

Climbing System for a Rail-Guided Climbing Scaffold

5 The invention relates to a climbing system for a rail-guided climbing scaffold with climbing rails and climbing shoes for attachment to a building structure, configured to mount the climbing rails such that they can be moved along the building structure. Further, the invention relates to a corresponding climbing scaffold, as well as a corresponding climbing protection screen, and a method of erecting a building structure by means of a rail-guided climbing scaffold.

10 In modern buildings, in particular in high-rise buildings, it is common to provide a central building core in which elevator shafts and stairwells are accommodated and which supports the floors of the building structure. In general, such a building core consists of cast concrete.

In general, such building structures do not have load-bearing exterior walls. As a result, for most of the construction period, the floors remain partially or completely open at the outside edges of the floors. It is only when a facade is installed that a building envelope is created.

15 Such open floors pose numerous health and safety risks. People working at the open edges of the floors are at risk of falling from the building structure. Further, there is a risk for people working on the building, but also for members of the public, that tools, equipment or debris could fall from the edges of the open floors.

20 It is therefore known to provide scaffolds or even protection screens that extend around at least part of the perimeter of such a building structure. These form a temporary building envelope and, preferably, also safe working platforms that are spaced from the floors in an outward direction. Preferably, these scaffolds and protection screens are movable at least in a vertical direction in order to protect the outside edges of each floor as construction progresses. Such protection screens are commonly referred to as climbing protection screens.

25 The corresponding scaffolds are referred to as climbing scaffolds. These climbing protection screens can be moved in a vertical direction along the building structure either with a crane or with a hydraulic lifting device which is supported by the floors of the building structure. With regard to a relocation process to the next construction phase, in particular the next concreting phase, a distinction is made between crane-independent (i.e., self-climbing) and crane-dependent climbing scaffolds. A crane is required for the basic assembly and disassembly of
30 self-climbing climbing scaffolds according to the prior art. The climbing units are partially pre-assembled on formwork floors and then moved to the suspension points by crane.

Climbing scaffolds and climbing protection screens generally comprise at least one climbing rail and climbing shoes which, during operation, hold the climbing rail and protrude outwards from the outside edges of the floors. In addition, the climbing protection screens comprise an enclosure. The climbing shoes allow the respective structure to be moved in a vertical direction
5 along the building structure and, in addition, can be used, during operation, to lock the position of the structure on floors.

Due to the size and weight of climbing scaffolds and climbing protection screens, these can, in general, only be attached to a building structure once the climbing rails can be supported in an adequate manner. In general, such a support is required to be provided by climbing shoes
10 at suspension points, as they are referred to. These suspension points serve to provide an anchorage for the climbing shoes. As a rule, these suspension points are provided during the construction of the respective floors and are cast into the concrete. In this context, the suspension points can be provided either on a floor slab or on outside walls of the floors.

The requirement to support climbing protection screens by means of climbing shoes at at least
15 two suspension points, in particular on the floor slabs of two floors, at the same time, represents a certain restriction on the use of climbing scaffolds and climbing protection screens. As a consequence, these can only be used once at least the first and second floors (in addition to the ground floor) have been constructed. Before this, a climbing scaffold and a climbing protection screen cannot be supported in a suitable manner.

20 As a consequence, no safety measures involving climbing scaffolds or climbing protection screens are intended to be provided until this point in time. If necessary, additional safety measures must therefore be taken at the outside edges of the floors during the construction of the lower floors.

Document GB 2 510 879 A discloses a climbing protection screen system comprising a
25 climbing protection screen with a climbing rail, which is arranged in such a way that it can be mounted on a building structure and moved along the building structure, and a climbing protection screen with a holder which comprises a base that is removably attached to the climbing protection screen and which is constructed in such a way that it holds the climbing protection screen in a vertical orientation before the climbing rail is mounted on the building
30 structure above ground level, in such a way that the climbing protection screen is free-standing.

It is an object of the invention to provide improved protection measures for floors with open outside edges. In particular, it is an object of the invention to provide a climbing system by means of which a simple and flexible way of protecting the outside edges of the floors is possible, both during the construction of the first few floors above the ground, as well as further
5 floors.

This object is solved by the teaching of the independent claims. Advantageous embodiments are claimed in the dependent claims.

A first aspect of the invention relates to a climbing system for a rail-guided climbing scaffold, comprising:

- 10 • climbing rails;
 - a support device configured to support a facade scaffold and to be detachably connected to the climbing rails to form a support structure; and
 - climbing shoes for fastening to a building structure, configured to mount the support structure on the climbing rails such that it can be moved along the building structure.
- 15 Preferably, the support device in the climbing system is detachably connected to the climbing rails to form a support structure.

A second aspect of the invention relates to a rail-guided climbing scaffold with a climbing system and a facade scaffold, wherein the facade scaffold can be fastened or is fastened to the support structure.

- 20 A third aspect of the invention relates to a climbing protection screen with a climbing scaffold, wherein an enclosure is attached to a side of the facade scaffold which faces away from the climbing rails.

A fourth aspect of the invention relates to a method of erecting a building structure by means of a rail-guided climbing scaffold, comprising the following process steps:

- 25 • providing the support device at a location where a building structure is to be erected;
- mounting the facade scaffold on the support device;
- erecting a first portion of the building structure;
- mounting the climbing shoes on the first part of the building structure;

- inserting the climbing rails into the climbing shoes;
- connecting the climbing rails to the support device to form the support structure;
- lifting the climbing scaffold a first time; and
- erecting a second portion of the building structure.

