

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 733 774 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
03.11.1999 Bulletin 1999/44

(51) Int Cl.⁶: **E06C 7/08**, E06C 1/10,
E04F 11/02

(21) Application number: **96830121.8**

(22) Date of filing: **18.03.1996**

(54) **Easily assembled modular element metal ladder**

Einfach zu montierende Metalleiter aus modularen Elementen

Echelle métallique composée d'éléments métalliques facilement assemblables

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU MC NL PT

• **Cavaler, Giovanni**
37125 Verona (IT)

(30) Priority: **21.03.1995 IT MI950564**

(74) Representative: **Cicogna, Franco**
Ufficio Internazionale Brevetti
Dott.Prof. Franco Cicogna
Via Visconti di Modrone, 14/A
20122 Milano (IT)

(43) Date of publication of application:
25.09.1996 Bulletin 1996/39

(73) Proprietors:
• **Mastella, Renato**
37135 Verona (IT)
• **Cavaler, Giovanni**
37125 Verona (IT)

(56) References cited:
EP-A- 0 060 014 **BE-A- 872 495**
CH-A- 554 998 **DE-A- 3 505 688**
FR-A- 604 662 **FR-A- 893 503**
FR-A- 2 065 332 **FR-A- 2 597 909**
GB-A- 151 487 **US-A- 4 355 700**

(72) Inventors:
• **Mastella, Renato**
37135 Verona (IT)

EP 0 733 774 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description**BACKGROUND OF THE INVENTION**

[0001] The present invention relates to an easily assembled metal ladder.

[0002] As is known, commercially available bearing constructions of metal ladders are usually made by assembling more elements, providing the static conditions of the net or grid-lattice construction which is formed by individual rods operating as tie-rods and strut elements.

[0003] The lattice constructions of the at present commercially available metal ladders are, in particular, constituted by several types of different elements which, moreover, are furthermore differentiated based on the type of ladder to be made.

[0004] This different construction of the structural elements constituting the bearing structure of the at present commercially available metal ladders greatly increases the making cost of these elements and, accordingly, the overall cost of the finished metal ladder.

SUMMARY OF THE INVENTION

[0005] Accordingly, the aim of the present invention is to solve the above mentioned problem by providing a metal ladder, including a very reduced number of modular elements, which can be made at very low cost.

[0006] Within the above mentioned aim scope, a main object of the present invention is to provide such a metal ladder which can be simply and quickly assembled.

[0007] Another object of the present invention is to provide such a metal ladder which, by a simple modification of the modular elements constituting the ladder, can have either a rectilinear or curved profile, depending on the user requirements.

[0008] Yet another object of the present invention is to provide such a metal ladder which is very safe and reliable in operation.

[0009] According to one aspect of the present invention, the above mentioned aim and objects, as well as yet other objects, which will become more apparent hereinafter, are achieved by an easily assembled metal ladder according to the preamble of claim 1 and known from EP-A-60 014 which ladder is characterized in that each of the plurality of structural metal sheet elements has a substantially cross configuration, said cross configuration including four arms near the end portions of which are provided further holes for assembling, said structural elements being provided for mutual connection by screws, engaged in the assembling holes, in order to define lattice structures constituting the legs of the ladder.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] Further advantages of the metal ladder according to the present invention will become more ap-

parent hereinafter from the following detailed disclosure of a preferred, though not exclusive, embodiment of the ladder which is illustrated, by way of an indicative, but not limitative, example, in the figures of the accompanying drawings, where:

Figure 1 is a schematic view illustrating a leg of the metal ladder according to the present invention, adjoining which are further shown three of the modular structural elements constituting the ladder;

Figure 2 is a perspective view illustrating a portion of a leg of the ladder according to the present invention;

Figure 3 illustrates a portion of the ladder according to the invention, with the steps thereof;

Figure 4 is a schematic view, as seen from the ladder inside, illustrating a portion of the ladder according to the present invention;

Figure 5 illustrates a cross-sectioned detail of the ladder according to the invention, and related to the connection region of a ladder step;

Figure 6 is a further schematic view illustrating a modified embodiment of the metal ladder according to the present invention and specifically relating to one of the legs of the ladder, and specifically showing on a side the structural modular elements constituting the ladder leg;

Figure 7 is a further schematic view illustrating a leg of the ladder with a different arrangement of the ladder steps;

Figures 8 and 9 are respectively a side and a front view illustrating a different embodiment of the ladder resting foot;

Figure 10 is a cross sectional view illustrating the bar for supporting a ladder step;

