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MOBILE ROLL FORMER ASSEMBLY

The present invention relates to a roll former assembly.

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The present invention relates particularly to a roll former assembly that can roll form coiled flat strip into a required profiled form and shear profiled strip into sheets of required length and thereafter transfer roll-formed profiled decking sheets onto an elevated section of a structure, such as a building, that requires the sheets in the construction of the structure.

The present invention also relates to a support structure that can support and guide the profiled decking sheets upwardly from a roll former onto the elevated section of the structure.

Profiled decking sheets are used in a range of applications in the construction of buildings, including, by way of example, as roof cladding materials and as base members of composite concrete slabs.

The present invention is concerned particularly, although by no means exclusively, with profiled decking sheets that are longer than the maximum length (typically 25 m) that can be transported by truck from a manufacturing plant to a building site.

The present invention is concerned more particularly, although by no means exclusively, with profiled decking sheets for use as roof cladding materials for roofs of industrial buildings.

In general terms, the present invention provides a portable roll former assembly that can be transported to a building site and operated at the site to roll form

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profiled decking sheets and to deliver the sheets onto an elevated section of a structure (such as a roof) being constructed on the site at or near to the required locations for the sheets.

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The roll former assembly of the present invention includes (a) a roll former that can be tilted from a transport position to an inclined position and operated to roll form profiled decking sheets of a required length and (b) a support structure that can support and guide the profiled decking sheets upwardly from the roll former onto the elevated section of the structure.

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Preferably the roll former is adapted to be operated on the site to roll form coiled flat strip into a required profiled form and shear the profiled strip into profiled decking sheets of required length at an outlet end of the roll former.

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Preferably the roll former assembly includes a base structure, such as a tray of a vehicle on which the roll former is located, and the roll former is mounted on the base structure.

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The transport position of the roll former may be a position in which the roll former is flat on the base structure, ie not tilted with respect to a base plane of the base structure.

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Alternatively, the transport position may be a position in which the roll former is inclined relative to the base structure.

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Preferably the roll former is mounted on the base structure so that it can be tilted upwardly with respect to the base structure from the transport position to the inclined position, whereby in the inclined position the

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outlet end of the roll former is clear of the base structure so that the profiled decking sheets produced in the roll former are discharged from the roll former in an upward direction towards the section of the structure under construction.

The support structure for the roll-formed profiled decking sheets produced by the roll former may include a means for coupling a rearward end of the support structure to the roll former or a base structure that supports the roll former so as to be an extension of the roll former or the base structure and at least substantially bridge a gap between the roll former and the structure under construction and support and guide profiled decking sheets from the outlet end of the roll former across the gap to the structure.

The support structure may include a means for coupling the support structure, and more preferably the forward end of the support structure, to the structure under construction.

Alternatively, the support structure may be constructed so that, in use, it is not necessary for the support structure to be coupled to the structure under construction.

Alternatively, the support structure may be a free-standing structure that need not be coupled to the roll former or the base structure or the structure under construction.

Preferably the support structure includes a means for supporting and guiding profiled decking sheets along the length of the support structure.

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Preferably the support/guide means includes a plurality of guide rollers positioned at spaced intervals along the length of the support structure.

5 The guide rollers may include guide rollers that are arranged in pairs of upper and lower rollers that are adapted to contact and guide upper and lower surfaces of the profiled decking sheets.

10 Alternatively, or in addition, the guide rollers may include guide rollers that are adapted to contact and guide lower surfaces of the profiled decking sheets.

15 Preferably the support/guide means is adapted to support and guide profiled decking sheets along a curved path at a forward end of the support structure so that the sheets can be transferred onto the structure under construction in a preferred orientation with respect to the structure.

20 The term "preferred orientation with respect to the structure" is understood herein to mean an orientation that is conducive to handling the profiled decking sheets on the structure under construction.

25 Preferably the radius of the curved path is selected so that the sheets can be bent without permanently deforming the sheets.

30 The radius of the curved path may be a fixed radius.

 Alternatively, radius of the curved path may be an adjustable radius.