5 Preferably, the detachable connection of the support device and the climbing rails is achieved by means of coupling elements, in particular pins. Further, it is preferable that the facade scaffold is arranged in a vertical direction on the support device, in particular rests thereon. Further, it is also preferable that the facade scaffold is connected to the climbing rails. Further, it is also preferable that the climbing rail can consist of several individual parts.

10 A fifth aspect of the invention relates to a coupling element for fastening a facade scaffold to a support, in particular to a climbing rail of a climbing system, wherein the coupling element comprises a fastening plate with at least one hole, in particular at least one hole, in particular an oblong hole, through which a fastening means, in particular a screw, can be guided for detachable fastening to the support in order to be detachably fastened to the support, and a
15 coupling mechanism for detachable fastening to at least one perforated disc or at least one vertical standard of the facade scaffold.

The coupling element in accordance with the invention has the advantage that a facade scaffold can be connected to a support particularly easily and can also be quickly detached from it again. In particular, through the use of the coupling element, no modifications need to
20 be made to a commercially available support provided with holes as well as to a commercially available climbing scaffold with vertical standards and perforated discs.

A facade scaffold within the meaning of the invention is a self-supporting scaffold that can rest on the ground in a free-standing manner. In particular, it is stabilized by its own construction and by being supported on the ground. In particular, it can also stand independently and does
25 not need to be attached to buildings or other surfaces. Preferably, by a combination of vertical and horizontal elements, in particular vertical and horizontal frames, longitudinal bars, and diagonal struts, individual scaffold sections are created, which are then connected to each other. This can give the facade scaffold additional stability. Preferably, the scaffold is made secure against falls by railings and other components. Facade scaffolds are defined in
30 particular in standards EN12810 and EN12811. Facade scaffolds are preferably also referred to as standing scaffolds. These are described in standard DIN 4420, Part 2, in the version of

December 1990. Preferably, the facade scaffold is a frame scaffold or a single-standard scaffold. Preferably, the facade scaffold is a modular scaffold.

Preferably, a climbing rail within the meaning of the invention is a profiled rail. Further preferably, a climbing rail can consist of several individual parts. For example, the climbing rail
5 can be a double U-profile or several I-profiles that are assembled in a lengthwise direction.

Within the meaning of the invention, "supporting" preferably means supporting or bracing from below. It is further preferable to provide support at those points of the facade scaffold where its load is transferred, in particular those points where the facade scaffold stands. Therefore, the support device preferably forms a base for the facade scaffold.

10 The invention is based on the approach of using a conventional facade scaffold known from the prior art in a first construction phase to erect the lower floors of a building structure, in particular the first and second floors above the ground floor, and to use the same facade scaffold as a climbing scaffold in a second construction phase to erect the further floors.

The invention implements this in such a way that a climbing system with climbing rails and a
15 support device is provided that are able to be connected to form a support structure. When used in accordance with its intended purpose, the support device of the climbing system is detachably connected to the climbing rails to form a support structure. In this context, the support device is arranged to support the facade scaffold. When used in accordance with its intended purpose, the support device supports the facade scaffold, and, in particular, the
20 support device supports the facade scaffold from below. In a first step, the facade scaffold is placed and/or mounted on the support device. Then, in a first construction phase, a first section of the building structure with at least the first floor and the second floor above the ground floor is erected. During this first construction phase, the facade scaffold secures the floors of the building structure. Once the floor slabs of the first few floors, in particular of the first two floors,
25 of the building structure have been erected, climbing shoes can be attached to these, in which the climbing rails can be received in a known manner. The climbing rails are connected to the support device to form the support structure in order to mount the entire support structure on at least one climbing rail by means of the climbing shoes. Preferably, the support structure formed by the support device and the climbing rails forms an L-shaped structure. In other
30 words, the climbing rails are mounted on the climbing shoes in a movable manner, whereby the support device is connected to the climbing rails and is thus mounted on the climbing rails.

The entire support structure formed by the climbing rails and the support device can then be moved along the building structure, preferably at least substantially in a horizontal direction.

As is known from the prior art, either a crane, which lifts the support device, or a lifting device, in particular a hydraulic device or a device comprising an electric motor, is used for the moving process. For example, such a device can be fastened, on the one hand, to the floor slabs or the climbing shoes and, on the other hand, to the support device in order to move the support device with respect to the floor slabs.

Then, in a second construction phase, a second section of the building structure with additional floors is erected. During this second construction phase, the facade scaffold, which has been moved upwards by means of the climbing system, again secures the additional floors of the building structure. This process can be repeated as often as desired.

The invention allows the open outside edges of floors of a building structure to be secured against hazards to persons by means of the facade scaffold both at the beginning of the construction phase and at a later stage of the construction phase, in particular during the entire construction phase. In addition, the facade scaffold can serve as a working platform during the first construction phase and subsequent construction phases. Activities such as applying exterior render and installation work, for example of windows, etc., can be carried out from the facade scaffold. Pure climbing protection screen systems, also known as climbing protection walls, as they are known from the prior art, can only be used above a certain height of the building structure. However, the disadvantage of this is that the outside edge of the building structure must be secured in some other way during the construction of the first floor or floors. With the climbing systems and rail-guided climbing scaffolds in accordance with the invention, this is solved by enabling the vertical position of the facade scaffold to be adjusted on the building structure by means of the climbing system.

