



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
21.06.2023 Bulletin 2023/25

(51) International Patent Classification (IPC):
E04F 11/112 ^(2006.01) **B21D 11/20** ^(2006.01)
E04F 11/02 ^(2006.01) **E04F 11/18** ^(2006.01)

(21) Application number: **21215660.8**

(52) Cooperative Patent Classification (CPC):
E04F 11/112; B21D 11/10; B21D 11/20;
B21D 53/00; E04F 2011/0209; E04F 2011/1889

(22) Date of filing: **17.12.2021**

(84) Designated Contracting States:
AL 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 RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

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(54) **STAIRCASE AND METHOD FOR MOUNTING SUCH STAIRCASE, AND A METHOD FOR PRODUCING A STAIRCASE PART**

(57) Disclosed is a staircase (1), methods for mounting such staircase (1) and a method for producing a staircase part (6a, 6b, ..., 6n), wherein the staircase (1) comprises a plurality of staircase parts (6a, 6b, ..., 6n), mounted consecutively to each other. Each staircase part (6a, 6b, ..., 6n) consists of one single sheet metal part (60), wherein each staircase part (6a, 6b, ..., 6n) comprises a tread part (20), a riser part (30) and at least one railing

part (40), wherein the tread part (20) comprises a back edge (21), a front edge (23), first and second side edges (22, 24), wherein the riser part (30) is arranged along the back edge (21) of the tread part (20) and extends in a first direction (Z), wherein the railing part (40) is arranged along the first side edge (22) of the tread part (20) and extends in the first direction (Z).

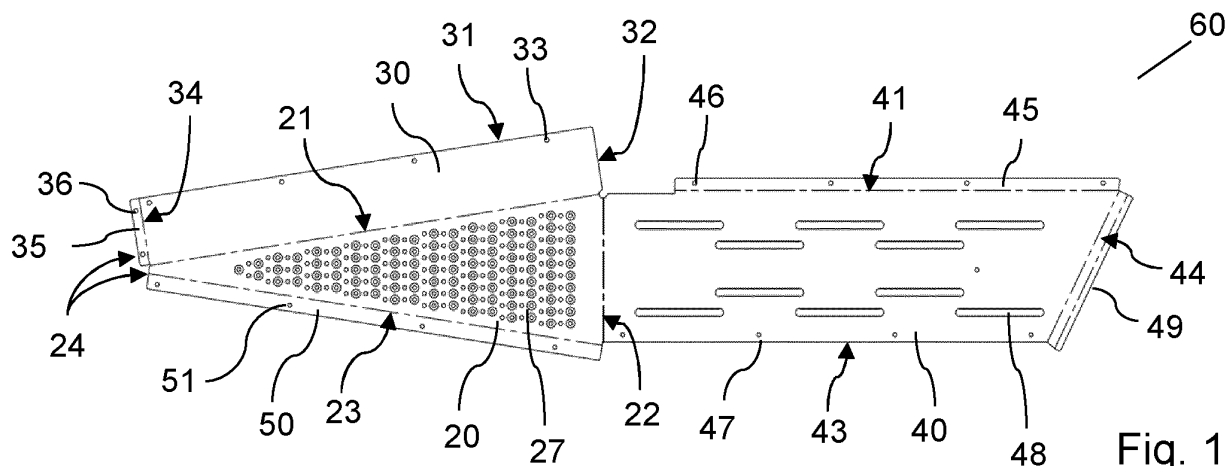


Fig. 1a

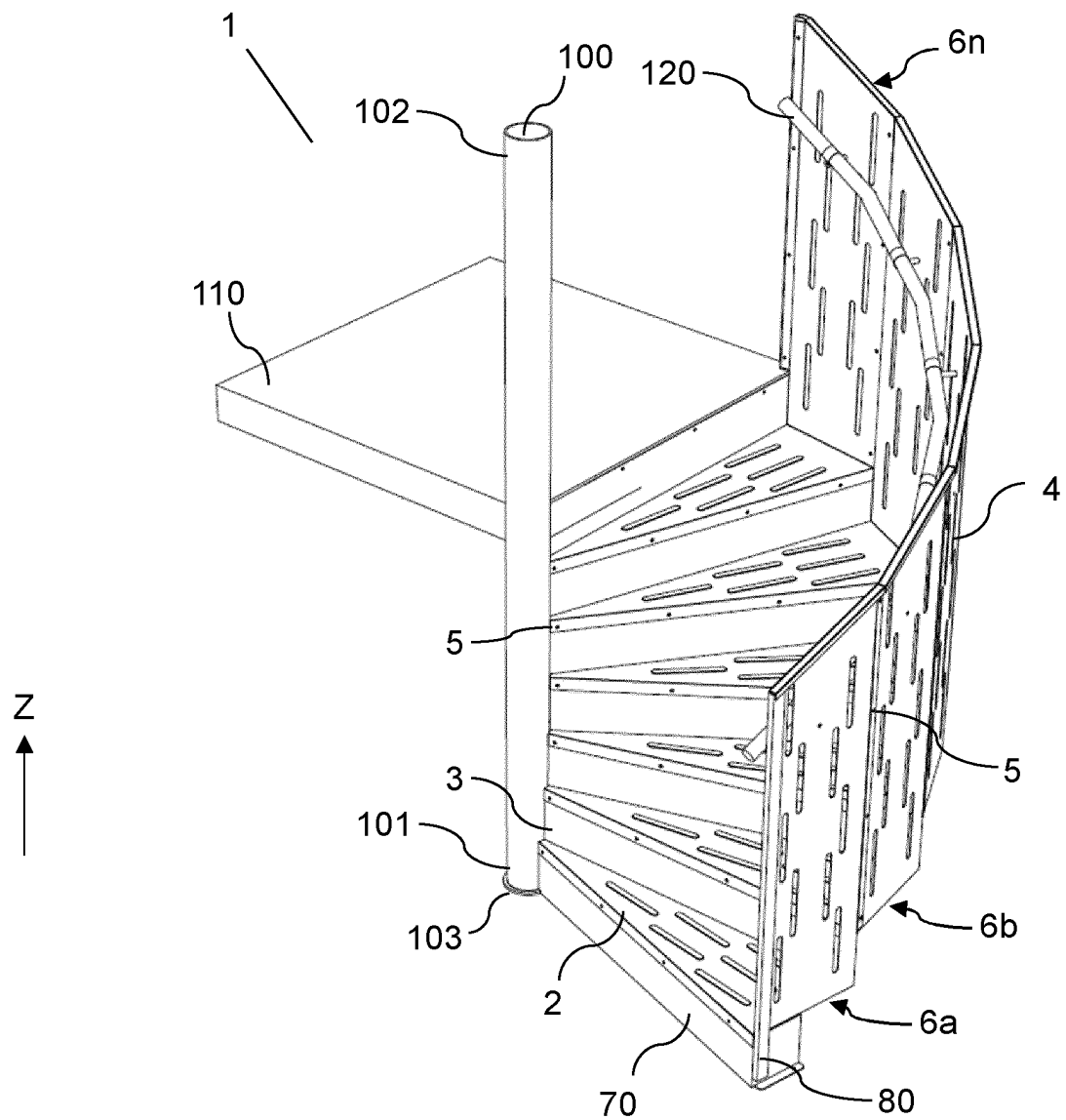


Fig. 2

Description

Technical field

[0001] The invention considers a staircase and a method for mounting such staircase. Further, a production method for producing a staircase part is disclosed.

Background art

[0002] Staircases consist of four main components, railings (or baluster), handrail, stair treads and landings. Other parts of a staircase are for example risers, stringers, followers, bolts etc. Risers may cover parts or the whole distance between the treads and the so-called followers are an alternative form of a stringer and may for example be one or two flat steel followers which runs between the steps, and by that connects the steps at its outer edges, wherein the construction becomes stable.

[0003] A spiral staircase normally comprises a pillar to which the treads are screwed, wherein the staircase runs around the central pillar upwards and a stringer, or one or more flat steel followers, connects the outer ends of the treads to make the staircase stable. Further, railings (balusters) are mounted to the outer ends of the treads and handrails are mounted to the railings or to the treads via railing posts and sometimes, an inner handrail is mounted to the central pillar. The treads of the staircase may be made in various designs, materials and so on, and may comprise perforations with a hole pattern and design of the holes to cope with issues like providing a non-slippery surface. One type of known staircase is where the treads are made of steel grating, where load bearing bars are joined with cross bars under high pressure and high amperage which gives a welded joint at each connection between load bearing and cross bars. Edging bars are welded perpendicularly to the bearing bars on the grating and the gratings are then normally hot dip galvanized, before they are ready to be packed and sent to a site for mounting to a complete staircase.