Figures 11 and 12 schematically illustrate spacer bushings, which can be arranged at the end portions of the rods for fitting the different ladder widths;

Figure 13 is a further schematic view, substantially taken from the inside of the ladder, illustrating a helical ladder portion;

Figure 14 is a further schematic view, in perspective, illustrating a helical ladder portion, as seen from the outside of the ladder;

Figure 15 is an elevation and top-plan view illustrating a starting structural inside element for a helical configuration metal ladder;

Figure 16 is an elevation and top plan view illustrating an inner structural element from a helical configuration ladder;

Figure 17 is an elevation and top plan view illustrating an inner end structural element for a helical ladder;

Figure 18 illustrates, respectively, in elevation and top plan view, a starting structural outer element for a helical ladder;

Figure 19 is an elevation top plan view illustrating an outer structural element for a helical ladder;

Figure 20 is an elevation and top plan view illustrating an end outer structural element for a helical ladder;

Figure 21 is an elevation and top plan view illustrating a fitting inner structural element for connecting a portion of a helical ladder to a rectilinear portion;

Figure 22 is an elevation top plan view illustrating an outer fitting structural element for connecting a helical metal ladder to a rectilinear metal ladder;

Figure 23 is a cross-sectional view illustrating a possible connection of the ladder steps;

Figure 24 illustrates a step connection arrangement with a step rise;

Figure 25 illustrates steps of the ladder, with coating and step rise;

Figure 26 illustrates coated steps of the metal ladder; and

Figure 27 illustrates ladder steps with an incorporated ladder step rise.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0011] With reference to the number references of the figures of the accompanying drawings, the metal ladder according to the present invention comprises a bearing construction or structure, constituted by a plurality of structural elements 1, made of a sheet metal material, preferably cut by laser apparatus, or simply sheared, the structural element being substantially equal to one another and being provided with a substantially cross configuration, including two vertical arms 2 and 3 and two horizontal arms 4 and 5.

[0012] The cross arms 2, 3, 4, 5 are provided, near the free end portions thereof, with holes or perforations, 6, 7, 8, 9 which are used for assembling mutually the several structural elements 1, the assembling being performed by using assembling screws, for making grid or lattice constructions constituting the legs of the ladder, as is clearly shown in figure 1.

[0013] More specifically, the two horizontal arms 4 and 5 of the structural element 1 are offset in the height direction thereof, with respect to one another.

[0014] The vertical arm 3 is connected to the horizontal arm 5 by a curved fitting or connection element.

[0015] The horizontal arm 4 is likewise connected to the vertical arm 2 by a further curved fitting or connecting element.

[0016] The vertical arms 2 and 3 are connected to one another and, along the axis thereof, middle holes or perforations 11 and 12 are formed, which are aligned or registered with the holes or perforations 6 and 7.

[0017] The middle holes 11 and 12 are used, jointly with the holes 6 and 7, as well as with the holes 8 and 9, for fixing the ladder steps or for fixing, either on the inner face and/or on the outer face of the structural element 1, reinforcement plates, as it will be disclosed in a more detailed manner hereinafter.

[0018] As clearly shown in figure 1, the several structural elements 1 are assembled mutually by using assembling screws, and by arranging a structural element 1 in an adjoining relationship with another structural element 1, so that the holes 6 of structural element 1 is aligned with the hole 8 of another structural element 1, whereas the hole 7 of a structural element 1 is aligned with the hole 9 of the other structural element 1 and so on, so as to obtain a ladder having a set or desired ladder height.

[0019] Thus, the lattice or grid construction constituting a leg of the subject metal ladder will be practically constituted by a plurality of constructional elements 1, all equal to one another.

[0020] At the top end portion of the ladder, moreover, is provided an end element 1a which is substantially equal to the constructional or structural element 1, without the arm 4.

[0021] The subject metal ladder is moreover provided with a ladder foot element 13 which can be associated, by means of an assembling screw, to the bottom vertical arm 2 of the structural element 1, constituting the bottom element of the lattice construction of the ladder.

[0022] Inner reinforcement plates are moreover provided, indicated by the reference number 14, which are provided with a pair of holes 14a and 14b with an axis corresponding to the intra-axis of the holes 11 and 12 and which are applied on the inner side of the structural element 1, by assembling screws, engaged through the holes 11 and 12 aligned or registered with the holes 14a and 14b of the reinforcement plate 14.

[0023] The ladder comprises moreover outer plates 15, also provided with holes 15a and 15b, the intra-axis of which corresponds to the intra-axis of the holes 11 and 12. The plates 15 can be associated with the outer face or surface of the structural elements 1, 1a, by possibly using those same screws which are used for assembling the inner plate 14.