In this context, commercially available facade scaffolds are particularly flexible in terms of possible shapes of facades of the building structure and the construction height. In addition, facade scaffolds are available from a large number of manufacturers and are particularly economical in terms of costs when compared to climbing scaffolds which are provided solely for the purpose as a climbing system.

Compared to the exclusive use of facade scaffold, a lot of scaffold material can be saved. In accordance with the invention, the facade scaffold only needs to be erected up to a certain

height, preferably around twelve meters. After that, this can be moved upwards by means of the climbing system for the purpose of erecting the rest of the building structure. By way of contrast, for conventional solutions, in which a facade scaffold with a height of several dozen meters is erected, appropriate reinforcement and fastening would have to be provided.

- 5 The invention combines the advantages of a facade scaffold with those of a climbing system. In particular, the adaptability of a facade scaffold on a building structure, in particular in terms of floor plan and height, can be transferred directly onto the climbing system. In addition, it is possible for the climbing system, in particular the climbing rails, the climbing shoes, and, if necessary, any drives, to be used only when it is really necessary, i.e. when the climbing scaffold has to be moved upwards. In addition, the facade scaffold can be set up independently of the climbing system and can be combined with different climbing systems.

Depending on the scenario of application, the climbing system, in particular its climbing shoes, can also be mounted on a wall instead of on floor slabs. In addition, it can also be mounted on balustrades and climb along them.

- 15 In an advantageous embodiment of the climbing system, the support device is connected to the climbing rails in the region of one end of the climbing rail. Preferably, this is one of the two ends in the longitudinal direction of the climbing rails. Further preferably, the support device can also be attached above the end of the climbing rail. As a result, preferably, an L-shaped structure of the support structure is formed. The support device can thus be arranged in the immediate vicinity of the ground or can even be placed on the ground.

In a further advantageous embodiment of the climbing system, the support device and the climbing rails are oriented at least substantially perpendicular to each other in the support structure. This advantageous embodiment is of advantage in particular if the facade of the building structure to be erected is intended to extend perpendicular with respect to the ground.

- 25 Within the meaning of the invention, "at least substantially perpendicular" means in a range between approximately 80° and approximately 100° or, in particular, approximately 90°.

- In a further advantageous embodiment of the climbing system, the support structure may further comprise cross braces, each of which additionally connects a climbing rail and a region of the support device facing away from the climbing rail. The cross braces can be used to further reinforce the support structure.

In a further advantageous embodiment of the climbing system, the support device comprises climbing rail beams, in particular I-beams and/or double U-beams and/or hollow section beams. The beams mentioned herein are characterized by high rigidity with respect to bending and torsional loads.

5 In a further advantageous embodiment, the support device is a support grid. By forming a support grid which supports the facade scaffold at those points at which its load is transferred, in particular on which the facade scaffold stands, a particularly lightweight construction of the support device can be realized. Therefore, the support grid preferably forms a base for the facade scaffold.

10 In a further advantageous embodiment of the climbing system, the beams of the support device are arranged in two planes. This allows a particularly flexible and compact support device to be realized. In particular, as a result of the arrangement in two planes, no welded connections of the beams of the support device are necessary. In particular, the beams do not have to be butt welded.

15 In a further advantageous embodiment, beams in a first plane run at least substantially perpendicular to beams in a second plane. This also enables a particularly sturdy construction of the support device to be achieved.

In a further advantageous embodiment of the climbing system, the beams of a first plane are oriented in such a way that they can be detachably connected to a respective climbing rail,
20 wherein beams of the first plane support beams of a second plane, and wherein beams of the second plane support the facade scaffold. This allows loads to be transferred by respectively supporting them from below.

In a further advantageous embodiment, the beams of the second plane connect the beams of the first plane to each other. As a result of this, there is no need for any additional connectors
25 between the beams of the first plane.

In a further advantageous embodiment of the climbing system, the support device comprises at least one fastening element, in particular a clevis, which can be fastened to the support device, in particular to the beams of the second plane, and which is configured respectively to receive at least one end of a vertical standard of the facade scaffold or to be received by the

vertical standard. The provision of such a fastening element allows the facade scaffold to be arranged particularly securely on the support device.

In a further advantageous embodiment of the climbing system, the fastening element comprises a first rod with a first threaded portion, in particular a base jack, wherein a nut, in particular a spindle nut, is located on the first threaded portion, by means of which spindle nut a support point for the vertical standard can be adjusted. The rod allows a vertical standard of the facade scaffold to be mounted particularly securely. In addition, the position of the support point for the vertical standards can be adjusted by the spindle nut, in particular in the horizontal direction.

10 In a further advantageous embodiment of the climbing system, the fastening element further comprises a first support element, a second support element and a second rod with a second threaded portion, wherein the first rod and the second rod are fastened to the first support element, wherein the first rod extends on a first side of the first support element and the second rod extends on a second side of the first support element which is opposite the first side, 15 wherein the second support element has a hole in which the second rod can be received. By providing the support element with the second rod with a threaded section, the fastening element can be fastened or clamped to the hole in a beam. As a result of this, the fastening element can be securely mounted on the support device without there being the risk that it could get lost.