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The support/guide means may be adjustable at the forward end of the support structure to thereby facilitate adjustment of the radius of the curved path.

5 For example, the pairs of upper and lower guide rollers may be adjustable with respect to each other at the forward end of the support structure thereby to facilitate adjustment the radius of the curved path.

10 The roll former assembly may be formed so that, in use, profiled decking strip produced by the roll former is forced part way along the support structure by the roll former prior to the roll former shearing the strip into profiled decking sheets.

15 The profiled decking sheets may be winched or otherwise pulled the balance of the distance along the support structure onto the structure under construction.

20 Alternatively, the support structure may include a means for moving profiled decking sheets along the support structure while being supported and guided by the support structure and transferring the profiled decking sheets to the structure under construction.

25 Preferably the means for moving profiled decking sheets along the support structure includes drive rollers.

30 Preferably the support structure includes a plurality of modular sections that can be coupled together to form the support structure.

35 According to the present invention there is provided a support structure for supporting and guiding roll-formed profiled decking sheets produced by a roll former from an outlet end of the roll former to a structure under construction and thereby define a bridge

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between the roll former and the structure under construction.

5 Preferably the support structure includes a plurality of modular sections that can be coupled together to form the support structure.

10 The support structure may include a means for coupling a rearward end of the support structure to the roll former or a base structure that supports the roll former.

15 The support structure may include a means for coupling the support structure to the structure under construction.

20 Alternatively, the support structure may be constructed so that, in use, it is not necessary for the support structure to be coupled to the structure under construction.

25 Alternatively, the support structure may be a free-standing structure that need not be coupled to the roll former or the base structure or the structure under construction.

The present invention is described further with reference to the accompanying drawings of which:

30 Figure 1 is a side elevation view of one embodiment of a roll former assembly in accordance with the present invention that is positioned in relation to a building under construction;

35 Figure 2 is a perspective view of a support structure of another embodiment of a roll former assembly in accordance with the present invention that includes

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four modules connected together in an end to end arrangement;

Figures 3 and 4 are top and side elevation views, respectively, of the support structure shown in Figure 2;

Figures 5 to 7 are perspective, side elevation, and top elevation views, respectively, of the most rearward one of the four modules of the support structure shown in Figure 2;

Figures 8 to 10 are perspective, top elevation, and side elevation views, respectively, of the next one of the four modules of the support structure shown in Figure 2;

Figures 11 to 13 are perspective, top elevation, and side elevation views, respectively, of the next one of the four modules of the support structure shown in Figure 2; and

Figures 14 to 16 are perspective, top elevation, and side elevation views, respectively, of the most forward one of the four modules of the support structure shown in Figure 2.

Figure 1 illustrates one embodiment of the roll former assembly in an operative position in which profiled decking sheets are being delivered onto a roof 7 of the building 5 shown in the drawing.

The roll former assembly shown in Figure 1 includes a vehicle-mounted roll former generally identified by the numeral 9.

The roll former 9 is of conventional configuration and includes a series of roll former stands

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shown schematically by the numerals 41 that are arranged to progressively roll form a flat sheet of steel strip that, in use, is unwound from an uncoiler 11, into a required profile and a shear 23 at an outlet end (ie at the rear of the tray 15) of the roll former 9.

A typical profile comprises a series of flat pans separated by upstanding closed ribs (typically trapezoidal in section) and male and female formations at opposite sides of the sheet that allow adjacent sheets to be positioned in overlapping relationship.

The roll former 9 is positioned on the tray 15 of the vehicle 17 so that the roll former 9 can be tilted from a transport position (not shown) in which the roll former 9 is flat on the tray 15 into an inclined position as shown in the drawing.

Specifically, the roll former 9 is pivotally mounted to a forward end of the tray 15 and can be raised and lowered at the rearward end thereof, ie the outlet end of the roll former 9, by means of an hydraulic lifting assembly 21 connected to the tray 15 and to the roll former 9.