[0024] The plates 15 extend on the top of the structural elements 1, 1a with a portion thereof, therethrough are formed further holes or perforations 16, for connecting the upright support element of the ladder banisters.

[0025] The banisters upright is engaged between the portion of the plates 15 extending on the top of the lattice construction, and inner plates 17 which are connected to the lattice construction, by using those same screws connecting two structural elements at the holes 9 and 7. The inner plates 17, in particular, are provided with additional holes or perforations 17a and 17b having an intra-axis equal to that of the holes 16.

[0026] In order to assemble the ladder steps, are provided bracket elements 18, which can be connected on the inner side of the structural elements 1, by using those same assembling screws mutually connecting the structural elements, at the holes 7 and 9, together with other assembling screws engaged in the holes 12.

[0027] The wood portion 19 of the step is connected to the assembling brackets 18 by means of assembling

screws 20.

[0028] As marble steps are to be assembled, a suitable bearing element would be provided, adapted to be connected to the legs of the ladder, by using those same holes 7 and 9 provided for mutually connecting the structural elements 1 and the middle holes 12.

[0029] The connection of the assembling brackets 18 and of the bearing elements of the lattice constructions, which constitute the two legs of the ladder, can be suitably performed by using threaded bushings 21 which are arranged between the assembling brackets 18 or the supporting or bearing element and the inner face of the structural elements 1, or of the possible reinforcement plate 14.

[0030] The threaded bushings 21, in particular, are traversed by a threaded hole, therein is engaged, from a side, the assembling screw 22 connecting the structural elements 1 or the structural element to the reinforcement plate 14 and, on the other side, the screws 23 for connecting the brackets or the step bearing or supporting element.

[0031] Both the assembling brackets 18 and the bearing element for supporting the marble steps, are also preferably made of a sheet metal.

[0032] At the hole 12, between the step and inner face of the structural element 1, or of the inner reinforcement plate 14, is arranged a spacer disc element, in order to fit the different overall thickness of the ladder leg at said hole, with respect to the connection region of the holes 7 and 9.

[0033] The intra-axis of the end holes 6 and 7 of the arms 2 and 3 can be changed, depending on the rise required for the steps of the subject metal ladder.

[0034] In this connection, it should be pointed out that the structural elements 1 and 1a can be curved or bent along the extension thereof, in order to provide either curved ladders or helical configuration ladders.

[0035] Figure 6 illustrates a variation of the ladder according to the present invention, made of structural elements similar to the above disclosed structural elements.

[0036] In this figure, the structural elements corresponding to the structural elements 1 and 1a have been indicated by the reference number 31 and 31a, whereas the foot element has been indicated by the reference number 43.

[0037] In this modified embodiment, the bottom structural element 44 is also provided with a slightly different configuration from that of the other structural elements.

[0038] With reference to figures 7 to 11, is herein shown a different connection of the step, which is supported by tubular rods 45 having a throughgoing hole 46 for engaging therein a screw 47 for holding the plate element 48 constituting the step proper.

[0039] Advantageously, the bars or rods 45, which are provided with end bushings 49, can be connected at the assembling holes 8 and 11 of the structural elements 1, thereby providing a different arrangement of the ladder

step, with respect to the leg of the ladder.

[0040] As clearly shown in figures 8 and 9, it is also possible to provide for the use a different bearing or resting foot element, generally indicated by the reference number 50, which is provided with two portions 51, of fork arrangement, extending from the base or bottom 52 and holding therebetween the structural element 1.

[0041] The metal ladder according to the present invention, owing to the fact that the bearing construction is practically made of a single type of modular element, can be made at a very low cost, both from the making proper standpoint and from the assembling standpoint, which costs are anyhow much smaller than that of conventional types of metal prior ladder.

[0042] By following the same logic making method providing for the use of a very reduced number of structural elements, which are mutually assembled, it is also possible to make helical configuration ladders.

[0043] To that end, and as is shown in figures 13 to 22, are provided inner structural elements and outer structural elements, depending on their mutual arrangement, with respect to the helical extension of the ladder.

[0044] Actually, an inner structural element 60 is provided, which has a bar or rod configuration, being provided with a central body 61 including spaced holes, according to that same principle which has been above disclosed for the rectilinear ladder, and being provided with a front lug 62 and a rear lug 63, with respect to the ladder extension, which are suitably slanted so as to provide the ladder with the desired slanted attitude.

