



(12)

EUROPEAN PATENT APPLICATION

(43)

Date of publication:
10.08.2011 Bulletin 2011/32

(51)

Int Cl.:
E04F 15/024 (2006.01) E04B 1/24 (2006.01)

(21)

Application number: 10151483.4

(22)

Date of filing: 22.01.2010

(84) Designated Contracting States: AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR Designated Extension States: AL BA RS (71) Applicant: Subfloor ApS 3400 Hillerød (DK)	(72) Inventors: • Knudsen, Stig B. 2900 Hellerup (DK) • Østen, Christian Bo 3400 Hillerød (DK) (74) Representative: Nielsen, Henrik Sten Budde Schou A/S Vester Søgade 10 1601 Copenhagen V (DK)
---	--

(54)

Support system for a floor

(57) A support system for supporting a floor relative to an underlying surface. The system comprises a panel stringer, which is made of thin metal plate, and has a generally inverted U-shaped cross-section profile with two generally parallel side portions and a generally planar interconnecting portion, which defines a supporting surface, a plurality of spaced apart through-going apertures which are provided in the interconnecting portion. The system further comprises a first plurality of supporting elements, adapted to support the panel stringer and each supporting element comprises a vertical through-going bore, which defines an interior screw thread. Each of the supporting elements are slidably positionable along the panel stringer within the inverted U-shaped cross-section profile in order to position a specific supporting element in registration with a cooperating specific aperture of the

plurality of spaced apart through-going apertures. The specific supporting element supports the panel stringer and cooperates with the panel stringer to prevent rotation of the specific supporting element relative to the panel stringer. The system further comprises a second plurality of elongate supporting legs made of a cuttable material and adapted to support the supporting elements. Each supporting leg is generally cylindrical and has a diameter adapted to allow it to pass through the plurality of spaced apart through-going apertures of the panel stringer. Each supporting leg further has an exterior screw thread interengageable with the interior screw thread of the supporting elements and an inner recess provided at one end which constitutes a top end and defines a tool engageable part to engage with a tool and an opposite bottom end which serves to engage with the underlying surface.

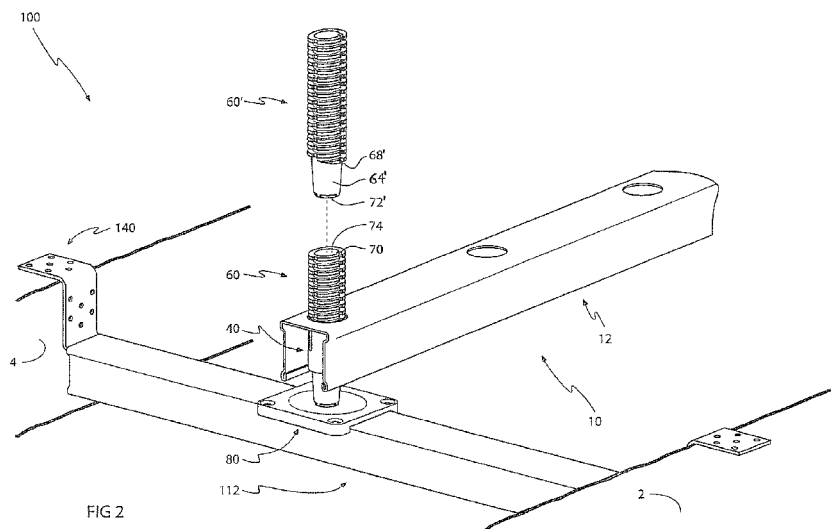


FIG 2

Description

[0001] Conventional floor construction involves the use of wooden floor joists supporting a subfloor attached to the floor joists. The subfloor may be made of wooden boards which support a flooring, for example laminated wood, ceramic tile, or stone, or a floor covering, such as an area rug, vinyl or linoleum, the flooring or floor covering providing a walking surface. In some cases the subfloor itself may provide a walking surface and no additional flooring or floor covering is used. The floor joists may be supported by bearers or may be supported directly by a concrete slab. To achieve a level floor, wedges are conventionally placed under the floor joists to adjust the height of the floor joists relative to the points where the floor joists are supported by the bearers or the concrete slab.

The conventional floor construction has a number of drawbacks, such as the use of wooden floor joists which may vary greatly in quality and are susceptible to damage and warping due to water and microorganisms, the time-consuming procedure of using wedges to achieve a level floor, the squeaky noise from the wood-wood contact between floor joists and subfloor, the weight of the floor joists which render them hard to handle, etc.

[0002] To mitigate some of the above identified disadvantages a number of systems are known which generally include height adjustable pedestals supporting stringers which may support a floor, floor panels or a subfloor, predominantly for applications in computer halls and fair stands. Such systems are described in amongst others WO2006053813, EP 1247922, DE3913984, GB1140957, GB1035817, DE20120006 (utility model), WO72008055292, EP0980944, EP1528181, US4893441, US4982539, EP1760222, FR2905395, EP1171678, EP0353360, and US5048242.

[0003] The above described systems mainly describe stringers having unique ends for connection to pedestals, thus any shortening of the stringer will cut off at least one of the unique ends, destroying the connection to the pedestals. Even where the stringer may be shortened, such shortening may only be possible at specific positions along the stringer and may require the use of motorized cutting tools or the like. Further, the above described systems may be tiresome and unergonomic to level as the pedestals may in some cases require access from below in order to be adjusted. In addition the above described systems may be difficult to combine with existing bearers or joists, particularly in older houses and building structures.

[0004] It is an object of the present invention to simplify the construction and levelling of a floor.

[0005] It is a further object of the present invention to reduce the number of components in a support system for supporting a floor.

[0006] It is a yet a further object of the present invention to reduce the cost of a support system for supporting a floor

[0007] It is furthermore an object of the present invention to provide a support system for a floor which is easily combined with existing bearers or joists.

[0008] It is a further object of the present invention to provide a support system for a floor having a variable load bearing capacity

[0009] The above objects, as well as numerous further objects which will be evident from the following detailed description of preferred embodiments of the support structure for a floor is according to corresponding first and fourth aspects of the present invention obtained by a support system for supporting a floor relative to an underlying surface, the system comprising

a panel stringer made of thin metal plate and having a generally inverted U-shaped cross-section profile with two generally parallel side portions and a generally planar interconnecting portion defining a supporting surface, a plurality of spaced apart through-going apertures being provided in the interconnecting portion,

a first plurality of supporting elements, adapted to support the panel stringer, each supporting element comprising a vertical through-going bore defining an interior screw thread, each of the supporting elements being slidably positionable along the panel stringer within the inverted U-shaped cross-section profile for positioning a specific supporting element in registration with a cooperating specific aperture of the plurality of spaced apart through-going apertures, the specific supporting element supporting the panel stringer and cooperating with the panel stringer to prevent rotation of the specific supporting element relative to the panel stringer, and,

a second plurality of elongate supporting legs made of a cuttable material and adapted to support the supporting elements, each supporting leg being generally cylindrical and having a diameter adapted to allow it to pass through the plurality of spaced apart through-going apertures of the panel stringer and each supporting leg further having an exterior screw thread interengageable with the interior screw thread of the supporting elements and an inner recess provided at one end constituting a top end and defining a tool engageable part for engaging with a tool and an opposite bottom end serving to engage with the underlying surface.

and,

a method for supporting a floor relative to an underlying surface comprising the steps of:

providing a support system according to the first aspect of the invention,

positioning each of the supporting elements within the inverted U-shaped cross section profile in registration with a corresponding aperture of the plurality of apertures,

inserting each of the supporting legs through a corresponding aperture of the apertures and interengaging the exterior screw thread of each of the supporting legs with the interior screw thread of a corresponding supporting element of the supporting elements, and

driving each of the supporting legs through the corresponding aperture and at least partly through the corresponding supporting element to engage the underlying surface and support the supporting elements,

respectively.

[0010] According to corresponding second and fifth aspects of the support structure for a floor according to the present invention a support system for supporting a floor relative to an underlying surface, the system comprising

a panel stringer made of thin metal plate and having a generally inverted U-shaped cross-section profile with two generally parallel side portions and a generally planar interconnecting portion defining a supporting surface,

a third plurality of supporting elements, adapted to support the panel stringer, each supporting element comprising a vertical through-going bore defining an interior screw thread and a polygonal top plate comprising a radially protruding engagement flange defining a planar top surface, the engagement flange being endwise slidably insertable into the panel stringer within the inverted U-shaped cross-section profile, the planar top surface supporting the panel stringer and the engagement flange engaging the side portions to prevent rotation of the supporting elements relative to the panel stringer, and,

a fourth plurality of elongate supporting legs, made of a cuttable material, adapted to support the supporting elements, each supporting leg being generally cylindrical and having an exterior screw thread interengageable with the interior screw thread of the supporting element and an inner recess provided at one end constituting a top end and defining a tool engageable part for engaging with a tool and an opposite bottom end serving to engage with the underlying surface,

and,

a method for supporting a floor relative to an underlying surface comprising the steps of

providing a support system according the second aspect of the present invention,

inserting the engagement flange of each of the supporting elements endwise into a corresponding end of the panel stringer within the inverted U-shaped cross-section profile,

interengaging the exterior screw thread of each of the supporting legs with the interior screw thread of a corresponding supporting element of the supporting elements, and

driving each of the supporting legs at least partly through the corresponding supporting element to engage the underlying surface and support the supporting elements,

respectively, are provided.