20 In a further advantageous embodiment, the climbing system further comprises a coupling element, which can be detachably fastened to the climbing rails, and a coupling mechanism for secure fastening to the facade scaffold, in particular to at least one perforated disc, or at least one vertical standard of the facade scaffold, without there being the risk of getting lost. By providing the coupling element, the facade scaffold can also be attached to the climbing 25 rails. This enables additional securing of the facade scaffold at a vertical distance from the support device to be achieved. This is of advantage, in particular for securing the climbing scaffold with respect to dynamic loads, such as for example loads caused by wind.

In a further advantageous embodiment of the climbing system, the coupling mechanism is a wedge head coupler for detachable fastening to the at least one perforated disc. This 30 embodiment is particularly advantageous because commercially available modular scaffolds are equipped with such perforated discs, which can be engaged by a wedge head coupler.

This makes the system particularly versatile and allows the use of coupling points already provided for this purpose.

In a further advantageous embodiment of the climbing system, the coupling element comprises a fastening plate with at least one hole, in particular at least one oblong hole, through which a fastening means, in particular a screw, can be guided for detachable fastening to the climbing rail. This allows the coupling element to be fastened to a climbing rail in a particularly advantageous and detachable manner. If an oblong hole is used, the respective position of the coupling element on the vertical rail can still be finely adjusted. As a result of this, the flexibility of the coupling elements is increased. In particular, this allows them to be used on different climbing rails with different hole patterns. It also allows any deviations in the spacing of holes in the climbing rails to be compensated for.

In a further advantageous embodiment of the climbing system, the coupling element comprises arms on which the coupling mechanisms are arranged, preferably at least substantially at an angle of 45° to a fastening plate. The arms can be used to compensate for any gap between the location of the climbing rail and the cross braces and the vertical standards and/or perforated discs of a facade scaffold. The arrangement at an angle of 45° enables any gap between the climbing rail and the facade scaffold to be bridged in a particularly advantageous manner. In addition, this angle is adapted to the perforations of commercially available perforated discs.

Within the meaning of the invention, "at least substantially at an angle of 45° " means "in a range between approximately 30° and approximately 60° or, in particular, approximately 45° ".

In a further advantageous embodiment of the climbing system, the arms extend from a fastening plate of the connecting element in two different, in particular opposite, directions in such a way that the coupling elements are spaced apart from the fastening plate both in a direction parallel to the fastening plate and in a direction perpendicular to the fastening plate. This makes it particularly easy to bridge any distances between the climbing rails and the facade scaffold.

In a further advantageous embodiment of the climbing system, the arms are reinforced by a vertically oriented first web, and/or the fastening plate is reinforced by a vertically oriented second web, wherein the first web and the second web are preferably oriented perpendicular

to each other. By the provision of the webs on the coupling element, the latter can be designed for significantly higher longitudinal and transverse loads as well as torsional loads.

5 In a further advantageous embodiment, the climbing system further comprises an electric or hydraulic drive, which can preferably be detachably fastened, on the one hand, to the support structure and, on the other hand, to the climbing shoe and/or the building structure, by means of which electric or hydraulic drive the support structure can be moved in a self-climbing manner with respect to the climbing shoe. This enables the climbing system to be raised or lowered in relation to the building structure without the use of cranes or external lifting devices.

10 The features and advantages which have been described above in relation to the first aspect of the invention also apply accordingly to the other aspects of the invention and vice versa.

In an advantageous embodiment of the climbing scaffold, the facade scaffold comprises balconies which surround the climbing rails so that a gap between the building and the climbing scaffold can be reduced, in particular minimized. By means of this, the danger to persons posed by the open outside edges of the floors are further reduced.

15 In an advantageous embodiment, the method further comprises the following process step:

- attaching a cross brace between a climbing rail and a support device of the support structure.

In a further advantageous embodiment, the method further comprises the following process step:

- 20
- attaching an enclosure to a side of the facade scaffold, in particular the side facing towards the climbing rails.

In a further advantageous embodiment, the method further comprises the following process steps:

- further lifting of the climbing scaffold; and
- 25
- erecting a further part of the building structure.

By means of this, the building structure can be secured up to the top floor by means of the climbing scaffold according to the invention.

In an advantageous embodiment of the coupling element, the coupling mechanism is a wedge head coupler for detachable fastening to the at least one perforated disc.

In a further advantageous embodiment, the coupling element comprises arms on which the coupling mechanisms are arranged, preferably at least substantially at an angle of 45° to a fastening plate.

In a further advantageous embodiment of the coupling element, the arms extend from the fastening plate in two different, in particular opposite, directions in such a way that the coupling elements are spaced apart from the fastening plate both in a direction parallel to the fastening plates and in a direction perpendicular to the fastening plate.

In a further advantageous embodiment of the coupling element, the arms are reinforced by a vertically oriented first web, and/or the fastening plate is reinforced by a vertically oriented second web, wherein preferably only the first web and the second web are oriented perpendicular to each other.

Further advantages and features are apparent from the following description with reference to the figures.

