot of the key element.

Preferably, each side member may include at least one resiliently displaceable leg. Specifically, the at least one resiliently displaceable leg may include a raised abutment member configured to engage the key element.

In one embodiment, the key element may include a tapered tip portion.

In a third aspect, there is provided a method for coupling components, comprising: placing a coupling device at aligned recesses of the components, the coupling device including a connector and a key element, the connector including a resiliently displaceable mechanism operable to be flexed outwardly in response to a force and to return to its normal unflexed state in the absence of the force; inserting the connector into the aligned recesses of the components; and inserting the key element into the connector to engage the resiliently displaceable mechanism to cause the resiliently displaceable mechanism to flex outwardly in response to force created by the engagement to couple the components together.

Preferably, the method may further comprise inserting the key element partially into the connector but without the key element engaging the resiliently displaceable mechanism prior to inserting the connector into the aligned recesses, and after the connector is inserted into

the aligned recesses, inserting the key element further into the connector to enable the key element to engage the resiliently displaceable mechanism.

5 The method may further comprise after the key element is engaged with the resiliently displaceable mechanism, withdrawing the key element to disengage from the resiliently displaceable mechanism, and withdrawing the connector from the aligned recesses of the components to uncouple the components.

10 The foregoing summary is illustrative only and is not intended to be in any way limiting. In addition to the illustrative aspects, embodiments, and features described above, further aspects, embodiments, and features will become apparent by reference to the drawings and the following detailed description.

Brief Description of the Drawings:

15 Embodiments of the invention will now be explained for the sake of example only, with reference to the following figures in which:

Figure 1 illustrates perspective, top, side and front views of a connector for coupling various components of a support apparatus, according to an embodiment of the present disclosure;

20 Figure 2 illustrates perspective, top, side and front views of a key element for engaging with the connector of Figure 1;

Figure 3 illustrates perspective, top, side and front views of a coupling device comprising the connector of Figure 1 engaged with the key element of Figure 2 and with the coupling device still in an unlocked state;

25 Figure 4 illustrates perspective, top, side and front views of the coupling device of Figure 3 but with the key element fully inserted into the connector to form a locked state;

Figure 5 illustrates enlarged views of the coupling device of Figure 3 illustrating the key element separated from the connector and the direction of insertion of the key element into the connector with the coupling device still in the unlocked state;

30 Figure 6 is a perspective view of two of the coupling devices of Figure 3 in the unlocked states being inserted into recesses of support apparatus components for coupling the support apparatus components together;

Figure 7 illustrates the connector of the coupling devices being fully inserted into the recesses of the support apparatus components but with the coupling devices still in the unlocked states and direction of slide or force of the key element for securing the support apparatus components;

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Figure 8 illustrates the respective key elements of the coupling devices of Figure 7 being fully inserted to lock the coupling devices and thus, securely engaging the support apparatus components together;

Figure 9 is a similar view of Figure 8 but showing the direction of slide or withdrawal of the key elements in order to unlock the coupling devices from the previously locked support apparatus components;

Figure 10 illustrates the detachment of the coupling devices of Figure 9 from the support apparatus components when the coupling devices are in unlocked states; and

Figure 11 illustrates cross sectional views of support apparatus components similar to Figures 6-8 to illustrate the insertion of the coupling device and locking of the coupling device in order to couple the support apparatus components together.

Detailed Description of the Preferred Embodiment

Figure 1 illustrates perspective, top, side and front views of a connector 100 for coupling various components of a support apparatus, according to an embodiment of the present disclosure. Figure 2 illustrates perspective, top, side and front views of a key element 200 for engaging with the connector of Figure 1, and Figure 3 illustrates perspective, top, side and front views of a coupling device 300 comprising the connector 100 of Figure 1 engaged with the key element 200 of Figure 2 and with the coupling device 300 still in an unlocked state. The connector 100 includes a resiliently displaceable mechanism operable to be flexed outwardly in response to a force and to return to its normal unflexed state in the absence of the force. In this embodiment, the connector 100 includes a generally U-shaped member 102 that includes a bottom member 106 and two side members 104. The bottom member 106 is positioned between the side members 104 to form an opening 108 that is configured to receive the key element 200.

