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(54) **Monolithic step made of reinforced concrete for helical staircases, and helical staircase provided therewith**

(57) Monolithic helical step (10) made of reinforced concrete, suitable for obtaining helical staircases, in the proximity of the internal side surface (11) of which a through hole (12), which is located parallel to the tread plane (18), is suitably positioned to receive a concrete or resin casting inside it and a falsework member (13) by means of which the connection of a plurality of super-imposed steps (10) is assured.

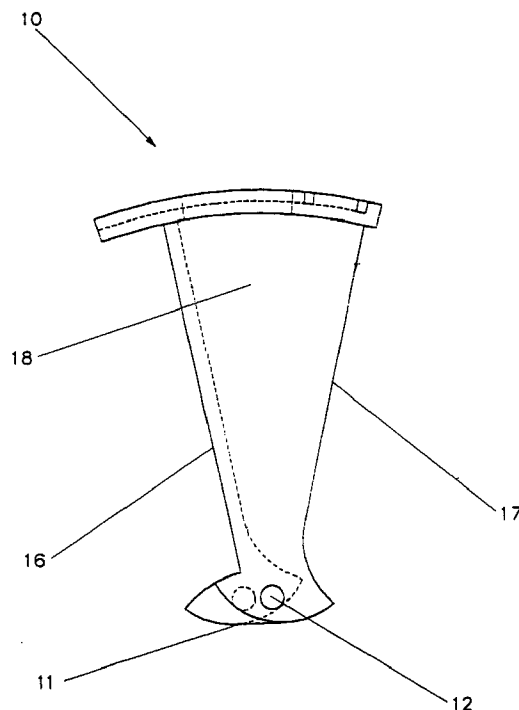


Fig. 1

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Description

TECHNICAL FIELD

[0001] The present invention relates to a monolithic step made of reinforced concrete, suitable to be used as the primary member of a helical staircase, commonly known as "winding staircase", said monolithic step having a predetermined structure and shape so as to allow the production of indefinitely high and structurally safe helical staircases.

[0002] In particular, the present invention applies to the building field and, even more particularly, to the field of precast works.

PRIOR ART

[0003] The use of forms suitable for producing reinforced concrete steps for helical staircases is well known in the art, said forms generally consisting of a plurality of interconnected elements which make it possible to obtain the desired step when a concrete casting is carried out.

[0004] Generally said forms of the prior art present a base element on which three suitably shaped walls are placed perpendicular to it, in order to respectively define a tread element, a riser element and the internal and external side surfaces of the step.

[0005] Said members, i.e. the base element and said walls, are connected to each other by suitable mechanical means, e.g. screws, bolts, nuts and tension rods.

[0006] In this way, when the casting has been carried out inside the space obtained after they are mutually coupled, said members can be disconnected and the steps obtained can be connected to each other so as to accomplish the desired helical staircase.

[0007] According to the prior art, some grooves with an essentially semicircular section are provided on the external surface of each step, said grooves being apt to host suitable iron rods and being placed according to the shape of said external surface.

[0008] Furthermore, said metallic rods follow a helical path so that one step can be coupled with another to produce the desired staircase, said coupling being facilitated by the presence of complementary portions which are contained by the edges of said surface so that a constraint is placed on the position of the riser of each step on the tread of the one next to it.

[0009] Therefore this means that, when the first step is placed and suitably anchored to the floor by means of a supporting surface which is able to host the tread of said first step, the second step and successively all the other steps are positioned by directly laying their risers directly upon the tread.

[0010] The exact arrangement of the steps is assured by the continuous interconnection of the joints of the frontal and the rear sides of said external side surfaces.

[0011] After the coupling of a predetermined plurality

of steps has been accomplished, the structure is anchored by inserting metallic rods inside the semicircular grooves located on the external and internal surfaces of each step.

[0012] Furthermore, during a later operational phase, said metallic rods located on the external surfaces are fastened by means of a soft iron wire, whereas those located on the inside surfaces are fastened to a suitable anchor which is provided inside the corresponding grooves.