[0011] In the context of the present invention the term floor is to be understood as comprising a subfloor, a floor covering, a flooring or any other generally planar surface providing a walking surface or a surface upon which furniture may be supported in a building construction

[0012] In the context of the present invention the locational and directional terms inner, outer, upper, lower, top, bottom are, unless clearly understood by the feature of the present invention that the relate to, to be interpreted in the framework of a building structure, thus upper or top would be closer to the ceiling of a room in the building structure and lower or bottom would be below upper or top.

[0013] In the context of the present invention the term planar, when used as an attribute for a surface, is to be understood as comprising also planar surfaces having surface structures such as grooves, ribs, creases, furrows, dimples, pits etc.

[0014] Further, in the context of the present invention the term cuttable is to understood as a material which may be severed or cut by a manual tool such as a knife, a saw, a chisel, an axe, or a power tool such as an electric or pneumatic saw, etc., a manual tool being preferred. Cuttable materials may for example comprise plastics such as nylon etc.

[0015] The panel stringer of the first and second aspect of the present invention is made from thin metal plate which has the advantage that the metal plate is impervious to water provided a suitable surface treatment, such as galvanizing. Further surface treatments include plating, painting, plastic coating etc. Further the thin metal plate gives a low weight to the panel stringer and the panel stringer is easily shortened by shears or other tools. The inverted U-shaped cross-section profile provides a supporting surface for supporting a floor while the side portions provide the load bearing strength for the panel stringer. The spaced apart apertures of the first aspect of the support system according to the present invention allows the panel stringer to be supported at positions along the length of the panel stringer, thus allowing long panel stringers to be used, while the panel stringer according to the second aspect of the present invention

may be provided in shorter, easily transportable and easily stored units

The spaced apart apertures may be set 15-30 cm apart, such as 20-25 cm, preferably 20 cm.

It is contemplated within the context of the present invention that the load bearing capacity of the support system according to the first aspect of the present invention may be varied by supporting the panel stringer with a supporting element and corresponding supporting leg at each of the spaced apart apertures for maximum load bearing capacity, or alternatively at every other or every third etc. of the spaced apart apertures for subsequently lower load bearing capacity requirements and reduced number of supporting elements and supporting legs needed, i.e. at reduced cost. It is thus contemplated that the supporting system according to the first aspect of the present invention may be used both for applications requiring high load bearing capacity, such as to support a floor in an office or shop, as well as applications requiring low load bearing capacity, such as a for residential house.

It is further contemplated within the present invention that the supporting elements according to the second aspect of the present invention could be used with the panel stringer according to the first aspect of the present invention, thus supporting the ends of the panel stringer using the supporting elements according to the second aspect of the present invention, and adding the supporting elements according to the first aspect of the present invention to support the panel stringer between the ends thereof to increase the load bearing capacity when required.

Although preferably made from galvanized steel, it is contemplated that the panel stringer could be made from plastic, compressed wood, etc

[0016] The supporting surface, being generally planar, may include surface structures such as grooves, ribs, creases, furrows, dimples, pits, etc., which may serve to facilitate the fastening of a floor to the panel stringer using nails or screws by providing pilot holes for the nails or screws. Alternatively the surface structures may serve to increase the load bearing capacity of the support system by strengthening the panel stringer.

[0017] The supporting elements of the first aspect of the support system according to the present invention are easily installed within the panel stringer and are longitudinally retained by the supporting leg at one of the apertures, thus the number of different components is decreased as the supporting leg performs multiple functions. The interior screw thread of the supporting element according to the first and second aspect of the present invention in combination with a supporting leg having an exterior screw thread allows the panel stringer to be adjustable to a desired height. Adjusting the height is performed from above which provides better ergonomics for the person making the adjustment.

[0018] The supporting element according to the first aspect of the present invention may cooperate with the panel stringer to prevent rotation of the supporting element relative to the panel stringer for example by a burr-like arresting element, a hole in the panel stringer being engaged by a pin extending from the supporting element, an adhesive substance or tape provided between the supporting element and the panel stringer, a magnet attached to, or moulded into the supporting element engaging the panel stringer when the panel stringer is made from steel or iron, short spikes being provided on the underside of the interconnection portion around the aperture, the spikes engaging the supporting element, etc.

This is advantageous as it allows the supporting leg to be driven through the supporting element singlehandedly.

[0019] The cuttable material of the supporting leg allows any excess of supporting leg, which may extend upwardly from the panel stringer once the panel stringer has been levelled and adjusted to the correct height, to be easily and quickly cut off using a saw or other manual tool, whereafter the floor may be attached to the panel stringer. Thus, the support system according to the first and second aspect of the present invention may be levelled also on an unlevel underlying surface. As an alternative to making the supporting legs from a cuttable material the supporting legs may be made with indications of fracture where the supporting legs may be easily shortened by breaking off the supporting leg at one of the indications of fracture.

[0020] The tool engageable part of the top end of the supporting leg allows the supporting leg to, in addition to being driven by hand, be driven by a tool, such as a screwdriver, electric screwdriver, or other tool, thus simplifying the levelling and height adjustment of the panel stringer. The tool engageable part may comprise a screw drive such as a slotted screw drive, a cross screw drive, a square screw drive, a hexagonal screw drive, a torx screw drive etc.

[0021] In a preferred embodiment of the support system according to the first aspect of the present invention each of the supporting elements comprises a rectangular top plate, the rectangular top plate supporting the panel stringer and engaging the side portions to prevent rotation of the supporting element relative to the panel stringer.

This is advantageous as it allows the supporting leg to be screwed in singlehandedly.

[0022] In one embodiment of the support system according to the first or second aspect of the present invention the panel stringer in cross section profile comprises a transition portion joining the generally planar interconnecting portion and one of the side portions and defining a sidewall displaced outwardly relative to the one side portion.

The top plate, or the engagement flange, of the supporting elements may be engageable by the transition portion.

[0023] This is advantageous as it may vertically retain the supporting element within the panel stringer which simplifies the handling of the support system and may retain the panel stringer vertically.

[0024] In an alternative embodiment of the support system according to the first or second aspect of the present invention the panel stringer in cross section profile comprises an inwardly projecting flange perpendicularly joined to

one of the side portions.

The top plate, or the engagement flange, of the supporting elements may be engageable by the flange.

This is advantageous as it may vertically retain the supporting element within the panel stringer which simplifies the handling of the support system and may retain the panel stringer vertically.

[0025] In an alternative embodiment of the support system according to the first or second aspect of the present invention the panel stringer in cross section profile comprises an inwardly projecting protrusion on one of the side portions. The supporting element, or the engagement flange may be engageable by the protrusion.

This is advantageous as it may vertically retain the supporting element within the panel stringer which simplifies the handling of the support system and may retain the panel stringer vertically.

[0026] In an alternative embodiment of the support system according to the first or second aspect of the present invention one of the side portions of the panel stringer in cross section profile comprises an inwardly converging lower end. The supporting element, or the engagement flange may be engageable by the lower end.

This is advantageous as it may vertically retain the supporting element within the panel stringer which simplifies the handling of the support system and may retain the panel stringer vertically.

[0027] In one embodiment of the support system according to the first or second aspect of the present invention one of the side portions of the panel stringer in cross section comprises an inwardly rolled edge.

The supporting element, or the engagement flange may be engageable by the rolled edge

[0028] This is advantageous as it may vertically retain the supporting element within the panel stringer which simplifies the assembly of the support system and may retain the panel stringer vertically. A further advantage is that it may increase the load bearing capacity of the panel stringer

[0029] It is contemplated within the context of the present invention that the panel stringer according to the second aspect of the present invention, although being defined as having an inverted U-shaped cross-section profile could instead have a box-shaped profile or a triangular profile and the engagement flange of the supporting elements could be engageable by the sides of the box-shaped profile or the triangular profile

[0030] In a preferred embodiment of the support system according to the first or second aspect of the present invention the thin metal plate of said panel stringer has a thickness of 0.4-1, preferably 0.5-0.6 or most preferably 0.6 mm

This is advantageous as it allows the panel stringer to simply, and without requiring motorized tools, be cut, for example by shears, thus simplifying the assembly of the support system. Additional tools suitable for cutting the panel stringer include saws etc. In addition to manual tools the panel stringer can also be cut with an electric circular saw, a pneumatic saw, etc. A further advantage is that the material needed for each panel stringer, and thus the cost, is reduced.

[0031] In one embodiment of the support system according to the first aspect of the present invention the vertical through-going bore of each of the supporting elements has a diameter smaller than the diameter of each of the supporting legs and comprises a cut defining a deflectable wall portion being deflectable and being engageable by the side portions when deflected.

