

Stripping Head and Formwork System

TECHNICAL FIELD

The invention relates to a stripping head adapted to support beams and/or panels of a formwork system, as well as a formwork system having such a stripping head.

In the field of construction engineering formwork panels are used to define spaces which are filled with steel reinforcement bars and concrete in order to create walls and slabs of buildings. Particularly the slab panels are usually supported by beams which are in turn supported by props. In order to facilitate the removal of the panels and the beams without endangering the persons handling these components of formwork system, so-called stripping heads are used.

BACKGROUND OF THE INVENTION

In this context, stripping heads are known and widely used in practice, which have a vertically movable part and a wedge which can be shifted between two positions. In a first position, the wedge supports the movable part in a use position, in which concrete is poured on the panels held by the stripping head in order to form a slab. In a second position, the movable part is supported at a height approximately a few centimeters lower than the above-described use position in order to allow the panels and any beams supporting the panels to be removed after the concrete has sufficiently hardened. However, sometimes the panels stick to the newly formed slab and any attempts by personnel,

which is frequently not highly qualified, to remove the panels and beams, can lead to dangerous situations.

SUMMARY OF THE INVENTION

Embodiments of the invention provide a stripping head which allows safe and reliable handling of components of a formwork system, particularly during stripping, i.e. disassembly of the system.

According to the first aspect of the invention the stripping head described in claim 1 is provided.

Accordingly, the stripping head according to the first aspect is connected or connectable with, at its lower end, with a prop, and connectable vertically downward. In other words, the stripping head described herein can be an integral part of a prop. However, it can also be a separate component, which is connectable with a prop at the top thereof.

The novel stripping head is, moreover, connectable with at least one beam and/or panel at its upper part. Thus, beams and/or panels can be supported by the stripping head and are, furthermore, positively engagable with a wedge of the stripping head such that displacement of the wedge in a vertical direction will also move the beam and/or the panel vertically and will, particularly, overcome any sticking force which may be present towards the newly formed slab. The described vertical displacement of the wedge is essentially effected by a horizontal displacement of the wedge and the wedge's engagement with a fixed portion of the stripping head transforming the horizontal displacement into a vertical displacement. As will be detailed below, this can, for example, be achieved by an appropriate ramp or a similar inclined surface of the wedge. In any case, the personnel do not have to make an effort to remove the formwork panels from the newly formed slab. Rather, horizontal displacement of the

wedge causes the panels and beams to "come down" a few centimeters so as to allow safe removal thereof.

It is noted that the wedge can be directly or indirectly engagable with the beams and/or the panels. In other words, one or more intermediate parts, such as a clip and/or plate described in more detail below can be present between the wedge and the beam and/or the panel.

Preferred embodiments of the stripping head described herein are defined in the dependent claims.

As already indicated, a clip having at least one clip recess is currently preferred for at least indirectly engaging the wedge with the beam and/or the panel.

Moreover, a plate guiding the wedge and being guided by a stationary part of the stripping head can be present between the wedge and the beam or the panel. Since the plate serves to transfer the vertical movement of the wedge to the beam and/or the panel, the plate is, in use of the stripping head, moveable in a substantially vertical direction by being guided on the stationary part of the stripping head.

When the clip and the plate are present, it has proven advantageous to provide the plate with at least one key hole for inserting the clip. The inserted clip will engage the beam and/or the panel with the plate.

As regards the fixed portion of the stripping head, with which the wedge is engagable, it is currently preferred to form this as at least one horizontally extending projection. This projection preferably has a substantially circular cross-section in order to allow smooth engagement with an inclined or ramped contour of the wedge.

Accordingly, the wedge preferably has at least one ramp facing the fixed portion for engagement therewith.

It has, moreover, proven advantageous to provide the stripping head with at least one stop which is adapted to cooperate with a portion of the beam so as to restrict movement of the beam in a longitudinal direction thereof. This allows a safe and reliable positioning of the beam as long as concrete is (to be) poured so as to create a slab as well as during a first stage of disassembly.

In this context, the at least one stop can in a particularly simple manner be integral with a guide for guiding the wedge, and the integral part providing the mentioned functions can be formed on or through the plate mentioned above.