[0004] When producing metal (steel) staircases the different components of the staircase may, more or less, all be of metal. A common type of spiral staircase comprises a metal pillar, to which the stair treads are fixedly attached by screws which connects the treads directly to the pillar or to brackets which in turn are fixedly connected to the central pillar. Further, this type comprises flat steel "followers", which are metal bands which are screwed to the outer ends of the treads, one upper and one lower. Of course, one wide steel follower may be used. To the outer ends of the treads or to the followers, some kind of railings are mounted. The railings may, depending on visual and/or safety issues be in form vertical bars, horizontal bars, combinations of horizontal and vertical bars, perforated or unperforated sheet metal, wire mesh, glass etc. Due to safety reasons, the railings must have a certain height, which height normally is higher than the natural height for a handrail, why the handrail must be po-

sitioned a bit below the upper edge of the railing. Known metal staircases are produced like single parts, where some of the parts are welded to each other and after the details are in a "ready" state, the parts are then normally galvanized to protect the steel from corrosion, as explained for a known staircase above.

[0005] When delivering a complete staircase, the kit comprises a lot of components which are to be mounted to each other to build up the staircase. The kit for a complete staircase in known art is bulky and to mount a complete staircase is time-consuming with a lot of components to handle and mount. Thus, there is a need of a staircase which is less bulky to deliver, and with less details and which is easier to mount. Further, one other problem with known staircases is that some parts first must be welded and then galvanized, why the lack possibility to produce the parts directly from a galvanized raw material, for example from a coil of galvanized steel.

Summary of the invention

[0006] It is an object of the invention to address at least some of the problems and issues outlined above. It is possible to achieve these objects and others by an inventive staircase and a method for mounting such staircase as defined in the attached independent claims.

[0007] According to an aspect of the invention, a complete staircase is disclosed. The staircase comprises a plurality of staircase parts which are mounted consecutively to each other, and wherein each staircase part consists of one single sheet metal part. Each staircase part comprises a tread part, a riser part and at least one railing part, which all preferably are substantially flat, and wherein the tread part comprises a back edge, a front edge, which is opposite the back edge, and further a first side edge and a second side edge, which is opposite the first side edge. The back edge, the front edge and the first and second side edge thereby encloses the tread part. The riser part is arranged along the back edge of the tread part and extends in a first direction, which preferably is perpendicular to the tread part, but the inventive concept also discloses other angles of the riser part relative the tread part. For example, the design of the riser part may comprise different bends and angles to provide a certain design, as long as the riser part originates from the one single sheet metal part. By that, a free riser edge of the riser faces away from the tread part. The railing part is arranged along the first side edge of the tread part and extends in the first direction, which preferably is perpendicular to the tread part such as a free railing edge faces away from the tread part. But in the same way as for the riser part, the inventive concept also discloses other angles of the railing part relative the tread part. For example, the design of the railing part may comprise different bends and angles to provide a certain design, as long as the railing part originates from the one single sheet metal part.

[0008] Such a staircase is unique in that a lot of parts

which normally are parts of a staircase, particularly for a metal staircase, are integrated in the modular staircase parts, which further by their design contribute to the overall stability and strength of the staircase, thus resulting in a reduced number of parts. This due to that the staircase parts are fixedly connected to each other in many positions along the parts. The reduced number of parts are positive in view of environment (less details, less weight, transport etc.) as well in view of mounting time. For example, a prior art spiral metal staircase comprises a number of individual parts as a plurality of steps, risers, railing parts, outer metal rim bands/followers which connects the plurality of steps to each other, handrail etc. Now, all these parts except the handrail are integrated (or omitted) in the inventive staircase, which achieves a good strength and stability and a quick and easy mounting. One further positive aspect is that the thickness of the steel sheet metal may be reduced compared to similar staircases of known art.

[0009] According to an embodiment, the free edge of the riser part of a lower arranged staircase part of the plurality of staircase parts is connected to the tread part of an upper arranged staircase part of the plurality of staircase parts positioned immediately adjacent the lower staircase part, preferably to its front edge. By connecting the free edge of the riser part to the tread part of an upper staircase part, the overall strength is improved, and a stable staircase is achieved. The free riser edge may be connected to the tread part in any "depth location" between the front edge and the back edge of the tread part of the upper staircase part so the invention is not limited to a connection with the front edge.

[0010] According to an embodiment, the tread part of each staircase part further comprises a nose part, arranged along the front edge of the tread part, wherein the nose part of an upper arranged staircase part of the plurality of staircase parts is connected to the free riser edge of the riser part of a lower arranged staircase part of the plurality of staircase parts, positioned immediately adjacent the upper staircase part, or to a riser part which is not part of any other of the plurality of staircase parts, if the upper arranged staircase part is a lowermost staircase part. By providing the front edge of each staircase part with a nose part, the tread part gets increased stability as well as the nose part provides a natural connection point for the free riser edge of a lower staircase part.

[0011] According to an embodiment, the nose part of each staircase part comprises a plurality of first through holes and the riser part of each staircase part comprises a corresponding number of second through holes arranged near the free riser edge of the riser part. By that, the free riser edge of a lower staircase part is easily connected to the nose part of an upper staircase part. Preferably, the first through holes of the nose part do not have threads and the second through holes of the riser part comprise threads. By inserting a respective screw through a respective first through hole of the nose part and then screw it into a respective corresponding second

through hole of the underlying riser part, the two staircase parts are fixedly connected to each other at the riser and the tread.

[0012] According to an embodiment, the railing part of each staircase part of the plurality of staircase parts comprises at least one first tongue part, arranged along a back edge of each railing part, which first tongue part of a lower arranged staircase part of the plurality of staircase parts is connected to a front edge of a railing part of an upper staircase part or to a post. By providing the back edge of each railing part with a first tongue part, the railing part gets increased stability as well as the first tongue part provides a natural connection point to the front edge of a railing part of an adjacent staircase part or to a post. A post is normally connected to the first tongue part of the uppermost staircase part to provide extra stability.

[0013] According to an embodiment, the tongue part of each staircase part comprises a plurality of third through holes and the railing part of each staircase part further comprises a corresponding number of fourth through holes arranged near the front edge of the railing part. Preferably, the third through holes of the tongue part have threads and the fourth through holes at the front edge do not comprise threads. By inserting a respective screw through a respective fourth through hole of the front edge and then screw it into a respective corresponding third through hole of the underlying tongue part, the two staircase parts are fixedly connected to each other at the railing parts, wherein a stable railing is achieved.

[0014] According to an embodiment, the riser part of each staircase part comprises at least one second tongue part arranged along a second side edge of the riser part, which second side edge faces away from the railing part, wherein the at least one second tongue part comprises at least one fifth through hole. By that, the staircase part may be screwed to a wall or a center pillar or the like, in a very convenient way, since the second tongue part may easily be adopted to the surface, or the angle between the surface (of the wall or pillar) by bending it further on site, if the predetermined angle is a bit wrong. Preferably, the fifth through hole do not have threads but underlying fixation means/holes of the pillar may comprise threads, for fixation of the staircase part to the pillar. If the staircase is mounted to a wall on one side, the wall may comprise fixation means or not, depending on the wall material (steel, concrete, wood, etc.).

[0015] According to an embodiment, the staircase is a spiral staircase, wherein the thread part of each staircase part has a substantially triangular shape, wherein the staircase further comprises a center pillar extending in the first direction, which preferably is a vertical direction, wherein each staircase part further is fixedly attached to the center pillar. This may be done via the second tongue part of the riser, if the riser is equipped with that tongue part, or via another part of the stair tread, for example a tongue or the like arranged directly on the second edge of the tread part. Preferably, the pillar comprises a plu-

rality of fixation means, for example holes, arranged spaced apart in the first direction and circumferentially around the pillar in a spiral pattern, wherein each riser part of the plurality of staircase parts may be fixedly attached to the center pillar.