This is advantageous as it allows the supporting element to be longitudinally retained in the panel stringer once the supporting leg has been driven into the supporting element, thus further increasing the stability of the assembled support system

[0032] In one embodiment of the support system according to the second aspect of the present invention the vertical through-going bore of each of the supporting elements has a diameter smaller than the diameter of each of the supporting legs and comprising an elongate cutout extending along a part of the vertical through-going bore into the engagement flange, the vertical through-going bore, the cutout and the engagement flange being widenable and the engagement flange being engageable by the side portions when widened

This is advantageous as it allows the engagement flange of the supporting element to be longitudinally retained in the panel stringer once the supporting leg has been driven into the supporting element, thus further increasing the stability of the assembled support system.

[0033] In a preferred embodiment of the support system according to the first or second aspect of the present invention the bottom end of each of the supporting legs further comprises a protrusion defining a tool part engageable by the tool engageable part of the top end.

This is advantageous as it allows one supporting leg to be joined to another supporting legs, thus increasing the height at which the supporting element can be supported, and thus increasing the height at which a floor can be supported. Further, since the supporting legs are joinable there is no need for different supporting legs of different length, thus reducing the number of different components and the cost of the support system

[0034] In a preferred embodiment of the support system according to the first or second aspect of the present invention the outer screw thread of each of the supporting legs is interrupted by a first multitude of notches defining a second multitude of screw thread segments and each of the supporting legs comprises a protrusion extending axially from a perimeter of the top end, the protrusion being engageable by one of the notches on a further supporting leg of the supporting legs.

This is advantageous as it increases the torque-transmitting capacity between joined supporting legs.

[0035] In a preferred embodiment of the support system according to the first or second aspect of the present invention the outer screw thread of each of the supporting legs is interrupted by a first multitude of notches defining a second multitude of screw thread segments and each of the supporting elements comprises a resiliently deflectable tongue in the wall of the vertical through-going bore, the tongue comprising a protrusion engageable by each of the notches.

The protrusion on the tongue ensures that the supporting leg does not turn unintentionally, such as when the support structure is subjected to vibrations from for example a washing machine etc, once the supporting leg has been driven properly into the supporting element.

[0036] In one embodiment of the support system according to the first or second aspect of the present invention the support system further comprises

a fifth plurality of base elements adapted to support the supporting legs and to be interposed between said bottom ends and said underlying surface, each of the base elements comprising first and second sides, the first side comprising a recess comprising a protrusion, and each of the supporting legs further comprises an indentation in the tool part, the indentation being engageable by the protrusion of the base elements.

This is advantageous as it may reduce the pressure from the supporting legs on an underlying substrate such as a floor joist, a bearer or a concrete base.

[0037] In one embodiment of the support system according to the first or second aspect of the present invention each of the base elements further comprises a perimetrically positioned through-going hole adapted to receive a fastening member.

This is advantageous as it allows the bottom ends of the supporting legs to be fixated relative the underlying surface, thus it increases the stability of the support system.

[0038] According to corresponding third and sixth aspects of the support structure for a floor according to the present invention a base supporting system for supporting a floor structure between two generally parallel floor joists or two generally parallel exposed bearers in a building structure comprising

a supporting stringer made of thin metal plate and having a generally inverted U-shaped cross-section profile with two generally parallel side portions and a generally planar interconnecting portion defining a base supporting surface, two suspension brackets, each defining a straight vertical web and top and bottom flanges extending in opposite directions perpendicularly from the web or alternatively defining an L having a straight vertical web and a bottom flange defining a top surface extending perpendicularly from the web, the bottom flange being endwise slidably insertable into the supporting stringer within the inverted U-shaped cross-section profile, the top surface supporting the supporting stringer and the bottom flange engaging the side portions of the supporting stringer to prevent rotation of the suspension bracket relative the supporting stringer, and the web and/or the top flange being adapted to be attachable to one of the floor joists or bearers,

and,

a method of supporting a floor structure between two generally parallel floor joists or two generally parallel bearers in a building structure is provided comprising the steps of

providing a base supporting system according to the third aspect of the present invention, inserting the bottom flange of each of the suspension brackets endwise into a corresponding end of said supporting stringer within said inverted U-shaped cross-section profile, and attaching the upper flange, or alternatively attaching the web, of each of the suspension brackets to a corresponding joist or bearer of the floor joists or the bearers,

respectively, are provided

[0039] The supporting stringer of the third aspect of the present invention is made from thin metal plate which has the advantage that the metal plate is impervious to water provided a suitable surface treatment, such as galvanizing. Further surface treatments include painting, plating and plastic coating. Further the thin metal plate gives a low weight of the supporting stringer. The inverted U-shaped cross-section profile provides a base supporting surface for supporting a floor structure while the side portions provides the load bearing strength for the supporting stringer.

[0040] The suspension brackets are easily installed within the supporting stringer. The bottom flange is prevented from rotating relative the panel stringer when inserted in the supporting stringer which increases the stability of the base supporting system.

[0041] By fastening the suspension brackets to the floor joists or bearers the load bearing strength of the suspension brackets are increased.

[0042] In one embodiment of the base supporting system according to the third aspect of the present invention the supporting stringer in cross section profile comprises a transition portion joining the generally planar interconnecting portion and one of the side portions and defining a sidewall displaced outwardly relative to the one side portion of said supporting stringer.

The bottom flange may be engageable by the transition portion.

This is advantageous as it may vertically retain the bottom flange within the supporting stringer which simplifies the handling of the base supporting system and may retain the supporting stringer vertically.

[0043] In an alternative embodiment of the base supporting system according to the third aspect of the present invention the supporting stringer in cross section profile comprises an inwardly projecting flange perpendicularly joined to one of the side portions of the supporting stringer.

The bottom flange may be engageable by the flange of the supporting stringer.

This is advantageous as it may vertically retain the bottom flange within the supporting stringer which simplifies the handling of the base supporting system and may retain the supporting stringer vertically.

[0044] In an alternative embodiment of the base supporting system according to the third aspect of the present invention the supporting stringer in cross section profile comprises an inwardly projecting protrusion on one of the side portions of the supporting stringer.

The bottom flange may be engageable by the protrusion.

This is advantageous as it may vertically retain the bottom flange within the supporting stringer which simplifies the handling of the support system and may retain the supporting stringer vertically.

[0045] In an alternative embodiment of the base supporting system according to the third aspect of the present invention one of the side portions of the supporting stringer in cross section profile comprises an inwardly converging lower end. The bottom flange may be engageable by the lower end of the supporting stringer This is advantageous as it may vertically retain the bottom flange within the supporting stringer which simplifies the handling of the base supporting system and may retain the supporting stringer vertically.

[0046] In one embodiment of the base supporting system according to the third aspect of the present invention one of the side portions of the supporting stringer in cross section comprises an inwardly rolled edge.

[0047] The bottom flange may be engageable by the rolled edge

This is advantageous as it may vertically retain the bottom flange within the supporting stringer which simplifies the assembly of the base supporting system and may retain the supporting stringer vertically. A further advantage is that it may increase the load bearing capacity of the supporting stringer

[0048] It is contemplated within the context of the present invention that the supporting stringer according to the third aspect of the present invention, although being defined as having an inverted U-shaped cross-section profile could instead have a box-shaped profile or a triangular profile and the bottom flange of the suspension bracket could be engageable by the sides of the box-shaped profile or the triangular profile.

[0049] In a preferred embodiment of the base supporting system according to the third aspect of the present invention each bottom flange comprises a horizontal transversal bend defining first and second non-parallel portions.

This is advantageous as it may retain the bottom flange longitudinally in the supporting stringer, thus simplifying the handling of the base supporting system

[0050] In a preferred embodiment of the base supporting system according to the third aspect of the present invention the thin metal plate of said supporting stringer has a thickness of at least 1 mm such as 1.5 mm.

This is advantageous as it increases the strength of the supporting stringer while still minimizing the material needed for each supporting stringer, and thus the cost. The supporting stringer may be cut by an angle grinder, which may be electrically or pneumatically driven or a rotary metal saw which may be electrically or pneumatically driven. It is also contemplated within the context of the present invention that the supporting stringer could be cut by a hacksaw.

[0051] In corresponding preferred embodiments of the third and sixth aspect of the present invention the base supporting system according the third aspect of the present invention further comprises the support system according to a preferred embodiment of the first or second aspects of the present invention for providing the underlying surface, the second side of each of the base elements being slidably attachable to the base supporting surface of the supporting stringer,

and,

the method according to the sixth aspect of the present invention further comprises the steps of:

providing a support system according to the first or the second aspect of the present invention,
performing the substeps of:

positioning each of the supporting elements within said inverted U-shaped cross section profile in registration with a corresponding aperture of the plurality of apertures,
inserting each of the supporting legs through a corresponding aperture of the apertures and interengaging the

exterior screw thread of each of the supporting legs with the interior screw thread of a corresponding supporting element of the supporting elements, and driving each of the supporting legs through the corresponding aperture and at least partly through the corresponding supporting element to engage the underlying surface and support the supporting elements,

or alternatively the substeps of:

inserting the engagement flange of each of the supporting elements endwise into a corresponding end of the panel stringer within the inverted U-shaped cross-section profile, interengaging the exterior screw thread of each of the supporting legs with the interior screw thread of a corresponding supporting element of the supporting elements, and driving each of the supporting legs at least partly through the corresponding supporting element of the supporting elements to engage the underlying surface and support the supporting elements, attaching the first side of each of the base elements to a corresponding supporting leg of the supporting legs of the support system, and attaching the second side of each of the base elements of the support system to the supporting stringer,

respectively.