The roll former assembly further includes a support structure, generally identified by the numeral 25, that is pivotally mounted to the roll former 9 and thereby extends across the gap between the roll former 9 and the building 5 and defines a bridge for transferring profiled decking sheets that are roll formed by the roll former 9 onto the roof 7 of the building 5.

In use, profiled decking sheets that are roll formed by the roll former 9 are moved along the support structure, as hereinafter described at, and delivered onto the roof 7 of the building 5 and form a stack of the

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sheets at that location. The sheets can then be moved from the stack and positioned as required on the roof.

5 The support structure 25 comprises a plurality of modular units that are bolted or otherwise secured together to form the structure.

10 The modular units are constructed so that the support structure 25 can be connected to the roll former 9 while the roll former 9 is in the transport position described above and tilted upwardly with the roll former 9 from the transport position (not shown) to the inclined position shown in the drawing in which the roll former 9 is in an inclined position with respect to the tray 15.

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The support structure 25 includes a means for supporting and guiding the profiled decking sheets along the length of the support structure.

20 The support/guide means is in the form of pairs of upper and lower guide rollers (not shown) mounted to framework members 27 that extend upwardly from a main frame 51 and are positioned at spaced intervals along the length of the support structure 25. In use, the profiled decking sheets extend between the guide rollers of each guide roller pair and the guide rollers contact upper and lower surfaces of profiled decking sheets and thereby support and guide the decking sheets.

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30 The support structure 25 further includes at least one pair of the guide rollers 29 located toward a forward end of the support structure 25 that are formed as drive rollers to move profile decking sheets along the support structure 25.

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Furthermore, the pairs of guide rollers at a forward section 31 of the support structure are relatively

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5 closely spaced apart compared to the other pairs of guide rollers and are coupled to the framework members 27 so as to be adjustable in height relative to the main frame 51 of the support structure 25 and to each other, thereby to define a curved path for the profiled decking sheets at that forward end.

10 It can really be appreciated that the curved path facilitates bending the profiled decking sheets in turn so as to deliver the sheets onto the roof 7 of the building 5 generally parallel to the roof. This is a particularly important feature in situations where the profiled decking sheets are relatively long. Typically, profiled decking sheets are at least 4 meters and in many
15 instances are at least 25 m. Delivering such profiled decking sheets onto a roof in a generally parallel orientation to the roof is a particularly important issue in terms of safe handling of the sheets onto the roof.

20 It is preferred that the radius of the curved path be selected so that the sheets can be bent without permanently deforming the sheets.

The radius of the curved path may be any
25 suitable radius having regard to factors such as, by way of example, the space that is available for the roll former assembly to operate in and the flexibility of the profiled decking sheets in the transverse direction. In the embodiment shown in the drawing the minimum radius of
30 the curved path is 14 m. Typically, the maximum radius of the curved path is 16 m.

In use, the vehicle 17, with the roll former in the lowered transport position and the support structure
35 25 detached from the roll former 9, is positioned at a selected location in relation to the building 5. Thereafter, the support structure 25 is connected to the

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roll former 9 so that it extends rearwardly from the vehicle 17. Thereafter, the rearward end of the roll former 9, as mounted to the vehicle tray 15, is lifted whereby the roll former 9 and the support structure 25
5 pivot about the pivot connection of the roll former 9 to the forward end of the vehicle tray 15. This movement positions the roll former 9 and the support structure 25 in the inclined position shown in the drawing, with the roll former 9 and the support structure 25 angled upwardly
10 and rearwardly in relation to the vehicle 17. Thereafter, the roll former 9 is operated and roll forms profiled decking sheets from a coil of steel strip and the support structure 25 supports and guides each profiled decking sheet from the outlet end of the roll former onto the roof
15 7 of the building 5.

Figures 2 to 16 illustrate in detail a support structure 25 of another embodiment of a roll former assembly in accordance with the present invention. The
20 same reference numerals are used in Figures 1 to 16 to illustrate the same parts.

The support structure 25 shown in Figures 2 to 16 includes four modules, generally identified by the
25 numerals 41, 43, 45, and 47, connected together in an end to end arrangement.