[0016] According to an embodiment, the staircase further comprising a floor part (landing), which at least is attached to the riser part of the uppermost staircase part of the staircase, and preferably also to a building part and/or a pillar, if applicable.

[0017] According to an aspect of the invention, a kit of parts for a staircase is disclosed. The kit of parts comprises a plurality of staircase parts, wherein each staircase part consists of one single sheet metal part. Each staircase part comprises a tread part, a riser part and at least one railing part, wherein the tread part comprises a back edge, a front edge, which is opposite the back edge, and further a first side edge and a second side edge, which is opposite the first side edge. The riser part is arranged along the back edge of the tread part and extends in a first direction, which preferably is perpendicular to the tread part, but the inventive concept also discloses other angles of the riser part relative the tread part. For example, the design of the riser part may comprise different bends and angles to provide a certain design, as long as the riser part originates from the one single sheet metal part. By that, a free riser edge of the riser faces away from the tread part. The railing part is arranged along the first side edge of the tread part and extends in the first direction, which preferably is perpendicular to the tread part such as a free railing edge faces away from the tread part. But in the same way as for the riser part, the inventive concept also discloses other angles of the railing part relative the tread part. For example, the design of the railing part may comprise different bends and angles to provide a certain design, as long as the railing part originates from the one single sheet metal part. Such kit of parts may easily be loaded on a one single pallet which then may comprise only one type of parts, which is far better and more convenient compared to prior art staircases. The kit of parts may of course further comprise, attachment means, pillar, handrail etc.

[0018] According to an aspect a method for mounting a staircase as described above is disclosed. The staircase is mounted between a lower floor level and an upper floor level in a building or the like, starting from a lowermost stair tread of the staircase. The method comprising:

- a) arrange a first staircase part of the plurality of staircase parts such as the first side edge of the tread part faces away from a building part or a pillar to which the staircase is to be mounted and mount the first staircase part to the building part or the pillar by attachment means such as the second side edge of the tread part abuts the building part or the pillar,
- b) mount a second staircase part of the plurality of staircase parts to the building part or the pillar by attachment means,

c) mount the first and second staircase parts together by connecting the riser part of the first staircase part to the tread part (i.e. to the nose part) of the second staircase part and further connect the back edge of the railing part of the first staircase part to the front edge of the railing part of the second staircase part, by a plurality of attachment means,

d) mount a next staircase part of the plurality of staircase parts to the building part or the pillar by attachment means,

e) mount the next staircase part to the second (former)/lower adjacent staircase part of the plurality of staircase parts by connecting the riser part of the second (former)/lower staircase part to the tread part of the next (upper) staircase part and further connecting the back edge of the railing part of the second (former)/lower staircase part to the front edge of the railing part of the next (upper) staircase part, by a plurality of attachment means,

f) repeat step d) - e) for rest of the plurality of staircase parts until an uppermost staircase part of the plurality of staircase parts is attached to the staircase part below the uppermost staircase part,

g) attach the riser part of the uppermost staircase part to a floor part of the staircase or to a floor of the upper floor level, by a plurality of attachment means,

h) optionally attach a riser part which is not part of another staircase part of the plurality of staircase parts to the first staircase part by a plurality of attachment means, at any step after step a),

i) optionally attach a post to the front edge of the railing part of the first staircase part, at any step after step a), by a plurality of attachment means,

j) optionally attach a post to the back edge or to a first tongue of the railing part of the uppermost staircase part by a plurality of attachment means.

[0019] The staircase comprises a plurality of staircase parts which are mounted consecutively to each other, wherein each staircase part consists of one single sheet metal part. Each staircase part comprises a tread part, a riser part and at least one railing part, which all preferably are substantially flat, and wherein the tread part comprises a back edge, a front edge, which is opposite the back edge, and further a first side edge and a second side edge, which is opposite the first side edge. The back edge, the front edge and the first and second side edge thereby encloses the tread part. The riser part is arranged along the back edge of the tread part and extends in a first direction, which preferably is perpendicular to the tread part, but the inventive concept also discloses other angles of the riser part relative the tread part. By that, a free riser edge of the riser faces away from the tread part. The railing part is arranged along the first side edge of the tread part and extends in the first direction, which preferably is perpendicular to the tread part such as a free railing edge faces away from the tread part. The method for mounting such a staircase provides an easy

way of mounting a staircase since very few modular parts are needed and which parts also are lighter than existing stair parts and all fits on one single pallet (within certain limits of course). Thus, the staircase is easy handled, easy mounted, and thus cheaper to mount compared to known staircases of metal.

[0020] According to an embodiment, a method for mounting a staircase is disclosed, wherein the staircase is a spiral staircase and wherein the spiral staircase comprises a center pillar, to which the staircase parts are to be mounted, the method further comprising, before the above presented step a):

- i) optionally attach a bottom plate to a floor of a lower floor level of a building,
- ii) position a bottom end of a center pillar on the floor of the lower floor level or optionally on the bottom plate and attach the pillar to the floor or optionally to the bottom plate,
- iii) optionally attach a floor part to the center pillar at a level close to the upper floor level and preferably attach it to a building part of the building, for example a wall or an upper floor of the upper floor level.

[0021] The spiral staircase comprises as mentioned some kind of pillar or central wall or the like, around which the staircase runs upwards in a spiral way, and in the case of having a pillar, the method steps i) - iii) are applicable. The bottom plate may be used to easier secure the lower end of the pillar to the floor, and when the pillar is positioned and secured, the mounting according to step a) - step j) may start.

[0022] According to an aspect, a method for mounting an alternative staircase between a lower floor level and an upper floor level in a building or the like, is disclosed. The method starts in a similar way by mounting a lowermost stair tread of the staircase. The alternative staircase is more or less similar with the previously described staircase but now each staircase part comprises two railing parts. One railing part is arranged along the first side edge of the tread part (similar with the former described staircase) and extends in the first direction such as a free railing edge faces away from the tread part, and one other railing part is arranged along the second side edge of the tread part and extends in the first direction such as a free railing edge faces away from the tread part. The method comprising:

- a) mount a first and a second staircase part of the plurality of staircase parts together by connecting the riser part of the first staircase part to the tread part of the second staircase part and further connecting the back edge of each railing part of the first staircase part to the respective front edge of each railing part of the second staircase part, by a plurality of attachment means,
- b) mount a next staircase part of the plurality of staircase parts to the second/lower staircase part of the

plurality of staircase parts by connecting the riser part of the second/lower staircase part to the tread part of the next staircase part and further connecting the back edge of each railing part of the second/lower staircase part to the respective front edge of each railing part of the next staircase part, by a plurality of attachment means,

- c) repeat step a) - b) for the rest of the plurality of staircase parts until an uppermost staircase part of the plurality of staircase parts is attached to the staircase part below the uppermost staircase part,
- d) attach the riser part of the uppermost staircase part to a floor part of the staircase or to a floor of the upper floor level, by a plurality of attachment means,
- e) optionally attach a riser part which is not part of another staircase part of the plurality of staircase parts to the first staircase part by a plurality of attachment means, at any step after step a),
- f) optionally attach a post to each front edge of the railing parts of the first staircase part, at any step after step a), by a plurality of attachment means,
- h) optionally attach a post to each back edge or each first tongue of the railing part of the uppermost staircase part by a plurality of attachment means.

[0023] By such a method, for example a straight or angled staircase with one railing part at respective sides of the staircase may be mounted according to the inventive concept.

[0024] According to an aspect, a method for producing a staircase part from a roll of sheet metal is disclosed. The method comprising:

- a) cut a sheet metal from a roll of sheet metal to one single sheet metal part, wherein the single sheet metal part comprises a tread part, a riser part and at least one railing part,
- b) bend the single sheet metal part to form the staircase part by bending the riser part along a back edge of the tread part such as the riser part extends in a first direction, wherein a free riser edge of the riser faces away from the tread part,
- c) bend the single sheet metal part to form the staircase part by bending the railing part along a first side edge of the tread part such as the railing part extends in the first direction, wherein a free railing edge faces away from the tread part, and
- d) bend the single sheet metal part to form the staircase part by bending a second tongue part along a second side edge of the riser part, which second side edge faces away from the railing part, such as the second tongue part extends in a direction which is transverse the first direction, wherein the second tongue part faces away from the riser part.