The figures are at least partially schematic:

Figure 1 shows a perspective view of an example embodiment of a rail-guided climbing scaffold which is mounted on a building;

Figure 2 shows a further perspective view of the example embodiment of a rail-guided climbing scaffold according to Figure 1;

Figure 3 shows a perspective view of an example embodiment of a climbing system for a rail-guided climbing scaffold according to Figures 1 and 2;

Figure 4 shows a cross-sectional view of the example embodiment of a rail-guided climbing scaffold according to Figures 1 and 2;

Figure 5 shows a detailed view of Figure 4;

Figure 6 shows a detailed perspective view of an example embodiment of the support device with the facade scaffold placed thereupon;

Figure 7 shows a detailed view of Figure 6 in the region of one of the fastening elements;

Figure 8 shows a side view of a fastening element mounted on a support device, and with climbing scaffold placed thereupon;

5 **Figure 9** shows a detailed perspective view of Figure 3 in the region of the fastening elements;

Figure 10 shows a detailed perspective view of Figure 1 in the region of a coupling element;

Figure 11 shows a perspective view of an example embodiment of a coupling element as it is used in Figure 10;

10 **Figure 12** shows a perspective view of a second example embodiment of a climbing scaffold in the region of the support device;

Figure 13 shows a perspective view of an example embodiment of a rail-guided climbing protection screen which is installed on a building structure;

Figure 14 shows a detailed perspective view of the rail-guided climbing protection screen according to Figure 13 in the region of the support device; and

15 **Figure 15** shows a block diagram of an example embodiment of a method of erecting a building structure by means of a rail-guided climbing scaffold.

20 **Figure 1** shows a perspective view of a climbing scaffold 1 which is installed on floor slabs 8 of a building structure to be erected. Here, the climbing scaffold 1 comprises a support grid 2, on which a facade scaffold 9 is arranged. The support grid supports the climbing scaffold 1 and thus serves as a base for the climbing scaffold 1. The support grid 2 is supported by the ground 36 and is attached to climbing rails 5. In order to be supported by the ground 36, the support grid 2 preferably comprises height-adjustable feet (not shown) and/or is placed on wooden beams on the ground 36.

25 In turn, the climbing rails 5 are guided by the climbing shoes 7, with one climbing shoe 7 per climbing rail 5 being attached to each of the floor slab 8 of the first floor, the floor slab 8 of the second floor, and the floor slab 8 of the third floor. The facade scaffold 9, together with a support structure which is formed by the support grid 2 and the climbing rails 5, can be moved upwards in a vertical direction along the building, whereby, during the movement, the climbing rails 5 are guided by the climbing shoes 7 along the building structure.

This can be done in a manner known per se by means of electric or hydraulic lifting devices (not shown). Alternatively, the entirety of the support structure and the facade scaffold 9 can be lifted in a manner known per se by means of a crane (not shown).

Figure 2 shows the climbing scaffold 1 from Figure 1 in a perspective view as seen from the building structure, whereby the building structure is not shown.

Figure 3 shows a perspective view of a first embodiment of a climbing system 2 for a rail-guided climbing scaffold 1 of Figures 1 and 2.

The climbing system 2 comprises the support grid 6 as well as the climbing rails 5 and the extension 38 of the climbing rails, which together form a support structure 4 for a facade scaffold 9.

Further, the climbing system 2 comprises the clevises 11 and coupling elements 24 (not shown), to which a facade scaffold 9 (not shown) can be fastened on the support structure 4. As has been described above with reference to Figures 1 and 2 and in a known manner, the climbing rails 5 are guided on a building structure to be erected by means of climbing shoes 7. In this context, the climbing rails 5 can be inserted into the guides of the climbing shoes 7 both in a lateral direction and from above.

Figure 4 shows a lateral cross-sectional view of the climbing scaffold 1 from Figures 1 and 2 in a plane that intersects the climbing shoes 7 in the middle.

As has already been described in relation to the climbing system 2 according to Figure 3, the support structure 4, which supports the facade scaffold 9, comprises the support grid 6, a climbing rail 5, as well as a rail extension 38. The facade scaffold 9 comprises vertical standards 12 and horizontal bars 35. In this context, the vertical standards 12 are constructed in a modular manner and are assembled lengthways by inserting one into another. The facade scaffold 9 is fastened to the support structure 4 by means of clevises 11 and coupling elements 24. The support structure 4 is mounted on the climbing shoes 7 via the climbing rails 5, which climbing shoes 7, in turn, are fastened to the floor slabs 8 of a building structure by means of anchorages 37. Alternatively or additionally, vertical standards 12 with horizontal bars 35 form vertical frames, which can preferably be assembled in a modular fashion as well. Alternatively or additionally, horizontal bars 35 which are arranged at least substantially perpendicular to each other form horizontal frames. These can preferably be fastened to the vertical frames.

Figure 5 shows an enlargement of section A of Figure 4.

In the region of the floor slabs 8, platforms 33 are preferably arranged in the facade scaffold in order to provide a working platform here. From these working platforms, work can be carried out on the exterior of the building, such as applying exterior render and installation work, for example of the windows, etc.

Further, the support structure 4 preferably comprises a cross brace 10 in order to reduce lever forces at the attachment point between the climbing rail 5 and the support grid 6.

In the region of the platforms 33, the climbing scaffold 9 preferably also comprises balconies 15 which surround the climbing rails 5 in order to close gaps between the floor slabs 8 of the building structure and the platforms 33 and thus to provide better fall protection. The balconies 15 are preferably supported by additional cross braces (no reference sign) with respect to the vertical standards 12 of the climbing scaffold 9. Further, the facade scaffold 9 preferably also comprises vertical standards 35 for reinforcement.

The climbing rails 5 comprise locking elements (no reference sign) in a manner known per se, in order to be locked against gravity on corresponding counterparts on the climbing shoes 7.

Figure 6 shows an enlarged view of a climbing scaffold 1 according to Figure 2 in a perspective view in the region of the support grid 6.