Each of the side members 104 of the generally U-shaped member 102 comprises a plurality of resiliently displaceable elements and in this embodiment, there are four resiliently displaceable elements in the form of finger-like projections or legs 110, which are arranged to engage with the key element 200 when the key element 200 is inserted into the opening 108. The connector 100 also includes a longitudinally extending flange portion 112 that are connected to a top portion 126 of the U-shaped member 102. The flange portions 112 are spaced from the finger-like projections 110 and extend outwardly from each side member 104. The flange portions 112 are arranged to restrain the connector 100 (and thus, the coupling device 300) from further insertion into aligned recesses of the support apparatus components. The flange portions 112 comprise a flat surface and are disposed substantially perpendicular

to the side members 104; and the flange portions 112 also reduce rotation of the coupling device 300 after insertion which is important for the coupling device 300 to secure the support apparatus components together.

5 The finger-like projections 110 are pivotally connected at one end to the side members 104. Gaps are provided between one or more sides of each finger-like projection 110, which extends primarily in a vertical direction towards the horizontally extending flange portions 112. This results in a separation between one or more finger-like projections 110 and a side member 104. In their normal unflexed state, the finger-like projections 110 are substantially
10 aligned and flushed with the side members 104. The pivotal connection of the finger-like projections 110 enables the finger-like projections 110 to flexed outwardly in response to a force (as provided by the engagement of the key element 200) so that the finger-like projections 110 are no longer aligned with the side members 104, and when the force is removed, the finger-like projections 110 biases back to the unflexed state.

15 As illustrated, the opening 108 configured to receive the key element 200 corresponds to an interior surface of the generally U-shaped member 102, which includes an interior surface of each side member 104 and the bottom member 106. Additionally, the interior surface of the top portion 126 of each side member 104 includes a raised protrusion 118 that is specifically
20 intended to engage with the key element 200.

Each finger-like projection 110 of each side member 104 of the connector 100 includes a raised protrusion 120a,120b located at the inner surface of its terminal end. It should be appreciated that the raised protrusions 120a,120b are configured to engage with the key
25 element 200 when the key element 200 is inserted into the opening 108.

Each side member 104 has a generally T-shaped or I-shaped cross-section. The horizontally extending flange portion 112 extends from the top of each side member 104 in a direction substantially perpendicular to each side member 104.

30 Referring to Figure 2, the key element 200 includes a handle portion 202, an arm portion 204 that has an elongate slot 206 which is arranged to receive and engage the raised protrusions 118 on the interior surface of the U-shaped member 102, and a tip portion 208 that is intended to be inserted into the opening 108 of the U-shaped member 102.

35 As illustrated, the elongate slot 206 of the key element 200 includes a kink 210. The cooperation between the elongate slot 206 and the raised protrusions 118 assist with the

sliding movement or insertion and withdrawal of the key element 200 from the connector 100. The presence of the kink 210, due to its slightly narrower dimension, is arranged to engage the raised protrusions 118 in a more secured state when the coupling device 300 is in a locked state as will be further explained later. The tip portion 208 of the key element 200 is located
5 at the bottom of the key element 200 and is tapered.

In implementations, the handle portion 202 of the key element 200 has a longitudinal axis that is oriented substantially perpendicular to a longitudinal axis of the arm portion 204. When the key element 200 is inserted into the generally U-shaped member 102, the handle portion 202
10 assumes a substantially parallel orientation with respect to each horizontally extending flange portion 112 coupled to each of the side members 104.

The generally U-shaped member 102 is configured to be in the normal unflexed or unstressed state when the key element 200 is not engaged with the raised protrusions 120a, 120b located
15 on the finger-like projections 110. The two side members 104 of the generally U-shaped member 102 are substantially parallel to each other and the two side members 102 are separated from each other by a distance that is sufficient to accommodate and receive the key element 200 and for the raised protrusions 120a, 120b to engage the key element.