[0025] According to an embodiment, the method further comprising:

- e) bend a nose part along a front edge of the tread part, which front edge is opposite the back edge, such as the nose part extends in a direction opposite the first direction wherein the nose part faces away from the tread part,
- f) optionally, bend a first tongue part along a back edge of the railing part, such as the first tongue part extends in a direction which is transverse the first direction, wherein the first tongue part faces away from the railing part.

[0026] By producing a staircase part which comprises tread part, riser part and railing part from a roll of sheet metal a number of advantages are achieved. First of all, the roll of sheet metal may already be galvanized, which is a great advantage over prior art staircases, which normally first must be produced as single parts which are not galvanized since a number of welding operations must be performed before galvanization is possible. The inventive production method eliminates a number of steps and speeds up the production process of a complete staircase. Other advantages are for example elimination transports and intermediate storage of the different parts since it is now possible to produce the staircase parts from the roll to a final product which is ready for delivery.

[0027] Further possible features and benefits of this solution will become apparent from the detailed description below.

Brief description of drawings

[0028] The solution will now be described in more detail by means of exemplary embodiments and with reference to the accompanying drawings, in which:

Fig. 1a is a top view of a flat sheet metal part according to the invention which is to be bent to a modular staircase part.

Fig. 1b is a perspective view of a modular staircase part which is formed by bending the flat sheet metal part of Fig. 1a.

Fig. 2 is a perspective view of a staircase according to the invention, which comprises a pillar, a floor part and a plurality of staircase parts as seen in Fig. 1b.

Fig. 3a is a detailed side view of a part of the pillar and shows how stair treads are attached to the pillar and Fig. 3b is a section view through the pillar of Fig. 3a.

Fig. 4 is a side view of the staircase mounted according to the inventive method and comprising a number four staircase parts.

Fig. 5 is a section view of a part of a railing of the staircase of Fig. 4 which shows how a handrail is

attached to the railing.

Detailed description

[0029] Briefly described, a staircase which is constructed by a plurality of modular staircase parts is disclosed. Further, methods for mounting different kinds of staircases, like a spiral staircase, a straight or angled staircase and the like, which are constructed by such modular staircase parts are disclosed as well as a method for producing such staircase part. The inventive staircase and methods for producing and mounting a staircase comprising the inventive staircase parts enables a very cost-efficient staircase due to very few parts and which further enables a very space-efficient and easy handled transport of the complete staircase. Further, a very quick mounting of the staircase on sight minimizes mounting time and thereby mounting costs.

[0030] This application will exemplify the invention by describing a spiral staircase, but it is understood that the invention is applicable at other forms of staircases, such as straight and angled staircases and the like.

[0031] Fig. 1a-b show a top view of a flat single sheet metal part 60 (Fig. 1a) and the single sheet metal part 60 when it is bent to form a staircase part 6a, 6b, ..., 6n (Fig. 1b). A plurality of staircase parts 6a, 6b, ..., 6n are used to together form a complete staircase (see Fig. 2), which according to the inventive concept reduces the number of parts and thus speeds up the mounting of the staircase. Each staircase part 6a, 6b, ..., 6n as visible in Fig. 1b as well as the sheet metal part 60 as visible in Fig. 1a comprises a tread part 20, a riser part 30 and one railing part 40. Figs. 1a-b show the sheet metal part 60/ the staircase part 6a, 6b, ..., 6n when designed for a spiral staircase, where the tread part 20 has a substantially triangular shape, and where the staircase parts 6a, 6b, ..., 6n normally are attached to a center pillar or a center wall or a similar building part or the like. If for example a straight or angled staircase is to be produced and mounted according to the inventive concept, the sheet metal part 60/ the staircase part 6a, 6b, ..., 6n would have a rectangular tread part 20 and preferably would comprise a second railing part 40, opposite the right railing part 40 of Figs. 1a-b.

[0032] In the description below, expressions like back, front, side, upper, lower etc. all refers to a staircase in its mounted form, where the "front" is closest to a user standing in front of the lowermost step of the staircase and the "back" thus is more far away from the user. Further, "sides" means the left and the right side referring to the same position of the user, and when a staircase is mounted, it is mounted from the bottom to the top and the first tread step is the lowermost tread step.

[0033] The tread part 20 comprises a back edge 21, a front edge 23 which is opposite the back edge 21, and further a first side edge 22 and a second side edge 24 opposite the first side edge 22. To minimize the risk of slipping, each tread part 20 may comprise a non-slip-

pery surface or some kind of anti-slip arrangement 27, which may be in the form of a perforation made in such a way that a plurality of holes is punched from the underside of the tread part 20, in a way to create an upwardly directed collars around the holes. The number of holes, the height of the collars as well as the design of the holes and the collars is proven to get the wanted anti-slip function. The tread part 20 further comprises a nose part 50, which is arranged as a bent tongue part along the front edge 23 of the tread part 20 of the staircase part 6a, 6b, ..., 6n. The nose part 50 is arranged to be connected to a free riser edge 31 of the riser part 30 of a lower arranged staircase part 6a, 6b, ..., 6n or to a riser part 70 which is not part of another staircase part 6a, 6b, ..., 6n, that is normally a riser part 70 arranged for the first (lowermost) step. Thus, the nose part 50 comprises a plurality of first through holes 51 and the riser part 30 comprises a corresponding number of second through holes 33, arranged near the free riser edge 31 of the riser part 30. The riser part 30 is explained further below.

[0034] In the formed (bent) staircase part 6a, 6b, ..., 6n, the railing part 40 is arranged along the first side edge 22 of the tread part 20 and protrudes in the first direction Z (upwards when mounted to a staircase) such as a free railing edge 44 faces away from the tread part 20. The railing part 40 further comprises a back edge 41, a front edge 43 opposite the back edge 41, and at least one first tongue part 45, which is arranged along the back edge 41 of the railing part 40 and extends in a direction perpendicular to the first direction Z, for example extending backwards with an angle relative the railing part 40. The first tongue part 45 is arranged to be connected to the front edge 43 of a railing part 40 of an adjacent staircase part 6a, 6b, ..., 6n or to a post 80 by that it comprises a plurality of third through holes 46. The railing part 40 further comprises a corresponding number of fourth through holes 47 arranged near the front edge 43 of the railing part 40, which are arranged in positions which correspond to the third through holes 46, when adjacent staircase part 6a, 6b, ..., 6n are mounted together to form the staircase 1, which of course depends on the height of the steps 2 (see Fig. 2) and the height of the riser 3/riser part 30. The railing part 40 may comprise a designed pattern of holes 48 or the like to create a visual effect and the pattern of holes 48 may vary within the concept from no holes to a very open structure/design of the railing part 40. The free railing edge 44 preferably comprise a tongue part 49, which in the formed (bent) staircase part 6a, 6b, ..., 6n, is bent to form a stable upper edge of the railing part 40.

[0035] In the formed (bent) staircase part 6a, 6b, ..., 6n, the riser part 30 is arranged along the back edge 21 of the tread part 20 and protrudes in the first direction Z, which is upwards in the vertical direction (when mounted), such as the free riser edge 31 faces away from the tread part 20. Further, the riser part 30 comprises a first side edge 32 and an opposite second side edge 34, wherein the first side edge 32 is arranged near the railing

part 40. As mentioned above, the plurality of second through holes 33 is arranged near the free riser edge 31 of the riser part 30. In the preferred embodiment, the riser part 30 comprises at least one second tongue part 35, which is arranged along the second side edge 34 of the riser part 30, and the second tongue part 35 comprises at least one, but preferably two fifth through holes 36, wherein the second tongue part 35 is arranged to be connected to a center pillar or the like (see Fig. 2).

[0036] Fig. 2 shows a perspective view of a staircase 1 according to the invention, which comprises a number of main parts in the form of a pillar 100, a floor part 110 (landing) and a plurality of staircase parts 6a, 6b, ..., 6n and which is mounted according to the inventive method. Fig. 3a shows a detailed side view of a part of the pillar 100 and shows how staircase parts 6a, 6b, ..., 6n are attached to the pillar 100 and Fig. 3b shows a section view through the pillar 100 of Fig. 3a.