[0052] The base supporting system according to the third aspect of the present invention is advantageous as it allows the support system according to the first or second aspects of the present invention to be integrated with existing floor joists or bearers in building structures. It is especially suitable when the existing floor joists or bearers are set too far apart, typically more than 40 or 60 cm, in relation to local building codes or regulation as it provides a base supporting surface for a new floor joist or bearer, or preferably, for the support system according to the first or second aspect of the present invention.

[0053] The invention and its many advantages will be described in more detail below with reference to the accompanying schematic drawings which for the purpose of illustration show some non-limiting embodiments and in which

Fig. 1 shows the support system and the base supporting system according to embodiments of the support system according to corresponding first and fourth, and third and sixth, aspects of the present invention,

Fig. 2 shows the extension of a supporting leg by connection to a further supporting leg,

Fig. 3 shows details of the connection between the supporting legs shown in fig. 2, and

Fig. 4 shows the support system according to embodiments of corresponding second and fifth second aspects of the present invention.

[0054] Fig. 1 shows a support system, in its whole designated the reference numeral 10, according to an embodiment of corresponding first and fourth aspects of the present invention. The support system 10 comprises a panel stringer, in its whole designated the reference numeral 12, a plurality of supporting elements, one of which is shown and designated the reference numeral 40, and a plurality of supporting legs, one of which is shown and designated the reference numeral 60. The support system 10 further comprises a plurality of base elements, one of which is shown and designated the reference numeral 80, which support the support system 10 from a base supporting system, in its whole designated the reference numeral 100. The base supporting system 100 comprises a supporting stringer, in its whole designated the reference numeral 112, and two suspension brackets, one of which is designated the reference numerals 140 which attach the base supporting system 100 to first and second floor joist, designated the reference numeral 2 and 4, respectively.

[0055] The panel stringer 12 comprises a supporting surface, designated the reference numeral 14 attached to first and second side portions, designated the reference numerals 16 and 18, respectively, along a first and second upper edges, designated the reference numerals 20 and 22 respectively. The side portions 16 and 18 further comprise first and second lower edges, designated the reference numerals 24 and 26, respectively, which are inwardly rolled. The supporting surface 14 further comprises a plurality of apertures, one of which is designated the reference numeral 28. The side portions 16 and 18 are joined to the supporting surface 14 via first and second sidewalls, designated the reference numerals 30 and 32, respectively, and first and second transition portions, designated the reference numerals 34 and 36, respectively.

[0056] The panel stringer 12 may be made from thin metal plate such as steel plate, aluminium plate, etc, and may be fabricated through rolling, extrusion, drawing etc. The thickness of the material of the panel stringer is preferably 0.6 mm as this dimension yields a good strength while also allowing the panel stringer 12 to be cut to a desired length by

shears or other simple hand tools. Further this dimension allows a floor such as a sub floor (not shown) to be fastened directly to the supporting surface 14 of the panel stringer 12 using self tapping screws (not shown) which penetrate the supporting surface 14. The apertures 28 shall have a diameter sufficient to allow the supporting leg 60 to pass through the aperture 28.

[0057] The supporting element 40 comprises a cylindrical body, designated the reference numeral 42 joined perpendicularly to a top plate, designated the reference numeral 44. A bore, designated the reference numeral 48, penetrates perpendicularly the top plate 44 and axially the body 42 and defines an interior screw thread, designated the reference numeral 50. A plurality of cuts in the wall of the body 42 and the top plate 44 define first and second resiliently deflectable tongues comprising protrusions, designated the reference numeral 52 and 54, respectively, spaced apart by 135°. The supporting element 40 is preferably made from moulded plastic such as nylon or alternatively from fibre reinforced polyester resins or epoxy resins. The height of the supporting element 40 is typically less than the height of the panel stringer 12, and the body 42 may, or may not, contact the inner wall of the side portions 16 and 18.

[0058] The supporting leg 60 is generally cylindrical and comprises a top end, designated the reference numeral 62 and a bottom end, designated the reference numeral 64. An exterior screw thread, designated the reference numeral 66 is provided on the exterior of the supporting leg 60. The exterior screw thread 66 is interrupted by a multitude of regularly spaced apart notches, one of which is designated the reference numeral 68, and the top end 62 of the supporting leg 60 further includes a protrusion, designated the reference numeral 70. The bottom end 64 of the supporting leg 60 comprises a tool part, designated the reference numeral 72, comprising a recess (not shown), and the top end 62 comprises a recess, designated the reference numeral 74, which include a tool engageable part (not shown). The interaction of protrusion 70 with notch 68, and the tool part 72 with recess 74, respectively, will be described in more detail in relation to figs. 2 and 3.

The supporting leg 60 is made from a cuttable material, preferably moulded plastic such as nylon or alternatively from fibre reinforced polyester resins or epoxy resins. The supporting leg 60 may have a length of about 5 cm to 30 cm and a diameter sufficient small to allow it to pass through the aperture 28 of the panel stringer 12.

The notches 68 are spaced evenly each 90° along the exterior screw thread 66 around the supporting leg 60, but may be spaced closer together or set wider apart.

[0059] The base element 80 comprises first and second generally rectangular sides, designated the reference numerals 82 and 84, respectively. The first side 82 further comprises a centred recess, designated the reference numeral 86 comprising a centred pin, designated the reference numeral 88. The second side 84 further comprises a slot, designated the reference numeral 90, for engagement with the base supporting system 100 as will be described in more detail below. Fastening holes, one of which is designated the reference numeral 92, are provided on the perimeter of the base element 80.

The base element may be made from moulded plastic such as nylon or alternatively from fibre reinforced polyester resins or epoxy resins. Although not shown in fig. 1, the second side 84 may also comprise the recess 86 and pin 88 of the first side, thus rendering the base element 80 reversible so that the load supported by the support system 10 may be more uniformly spread, when the base element 80 is turned upside down, to the support substrate as will be described in relation to figs. 3 and 4. The pin 88 is protected when the base element is turned upside down by its position in the recess 86 which ensure that the pin is below the datum of the first side 82.

[0060] The supporting stringer 112 of the base supporting system 100 is analogous to the panel stringer 12, the difference being the omission of the apertures 28 of the panel stringer 12 and a larger thickness of the material used for the supporting stringer 112 when compared to the panel stringer 12. The supporting stringer 112 comprises a base supporting surface, designated the reference numeral 114 attached to first and second side portions, designated the reference numerals 116 and 118, respectively, along a first and second upper edges, designated the reference numerals 120 and 122 respectively. The side portions 116 and 118 further comprise first and second lower edges, designated the reference numerals 124 and 126, respectively, which are inwardly rolled. The side portions 116 and 118 are joined to the supporting surface 114 via first and second sidewalls, designated the reference numerals 130 and 132, respectively, and first and second transition portions, designated the reference numerals 134 and 136, respectively.

[0061] The supporting stringer is made from the same material and using the same manufacturing process as the panel stringer. The thickness of the material used for the supporting stringer is preferably 1,5 mm as this gives an increased strength and load bearing capacity which may be needed when the base supporting system 100 as shown in fig. 1 is used to support the support system 10 between to floor joists 2 and 4, however, the height and width of the base supporting stringer 112 are typically similar to the height and width of the panel stringer 12.

[0062] The suspension bracket 140 of the base supporting system 100 comprises top and bottom flanges, designated the reference numerals 144 and 146, respectively, perpendicularly extending in opposite directions from a vertical web, designated the reference numeral 142. The bottom flange 146 is joined to a flange tip, designated the reference numeral 148, which is slightly angled in relation to the bottom flange 146. The web 142 and the top flange 144 comprise attachment holes, one of which is designated the reference numeral 150 for fastening the suspension bracket 140 to the floor joist 104 using screws, one of which is designated the reference numeral 152. The suspension bracket 140 is made from

metal such as steel or aluminium and may be manufactured by rolling, bending using a press brake, or the top and bottom flanges 144 and 146 can be welded to the web 142.

[0063] The support system 10 is assembled by sliding the supporting element 40 into the panel stringer 12 whereby the top plate 44 of the supporting element 40 is vertically retained within the panel stringer 12 the engagement of the transition portions 34 and 36 with the top plate since the width of the side 46 of the top plate 44 is smaller than the perpendicular distance between the sidewalls 32 and 34, but larger than the perpendicular distance between the side portions 16 and 18. The supporting element 40 is thus slid along the panel stringer until it reaches a position of registration with aperture 28 The supporting leg 60 is then passed with its bottom end 64 first through the aperture 28 and into the bore 48 whereby the exterior screw thread 66 engages the interior screw thread 50 as the supporting leg 60 is turned clockwise. A tool (not shown) may be used to engage the recess 74 to facilitate driving the supporting leg 60 through the supporting element 40, but the supporting leg 60 may also be driven by turning it clockwise by hand A tool may for example be manufactured to comprise a lower part analogous to the bottom end 64 and the tool part 72 of the supporting leg 60 coupled to an upper part comprising a handle for simplifying turning the supporting leg 60, or alternatively the upper part of the tool may include a bit engageable by an electric screwdriver or the like. Alternatively the recess 74 of the supporting leg 60 may further comprise a screw drive engageable directly by a screwdriver or electric screwdriver.