When the key element 200 is inserted into the U-shaped member 102, the elongate slot 206 of the key element 200 is arranged to engage with the raised protrusions 118 and with a slight force, the key element 200 is arranged to slide with respect to the U-shaped member 102 as guided by the elongate slot 206 and the raised protrusions 118 up until the kink 210. At this stage, the coupling device 300 is still considered to be in the unlocked state. With greater force,
20 the raised protrusions 118 moves past the kink 210 to frictionally lock the key element 200 to the U-shaped member 102.
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Figure 4 illustrates perspective, top, side and front views of the coupling device 300 in a locked state with the key element 200 fully inserted into the connector 100. To achieve the locked state, starting with the arrangement in Figure 3, the handle 202 of the key element 200 is pushed further inwards into the opening 108 of the connector 100 and this action causes the substantially planar arm portion 204 of the key element 200 to engage the raised abutment members 120a, 120b present on the interior surfaces of the finger-like projections 110. The engagement of the key element 200 and the raised abutment members 120a and 120b results
30 in the outward flexing or expansion of the free-end of the finger-like projections 110 on each side member 104 and deformation of the connector 100 to operate in a stressed or flexed state which can be used to couple the components together.
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In the locked state, the tip portion 208 and the bottom member 106 form a hull 400 in the inner surface of the generally U-shaped member 102. The hull 400 may be configured with different widths to provide for varying inner girth sizes to accommodate to varying thicknesses of the key element 200.

Figure 5 is an enlarged view of the key element 200 of Figure 2 being inserted into the connector 100 of Figure 1 but with the coupling device 300 still in the unlocked state. It should be appreciated that in this embodiment, the distance between the four raised projections 120a, 120b to the raised protrusions 118 is equidistant. The raised abutment members 120a, 120b, and the raised protrusions 118 are configured to engage with the key element 200 when the key element 200 is inserted into the opening 108 of the connector 100.

Figures 6 to 8 are views of two of the coupling devices 300 being used to couple support apparatus components 602, 604 together, and in this embodiment, the support apparatus components 602, 604 include a connecting plate 602 and a stiffener member 604.

As illustrated, the connecting plate 602 includes connecting plate recesses 606 and the stiffener member 604 includes stiffener member recesses 608 and the recesses 606, 608 are configured to be aligned or in registration with each other. With the recesses 606, 608 aligned, the two coupling devices 300 are then inserted into the corresponding aligned pairs of the aligned recesses 606, 608.

Starting with the arrangement in Figure 6, with the key elements 200 partially inserted into the respective connectors 100 (with the coupling devices 300 still in the unlock state), the coupling devices 300 are inserted into the respective aligned pairs of recesses 606, 608 as shown in Figure 7 with the flange portions 112 of the connectors 100 resting on the connecting plate 602.

As explained earlier, the shape of the bottom members 106 of the coupling devices 300 are generally U-shaped and the dimensions are configured to fit the combined thickness of the connecting plate 602 and the stiffener member 604.

Next, force 700 is then applied to push the key elements 200 further into the respective connectors 200 until the coupling devices 300 is in the locked state as shown in Figure 8. In the locked state, the raised protrusions 118 of the connector 100 sit after the kink 210 of the elongate slot 206 of the key element 200 and thus, provides a more secure engagement to

reduce accidental dislodgement between the connector 100 and the key element 200. As discussed earlier, in the locked state, the key elements 200 engage the raised abutment members 120a, 120b of the corresponding connectors to cause the finger-like projections 110 to flex outwardly and the free ends of the finger-like projections 110 then engage with internal surfaces of the stiffener member 604 and in this way, the coupling devices 300 couple the connecting plate 602 and the stiffener member 604 together.

When the support apparatus is in a locked state as illustrated in Figure 8, the horizontally extending flange portions 112 and the handle portion 202 of the key element 200 come in contact with the connecting plate 602. This contact along with the contact between the flexed finger-like projections 110 against the inner surfaces of the stiffener member 604 create a secure engagement between the connecting plate 602 and the stiffener member 604 enhancing stability.