[0013] After the metallic rods have been laid inside the grooves of the internal and external surfaces of the helical staircase which has been so obtained, said metallic rods are coated with a cement mortar.

[0014] Moreover, according to the prior art, the internal and external side surfaces of each step are provided with metallic grids which make up the falsework of said surfaces; furthermore, some suitable rods are placed longitudinally to the contour of the step and they join said grids together, in order to form the falsework of the tread of said step.

[0015] The main drawback of the monolithic helical steps according to the prior art is the impossibility to obtain indefinitely high helical staircases since the structure accomplished by consecutively connecting each step according to the prior art, is not sufficiently stable and safe to assure a size which goes beyond being one floor high.

[0016] In particular, the joining surface corresponding to the internal side surface is rather critical, as it is where the coupling of a step to the next one is only assured by said suitably shaped profile, which makes it possible for them to couple correctly, and by the presence of suitable metallic rods located inside suitable grooves which are provided on said internal side surfaces.

DESCRIPTION OF THE INVENTION

[0017] The present invention aims at overcoming the disadvantages and drawbacks of the prior art, by providing a monolithic step made of reinforced concrete, which is suitable to be used as a primary member of a helical staircase, said monolithic step presenting a suitable structure and shape which allow the production of indefinitely high and structurally safe helical staircases.

[0018] The above aim has been accomplished by means of the features disclosed in the main claim.

[0019] The dependent claims outline particularly advantageous forms of embodiment of the present invention.

[0020] According to the invention, in the proximity of its inside surface, the monolithic step provided for the accomplishment of helical staircases presents a through hole which is suitable for the passage of a concrete casting and of a metallic rod, in order to attain the connection of a plurality of superimposed steps.

[0021] Said through hole is obtained by providing a

conjugated hole on the side walls of a form which is used to obtain the desired step.

[0022] During the building of said step, when the form is arranged for the obtainment of said step, said hole is engaged by a metallic rod so that, during the following concrete casting, said hole does not end up being occluded by the concrete itself.

[0023] Afterwards, when said casting has come to a complete consolidation, the step is released by disassembling the members of the form and by removing said metallic rod in order to obtain a step provided with a suitable hole on its inside surface.

[0024] Therefore, in such a way, during the building of the helical staircase, a concrete casting is carried out inside said hole and then a suitable metallic rod is inserted into it by means of which an efficacious and safe coupling of a plurality of consecutive steps of said staircase is achieved.

[0025] Besides, it is possible to assure a remarkably increased structural stability to said staircase, especially in that critical area, i.e. the inside surface.

[0026] Furthermore, said holes of each step according to the invention represent a simple and perfect reference frame for the assembly of the staircase when said steps have to be carefully superimposed.

[0027] According to an advantageous feature of the present invention, said structural safety is further increased by positioning a falsework metallic rod which is longitudinal to the step tread, said metallic rod uninterruptedly placed all along the front perimetral edge of the tread, and running around said hole to further continue along the rear perimetral edge of said tread.

[0028] In fact, the above embodiment of the invention makes it possible to increase the structural stability of each step, and of the whole staircase, in the proximity of the internal side surface which is particularly critical and limiting for the height that can be reached by the helical staircase, as mentioned above.

[0029] According to the present invention, the hole provided on the circular area in the proximity of the inside surface of each step is slightly tipped with respect to the vertical line, in order to accomplish the helical shape of said staircase.

[0030] Furthermore, said hole of the step according to the invention presents a slightly frusto-conical section so that each successive step has a larger supporting surface given by the previous step, which is exactly what makes it possible to accomplish a structure which is stabler and safer.

[0031] As to the assembly of a staircase made of the steps according to the present invention, the main operational phases are disclosed hereinbelow.

[0032] First of all, it is necessary to obtain the concrete steps separately, said concrete steps being obtained by using forms whose side walls, as mentioned above, are rounded off in the proximity of their connection with the base element and are provided with a suitable hole on the inside surface of the desired step.