The above-mentioned clip preferably has at least one clip recess adapted to accommodate a portion of the wedge and/or of the plate and/or of the beam and/or of the panel. As indicated above, the clip can thus be used to connect a beam or panel with a plate of the stripping head. However, the clip can also be used to connect formwork panels, particularly the panel described in more detail below with an adjacent panel, usually a slab panel, and the projection of the described formwork panel is advantageously used to apply the required clamping force by the clip.

An L-shape is preferred for the clip, in order to allow the clip to be brought, particularly turned into a position, in which the clamping force is applied. It is noted that the recess is preferably present on one leg of the L-shape, and the other leg provides a lever arm for applying the mentioned turning force.

Since the described clamping force requires a contour to take up the counter force, it has proven advantageous to provide

the clip with at least two radial extensions which define the clip recess between them.

It is, moreover, advantageous to provide a formwork system at least one radial extension, which is adapted to act as a spacer between connected formwork panels. The formwork panels can, for example, be connected with an angle of 90° , and one formwork panel can be the above-described formwork panel, and the connected panel can be a slab panel. As can be seen from the enclosed drawings, the appropriate angle and/or spacing can advantageously be reliably secured when the clip has at least one radial extension which defines the distance between appropriate contours of the panels and, as a consequence, of the panels themselves and/or the angle between them.

According to another aspect of the system, it is provided a formwork system having at least one stripping head as described above and at least one or preferably a plurality of formwork panels and beams.

Moreover, the formwork system described herein preferably has a formwork panel having a top part with a certain thickness. A recess is present adjacent the top part and reduces the thickness adjacent the top part. Finally, a projection projects into the recess.

It is noted that the novel type of formwork panel is usually used as a wall panel, i.e. it is, in use, vertically oriented. The top part is that part of the panel, which represents the highest point of the panel, when the panel is arranged vertically. In this orientation, the thickness extends horizontally. As will be detailed below, the top part preferably defines an approximately horizontal surface, which is part of that horizontal surface on which concrete is poured in order to build a slab or a ceiling. Since the novel panel can advantageously be used as the top most wall panel and thus contributes to the transition to (horizontally

oriented) slab panels, the top part of the novel panel can be said to define the slab at the edges thereof, i.e. at the transitions to the walls.

The above-mentioned recess adjacent the top part, which reduces the thickness adjacent the top part, allows the panel to be pivoted away from the (newly cast) concrete wall in order to remove the panel. The described pivoting movement is essentially effected about the point of transition between the top part having a certain thickness and the recess. Finally, a projection projects into the recess and allows the novel panel to be connected and held together with an adjacent slab panel. Due to the described recess, the mentioned pivoting movement in order to remove the panel can be performed without the need of excessive force or torque and in a safe manner also by personnel lacking a particularly high qualification.

Whereas the novel formwork panel can be a corner panel, it is preferred that the panel is essentially plate-like and, consequently, constitutes a wall panel having specific features leading to the described advantages, when the panel is used as the top most wall panel.

In order to contribute to the safe and easy handling of the panel described herein, it is currently preferred that it is at least primarily made of aluminum. This particularly applies to any structural parts thereof, i.e. those parts, which provide the panel with rigidity and stiffness. It is noted that particularly those parts of the panel, which are essentially plate-like and define the surface of the wall to be concreted, can be made of wood such as plywood.

In a preferred embodiment, the formwork panel has an inclined bottom opposite the top part in order to facilitate the removal of any formwork panels which are present underneath the formwork panel described herein.

The above described pivoting movement for stripping the panel described herein is further facilitated by a rounded corner which is preferably present at the top part opposite the recess. During the described pivoting movement, the corner of the top part opposite the recess slides along the newly cast concrete wall, and this action is significantly smoothed by the described rounded corner.

As regards the above described recess and/or projection and/or rounded corner, these are easily manufactured by extrusion molding. In particular, an integrated profile having all of the above-mentioned structural contours can be provided and can form the top most region of the panel described herein.