With reference to Figure 2, a rearward end 81 of the support structure 25 is the right hand end of the
30 structure 25 as shown in the Figure and the forward end 83 of the support structure 25 is the left hand end of the structure 25 as shown in the Figure.

Figure 2 shows a typical profiled decking sheet
35 51 on the module 45. The profiled decking sheet 51 includes three flat pans 53 separated by parallel ribs 55 and underlap and overlap side formations 59 that enable

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adjacent profiled decking sheets to be positioned in side by side overlapping relationship.

Each of the modules 41, 43, 45, and 47 includes a tubular steel framework that is lightweight and provides sufficient structural support. The framework includes forward and rearward mountings 61 to facilitate connection together of successive modules and connection of the most rearward module 41 to the roll former 9.

With reference to Figures 5 to 7, the most rearward module 41 includes three support/guide means in the form of (a) one pair of upper and lower guide rollers, generally identified by the numeral 63, that are adapted to contact and guide upper and lower surfaces of profiled decking sheets and (b) two lower guide rollers 65 that are adapted to contact and guide lower surfaces of the profiled decking sheets. Each of the lower guide rollers includes spaced apart disks 67 that are adapted to extend into the upstanding ribs 55 of profiled decking sheets 51.

The next two modules 43 and 45 shown in Figures 8 to 13 are similar to the most rearward module 42 in that the modules include pairs of upper and lower guide rollers 63 and separate lower guide rollers 65 that are adapted to support and guide profiled decking sheets 51.

The module 45 shown in Figures 11 to 13 also includes a pivotally mounted damping arm assembly 67. The assembly 67 includes a cross-member 71 that suspends two rollers 69. The rollers 69 are provided to contact and guide the upstanding ribs 55 of profiled decking sheets 51 from above the sheets 51. As can best be seen in Figure 13, the assembly 67 includes lever arms 73 that form part of the pivot connection of the assembly 67 to the framework of the module 45. The lever arms 73 have pivot connections at opposite ends. The assembly 67 further

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includes an hydraulic assembly 75 that is mounted to the framework of the module 45 and to the lever arms 73. The arrangement is such that extension of the pistons of the hydraulic assembly 75 results in a downward damping force
5 being transferred via the rollers 69 to profiled decking sheets 51 moving under the damping arm assembly 67 at any given time.

The most forward module 47 is a quite different
10 module to the other three modules 41, 43, and 45 in terms of the form of the support/guide means. Specifically, the main support/guide means of this module is an array of underlap support rollers 75 on one side of the module 47 and an array of overlap support rollers 77 on the other
15 side of the module 47.

Many modifications may be made to the embodiments of the present invention described above with that departing from the spirit and scope of the invention.
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By way of example, whilst the embodiments have been described in the context of operating with the roll former in an inclined position as shown in the drawing, it can readily be appreciated that the present invention also
25 extends to arrangements in which the roll former is operated in both the lowered transport position and the tilted inclined position. When operated in the lowered transport position the roll former assembly may include a suitable run-out table or trestles.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A portable roll former assembly that can be transported to a building site of a structure under construction and operated at the site to roll form profiled decking sheets and to deliver the sheets onto an elevated section of the structure at or near to the required locations for the sheets in the construction of the structure, which roll former assembly includes (a) a roll former that can be tilted from a transport position to an inclined position and operated to roll form profiled decking sheets of a required length and (b) a support structure that can support and guide the profiled decking sheets upwardly from the roll former onto the elevated section of the structure.
2. The assembly defined in claim 1 wherein the roll former is adapted to be operated on the site to roll form coiled flat strip into a required profiled form and shear the profiled strip into profiled decking sheets of required length at an outlet end of the roll former.
3. The assembly defined in claim 1 or claim 2 includes a base structure, such as a tray of a vehicle on which the roll former is located, and the roll former is mounted on the base structure.
4. The assembly defined in claim 3 wherein the transport position of the roll former is a position in which the roll former is flat on the base structure, ie not tilted with respect to a base plane of the base structure.
5. The assembly defined in claim 4 wherein the roll former is mounted on the base structure so that it can be tilted upwardly with respect to the base structure from the transport position to the inclined position, whereby

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in the inclined position the outlet end of the roll former is clear of the base structure so that the profiled decking sheets produced in the roll former are discharged from the roll former in an upward direction towards the section of the structure under construction.