[0037] The staircase 1 is made of metal and comprises of course a plurality of stair treads 2 and risers 3 as well as a railing 4 and attachment means 5, the latter for fixedly attaching the parts to each other. The attachment means 5 may be screws, screw plus bolt and other types of known attachment means. The inventive staircase 1 is unique in that a lot of parts which normally are parts of a staircase, particularly a metal staircase, are integrated in the modular staircase parts 6a, 6b, ..., 6n which further by their design contribute to the overall stability and strength of the staircase, thus resulting in a reduced number of parts. The reduced number of parts are positive in view of environment (less details, less weight, transport etc.) as well in view of mounting time. For example, a prior art spiral metal staircase comprises a number of individual parts as a plurality of steps, risers, railing parts, outer metal rim bands/followers which connects the plurality of steps to each other, handrail etc. Now, all these parts except the handrail are integrated (or omitted) in the inventive staircase 1, which achieves a good strength and stability and a quick and easy mounting.

[0038] Each staircase part 6a, 6b, ..., 6n is arranged to be connected to at least one other staircase part 6a, 6b, ..., 6n and also to be connected to the center pillar 100 and a post 80 or the like (where applicable), see Figs. 2 and 4. In the preferred embodiment, only the first staircase part 6a and the last, uppermost staircase part 6n are connected, preferably by screws 5, to a respective post 80.

[0039] The staircase 1 is mounted between a lower floor level and an upper floor level in a building or the like, from the bottom to the top such as the first stair tread 2 to be mounted, is the lowermost stair tread 2 of the staircase 1, i.e. the lowermost staircase part 6a. In Fig. 2, the first step 2, the riser 3 and the ceiling 4 (part of ceiling 4) is constituted by the first staircase part 6a.

[0040] When mounting the spiral staircase 1, the pillar 100 shall be positioned in a vertical position before mounting the rest of the staircase and depending on the

type of pillar, a first method step may be to first fixedly attach a bottom plate 103 to the floor of the lower floor level and then apply the pillar 100 to the bottom plate 103. To use a bottom plate 103 is as said optionally depending on the pillar design, but according to the preferred embodiment, a bottom plate 103 is used. After fixation of the bottom plate 103 to the floor, one positions a bottom end 101 of the center pillar 100 on the bottom plate 103 and then fixedly attaches the pillar 100 to the bottom plate 103 (or optionally direct to the floor if a bottom plate is not used). A second end 102 of the pillar 100, which is opposite the first end 101, may be attached to a ceiling or be a free end, like the staircase 1 of Fig. 2. The pillar 100 has according to the preferred embodiment a circular cross-section, but may as well have a square, hexagonal, octagonal or other cross-section. The next method step is to attach a floor part 110 to a preferably uppermost fixation means of the center pillar 100, at a level close to or at the upper floor level and preferably also attach it to a building part of the building, for example a wall or an upper floor of the upper floor level, by some kind of fixation means. This is optionally, since the floor part 110 (or the landing which it is also called) may be omitted if the staircase 1 is possible to attach directly to the floor of the next floor level.

[0041] The next step is to mount a first stair tread 2 by arranging one first staircase part 6a such as the railing part 40 faces away from the pillar 100 wherein it is possible to, after that, attaching/mounting the first staircase part 6a to a first fixation means 105a of the center pillar 100 by one or more attachment means 5, for example screws, wherein the second side edge 24 of the tread part 20 of the staircase part 6a is close to the pillar 100 and the first side edge 22 faces away from the pillar 100. As mentioned above, the riser part 30 of each staircase part 6a, 6b, ..., 6n comprises the second tongue part 35, arranged along the second side edge 34 of the riser part 30, and the second tongue part 35 comprises two fifth through holes 36, wherein the second tongue part 35 is connected/screwed to the center pillar 100, see Figs. 3a-b. The fixation means 105a, 105b, ... 105n of the pillar preferably are holes in which a respective screw (attachment means 5) may be screwed to fixedly attach the second tongue part 35 of the riser 30 of each staircase part 6a, 6b, ... 6n. As can be seen, the fixation means 105a, 105b, ..., 105n follows helically around and upwards along the circular pillar 100, like a spiral pattern.

[0042] Optionally, or at any time during the mounting of the staircase 1, a riser 70, which not is a part of another staircase part 6a, 6b, ..., 6n may be mounted to the first staircase part 6a, by connecting the riser 70 to the tread part 20 of the first staircase part 6a, preferably to the nose part 50 of the same.

[0043] The next step is to mount a next stair tread 2 by mounting one second staircase part 6b to the next second fixation means 105b of the center pillar 100 by one or more attachment means 5, in the same way as described above in relation to the first step 2.

[0044] After that the next stair tread 2 is fixedly attached to the pillar 100, one connects the two adjacent stair treads 2 by connecting the riser part 30 of the first (lower) staircase part 6a to the tread part 20 of the second (upper) staircase part 6b, preferably to the nose part 50 of the second (upper) staircase part 6b, and further connect the back edge 41 of the railing part 40 of the first staircase part 6a to the front edge 43 of the railing part 40 of the second staircase part 6b, by a plurality of attachment means 5. Of course, one can mount these parts together (as described in this section) before mounting this next step 2 to the pillar 100 (as described in the foregoing section) if that is preferred.

[0045] The following step is to mount another stair tread 2 by mounting one next staircase part 6c to the corresponding fixation means 105c of the center pillar 100 by one or more attachment means 5, in the same way as described above.

[0046] The staircase 1 is the further mounted by repeating the above steps, for each step, until the uppermost stair tread 2 is attached to a fixation means 105n of the pillar 100 and to the stair tread 2 below the uppermost stair tread 2. Then, the riser part 30 of the uppermost stair tread 2 is attached to an upper floor of the upper floor level or to the floor part 110 by a plurality of attachment means 5.

[0047] As mentioned above, the staircase preferably comprises two posts 80, wherein the method for mounting the staircase 1 further comprises to attach one post 80 to the front edge 43 of the staircase part 6a of the first stair tread 2, and further to attach one second post 80 to the back edge 41 or the first tongue 45 of the uppermost staircase part 6n of the last stair tread 2 of the staircase 1, by a plurality of attachment means 5. This may be done at any time during the mounting, but preferably in connection to the mounting of respective first and last step 2.

[0048] Fig. 4 shows a side view of a staircase 1 mounted according to the inventive method and comprising a number of staircase parts 6a, 6b, ..., 6n. This is an example showing four staircase parts 6a, 6b, 6c, 6d, but it is easy to understand how a staircase may comprise from two stair treads 2 to a plurality of stair treads 2. The staircase 1 made of metal comprises in this case four stair treads 2 and the floor part 110. There are five risers 3 wherein four are riser parts 30 of respective staircase part 6a, 6b, 6c, 6d, and the first one is the "extra" riser 70. The railing 4 actually consists of four railing parts 40 attach to each other by attachment means 5, to form the complete railing 4. The first and the last riser part 40 are attached to a respective squared post 80. The railing part 40 comprises the designed pattern of holes 48 and the free railing edge 44 comprises the tongue part 49, which in the formed (bent) staircase part 6a, 6b, ..., 6n, is bent to form a stable upper edge of the railing part 40. Fig. 5 shows a section view of a part of a railing 4 of the staircase 1 of Fig. 4 which shows how a handrail 120 is screwed to the railing by a threaded spacer.

[0049] Although the description above contains a plu-

rality of specificities, these should not be construed as limiting the scope of the concept described herein but as merely providing illustrations of some exemplifying embodiments of the described concept. Reference to an element in the singular is not intended to mean "one and only one" unless explicitly so stated, but rather "one or more."