As can be seen from Figure 6, the support grid 6 comprises two planes of beams 6a, 6b. Here, the first beams 6a of the lower plane are arranged perpendicular to the second beams 6b of the second plane, and a first beam 6a is connected to a respective climbing rail 5. The cross brace 10 is also preferably arranged between the climbing rail 5 and the respective first beams 6a. The two beams 6b rest on the first beams 6a and connect the first beams 6a to each other.

The first beams 6a and the second beams 6b are preferably connected by means of connectors 39. These connectors preferably comprise support elements which can be connected by means of a threaded rod and nuts, whereby the threaded rod is inserted through holes respectively in a first beam 6a and a second beam 6b.

The clevis 11 is explained in detail below with reference to Figures 7, 8, and 9:

Figure 7 shows an enlarged view of section B from Figure 6 in the region of the clevis 11. **Figure 8** shows an enlarged view of Figure 5 in the area of the clevis 11. **Figure 9** shows an enlarged view of section C in Figure 3.

5 In a manner similar to the connectors 39, the clevises 11 comprise a first support element 17 and a second support element 18, which are connected to a second threaded portion (not shown) by means of a second rod 19 by inserting the second rod 19 through a hole in a second beam 6b and by fastening the second support element 18 to the second threaded portion by means of a nut.

10 Preferably, the second rod 19 is constructed merely as a screw, which is inserted through a hole in the clevis 11, in particular through the first support element 17 of the clevis, and through a corresponding hole in the second support element 18, as is shown in the figures.

15 The clevis comprises, in addition to the support elements 17, 18, a first rod 13 with a threaded portion 20 on which a spindle nut 14 is arranged so as to be rotatable. Preferably, the first rod 13 is designed as an extension of the second rod 19. In the figures, the beam 6b of the support device is constructed as a double I-beam. The first rod 13 can be guided through the space in the beam so that the first section element 13 and the second section element 19 can be braced against each other by means of a nut (not shown).

20 Vertical standards 12 of the facade scaffold 9 are preferably placed on the first rods 13 of the clevis 11. These surround the first rods 13 until they meet the spindle nuts 14, which form a stop 16 for the vertical standards 12. The relative position of the stops 16 in relation to the stops 17 can be changed by turning the spindle nut 14.

25 As can also be seen from the figures, the facade scaffold 9 comprises a perforated disc 27 in the region of each of the end pieces of vertical standard modules. In this perforated disc, wedge head couplers can be locked to perforated discs by means of wedge heads. Further, individual elements of the vertical standards 12 and the horizontal bars 35 are preferably fastened to the perforated discs 27.

Figure 10 shows a perspective view of the climbing scaffold 1 in the region of the climbing rails 5, which are guided on the building by the climbing shoes 7.

In order to secure the facade scaffold 9 to the climbing rails 5, coupling elements 24 are preferably provided. These coupling elements 24 preferably comprise oblong holes 29a, 29b, by means of which they can be fastened to holes in the climbing rail 5 by means of screws 30. These holes are preferably formed in a fastening plate 28 of the coupling element 24. Arms 31a, 31b extend from the fastening plate 28 outwardly at an angle, preferably at an angle of 45° with respect to the fastening plate 28, and coupling mechanisms, in the case shown wedge head couplers, are attached to the arms 31a, 31b, which coupling mechanisms are constructed so as to be fastened to perforated discs 27 by means of wedge heads 25a, 25b.

In order to enable the climbing scaffold 1 to be walked upon, the facade scaffold 9 preferably comprises platforms which are attached between vertical standards 12 of the facade scaffold, in particular to the perforated discs 27. In order to make safe a gap between a building structure and the platforms 33, the balconies 15 already described above are also provided.

In Figure 10, a possible coupling mechanism between guide rail 5 and climbing shoe 7 is also shown.

Figure 11 shows a detailed view of an example embodiment of a coupling element 24 according to Figure 10.

As has already been explained above, the coupling element 24 comprises a fastening plate 28 in which oblong holes 29a, 29b are formed. Arms 31a, 31b extend from the fastening plate 28, preferably at an angle of about 45°, away from the fastening plate 28. At their ends, these arms 31a, 31b preferably have an angle as shown, wherein a plane formed by this angle is preferably oriented at least substantially perpendicular to the actual arm 31a, 31b. A wedge head coupler is preferably arranged on the plane as a coupling mechanism 25a. The wedge head coupler can be fastened with wedge heads 41a, 41b to a respective opening, in particular to openings of a perforated disc (not shown).

The fastening plate 28 as well as the arms 31a, 31b are preferably reinforced by means of a first web 32a and a second web 32b. The two webs 32a, 32b are preferably oriented at right angles to each other and are further preferably welded to the fastening plate 28 and the arms 31a, 31b. Preferably, the first strut 32a also extends in the region of the angle of the arms 31a, 31b.

Figure 12 shows a second example embodiment of a climbing scaffold 1, wherein a perspective view of the region of the lower end of the climbing rails 5 is shown.

In contrast to the first embodiment of the climbing scaffold 1, the climbing system 2 in the second embodiment comprises several parts. Accordingly, the climbing system 2 has two support devices 6. In this example embodiment, the support devices 6 also preferably comprise a first beam 6a, which can be connected and, in Figure 12, is connected, to the climbing rail 5, and a second beam 6b, which is supported vertically by the first beam 6a and which supports vertical standards 12 of the climbing scaffold 9. In this example embodiment, too, the support device 6, together with the climbing rail 5, forms a support structure 4 in the connected condition.