[0033] Then, after the first step has been anchored to the floor according to a well known modality in this specific technical field, a metallic rod having a predetermined length and width is positioned inside the hole of the first step in the proximity of its inside surface.

[0034] Then, the other steps are successively superimposed onto said first step by carrying out the introduction of the metallic rod of which above into the respective holes of said steps.

[0035] When a predetermined sequence of steps has been assembled, a highly resistant concrete or similar material casting, e.g. a resin, is carried out within the space left empty between the inside walls of the holes of each step and the metallic rod that runs all along said holes.

[0036] In such a way, said casting assures a stable and strengthened coupling of said steps with said metallic rod and confers an excellent solidity on the helical staircase.

[0037] After the concrete or the resin has reached complete solidification, the helical staircase is given further height by welding a second metallic rod of a predetermined length to the previous rod which has already been put in place.

[0038] Thus, according to modalities which are similar to those of the above phases, the following steps are superimposed onto the previous ones until the staircase has come to its desired height.

[0039] Therefore, the heights achieved by means of the helical staircases provided with the steps according to the present invention are greater than those reachable with the helical staircases of the prior art.

[0040] This is possible since, according to the invention, when in place, the inside portion of the helical staircase is indeed a spirally shaped pillar.

[0041] For instance, it is possible to obtain a height of about 15 metres instead of a traditional maximum height of about 2,80 - 3,00 metres which is generally achieved by a helical staircase of the prior art.

[0042] Furthermore, thanks to the constructive modalities described above, which make it possible to have a stable mutual connection of all steps, and the arrangement of a suitable reinforcement at the structural critical areas, the helical staircase obtained presents advantageous antiseismic features which are not found in traditional helical staircases.

ILLUSTRATION OF DRAWINGS

[0043] Other features and advantages of the present invention will become apparent by reading the following description, given as a non-limiting example, with the help of the figures illustrated in the attached drawings, in which:

- figure 1 shows a top plan view of a step according to the invention;
- figure 2 shows the longitudinal positioning of the

- metallic rod inside the step of figure 1, and
- figure 3 shows a perspective view of a helical staircase provided with a step according to the present invention.

DESCRIPTION OF AN EMBODIMENT

[0044] In figures 1 and 2, reference number 10 indicates a helical type monolithic step according to the present invention.

[0045] According to the present invention, in the proximity of its inside surface 11, step 10 presents a rounded off shape inside which a hole 12 is obtained, said hole 12 being positioned on the plane of tread 18 (corresponding to the plane of figures 1 and 2) and running through the whole thickness of step 10.

[0046] Said hole 12 is suitable for the passage of a metallic rod 13 which is used as falsework for said step 10.

[0047] As mentioned above, said hole 12 is obtained by providing the side walls of the form used for the accomplishment of the desired step 10 with a corresponding hole and with a metallic rod inside hole 12 during the concrete casting phase, used to produce said hole.

[0048] According to the invention, the axis of hole 12 is slightly tipped with respect to the vertical line, in order to make it possible for the staircase to extend vertically when the monolithic steps are assembled together and to acquire a helical shape.

[0049] Furthermore, said hole 12 presents a slightly frusto-conical section converging towards the base of step 10 so that each successive step has a larger supporting surface given by the previous step, thing that makes it possible to obtain a stable and safe structure.

[0050] According to the present invention, the structural safety of the helical staircase is further increased by positioning one or more metallic rods 15 which are longitudinal to the step and parallel to the tread plane of said step.

[0051] Said metallic rods 15 run all along front perimetral edge 16 of tread 18, bypassing the area around hole 12 and continuing along rear perimetral edge 17 of said tread.

[0052] Said particular embodiment of the present invention makes it possible to increase the structural stability of each step and of the whole staircase mostly in the proximity of internal side surface 11 of step 10, said area being particularly critical for the overall height of the helical staircase.

Claims

1. Monolithic helical step (10) made of reinforced concrete, suitable for obtaining helical staircases, characterized in that the area in the proximity of the inside surface (11) of said step (10) presents a through hole (12) which is placed parallel to the

tread plane (18) and is suitable to host a concrete or resin casting and a falsework member (13) inside it, by which the mutual joining of a plurality of superimposed steps (10) is assured.