In view of the preferred embodiment of the above described formwork panel having an inclined bottom, it is preferred for the formwork system to have at least one formwork panel having an inclined top. The inclined surfaces are advantageously complementary to each other and allow the reliable stacking in order to define one side or wall to be formed by concrete. Further, as mentioned above, the inclined structures allow a ready stripping, particularly with the lower wall panels first. In other words, the above described novel formwork panel and any slab panels are removed last which supports an efficient assembly of the formwork system described herein in a further floor on top of a newly formed floor. This is because lower wall panel can be removed first and can immediately be brought up to a further floor.

In order to allow walls with different heights to be provided with one and the same system, the formwork system preferably has wall formwork panels of at least two different heights. In this context, it is noted that the above described novel formwork panel can have a height corresponding to a usual

wall height. However, the novel formwork panel can also have a significantly lower height and different wall heights can be provided by one or more further formwork panels having appropriate heights. In particular, in order to ensure easy and reliable handling of the wall formwork panels, several panels having a certain height can be provided to form a significant part of a wall, with the above described formwork panel forming the top part and several different formwork panels forming the lowest part of the wall and allowing different wall heights to be realized.

Finally, particularly for lower parts of a wall, panels with a smaller height can be provided and advantageously have anchors arranged with smaller pitch than panels with a greater height, in order to accommodate the higher concrete pressure and corresponding forces which are present in the lower parts of a wall. It is noted that the anchors preferably used together with the formwork system described herein have an outer sleeve which stays in the concrete wall, after the anchors are removed.

BRIEF DESCRIPTION OF THE DRAWINGS

Hereinafter, the invention is described with reference to preferred embodiments which are shown in the drawings, in which:

- Fig. 1 shows elements of a formwork system in use;
- Fig. 2a shows the transition between a slab and a wall panel during removal of the wall panel;
- Fig. 2b shows the connection between the slab and the wall panel of Fig. 2a;
- Fig. 3 shows a clip used to connect the panels of the formwork system;

- Fig. 4 shows the novel stripping head in a first position;
- Fig. 5 shows the novel stripping head in a second position;
- Fig. 6 shows the novel stripping head in a perspective bottom view;
- Fig. 7 shows the novel stripping head in the second position viewed perpendicular to the viewing direction of Fig. 5; and
- Fig. 8 shows the novel stripping head in a view corresponding to Fig. 7 and in a third position.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

As can be seen in Fig. 1, several wall formwork panels, among them the top most formwork panel 10 are used to define an essentially vertical space between them, into which concrete is poured in order to form a wall 28. Further, several slab panels 30 are arranged essentially horizontally in order to allow concrete to form a slab 32. The slab panels 30 are supported by appropriate stripping heads 40 and props 42.

When the concrete of the wall 28 and the slab 32 is sufficiently hard, the wall panels can be removed. This is advantageously facilitated by the novel formwork panel 10 having an inclined bottom 18 and the formwork panel underneath the novel formwork panel 10 having a correspondingly inclined top. These structures allow the formwork panel underneath the novel formwork panel 10 to be removed first, by swiveling it away from the wall 28, about the panel's bottom, and any further formwork panels, which define the wall 28, to be removed afterwards.

As can particularly be seen in Fig. 2a, the structure of the top of the novel formwork panels 10 significantly facilitates this removal. This is because the top part 12 of the formwork panel 10 has a thickness T which defines the contribution of the novel formwork panel to that surface on which concrete is poured to form the slab 32. In order to allow the formwork panel 10 to be removed without excessive force, a recess 14 reducing the thickness adjacent to the top part is provided underneath the top part. This, advantageously together with a rounded corner 20 opposite the recess 14 allows the formwork panel 10 to be pivoted or inclined essentially as shown in Fig. 2a, i.e. about the transition to the slab panel 30 and, in lower parts of the formwork panel 10, away from the wall 28. In this inclined state, the panel 10 can be removed by pulling it essentially vertically downwards. The position, where the recess starts underneath the "full" thickness T of the top part 12, can advantageously be at the same height (as shown in Fig. 2a) as the lower end of the rounded corner 20 or even at a somewhat higher height than this end, in order to facilitate the pivoting. As indicated in Fig. 1, the projection 16 projecting into the recess essentially perpendicular to the thickness direction (from left to right in figures 1 and 2) allows the formwork panel 10 to be clamped to the slab panel 30 by means of a clip.