In contrast to the first example embodiment, however, here, not all of the vertical standards 12 are supported on the second beams 6b. Rather, the facade scaffold 9 is self-supporting in the region between the individual support devices 6.

When compared with the first example embodiment of the climbing scaffold 1, the second example embodiment requires significantly fewer beams 6a, 6b. As a result of this, in particular the load on the support device 6 and/or the support structure 4 due to the weight is reduced.

Figure 13 shows an example embodiment of a rail-guided climbing protection screen 3.

Here, the climbing protection screen 3 comprises a climbing scaffold 1 according to the first example embodiment as shown in Figure 1, as well as an enclosure 34, which closes off the facade scaffold 9 on the side which faces away from the building structure 8. In this way, a temporary building envelope for the building 8 can be achieved, which can also be moved with respect to the building structure 8.

In the same way, a climbing scaffold 1 of the second example embodiment according to Figure 12 can be used.

Figure 14 shows a detailed perspective view of the rail-guided climbing protection screen according to Figure 13 in the region of the support device 6.

The open regions of the facade scaffold 9 are closed off by the enclosure 34, which is formed in one piece or as individual elements, each of which closes off an opening which is formed by

the vertical standards 12 and the horizontal bars 35. Preferably, the enclosure 34 is constructed in the form of a mesh, plate, net, or sheet.

In the region of the climbing scaffold 9 which is directly adjacent to the support device 6, there are preferably no elements for the enclosure 34.

- 5 **Figure 15** shows an example embodiment of a method 100 for erecting a building structure 8 by means of a rail-guided climbing scaffold 1 in accordance with any one of the example embodiments described above.

In a first process step 101, the support grid 6 is provided at a location where a building structure 8 is to be erected.

- 10 In a second process step 102, a first portion of the building structure 8 is erected. Preferably, these are the first two floors of a building structure 8 with open outside edges of the floors. This may be different for other building structures. In any case, the building structure 8 must be high enough so that two climbing shoes 7 for the climbing rail 5 can be attached to the building structure 8 at a sufficient distance. Preferably, the facade scaffold 9 is used to erect this first
15 portion and already serves as a working platform and/or to provide safety for the people working on the construction site as well as for the area around the building structure to be erected.

- 20 In a third process step 103, the climbing shoes 7 are mounted on the first part of the building structure 8. In the embodiment shown, the climbing shoes 7 are anchored to the floor slabs 8 of the floors that have already been erected.

The climbing rails 5 are preferably inserted into the climbing shoes 7 in a fourth process step 104.

- 25 In a fifth process step 105, the climbing rails 5 are connected to the support grid 6 in order to form the support structure 4. Here, in particular, first beams 6a are connected to the climbing rails 5.

Further, in a sixth process step 106, a cross brace 10 is preferably attached between the climbing rail 5 and the support grid 6, in particular between the climbing rail 5 and a first support 6a of the support grid.

In an alternative embodiment, the fifth process step 105 and/or the sixth process step 106 may also be carried out before the fourth step 104. In this case, the support structure 4 is first created and only then is the climbing rail 5 inserted into the climbing shoe 7.

5 If it is not just a climbing scaffold 1 but a climbing protection screen 3, an enclosure 34 is attached, in a seventh process step 107, to one side of the facade scaffold 9 that faces away from the climbing rails. This process step can be performed at any time after the facade scaffold 9 has been mounted on the support grid 6. This is preferably done as soon as the climbing rails 5 are connected to the support grid 6 to form the support structure 4.

10 In an eighth process step 108, the climbing scaffold 1 is lifted for a first time. Preferably, the climbing scaffold 1 is then locked in this position on the climbing shoes 7.

As has already been described above, the lifting is preferably carried out in a known manner by means of an electric or hydraulic lifting device (not shown), which is attached between the support structure 4 and the climbing shoes 7 or the building structure 8. Otherwise, the lifting can also be carried out by means of a crane.

15 In a ninth process step 109, a second portion of the building structure 8, in particular a third floor slab 8, is erected.

In a tenth process step 110, further climbing shoes 7 are mounted on this second portion of the building structure 8, in particular on the third floor slab 8.

20 In an eleventh process step 111, the climbing scaffold 1 is lifted so that the climbing rails 5 are threaded into the additional climbing shoes 7 on the second portion of the building structure 8. Here, too, the climbing rails 5 are locked onto the climbing shoes 7.

Subsequently, further parts of the building structure 8 can be erected, whereby, in a twelfth process step 112, further floor slabs 8 in particular are erected.

25 The tenth process step 110 to the twelfth process step 112 are preferably repeated until the last floor of the building structure 8 has been erected.

It should be noted that the example embodiments are merely examples which are not intended to limit the scope of protection, the application, and the structure in any way. Rather, through the preceding description, the skilled person is provided with a guide for the implementation of at least one example embodiment, whereby various modifications, in particular with regard to
30 the function and the arrangement of the components described, can be made without departing

from the scope of protection as it results from the claims and their equivalent combinations of features.