[0064] As the supporting leg 60 is driven into the supporting element 40 each notch 68 is sequentially engaged by the protrusions on the locking tongues 52 and 54 as each locking tongue 52 and 54 returns to its relaxed, non-deflected, position with the protrusion engaging the notch. As the supporting leg is turned the 45° from one locking angular position to the next locking angular position the protrusion on one of the locking tongues is forced out of the notch 60 which deflects the locking tongue. At the end of the 45° turn the other protrusion on the other locking tongue engages the notch 68 as the other locking tongue becomes relaxed. Thus one of the locking tongues is always deflected when exterior screw thread 66 of the supporting leg 60 is engaged with the interior screw thread 50 of the supporting element 40

[0065] In fig. 1 the support system 10 is shown in use with the base supporting system 100, where the base element 80 serves as an interface between the support system 10 and the base supporting system 100, however, the base support system 10 may be used without the base supporting system 100 and without the base element 80 on support substrates which can support the supporting leg 60 directly For example, if the base support system 10 is to be used to support a floor above an existing concrete floor the base element 60 may be omitted, however, for supporting the base support system 10 on a slippery surface and or narrow surface such as the base supporting surface 114 of the supporting stringer 112, or on a soft substrate such as a particle board, the base element 80 ensure that the supporting leg 60 does not slip, and reduces the pressure on the substrate.

Once the supporting leg 60 has been driven at least partly through the supporting element 60 the recess in the tool part 72 of the supporting leg 60 may engage the pin 88 of the base element 80.

[0066] The base supporting system 100 is assembled by inserting the lower flange 146 of each suspension bracket 140 endwise into the supporting stringer whereby the lower flange 146 becomes vertically retained as the transversal width of the lower flange is smaller than the perpendicular distance between the inner walls of the sidewalls 130 and 132 but larger than the perpendicular distance between the side portions 116 and 118. Further the lower flange 146 is longitudinally retained by the flange tip 148 which due to its angle with the lower flange resiliently abuts the underside of the base supporting surface.

Each suspension bracket is then fastened to one of the floor joist 2 and 4. The slot 90 of the base element 80 then straddles the base supporting surface 114 of the supporting stringer 112 to support the support system 10.

[0067] in fig. 2 the support system 10 is assembled and supported by the assembled base support system 100 between the floor joists 2 and 4. Once the panel stringer 12 has been adjusted to the correct height and been levelled to provide a level surface for the floor (not shown) which is to be supported by the panel stringer 12, the supporting leg are cut of using a knife, a saw, a chisel etc, and the floor (not shown) may be attached to the supporting surface of the panel stringer 12 using self tapping screws, glue, etc. If, as will be described in relation to fig. 2, the panel stringer 12 should be elevated then a second supporting leg, designated the reference numeral 60^I, identical to the first supporting leg 60, may be connected to the supporting leg 60 to extend the supporting leg 60 and increase the height to which the panel stringer 12 can be elevated. The bottom part 64^I with the tool part 72^I of the second supporting leg 60^I is thus inserted into the recess 74, of the supporting leg 60, which has a shape, and a tool engageable part (not shown), which are complementary to the bottom end 64^I and the tool part 72^I of the second supporting leg 60^I. Further, the protrusion 70 on the supporting leg 60 engages the notch 68^I on the second supporting leg 60^I, thus allowing a higher torque to be transmitted from the second supporting leg 60^I to the supporting leg 60.

[0068] In fig. 3 further turns of the supporting leg 60 extended by the second supporting leg 60^I has elevated the panel stringer 12 above the height reachable by the supporting leg 60 alone. The enlargement shows in detail the protrusion 70 engaging the notch 68^I and the engagement between the bottom end 64^I and the tool part 72^I of the second supporting leg 60^I with the recess 74 of supporting leg 60.

Also shown in fig. 3 is a third supporting leg, designated the reference numeral 60^{II}, elevating the other end of the panel stringer 12. The third supporting leg 60^{II} is driven through a second aperture, designated the reference numeral 28^I, of

the apertures in the panel stringer 12 and through a second supporting element within the panel stringer (not shown) in registration with the aperture 28^l, and is supported by a second base element, designated the reference numeral 80^l, which is fastened to a support substrate, designated the reference numeral 6, by a second set of screws, one of which is designated the reference numeral 94^l through fastening holes, one of which is designated the reference numeral 92^l.

[0069] Fig. 4 shows a support system, in its whole designate the reference numeral 160, according to embodiments of corresponding second and fifth second aspects of the present invention. The support system 160 is shown comprising a plurality of panel stringers, one of which is designated the reference numeral 162, which is similar to the panel stringer 12 of the support system 10, the difference being that the apertures 28 of the panel stringer 12 are omitted in the panel stringer 162. The panel stringer 162 comprises a supporting surface, designated the reference numeral 164 attached to and first and second side portions, designated the reference numerals 166 and 168, respectively, along a first and second upper edges, designated the reference numerals 170 and 172 respectively. The side portions 166 and 168 further comprise first and second lower edges, designated the reference numerals 174 and 176, respectively, which are inwardly rolled. The side portions 166 and 168 are joined to the supporting surface 164 via first and second sidewalls, designated the reference numerals 178 and 180, respectively, and first and second transition portions, designated the reference numerals 182 and 184, respectively.

The panel stringer 162 may be made from the same materials, using the same manufacturing methods, as the panel stringer 12 and the material preferably has the same thickness of 0.6 mm as the panel stringer 12, however, as the panel stringer 162 of the support system 160 is only supported at the ends of the panel stringer 162, thicker material may be contemplated for longer panel stringer 162.

[0070] The panel stringer 162 may be 0.9 m long for simple handling but may be manufactured, or shortened, to any length.

The support system 160 further comprises a plurality of supporting elements, one of which is designated the reference numeral 190, which is similar to the supporting element 40 of the support system 10, the difference being a polygonal top plate, designated the reference numeral 194, defining four radially protruding engagement flanges, one of which is designated the reference numeral 196, and larger reinforcement webs, one of which is designated the reference numeral 198 for supporting the engagement flange 196. Fig. 4 also shows an embodiment of a supporting element, designated the reference numeral 200, which is similar to the supporting element 190, the difference being a different top plate, designated the reference numeral 202, defining three engagement flanges, one of which is designated the reference numeral 204, in a T-configuration. Also a further embodiment of a supporting element, designated the reference numeral 210, is shown in fig. 4. The supporting element 210 is similar to the supporting element 190, the difference being a different top plate, designated the reference numeral 212, which defines two engagement flanges, one of which is designated the reference numeral 214, the two engagement flange being opposite each other.

A further embodiment (not shown) of the supporting element comprises a top plate defining two engagement flanges perpendicular to each other.

[0071] The support system 160 is assembled by sliding the engagement flange 196 of the supporting element 190 endwise into the one of the ends of the panel stringer 162 and driving the supporting leg 60 through the supporting element 190 to engage with the base element 80 until the desired elevating of the panel stringer 162 is reached. Further panel stringers 162^{l-n} and further supporting elements 190 1-n, 200^{l-n} or 210^{l-n} may be used to build a grid structure for supporting a floor.

[0072] As previously described in relation to fig. 1 and the support structure 10, the base element 80 may be omitted where the substrate which supports the is sufficiently hard to withstand the pressure generated by the supporting leg 60 on it.

[0073] The supporting elements 190, 200 and 210 of the support system 160 shown in fig. 4 may be used together with the panel stringer 12 of the support system 10 shown in fig. 1. Thus a support structure may be assembled comprising the panel stringer 12 with the supporting element 40 provided within the panel stringer 12 for supporting the panel stringer 12 at a positing between the ends of the panel stringer 12 and the supporting element 160 provided at the ends of the panel stringer 12 to support the ends of the panel stringer 12.

Example

[0074] A prototype implementation of the presently preferred embodiment of the support system according to the first aspect of the present invention and described in fig 1 was made from the following components. The panel stringer 12 was made from 0.6 mm galvanized steel plate and rolled into the configuration shown having the following dimensions: The supporting surface 14 had a width of 4.6 cm and a length of 90 cm with each aperture 28 having a diameter of 3 cm, there being in total 5 apertures being centred longitudinally at the distances 5 cm, 25 cm, 45 cm, 65 cm, and 85 cm from one end of the panel stringer along the supporting surface, each aperture 28 being further being centered at the perpendicular distance 2,3 cm from the first upper edge 20. The sidewalls 30 and 32 each extended perpendicularly to the supporting surface and had a width of 0.7 cm. The transition portions 34 and 36 each had a width of 0.5 cm and the

angle between each transition portion 34, 36 and its adjoining sidewall was 30°, 32 was approximately 135°. The side portions 16 and 18 each had a width of 4 cm and were terminated by lower edges 24 and 26 which were rolled inwardly, the width of the rolled metal plate being 0.7 cm.