6. The assembly defined in any one of the preceding claims wherein the support structure for the roll-formed profiled decking sheets produced by the roll former includes a means for coupling a rearward end of the support structure to the roll former or a base structure that supports the roll former so as to be an extension of the roll former or the base structure and at least substantially bridge a gap between the roll former and the structure under construction and support and guide profiled decking sheets from the outlet end of the roll former across the gap to the structure.

7. The assembly defined in claim 6 wherein the support structure includes a means for supporting and guiding profiled decking sheets along the length of the support structure.

8. The assembly defined in claim 7 wherein the support/guide means is adapted to support and guide profiled decking sheets along a curved path at a forward end of the support structure so that the sheets can be transferred onto the structure under construction in a preferred orientation with respect to the structure.

9. The assembly defined in claim 8 wherein the support/guide means includes a plurality of guide rollers positioned at spaced intervals along the length of the support structure.

10. The assembly defined in claim 9 wherein the guide rollers are arranged in pairs of upper and lower

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rollers that are adapted to contact and guide upper and lower surfaces of the profiled decking sheets.

11. The assembly defined in any one of claims 8 to
5 10 wherein the support/guide means is adjustable at the forward end of the support structure to thereby facilitate adjustment of the radius of the curved path.

12. The assembly defined in any one of claims 8 to
10 11 wherein the radius of the curved path is selected so that the sheets can be bent without permanently deforming the sheets.

13. The assembly defined in claim 10 wherein the
15 pairs of guide rollers are adjustable with respect to each other at the forward end of the support structure thereby to facilitate adjustment of the radius of the curved path.

14. The assembly defined in any one of the preceding
20 claims wherein the support structure includes a means for moving profiled decking sheets along the support structure while being supported and guided by the support structure and transferring the profiled decking sheets to the structure.

25 15. The assembly defined in claim 14 wherein the means for moving profiled decking sheets along the support structure includes drive rollers.

30 16. The assembly defined in any one of the preceding claims wherein the support structure includes a means for coupling the support structure to the structure under construction.

35 17. The assembly defined in any one of the preceding claims wherein the support structure includes a plurality

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of modular sections that are adapted to be coupled together to form the support structure.

18. A portable roll former assembly that can be transported to a building site of a structure under construction that requires profiled decking sheets as a part of the structure and includes:

(a) a roll former that can be operated on the site to roll form coiled flat strip into a required profiled form and shear the profiled strip into profiled decking sheets of required length at an outlet end of the roll former and can be tilted upwardly with respect to a base structure, such as a tray of a vehicle on which the roll former is located, so that the outlet end of the roll former is lifted clear of the base structure so that the profiled decking sheets produced in the roll former are discharged from the roll former in a direction towards a section (such as a roof) of the structure under construction, and

(b) a support structure for supporting and guiding roll-formed profiled decking sheets produced by the roll former from the outlet end of the roll former to the structure under construction and thereby define a bridge between the roll former and the structure under construction.

19. A support structure for supporting and guiding roll-formed profiled decking sheets produced by a roll former from an outlet end of the roll former to a structure under construction and thereby define a bridge between the roll former and the structure under construction.

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20. The support structure defined in claim 19 includes a plurality of modular sections that can be coupled together to form the support structure.

5 21. The support structure defined in claim 19 or claim 20 includes a means for coupling a rearward end of the support structure to the roll former or a base structure that supports the roll former.

10 22. The support structure defined in any one of claims 19 to 21 includes a means for coupling the support structure to the structure under construction.

15 23. The support structure defined in claim 19 or claim 21 wherein the support structure is a free-standing structure that need not be coupled to the roll former or the structure under construction.