List of Reference Signs

	1	Climbing scaffold
	2	Climbing system
	3	Climbing protection screen
5	4	Support structure
	5	Climbing rail
	6	Support device
	6a, 6b	First and second beams
	7	Climbing shoes
10	8	Building structure, floor slab
	9	Facade scaffold
	10	Cross brace
	11	Fastening element, clevis
	12	Vertical standard
15	13	First rod
	14	Nut
	15	Balcony
	16	Support point
	17	First support element
20	18	Second support element
	19	Second rod
	20	First threaded portion

	24	Coupling element
	25a, 25b	Coupling mechanism
	26	Safety device
	27	Perforated disc
5	28	Fastening plate
	29a, 29b	Hole, oblong holes
	30	Fastening means
	31a, 31b	Arms
	32a, 32b	Webs
10	33	Platform
	34	Enclosure
	35	Horizontal bar
	36	Ground
	37	Anchorage
15	38	Extension of the climbing rail
	39	Connector
	41a, 41b	Wedge heads

Claims

1. A climbing system (2) for a rail-guided climbing scaffold (1), comprising:
climbing rails (5);
5 a support device (6) configured to support a facade scaffold (9) and to be detachably connected to the climbing rails (5) to form a support structure (4); and
climbing shoes (7) for fastening to a building structure (8), configured to mount the support structure (4) on the climbing rails (5) such that it can be moved along the building structure (8).
10
2. The climbing system (2) according to claim 1, wherein the support structure (4) further comprises cross braces (10), each of which additionally connects a climbing rail (5) and a region of the support device (6) facing away from the climbing rail (5).
- 15 3. The climbing system (2) according to claim 1 or 2, wherein the support device (6) comprises supports (6a, 6b) which are arranged in two planes.
4. The climbing system (2) according to claim 3, wherein supports (6a) of a first plane are oriented in such a way that they can be detachably connected to a respective climbing
20 rail (5), wherein supports (6a) of the first plane support supports (6b) of a second plane, and wherein supports (6b) of the second plane support the facade scaffolding (9).
5. The climbing system (2) according to any one of the preceding claims, wherein the support device (6) comprises at least one fastening element (11), in particular a clevis,
25 which can be fastened to the support device (6), in particular to the supports (6b) of the second plane, and which is configured respectively to receive at least one end of a vertical standard (12) of the facade scaffold (9) or to be received by the vertical standard (23).
- 30 6. The climbing system (2) according to claim 5, wherein the fastening element (11) comprises a first rod (13) with a first threaded portion (20), in particular a base jack, wherein a nut (14), in particular a spindle nut, is located on the first threaded portion (20), by means of which spindle nut a support point (16) for the vertical standard (12) can be adjusted.
- 35 7. The climbing system (2) according to any one of the preceding claims, further comprising a coupling element (24) which can be detachably fastened to the climbing

rails (5) and which comprises a coupling mechanism (25a, 25b) for being detachably fastened to the facade scaffold (9), in particular to at least one perforated disc (27) or at least one vertical standard (12) of the facade scaffold (9).

- 5 8. The climbing system (2) according to claim 7, wherein the coupling mechanism (25a, 25b) is a wedge head coupler for detachable fastening to the at least one perforated disc (27).
- 10 9. The climbing system (2) according to claim 7 or 8, wherein the coupling element (24) comprises a fastening plate (28) with at least one hole (29a, 29b), in particular at least one oblong hole, through which a fastening means (30), in particular a screw, can be guided for detachable fastening to the climbing rail (5).
- 15 10. The climbing system (2) according to any one of claims 7 to 9, wherein the coupling element (24) comprises arms (31a, 31b) on which the coupling mechanisms (25a, 25b) are arranged, preferably at least substantially at an angle of 45° to a fastening plate (28).
- 20 11. The climbing system (2) according to claim 10, wherein the arms (31a, 31b) extend from a fastening plate (28) of the coupling element (24) in two different, in particular opposite, directions in such a way that the coupling mechanisms (25) are spaced apart from the fastening plate (28) both in a direction parallel to the fastening plate (28) and in a direction perpendicular to the fastening plate (28).
- 25 12. The climbing system according to claim 10 or 11, wherein the arms (31a, 31b) are reinforced by a vertically oriented first web (32a), and/or the fastening plate (28) is reinforced by a vertically aligned second web (32b), wherein the first web (32a) and the second web (32b) are preferably oriented perpendicular to each other.
- 30 13. A rail-guided climbing scaffold (1), in particular with a climbing system (2) according to any one of the preceding claims, comprising:
a facade scaffold (9);
climbing rails (5);
a support device (6) which supports the facade scaffold (9) and which is connected to
35 the climbing rails (5) to form a support structure (4); and

climbing shoes (7) for fastening to a building structure (8), configured to mount the support structure (4) on the climbing rails (5) such that it can be moved along the building structure (8),

wherein the facade scaffold (3) is fastened to the support structure (4).

5

14. A rail-guided climbing protection screen (3) with a climbing scaffold (1) according to claim 13, wherein an enclosure (34) is attached to a side of the facade scaffold (9) facing away from the climbing rails (5).

10 15. A method (100) of erecting a building structure (8) using a rail-guided climbing scaffold (1) according to claim 13 or 14, comprising the following process steps:

providing (101) the support device (6) at a location where a building structure (8) is to be erected;

mounting (101) the facade scaffold (9) on the support device (6);

15 erecting (102) a first portion of the building structure (8);

mounting (103) the climbing shoes (7) on the first portion of the building structure (8);

inserting (104) the climbing rails (5) into the climbing shoes (7);

connecting (105) the climbing rails (5) to the support device (6) to form the support structure (4);

20 lifting (108) the climbing scaffold (1) a first time; and

erecting (109) a second portion of the building structure (8).