2. Step (10) according to claim 1, characterized in that said falsework member (13) is a metallic rod.
3. Step (10) according to claim 1 or 2, characterized in that the axis of hole (12) is slightly tipped with respect to the vertical line.
4. Step (10) according to any of the preceding claims, characterized in that said hole (12) presents a section converging towards the base of said step (10).
5. Step (10) according to any of the preceding claims, characterized in that it is provided with at least a continuous metallic rod (15) placed parallel to the plane of tread (18) along the front (16) and rear (17) perimetral edges of the step (10), said falsework member (15) being partially surrounded by said hole (12) in the proximity of the inside surface (11).
6. Helical staircase, characterized in that it is obtained by the superimposition and the joining of a plurality of steps according to any of the preceding claims.

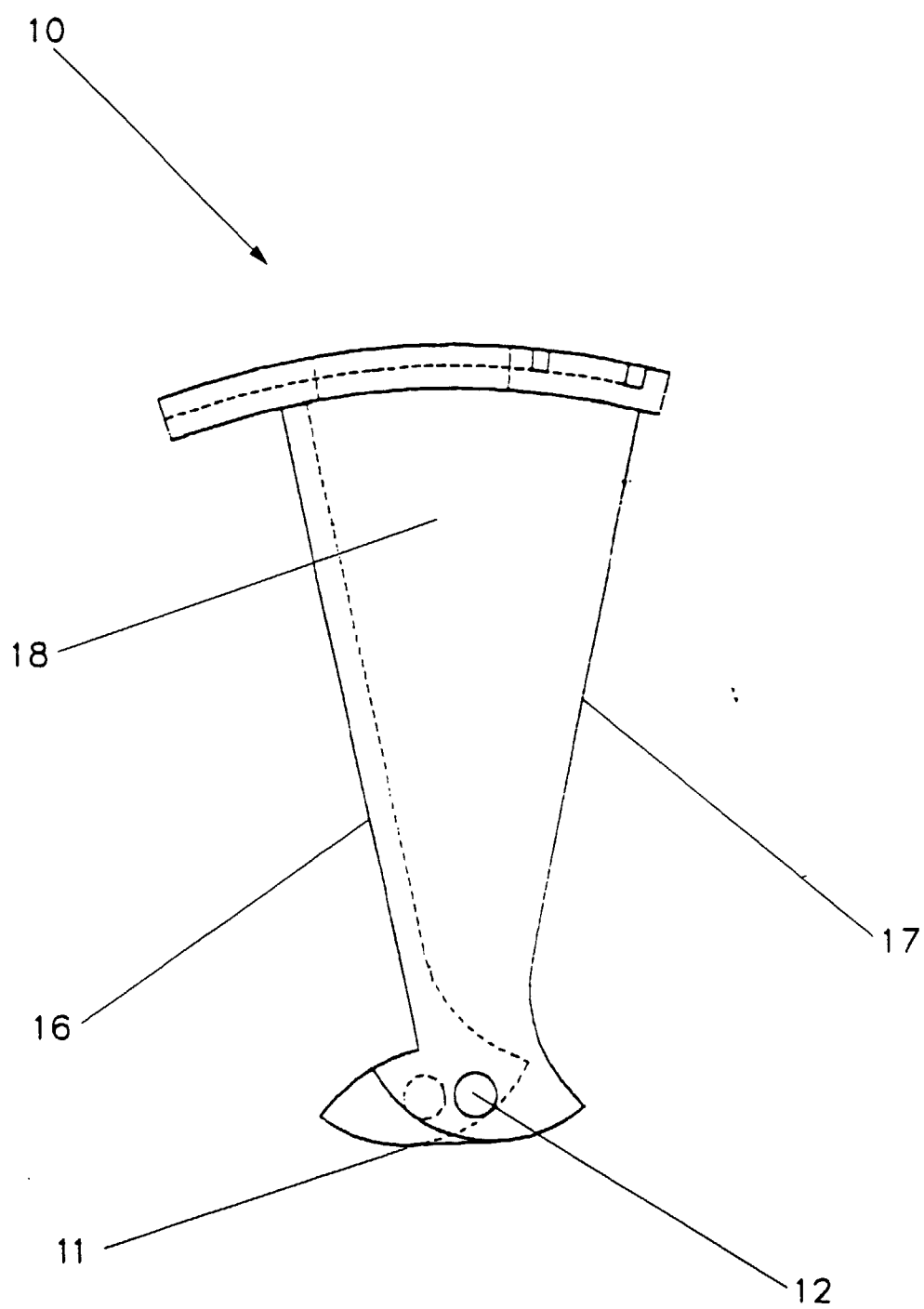


Fig. 1

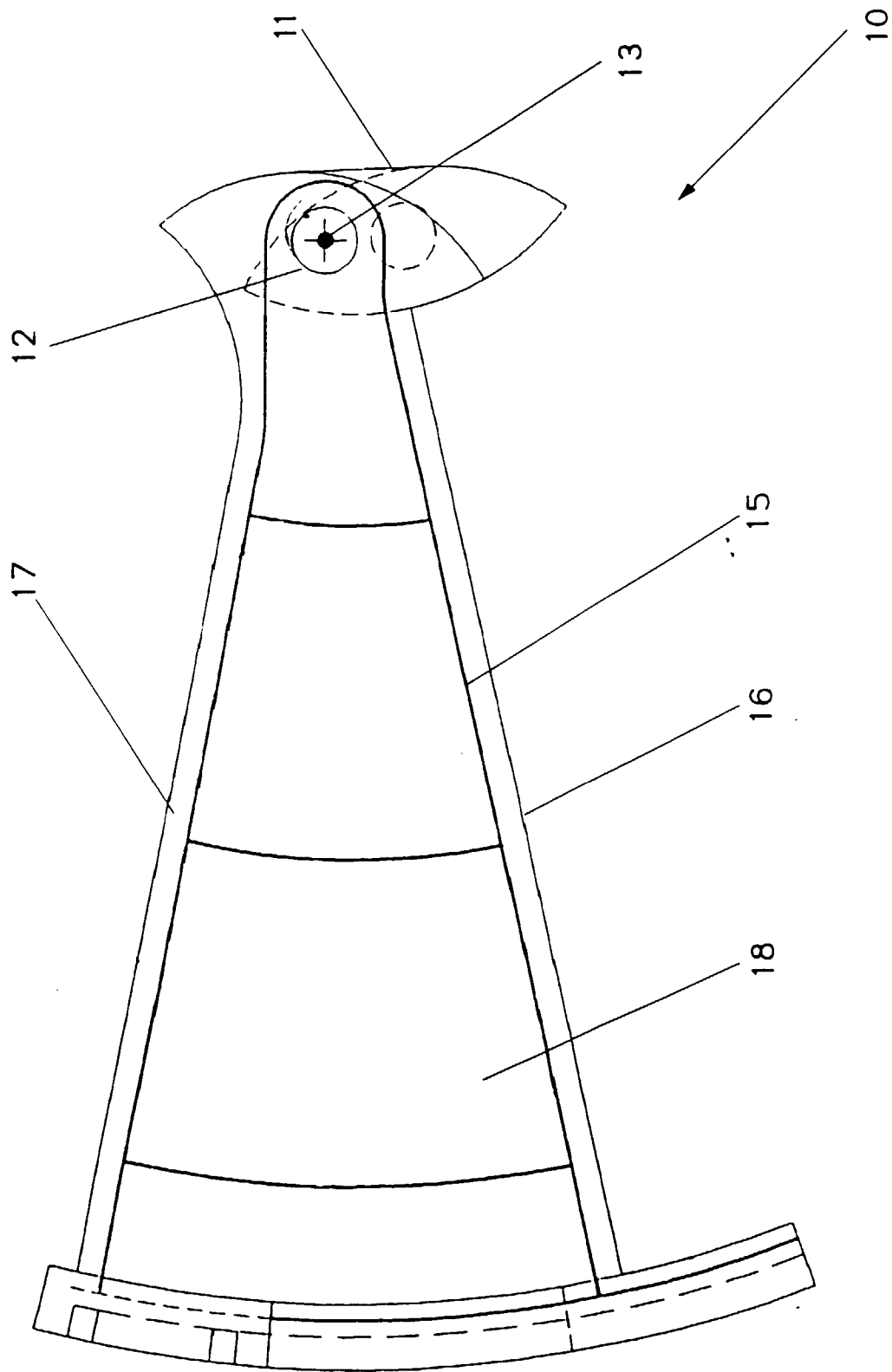


Fig. 2

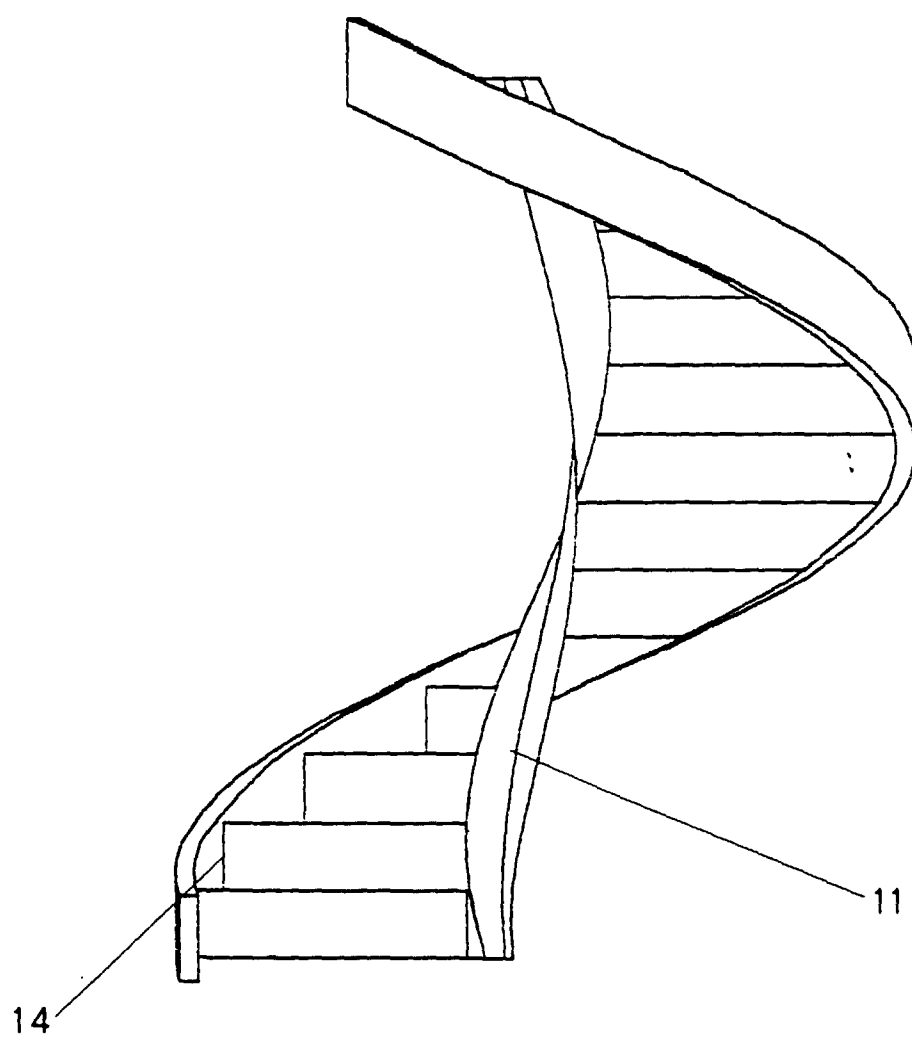


Fig. 3