Claims

1. A staircase (1) comprising a plurality of staircase parts (6a, 6b, ..., 6n), mounted consecutively to each other, wherein each staircase part (6a, 6b, ..., 6n) consists of one single sheet metal part (60), wherein each staircase part (6a, 6b, ..., 6n) comprises a tread part (20), a riser part (30) and at least one railing part (40), wherein the tread part (20) comprises a back edge (21), a front edge (23) opposite the back edge (21), a first side edge (22) and a second side edge (24) opposite the first side edge (22), wherein the riser part (30) is arranged along the back edge (21) of the tread part (20) and extends in a first direction (Z) such as a free riser edge (31) faces away from the tread part (20), wherein the railing part (40) is arranged along the first side edge (22) of the tread part (20) and extends in the first direction (Z) substantially perpendicular to the tread part (20) such as a free railing edge (44) faces away from the tread part (20).
2. Staircase (1) according to claim 1, wherein the free edge (31) of the riser part (30) of a lower arranged staircase part (6a, 6b, ..., 6n) of the plurality of staircase parts is connected to the tread part (20) of an upper arranged staircase part (6a, 6b, ..., 6n) of the plurality of staircase parts, positioned immediately adjacent the lower staircase part, preferably to its front edge (23).
3. Staircase (1) according to claim 1 or 2, wherein the tread part (20) of each staircase part (6a, 6b, ..., 6n) further comprises a nose part (50), arranged along the front edge (23) of the tread part (20), wherein the nose part (50) of an upper arranged staircase part (6a, 6b, ..., 6n) of the plurality of staircase parts is connected to the free riser edge (31) of the riser part (30) of a lower arranged staircase part (6a, 6b, ..., 6n) of the plurality of staircase parts, positioned immediately adjacent the upper staircase part, or to a riser part (70) which is not part of any other of the plurality of staircase parts (6a, 6b, ..., 6n) if the upper arranged staircase part (6a, 6b, ..., 6n) is a lowermost staircase part.
4. Staircase (1) according to claim 3, wherein the nose part (50) of each staircase part (6a, 6b, ..., 6n) comprises a plurality of first through holes (51) and the

riser part (30) of each staircase part (6a, 6b, ..., 6n) comprises a corresponding number of second through holes (32) arranged near the free riser edge (31) of the riser part (30).

5. Staircase (1) according to any of the preceding claims, wherein the railing part (40) of each staircase part (6a, 6b, ..., 6n) of the plurality of staircase parts comprises at least one first tongue part (45), arranged along a back edge (41) of each railing part (40), which first tongue part (45) of a lower arranged staircase part (6a, 6b, ..., 6n) of the plurality of staircase parts is connected to a front edge (43) of a railing part (40) of an upper staircase part (6a, 6b, ..., 6n) of the plurality of staircase parts or to a post (80).
6. Staircase (1) according to claim 5, wherein the tongue part (45) of each staircase part (6a, 6b, ..., 6n) comprises a plurality of third through holes (46) and the railing part (40) of each staircase part (6a, 6b, ..., 6n) further comprises a corresponding number of fourth through holes (47) arranged near the front edge (43) of the railing part (40).
7. Staircase (1) according to any of the preceding claims, wherein the riser part (30) of each staircase part (6a, 6b, ..., 6n) comprises at least one second tongue part (35) arranged along a second side edge (34) of the riser part (30) which second side edge (34) faces away from the railing part (40), wherein the at least one second tongue part (35) comprises at least one fifth through hole (36).
8. Staircase (1) according to any of the preceding claims, wherein the staircase (1) is a spiral staircase (1), wherein the tread part (20) of each staircase part (6a, 6b, ..., 6n) has a substantially triangular shape, wherein the staircase (1) further comprises a center pillar (100) extending in the first direction (Z), wherein each staircase part (6a, 6b, ..., 6n) further is fixedly attached to the center pillar (100).
9. Staircase (1) according to claim any preceding claim, further comprising a floor part (110), which at least is attached to the riser part (30) of the uppermost staircase part (6n) of the staircase (1).
10. Kit of parts for a staircase (1) comprising a plurality of staircase parts (6a, 6b, ..., 6n), each staircase part (6a, 6b, ..., 6n) consisting of one single sheet metal part (60), wherein each staircase part (6a, 6b, ..., 6n) comprises a tread part (20), a riser part (30) and at least one railing part (40), wherein the tread part (20) comprises a back edge (21), a front edge (23) opposite the back edge (21), a first side edge (22) and a second side edge (24) opposite the first side edge (22), wherein the riser part (30) is arranged along

the back edge (21) of the tread part (20) and extends in a first direction (Z) such as a free riser edge (31) faces away from the tread part (20), wherein the railing part (40) is arranged along the first side edge (22) of the tread part (20) and extends in the first direction (Z) such as a free railing edge (44) faces away from the tread part (20).

11. Method for mounting a staircase (1) according to any of claims 1 - 9, between a lower floor level and an upper floor level in a building or the like, starting from a lowermost stair tread (2) of the staircase (1), the method comprising:

a) arrange a first staircase part (6a) of the plurality of staircase parts such as the first side edge (22) of the tread part (20) faces away from a building part or a pillar to which the staircase (1) is to be mounted and mount the first staircase part (6a) to the building part or the pillar by attachment means (5) such as the second side edge (24) of the tread part (20) abuts the building part or the pillar,

b) mount a second staircase part (6b) of the plurality of staircase parts to the building part or the pillar by attachment means (5),

c) mount the first and second staircase parts (6a, 6b) together by connecting the riser part (30) of the first staircase part (6a) to the tread part (20) of the second staircase part (6b) and further connect the back edge (41) of the railing part (40) of the first staircase part (6a) to the front edge (43) of the railing part (40) of the second staircase part (6b), by a plurality of attachment means (5),

d) mount a next staircase part (6c) of the plurality of staircase parts to the building part or the pillar by attachment means (5),

e) mount the next staircase part (6c) to the second/lower adjacent staircase part (6b) of the plurality of staircase parts by connecting the riser part (30) of the second/lower staircase part (6b) to the tread part (20) of the next staircase part (6c) and further connecting the back edge (41) of the railing part (40) of the second/lower staircase part (6b) to the front edge (43) of the railing part (40) of the next staircase part (6c), by a plurality of attachment means (5),

f) repeat step d) - e) for rest of the plurality of staircase parts (6a, 6b, ..., 6n) until an uppermost staircase part (6n) of the plurality of staircase parts is attached to the staircase part below the uppermost staircase part (6n),

g) attach the riser part (30) of the uppermost staircase part (6n) to a floor part (110) of the staircase (1) or to a floor of the upper floor level, by a plurality of attachment means (5),

h) optionally attach a riser part (70) which is not

part of another staircase part (6a, 6b, ..., 6n) of the plurality of staircase parts to the first staircase part (6a) by a plurality of attachment means (5), at any step after step a),

i) optionally attach a post (80) to the front edge (43) of the railing part (40) of the first staircase part (6a), at any step after step a), by a plurality of attachment means (5),

j) optionally attach a post (80) to the back edge (41) or to a first tongue (45) of the railing part (40) of the uppermost staircase part (6n) by a plurality of attachment means (5).

12. Method for mounting a spiral staircase (1) according to claim 11, wherein the staircase is a spiral staircase and the method further comprising, before step a):

i. optionally attach a bottom plate (103) to a floor of a lower floor level of a building,

ii. position a bottom end (101) of a center pillar (100) on the floor of the lower floor level or optionally on the bottom plate (103) and attach the pillar (100) to the floor or optionally to the bottom plate (103),

iii. optionally attach a floor part (110) to the center pillar (100) at a level close to the upper floor level and preferably attach it to a building part of the building, for example a wall or an upper floor of the upper floor level.

13. Method for mounting a staircase (1) according to any of claims 1 - 9, between a lower floor level and an upper floor level in a building or the like, starting from a lowermost stair tread (2) of the staircase (1), wherein each staircase part (6a, 6b, ..., 6n) comprises two railing parts (40) wherein one railing part (40) is arranged along the first side edge (22) of the tread part (20) and extends in the first direction (Z) such as a free railing edge (44) faces away from the tread part (20) and one railing part (40) is arranged along the second side edge (24) of the tread part (20) and extends in the first direction (Z) such as a free railing edge (44) faces away from the tread part (20), the method comprising:

a) mount a first and second staircase parts (6a, 6b) of the plurality of staircase parts together by connecting the riser part (30) of the first staircase part (6a) to the tread part (20) of the second staircase part (6b) and further connecting the back edge (41) of each railing part (40) of the first staircase part (6a) to the respective front edge (43) of each railing part (40) of the second staircase part (6b), by a plurality of attachment means (5),

b) mount a next staircase part (6c) of the plurality of staircase parts to the second/lower staircase part (6b) of the plurality of staircase parts by con-

necting the riser part (30) of the second/lower staircase part (6b) to the tread part (20) of the next staircase part (6c) and further connecting the back edge (41) of each railing part (40) of the second/lower staircase part (6b) to the re-

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spective front edge (43) of each railing part (40) of the next staircase part (6c), by a plurality of attachment means (5),

c) repeat step a) - b) for rest of the plurality of staircase parts (6a, 6b, ..., 6n) until an upper-

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most staircase part (6n) of the plurality of staircase parts is attached to the staircase part below the uppermost staircase part (6n),

d) attach the riser part (30) of the uppermost staircase part (6n) to a floor part (110) of the staircase (1) or to a floor of the upper floor level, by a plurality of attachment means (5),

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e) optionally attach a riser part (70) which is not part of another staircase part (6a, 6b, ..., 6n) of the plurality of staircase parts to the first staircase part (6a) by a plurality of attachment means (5), at any step after step a),

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f) optionally attach a post (80) to each front edge (43) of the railing part (40) of the first staircase part (6a), at any step after step a), by a plurality of attachment means (5),

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g) optionally attach a post (80) to each back edge (41) or each first tongue (45) of the railing part (40) of the uppermost staircase part (6n) by a plurality of attachment means (5).