Fig. 3 shows this clip 22 in a perspective view. The clip 22 is essentially L-shaped, and a first, annular extension 26.1 defines, how deep the clip 22 can be inserted into a key hole 34 such as shown in the left part of Fig. 2a. A second radial extension 26.2 is adapted to engage and accommodate the projection 16 of the formwork panel 10. The projection 16 will be accommodated in the clip recess 24 between the extensions 26. Thus, in use, the (shorter) leg of the clip 22 having the projections 26 is inserted (from left to right in Fig. 2a into a key hole such as that denoted with 34 and being present in the slab panel 30 at a position facing the wall panel 10. Afterwards, a pivoting or turning force can be

applied by means of the longer leg of the clip 22 in order to bring the longer leg 22, in the embodiment shown, in an essentially vertical orientation and allow the second radial projection 26.2 to engage the projection 16 of the formwork panel 10 at the side opposite the recess 14. Thus, the formwork panel 10 can be connected with or clamped to a slab panel 30 and the assembly of Fig. 1 can be provided.

It can be seen in Fig. 2a that the recess 14, the projection 16, the rounded corner 20 and the top part 12 as a whole are formed on an integrated profile, which can be formed by extrusion molding. Also the L- and S-formed portions providing the formwork panel 10 with the required reinforcing structures can be formed on the integrated profile which is part of a reliable formwork panel as described above. In particular, the integrated profile can be formed of aluminum in order to save weight.

The first radial extension 26.1 can have ridges 36 facing the second radial extension 26.2 which are adapted to engage with complement any recesses in order to define a certain, preferably clamped or engaged position of the clip 22.

In the depicted embodiment, the (along the shorter leg of the clip 22) axial length A of a third extension 26.3 opposite the second extension 26.2 essentially corresponds to the distance between the end of the slab panel 30 (Fig. 2a; in horizontal direction towards the wall panel 10) and the vertical leg 38 of the above described S-shaped structure in order to define the relative positions of wall panel 10 and slab panel 30 with an angle of essentially 90° between them.

This is additionally shown in Fig. 2b which shows a state, in which the slab panel 30 and the wall panel 10 are connected by means of the clip 22. It can be seen that the projection 16 of the wall panel 10 is accommodated in the clip recess 24 between the radial extension 26.2 and the radial extension

26.1 only visible in Fig. 3. Moreover, the radial extension 26.3, provided in the embodiment shown essentially opposite the extension 26.2, defines the distance between the slab panel 30 and the vertical leg 38 and, as consequence, the distance of the wall panel 10 to the slab panel 30. This, in cooperation with the fact that the top part 12 of the wall panel 10 abuts the slab panel 30, ensures a connection with an angle of essentially 90° between the two panels.

It is noted that the above described clip with all features and embodiments is considered a separate invention which advantageously allows a connection of formwork panels having appropriate key holes. Thus, the clip is to be seen as subject-matter of the present disclosure which can have one or more of the mentioned features and embodiments and can advantageously be combined with the formwork panels and systems described herein.

Fig. 4 shows the novel stripping head in use in more detail. As will be further explained with regard to Fig. 6, the novel stripping head 40 has a stationary pole 50 which, in the embodiment shown, has a cross-section essentially in the form of a square with rounded edges. A stationary plate 54 is provided at the lower end of the pole 50 and abuts, in the use state shown in Fig. 4, a prop plate 56. Moreover, the stripping head 40 has a tubular extension 58 (see Fig. 6) which is accommodated in the top part of the prop 42.

A wedge 48 having a rectangular aperture in essentially the center thereof is movable in a horizontal direction with regard to the stationary pole 50. As can be seen better in Fig. 6, the horizontal movement of the wedge 48 is guided by hooks 60 provided at the bottom of a plate 62 which is movable along the pole 50 in a vertical direction only. As can also be seen in Fig. 6, the plate has key holes 34, through which the clip 22 of Fig. 3 can be inserted so as to clamp a beam 44 (see Fig. 4). As can also be seen in Fig. 4,

slab formwork panels 46 are clamped to the beam 44 by means of further clips.