[0075] The supporting element 40 was made from nylon 6/6 and had the following dimensions: A square top plate 44 having a side 46 of 4.4 cm and centred on the top plate 44 a bore 48 having a diameter of 3.1 cm. The body 42 of the supporting element 40 was cylindrical and had an outer diameter of 3.5 cm. The top plate had a thickness of 0.3 cm and the body had a length of 4.2 cm, thus the total height of the supporting element was 4.5 cm. The locking tongues 52 and 54 were each 1.3 cm long and 0.7 cm wide. The protrusion on each locking tongue 52, 54 was 0.2 cm. The interior screw thread had trapezoidal threads and had a pitch of 0.6 cm.

[0076] The supporting leg 60 was also made from nylon 6/6 to the following dimensions: A length of 12.5 cm, a major diameter of 3 cm and a minor diameter of 2.4 cm. The bottom end 64 had a length of 3 cm and a diameter of 2 cm. The screw thread 66 had trapezoidal threads and a pitch of 0.6 cm and a 0.1 cm deep and 0.3 cm broad notch every 90° of the thread. The protrusion 70 extended 0.2 cm and was 0.3 cm broad and 0.1 cm long. The tool part 72 comprised four indentations along the perimeter in the lower 0.3 cm of the bottom end 64, the indentations defining four tabs, three of which were 0.3 cm broad and 0.1 mm long and one which was 0.5 cm broad and 0.1 cm long, indentations matching the tabs being provided on the inner walls of the recess 74

[0077] The load bearing capacity of the above prototype was calculated using finite element analysis and gave the results shown in table 1, which depend on whether the panel stringer 12 was supported at every second (40 cm), every third (60) or every fourth (80cm) aperture 28.:

Table 1:

Distance between supporting elements	Deflection at a load of 2000 N	Maximum load at 1.35 mm deflection
80 cm	1.44 mm	1872 N
60 cm	0.66 mm	4104 N
40cm	0.44 mm	11321 N

From the results it is clear that the support system according to the present invention has a high load bearing strength which further can be varied depending on the load bearing capacity required.

[0078] Although the present invention has been described above with reference to specific advantageous embodiments of the system and method according to the invention, it is however contemplated that numerous amendments and variations may be provided without deviating from the spirit of the invention as defined in the appended claims and the invention is therefore deemed to be understood in the broadest sense of the claims

List of reference signs with reference to the figures:

[0079]

2	First floor joist
4.	Second floor joist
6	Support substrate
10.	Support system
12	Panel stringer
14.	Supporting surface
16.	First side portion
18.	Second side portion
20	First upper edge
22.	Second upper edge
24.	First lower edge
26.	Second lower edge
28.	Aperture

EP 2 354 371 A1

(continued)

5

10

15

20

25

30

35

40

45

50

55

28 ^I	Second aperture
30.	First sidewall
32.	Second sidewall
34.	First transition portion
36.	Second transition portion
40.	Supporting element
42	Body
44	Top plate
46.	Side
48.	Bore
50.	Interior screw thread
52.	First locking tongue
54.	Second locking tongue
56	Reinforcement web
60	Supporting leg
60 ^I .	Second supporting leg
60 ^{II} .	Third supporting leg
62	Top end
64	Bottom end
64 ^I .	Second bottom end
66	Exterior screw thread
68	Notch
68 ^I .	Second notch
70.	Protrusion
72	Tool part
72 ^I	Second tool part
74	Recess
80	First base element
80 ^I	Second base element
80 ^{II} .	Third base element
82.	First side
84.	Recess
86.	Pin
88.	Slot
90	Second side
92.	Fastening hole
92 ^I	Second fastening hole
94.	Screw
94 ^I	Second screw

EP 2 354 371 A1

(continued)

5

10

15

20

25

30

35

40

45

50

55

100.	Base supporting system
112	Supporting stringer
114	Base supporting surface
116.	First side portion
118	Second side portion
120	First upper edge
122	Second upper edge
124.	First lower edge
126	Second lower edge
130	First sidewall
132.	Second sidewall
134.	First transition portion
136	Second transition portion
140.	Suspension bracket
142.	Web
144	Top flange
146	Bottom flange
148	Flange tip
150.	Attachment hole
152.	Screw
160.	Support system (second embodiment)
162.	panel stringer (second embodiment)
164.	supporting surface (second embodiment)
166	First side portion (second embodiment)
168	Second side portion (second embodiment)
170	First upper edge (second embodiment)
172	Second upper edge (second embodiment)
174	First lower edge (second embodiment)
176.	Second lower edge (second embodiment)
178.	First sidewall (second embodiment)
180.	Second sidewall (second embodiment)
182.	First transition portion (second embodiment)
184.	Second transition portion (second embodiment)
190	Supporting element (second embodiment)
192	Body (second embodiment)
194	Top plate (second embodiment)
196.	Engagement flange (second embodiment)
198.	Reinforcement web (second embodiment)
200.	Supporting element (alternative embodiment)

(continued)

202.	Top plate (alternative embodiment)
204.	Engagement flange (alternative embodiment)
210.	Supporting element (alternative embodiment)
212.	Top plate (alternative embodiment)
214.	Engagement flange (alternative embodiment)

Claims

1. A support system for supporting a floor relative to an underlying surface, said system comprising

a panel stringer made of thin metal plate and having a generally inverted U-shaped cross-section profile with two generally parallel side portions and a generally planar interconnecting portion defining a supporting surface, a plurality of spaced apart through-going apertures being provided in said interconnecting portion, a first plurality of supporting elements, adapted to support said panel stringer, each supporting element comprising a vertical through-going bore defining an interior screw thread, each of said supporting elements being slidably positionable along said panel stringer within said inverted U-shaped cross-section profile for positioning a specific supporting element in registration with a cooperating specific aperture of said plurality of spaced apart through-going apertures, said specific supporting element supporting said panel stringer and cooperating with said panel stringer to prevent rotation of said specific supporting element relative to said panel stringer, and, a second plurality of elongate supporting legs made of a cuttable material and adapted to support said supporting elements, each supporting leg being generally cylindrical and having a diameter adapted to allow it to pass through said plurality of spaced apart through-going apertures of said panel stringer and each supporting leg further having an exterior screw thread interengageable with said interior screw thread of said supporting elements and an inner recess provided at one end constituting a top end and defining a tool engageable part for engaging with a tool and an opposite bottom end serving to engage with said underlying surface.

2. The support system according to claim 1, each of said supporting elements comprising a rectangular top plate, said rectangular top plate supporting said panel stringer and engaging said side portions to prevent rotation of said supporting element relative to said panel stringer.

3. A support system for supporting a floor relative to an underlying surface, said system comprising

a panel stringer made of thin metal plate and having a generally inverted U-shaped cross-section profile with two generally parallel side portions and a generally planar interconnecting portion defining a supporting surface, a third plurality of supporting elements, adapted to support said panel stringer, each supporting element comprising a vertical through-going bore defining an interior screw thread and a polygonal top plate comprising a radially protruding engagement flange defining a planar top surface, said engagement flange being endwise slidably insertable into said panel stringer within said inverted U-shaped cross-section profile, said planar top surface supporting said panel stringer and said engagement flange engaging said side portions to prevent rotation of said supporting element relative to said panel stringer, and, a fourth plurality of elongate supporting legs, made of a cuttable material, adapted to support said supporting elements, each supporting leg being generally cylindrical and having an exterior screw thread interengageable with said interior screw thread of said supporting element and an inner recess provided at one end constituting a top end and defining a tool engageable part for engaging with a tool and an opposite bottom end serving to engage with said underlying surface.

4. The support system according to any preceding claim, said panel stringer in cross section profile comprising a transition portion joining said generally planar interconnecting portion and one of said side portions and defining a sidewall displaced outwardly relative to said one side portion.

5. The support system according to any preceding claim, said bottom end of each of said supporting legs further comprising a protrusion defining a tool part engageable by said tool engageable part of said top end.

6. The support system according to any preceding claim, said outer screw thread of each of said supporting legs being interrupted by a first multitude of notches defining a second multitude of screw thread segments and each of said supporting legs comprising a protrusion extending axially from a perimeter of said top end, said protrusion being engageable by one of said notches on a further supporting leg of said supporting legs.

7. The support system according to claim 6, each of said supporting elements comprising a resiliently deflectable tongue in a wall of said vertical through-going bore, said tongue comprising a protrusion engageable by each of said notches.

8. The support system according to any preceding claim, further comprising

a fifth plurality of base elements adapted to support said supporting legs and to be interposed between said bottom ends and said underlying surface, each of said base elements comprising first and second sides, said first side comprising a recess comprising a protrusion, and each of said supporting legs further comprising an indentation in said tool part, said indentation being engageable by said protrusion of said base elements.