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14. Method for producing a staircase part (6a, 6b, ..., 6n) from a roll of sheet metal, the method comprising:

a) cut a sheet metal from a roll of sheet metal to one single sheet metal part (60), wherein the single sheet metal part (60) comprises a tread part (20), a riser part (30) and at least one railing part (40),

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b) bend the single sheet metal part (60) to form the staircase part (6a, 6b, ..., 6n) by bending the riser part (30) along a back edge (21) of the tread part (20) such as the riser part (30) extends in a first direction (Z) wherein a free riser edge (31) of the riser (30) faces away from the tread part (20),

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c) bend the single sheet metal part (60) to form the staircase part (6a, 6b, ..., 6n) by bending the railing part (40) along a first side edge (22) of the tread part (20) such as the railing part (40) extends in the first direction (Z) wherein a free railing edge (44) faces away from the tread part (20),

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d) bend the single sheet metal part (60) to form the staircase part (6a, 6b, ..., 6n) by bending a second tongue part (35) along a second side edge (34) of the riser part (30) which second side edge (34) faces away from the railing part

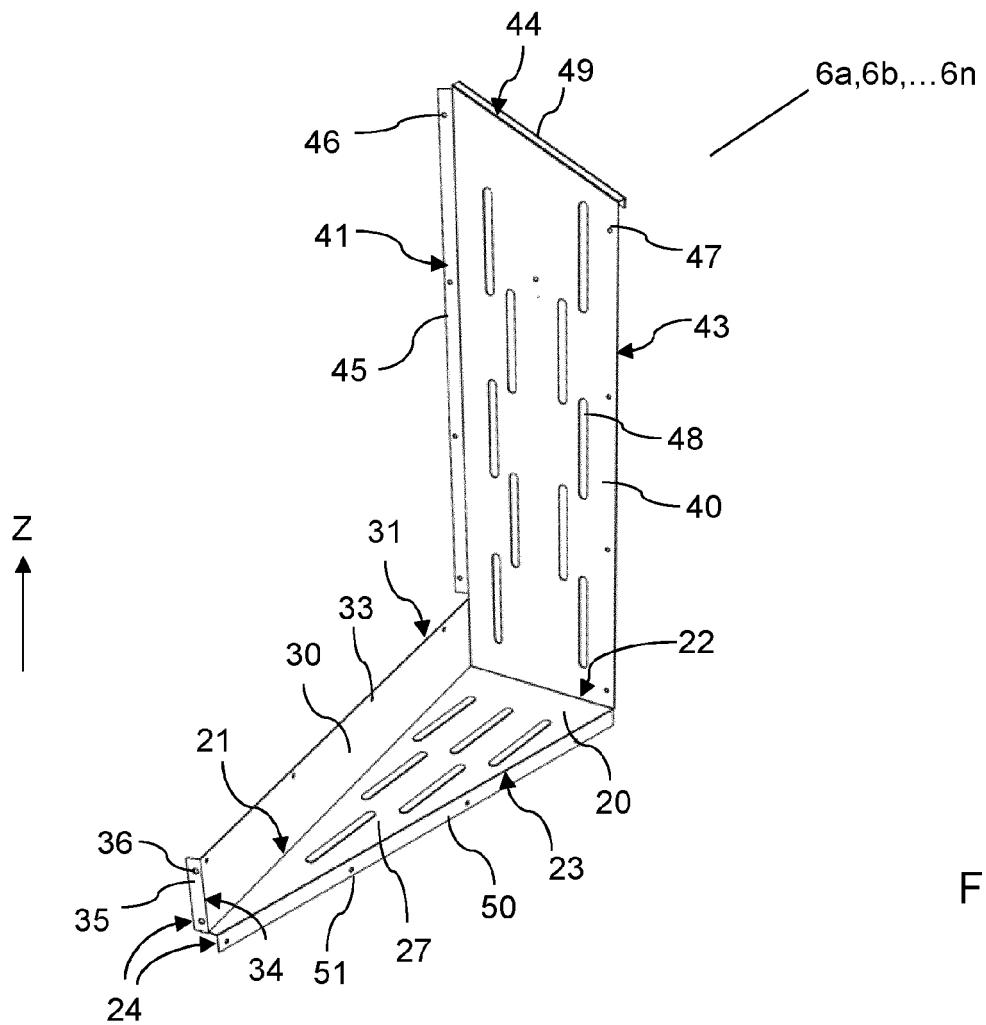
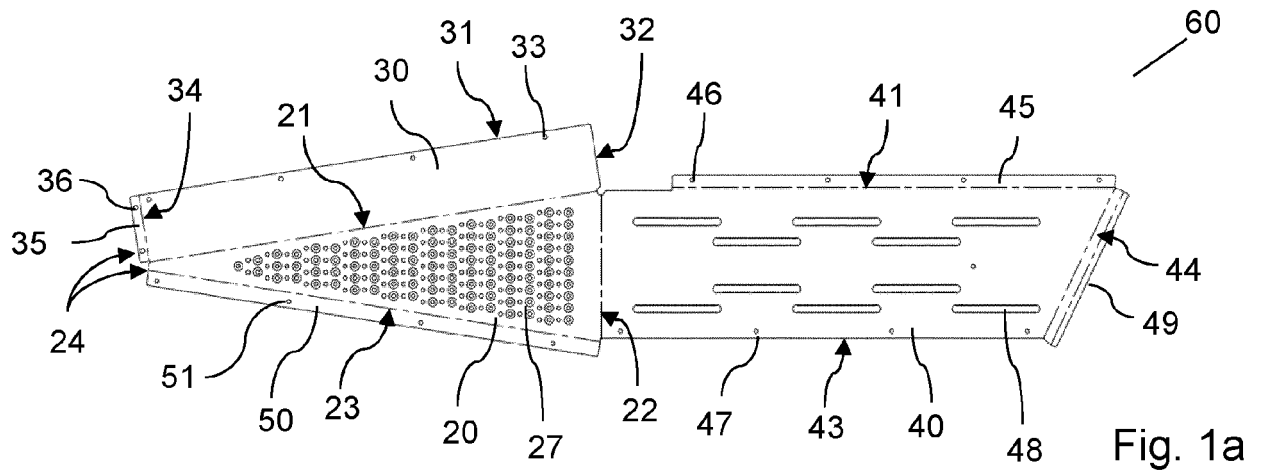
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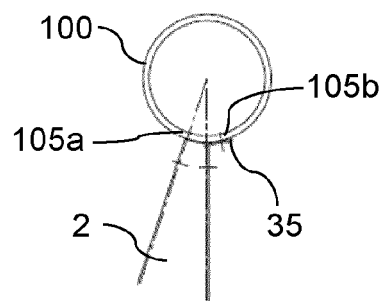
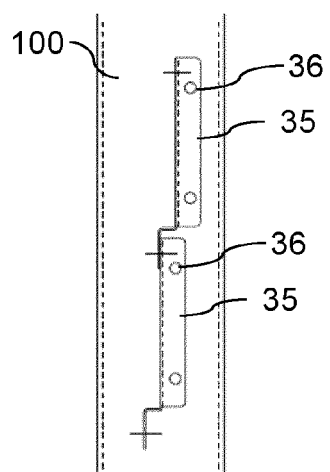
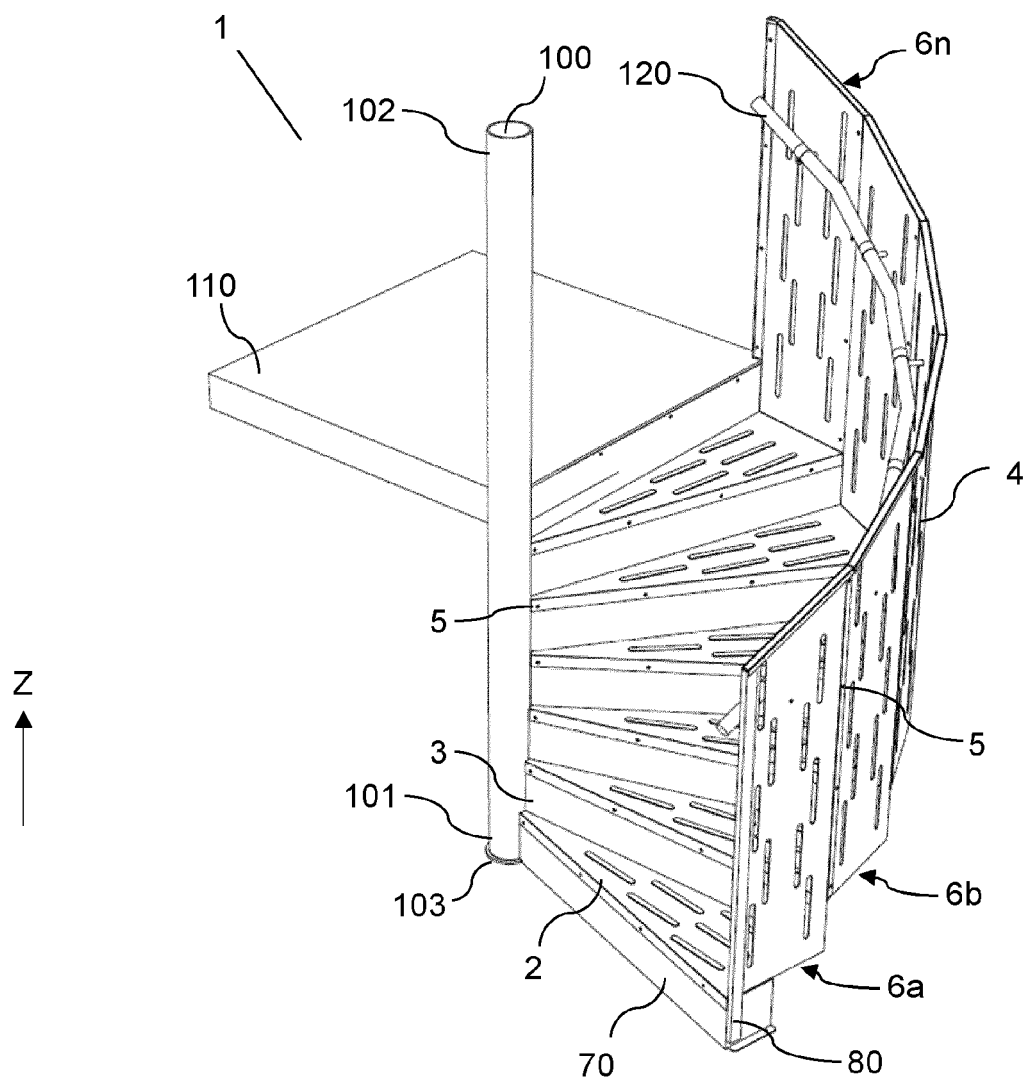
(40), such as the second tongue part (35) extends in a direction which is transverse the first direction (Z), wherein the second tongue part (35) faces away from the riser part (30).