As will be described in more detail with regard to Fig. 6, the arrangement comprising wedge 48, clip 22, plate 62, beam 44 and panels 46 can be urged downwards, i.e. away from the slab 32 by a distance B which can, for example, be 15 mm. This urging downwards is essentially achieved by the positive engagement between all of the above-mentioned components. In other words, the hooks 60 force the plate 62 to move vertically downwards when the wedge 48 moves downwards, and by means of the clips 22 clamping the beam 44 to plate 62, also the beam 44, and as a consequence the panels 46 are moved downwards. Thus, any adherence between the panel 46 and the beam 44, on the one hand, and the slab 32 on the other hand, can be overcome. As indicated by the comparison between Fig. 4 and 5, the downward movement is effected by bringing the wedge 48 into a horizontally different position. The horizontal movement of the wedge can, for example, be effected by applying a horizontal force with a hammer.

As can be seen in Fig. 6, the wedge 48 has, at the bottom thereof, two ramps 64, which form a surface which is not oriented horizontally, but, in the embodiment shown, is higher at the end of the wedge 48 than at the center thereof. Consequently, when the wedge 48 is moved from the state shown in Fig. 4 and 6 towards the right in Fig. 4 and the left in Fig. 6, two projections 66 provided on the pole 50, only one of which can be seen in Fig. 6, engage with the ramps 64 and positively urge the wedge 48 downwards. This also brings the above-mentioned components, which are positively engaged with the wedge 48, either directly or indirectly, downwards. In order to completely remove the formwork system, the clip 22 clamping the beam 44 to the plate 62 can be removed, and the plate 62 together with the wedge 48 can be allowed to drop all the way to the plate 54 of the stripping head.

Afterwards, in particular after the topmost wall panel 10 has been removed as shown in Fig. 2a, the slab panels 46 can be removed, starting with those near the walls. In order to accomplish this, the clips clamping these slab panels 46 to the beam 44 are removed first.

Fig. 7 shows that the beams 44 (two of which are shown in Fig. 7) cannot be removed when the stripping head is in the second position shown in Fig. 5 and 7. It is noted that with the viewing direction of Fig. 5, the beam 44 extends perpendicular to the plane of the drawing, and Fig. 7 represents a view essentially perpendicular to the viewing direction of Fig. 5 so that the two beams shown in Fig. 7 extend from left to right. In particular, they essentially end at a top plate 68 of the stripping head and, together with this top plate 68, essentially form a strip-like surface, adjacent to which (see Fig. 4) slab panels 46 are present. In a lower part of the beam 44, a beam recess 70 is present, into which both in the position of Fig. 5 and 7 and that of Fig. 4 a stop 72 extends. In the embodiment shown, the stop 72 is formed integral with the hook 60 guiding the wedge 48 (see Fig. 6).

The stop 72 cooperates with a sidewall 74 of the beam 44 so as to restrict any movement in the longitudinal direction of the beam 44, i.e. from left to right in Fig. 7. The sidewall 74 is, moreover, provided with an extension 76 which extends beyond the upper edge of the beam 44, i.e. that edge which abuts the top plate 68 of the stripping head in the position shown in Fig. 4 and is, in this position, urged towards the top plate 68 by the stop 72.

As can be seen in Fig. 7, when the stripping head including the beams 44 has been lowered somewhat, the extensions 76 rest on a base plate 78 of the stripping head. In this position, the beams 44 cannot be removed yet. This is, firstly, because of the clips 22 which connect the beams 44

with the plate 62 of the stripping head. Further, the stops 72 restrain the movement of the beams in a longitudinal direction thereof which is not necessarily restricted by the clips 22.

As can be seen in Fig. 8, as soon as the clips 22 are removed, the assembly of wedge 48, plate 62, guide 60 and stop 72 can be brought to a lower, third position, in which the mentioned assembly rests on the stationary plate 54. The stops 72 do no longer restrict the movement of the beams 44 in their longitudinal direction so that these can be removed. It is noted that the stop 72 and the guide 60 are integrally provided on an essentially C-formed component which is arranged so as to extend through the plate 62.