9. A base supporting system for supporting a floor structure between two generally parallel floor joists or two generally parallel bearers in a building structure comprising

a supporting stringer made of thin metal plate and having a generally inverted U-shaped cross-section profile with two generally parallel side portions and a generally planar interconnecting portion defining a base supporting surface,

two suspension brackets, each defining a straight vertical web and top and bottom flanges extending in opposite directions perpendicularly from said web or alternatively defining an L having a straight vertical web and a bottom flange defining a top surface extending perpendicularly from said web, said bottom flange being endwise slidably insertable into said supporting stringer within said inverted U-shaped cross-section profile, said top surface supporting said supporting stringer and said bottom flange engaging said side portions of said supporting stringer to prevent rotation of said suspension bracket relative said supporting stringer, and said web and/or said top flange being adapted to be attachable to one of said floor joists or bearers

10. The base supporting system according to claim 9, said supporting stringer in cross section profile comprising a transition portion joining said generally planar interconnecting portion of said supporting stringer and one of said side portions of said supporting stringer and defining a sidewall displaced outwardly relative to said one side portion of said supporting stringer

11. The base supporting system according to any of the claims 9-10, further comprising the support system according to claim 8 for providing said underlying surface, said second side of each of said base elements being slidably attachable to said base supporting surface of said supporting stringer.

12. A method for supporting a floor relative to an underlying surface comprising the steps of

providing a support system according to any of the claims 1-2 or 4-8, positioning each of said supporting elements within said inverted U-shaped cross section profile in registration with a corresponding aperture of said plurality of apertures, inserting each of said supporting legs through a corresponding aperture of said apertures and interengaging said exterior screw thread of each of said supporting legs with said interior screw thread of a corresponding supporting element of said supporting elements, and driving each of said supporting legs through said corresponding aperture and at least partly through said corresponding supporting element to engage said underlying surface and support said supporting elements.

13. A method for supporting a floor relative to an underlying surface comprising the steps of

providing a support system according to any of the claims 3-8, inserting said engagement flange of each of said supporting elements endwise into a corresponding end of said panel stringer within said inverted U-shaped cross-section profile, interengaging said exterior screw thread of each of said supporting legs with said interior screw thread of a corresponding supporting element of said supporting elements, and

driving each of said supporting legs at least partly through said corresponding supporting element to engage said underlying surface and support said supporting elements

- 5 **14.** A method of supporting a floor structure between two generally parallel floor joists or two generally parallel bearers in a building structure comprising the steps of

10 providing a base supporting system according to claim 9-10,
 inserting said bottom flange of each of said suspension brackets endwise into a corresponding end of said supporting stringer within said inverted U-shaped cross-section profile, and
 attaching said upper flange, or alternatively attaching said web, of each of said suspension brackets to a corresponding joist or bearer of said joists or said bearers.

- 15.** The method according to claim 14 further comprising the steps of:

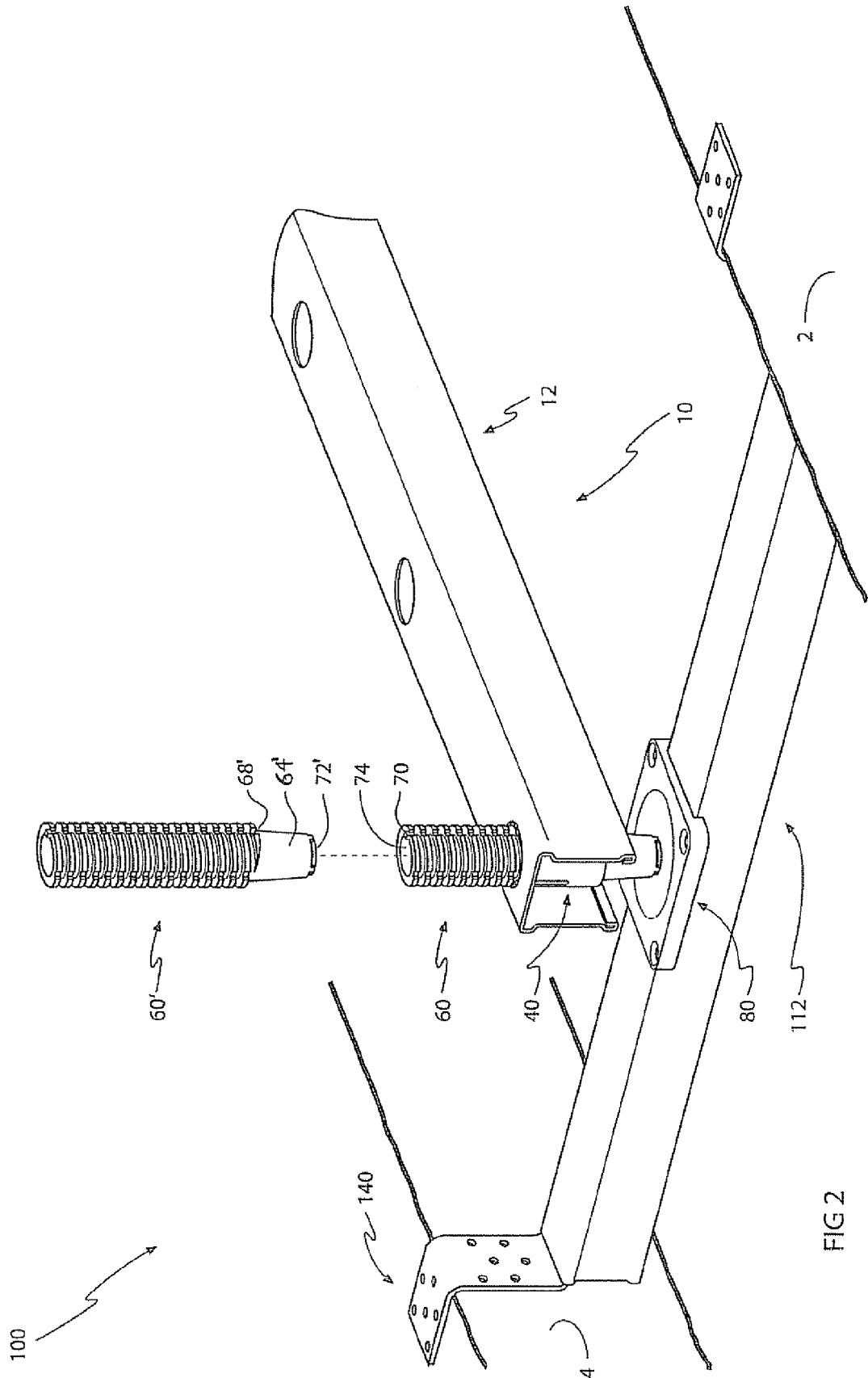
15 providing a support system according to claim 8,
 performing the substeps of:

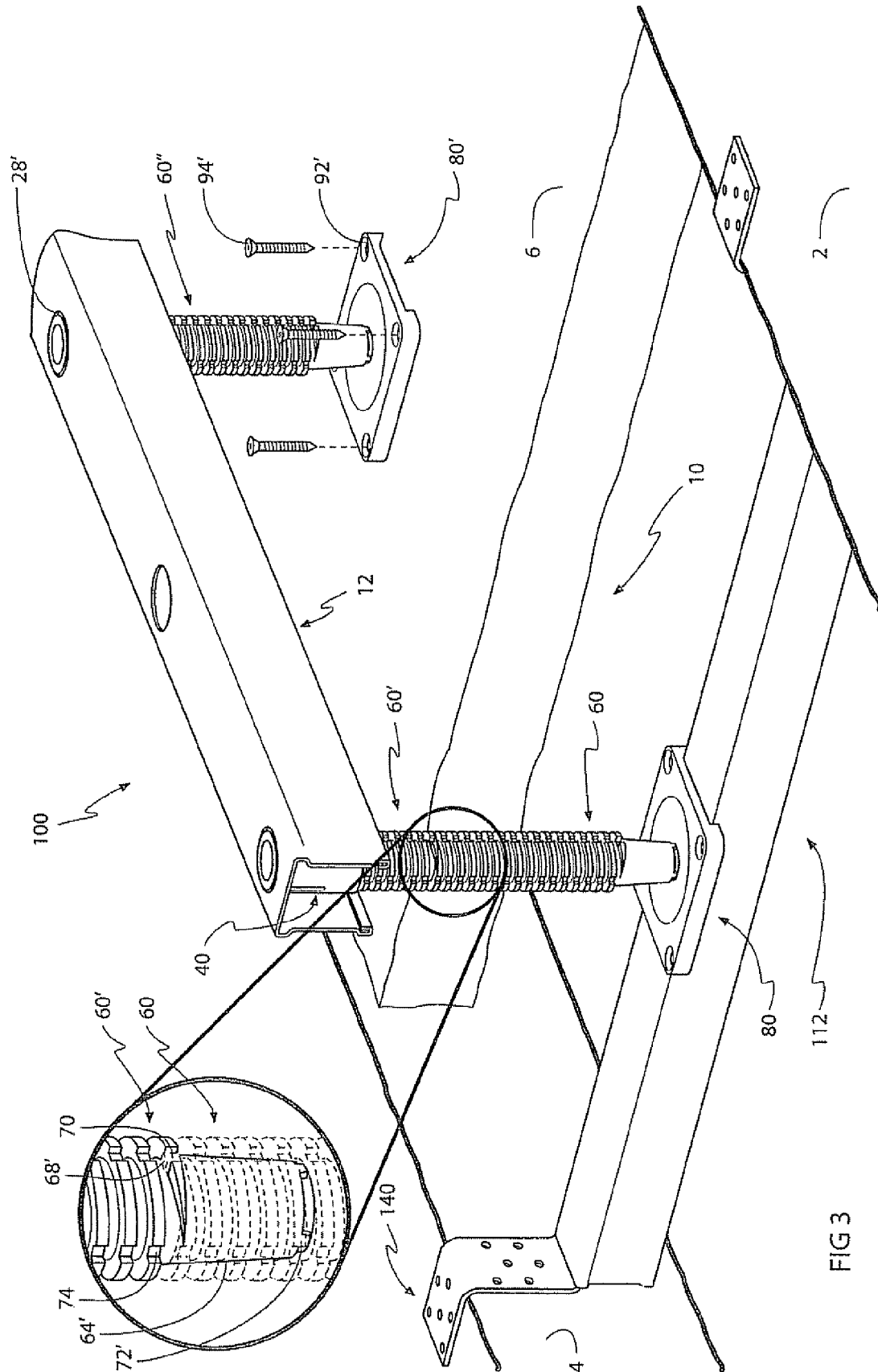
20 positioning each of said supporting elements within said inverted U-shaped cross section profile in registration with a corresponding aperture of said plurality of apertures,
 inserting each of said supporting legs through a corresponding aperture of said apertures and interengaging said exterior screw thread of each of said supporting legs with said interior screw thread of a corresponding supporting element of said supporting elements, and
 driving each of said supporting legs through said corresponding aperture and at least partly through said corresponding supporting element to engage said underlying surface and support said supporting elements,