15. Method for producing a staircase part (6a, 6b, ..., 6n) according to claim 14, wherein the method further comprising:

e) bend a nose part (50) along a front edge (23) of the tread part (20), which front edge (23) is opposite the back edge (21), such as the nose part (50) extends in a direction opposite the first direction (Z) wherein the nose part (50) faces away from the tread part (20),

f) optionally, bend a first tongue part (45) along a back edge (41) of the railing part (40), such as the first tongue part (45) extends in a direction which is transverse the first direction (Z), wherein the first tongue part (45) faces away from the railing part (40).





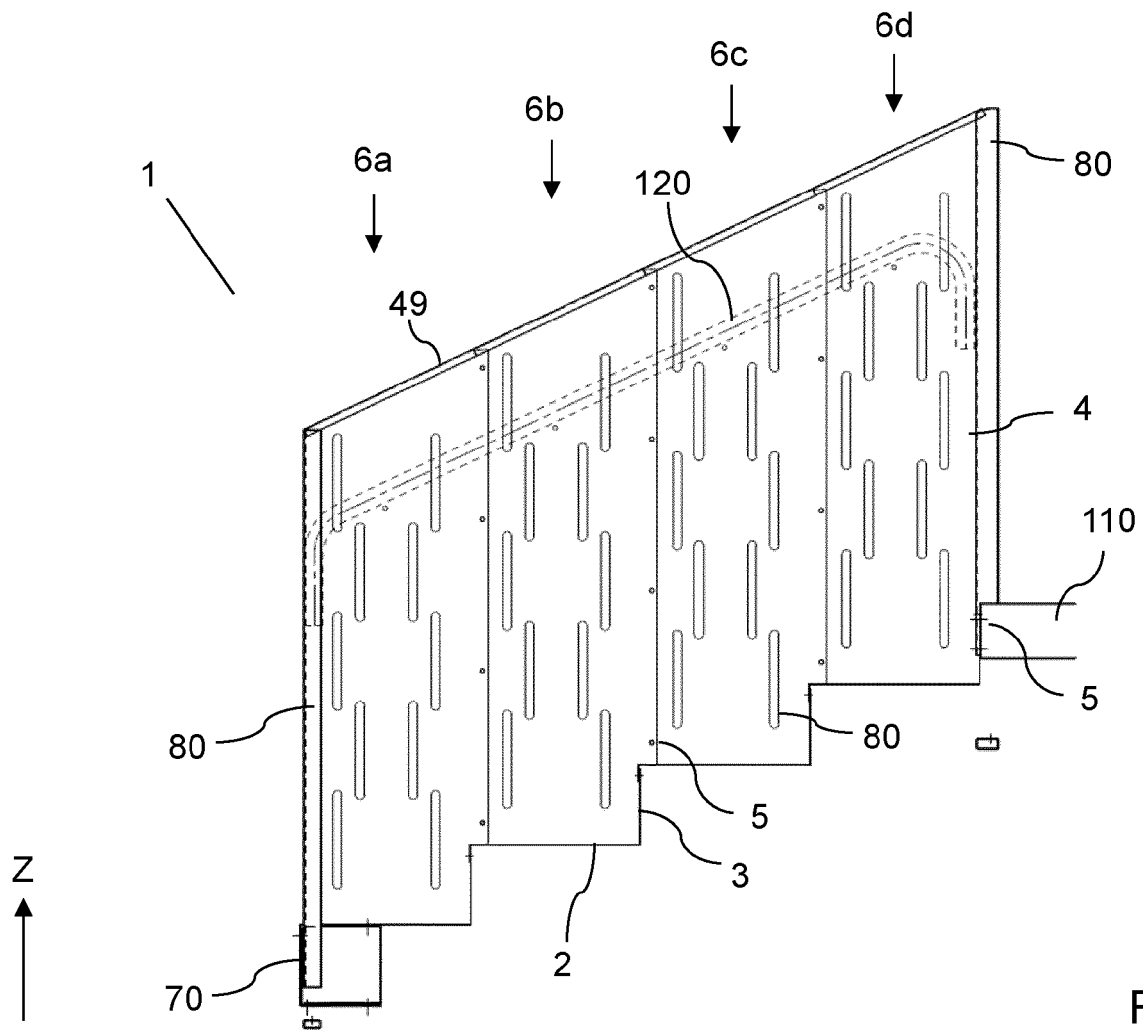


Fig. 4

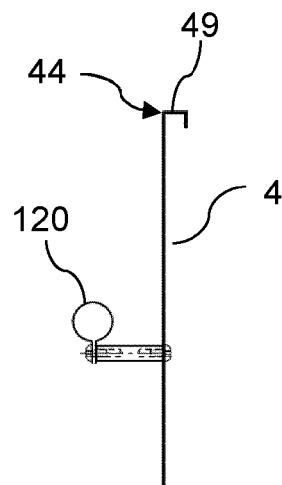


Fig. 5



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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 25 May 2022	Examiner Arsac England, Sally
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