Afterwards, further slab panels, for example, those left of the beam in Fig. 5, assuming that those right of the beam are the slab panels closest to the wall, can be removed, further beams can be taken away as described above and finally, also the props including the stripping heads can be brought down. However, some time can pass between removing the panels and the beams and removing the props in order to support the not entirely hardened slab at some points, i.e. where the props are located.

Claims

1. A stripping head (40), connected or connectable with, at its lower end, with a prop (42), and connectable with, at its upper part with at least one beam (44) and/or panel (46), having a wedge (48), which is at least indirectly positively engagable with the beam (44) and/or the panel (46) and with a fixed portion (66) of the stripping head (40) such that displacement of the wedge (48) in horizontal direction urges the beam (44) and/or the panel (46) vertically downwards.
2. The stripping head of claim 1, characterized in that the wedge (48) is engagable with the beam (44) and/or the panel (46) by means of a clip (22) having at least one clip recess (24).
3. The stripping head of claim 1 or 2, characterized in that the wedge (48) is engagable with the beam (44) and/or the panel (46) by means of a plate (62) guiding the wedge (48) and being guided by a stationary part (50) of the stripping head (40) which is, in use, oriented essentially vertically.
4. The stripping head of claims 2 or 3, characterized in that the plate (62) has at least one key hole (34) for inserting the clip (22).
5. The stripping head of one of the preceding claims, characterized in that the fixed portion (66) of the stripping head (40) is at least one projection, which extends essentially horizontally and preferably has a substantially circular cross-section.

6. The stripping head of one of the preceding claims, characterized in that the wedge (48) has at least one ramp (64) facing the fixed portion (66) of the stripping head (40).
7. The stripping head of one of the preceding claims, characterized in that it further comprises at least one stop (72) adapted to cooperate with a portion (74) of the beam (44) so as to restrict movement of the beam (44) in a longitudinal direction thereof.
8. The stripping head of claim 7, characterized in that the stop (72) and a guide (60) for guiding the wedge (48) are integrally formed.
9. The stripping head of one of claims 2 to 8, characterized in that the clip has a clip recess (24) adapted to accommodate a portion of the wedge (48) and/or of the plate (62) and/or of the beam (44) and/or of the panel (46).
10. The stripping head of one of claims 2 to 9, characterized in that the clip (22) is essentially L-shaped.
11. The stripping head of one of claims 2 to 10, characterized in that the clip (22) has at least two radial extensions (26) defining the clip recess (24) between them.
12. The stripping head in accordance with one of claims 9 to 11, characterized in that the clip (22) has at least one radial extension (26.3) adapted to act as a spacer between two formwork panels (10, 30).
13. Formwork system having at least one stripping head of one of the preceding claims and at least one of, preferably a plurality of panels (46) and beams (44).

14. The formwork system of claim 13, characterized in that at least one formwork panel (10) has:
 - a top part (12) having a thickness (T)
 - a recess (14) adjacent the top part (12) so as to reduce the thickness adjacent the top part (12), and
 - a projection (16) projecting into the recess (14).
15. The formwork system of claim 14, characterized in that the formwork panel (10) is plate-like.
16. The formwork system of claims 14 or 15, characterized in that the formwork panel is at least primarily made of aluminum.
17. The formwork system of one of claims 14 to 16, characterized in that the formwork panel (10) has an inclined bottom (18) opposite the top part (12).
18. The formwork system of one of claims 14 to 17, characterized in that the top part (12) of the formwork panel (10) has a rounded corner (20) opposite the recess (14).
19. The formwork system of one of claims 14 to 18, characterized in that the recess (14) and/or the projection (16) and/or the rounded corner (20) of the formwork panel (10) is formed by extrusion molding.
20. The formwork system of one of claims 13 to 19, further having at least one wall formwork panel having an inclined top.

21. The formwork system of one of claims 13 to 20, further having wall formwork panels of at least two different heights.
22. The formwork system of claim 21, characterized in that panels with a smaller height have anchors arranged with a smaller pitch than panels with a greater height.