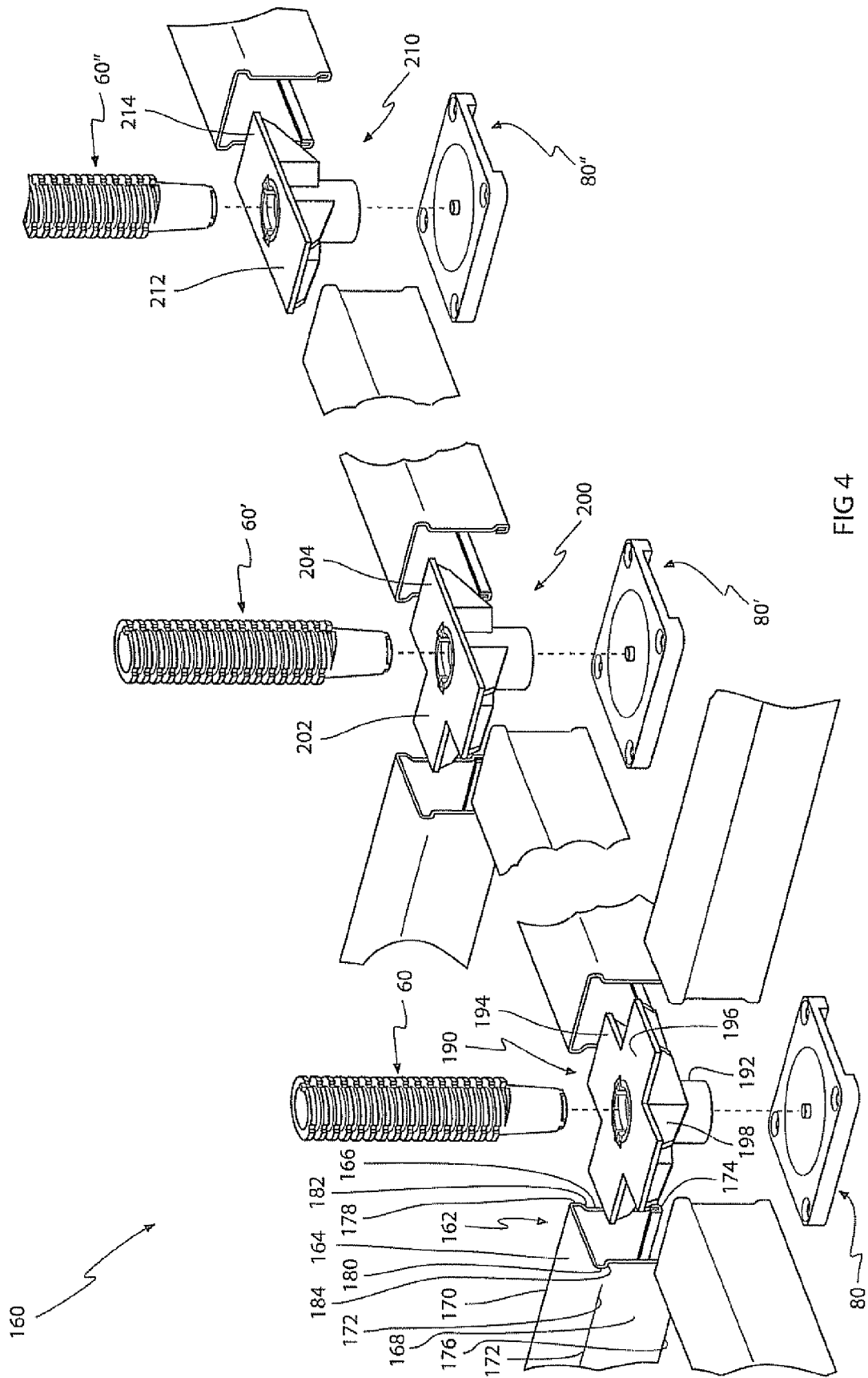
25 or alternatively the substeps of:

30 inserting said engagement flange of each of said supporting elements endwise into a corresponding end of said panel stringer within said inverted U-shaped cross-section profile,
 interengaging said exterior screw thread of each of said supporting legs with said interior screw thread of a corresponding supporting element of said supporting elements, and

35 driving each of said supporting legs at least partly through said corresponding supporting element of said supporting elements to engage said underlying surface and support said supporting elements,
 attaching said first side of each of said base elements to a corresponding supporting leg of said supporting legs of said support system, and
 attaching said second side of each of said base elements of said support system to said supporting stringer.









EUROPEAN SEARCH REPORT

Application Number
EP 10 15 1483

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 874 943 B1 (BLOM KENT [SE]; BLOM FREDRIK [SE]; HANSEN STEFAN [SE] BYGG OCH MILJOET) 7 April 2004 (2004-04-07)	1-4,12,13	INV. E04F15/024 E04B1/24
Y	* figures 4a-4c, 5a, 5b, 6c, 6d 7, 8 *	5,6	
Y	US 5 511 760 A (KAMBARA GORO [US]) 30 April 1996 (1996-04-30) * figures 2A,2B *	5,6	
X	WO 02/057557 A1 (WARD BUILDING COMPONENTS LTD [GB]; MORGAN GARRY [GB]) 25 July 2002 (2002-07-25) * figures 1-4 *	9,10,14	
A	DE 196 07 511 A1 (CADOSCH BEAT [CH]) 17 October 1996 (1996-10-17) * figure 1 *	3,13	
			TECHNICAL FIELDS SEARCHED (IPC)
			E04F E04B F16M
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 June 2010	Examiner Fournier, Thomas
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

1
EPO FORM 1503 03.92 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 15 1483

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

24-06-2010

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0874943	B1	07-04-2004	AT 307248 T	15-11-2005
			AT 263881 T	15-04-2004
			AU 1561197 A	11-08-1997
			DE 69632150 D1	13-05-2004
			DE 69632150 T2	21-04-2005
			DE 69635317 D1	24-11-2005
			DE 69635317 T2	08-06-2006
			DK 1314833 T3	28-11-2005
			DK 874943 T3	14-06-2004
			EP 0874943 A1	04-11-1998
			ES 2247440 T3	01-03-2006
			ES 2219707 T3	01-12-2004
			NO 983328 A	17-09-1998
			SE 505841 C2	13-10-1997
			SE 9600203 A	20-07-1997
			WO 9726424 A1	24-07-1997

US 5511760	A	30-04-1996	NONE	

WO 02057557	A1	25-07-2002	GB 2372514 A	28-08-2002
			IE 20020028 A1	24-07-2002

DE 19607511	A1	17-10-1996	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 2006053813 A [0002]
- EP 1247922 A [0002]
- DE 3913984 [0002]
- GB 1140957 A [0002]
- GB 1035817 A [0002]
- DE 20120006 [0002]
- WO 72008055292 A [0002]
- EP 0980944 A [0002]
- EP 1528181 A [0002]
- US 4893441 A [0002]
- US 4982539 A [0002]
- EP 1760222 A [0002]
- FR 2905395 [0002]
- EP 1171678 A [0002]
- EP 0353360 A [0002]
- US 5048242 A [0002]