To disconnect the coupling devices 300 from the connecting plate 602 and the stiffener member 604, the key elements 200 are withdrawn linearly or pulled out in the direction 900 as shown in Figure 9, guided by the elongate slot 206 and with enough force to allow the raised protrusions 118 to pass the elongate slot's kink 210. At the same time, the key elements 200 disengage from the respective raised abutment members 120a, 120b, and the finger-like projections 110 bias back to their unflexed or normal state. In this state, the coupling devices 300, in the unlocked state, are then pulled outwardly, also in direction 900, to detach the coupling devices 300 from the connecting plate 602 and the stiffener member 604. This also uncouples the connecting plate 602 from the stiffener member 604.

Figure 11 illustrates cross-sectional views of Figures 6-8 to illustrate how one of the coupling devices 300 couples the connecting plate 602 and the stiffener member 604 together.

The described embodiment should not be construed as limitative. For example, while the embodiment describes four finger-like projections 110, other numbers of projections 110 and also in other configurations are envisaged. The generally U-shaped member 102 may also be in other shapes and sizes. Instead of two raised protrusions 118, which is preferred, only one raised protrusion 118 may be provided.

Having now fully described the invention, it should be apparent to one of ordinary skill in the art that many modifications can be made hereto without departing from the scope as claimed.

Claims:

1. A connector for coupling components, comprising
a resiliently displaceable mechanism arranged to be inserted into aligned recesses of
5 the components and operable to be flexed outwardly in response to a force and to return to its
normal unflexed state in the absence of the force.
2. The connector according to claim 1, wherein the resiliently displaceable mechanism
includes two side members arranged to form an opening for receiving a key element, and each
10 side member having at least one resiliently displaceable leg.
3. The connector according to claim 2, further comprising flange portions extending outwardly
from respective side members.
- 15 4. The connector according to claim 2 or 3, wherein at least one of the side members includes
a raised protrusion configured to engage the key element.
5. The connector according any one of claims 1 to 4, wherein the at least one resiliently
displaceable leg includes a raised abutment member configured to engage the key element.
20 6. The connector according to claim 5, wherein the raised abutment member is positioned in
proximity to a terminal end of the at least one resiliently displaceable leg.
7. A coupling device for coupling components, comprising:
25 a connector including a resiliently displaceable mechanism arranged to be inserted into
aligned recesses of the components and operable to be flexed outwardly in response to a
force and to return to its normal unflexed state in the absence of the force; and
a key element configured to engage the connector to create the force.
- 30 8. The coupling device according to claim 7, wherein the key element comprises an elongate
slot.
9. The coupling device according to claim 8, wherein the resiliently displaceable mechanism
includes two side members arranged to form an opening for receiving the key element.
35 10. The coupling device according to claim 9, wherein at least one of the side members
includes a raised protrusion for engaging the elongate slot of the key element.

11. The coupling device according to claim 9 or 10, wherein each side member includes at least one resiliently displaceable leg.

5 12. The coupling device according to claim 11, wherein the at least one resiliently displaceable leg includes a raised abutment member configured to engage the key element.

13. The coupling device according to any of claims 9 to 14, wherein the key element includes a tapered tip portion.

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14. A method for coupling components, comprising:

placing a coupling device at aligned recesses of the components, the coupling device including a connector and a key element, the connector including a resiliently displaceable mechanism operable to be flexed outwardly in response to a force and to return to its normal

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unflexed state in the absence of the force;

inserting the connector into the aligned recesses of the components; and

inserting the key element into the connector to engage the resiliently displaceable mechanism to cause the resiliently displaceable mechanism to flex outwardly in response to force created by the engagement to couple the components together.

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15. The method of claim 14, further comprising

inserting the key element partially into the connector but without the key element engaging the resiliently displaceable mechanism prior to inserting the connector into the aligned recesses, and

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after the connector is inserted into the aligned recesses, inserting the key element further into the connector to enable the key element to engage the resiliently displaceable mechanism.

16. The method of claim 14 or 15, further comprising

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after the key element is engaged with the resiliently displaceable mechanism, withdrawing the key element to disengage from the resiliently displaceable mechanism, and withdrawing the connector from the aligned recesses of the components to uncouple the components.

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