[0045] On the body 61 are provided a bottom hole 64, a top hole 65, as well as a middle hole 66 which is arranged substantially flush with the rear lug 63.

[0046] This constitutes the basic element adjoining which will be arranged an inner starting structural element, indicated by the reference number 70, having a central body 71 and a single rear lug 72 which is slanted with respect to said body.

[0047] An inner end structural element 75 is moreover provided, shown in figure 17, which has a central body 76 and a single front lug 77, also slanted with respect to the central body 76.

[0048] On the outer side, that is on the outer periphery of the helical ladder, is provided an outer helical structural element 80, which is conceptually analogous to the structural element 1 and which is substantially provided with a central body 81 therefrom extend front 82 and rear 83 arms, which are slanted with respect to the central body 81 and end with front 84 and rear 85 lugs, so as to provide the mutual inclination for obtaining the desired curvature ray.

[0049] For completing the ladder assembly, is moreover provided a starting outer structural element 86, shown in figure 18, which includes its central body 87 to which is connected a rear arm 88 ending with a rear lug 89.

[0050] The outer end structural element would be of course moreover provided, for forming a helical ladder,

said element being indicated by the reference number 90 in figure 20 and being provided with a central body 91 coupled to a front arm 92 ending with a front lug 93, all of these elements being mutually slanted.

[0051] The elements which are herein used also allow to connect to one another ladders of rectilinear configuration including helical portions.

[0052] To that end, an inner fitting or connecting structural element is moreover provided, shown in figure 21 and indicated by the reference number 100, which is substantially provided with a central body 101 to which is connected, on the same plane, a front arm 102 and a front lug 103, the rear lug 104 being provided with a slanted attitude.

[0053] Likewise, is provided an outer fitting or connecting structural element 110, shown in figure 22, having a central body 111 coplanar with the front arm 112 and front lug 113 and slanted with respect to the rear arm 114 in turn slanted with respect to the rear lug 115.

[0054] On the ladder, as above stated, is possible to apply a lot of different types of steps, for example by using the rods or bar 46 supporting the plate element 48, as shown in figure 23, but it is also possible to provide a step rise 120, which is held in milled portions 121 directly formed on the edge of the plate element 48 forming the ladder step.

[0055] It is also possible to provide a supporting sheet metal element 130, provided with corner elements 131 for the connection to the leg of the ladder, on which will be provided a coating 132 constituting the tread of the ladder step.

[0056] Furthermore, it is also possible, by using the same constructional connection, to provide a rise 133, as is shown in figure 25.

[0057] This step rise, as shown in figure 27, can be directly made as a single body with the sheet metal 140 constituting the structural element supporting the ladder step and which, on the front thereof, is provided with a slanted rise 141 to be coated by a coating 142 constituting the ladder step proper and allowing to make both the step rise and the step tread.

[0058] From the above disclosure and from an observation of the figures of the accompanying drawings, it should be apparent that the invention fully achieves the intended aim and objects.

[0059] While the metal ladder according to the invention has been hereinabove disclosed and illustrated by way of a merely indicative, but not limitative example, it should be apparent that it is susceptible to several modifications and variations all of which will come within the scope of the enclosed claims.

Claims

1. An easily assembled metal ladder comprising a plurality of modular bearing elements formed as structural metal sheet elements, substantially equal to

one another, through said structural elements holes being formed for fixing the ladder steps, characterized in that each of said structural elements has a substantially cross configuration, said cross configuration including four arms near the end portions of which are provided further holes for assembling, said structural elements being provided for mutual connection by screws, engaged in the assembling holes, in order to define lattice structures constituting the legs of the ladder.

2. A metal ladder, according to Claim 1, characterized in that the two horizontal arms of said structural elements are offset from one another in the height direction.

3. A metal ladder, according to the preceding claims, characterized in that the two vertical arms of said structural elements are mutually aligned and, along the common axis thereof being formed middle holes between the respective assembling holes.

4. A metal ladder, according to one or more of the preceding claims, characterized in that said vertical arms of said structural elements are connected to the horizontal arms by a curved fitting element.

5. A metal ladder, according to one or more of the preceding claims, characterized in that said metal ladder comprises moreover a foot element which can be associated with the bottom vertical arm of the structural element, constituting the bottom element of said lattice constructions.

6. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover end structural elements which are substantially made as the other structural elements, without one of the horizontal arms.

7. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover reinforcement plates to be associated with the inner and/or outer face of said structural elements.

8. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover supporting plates for supporting the ladder banisters upright, and which can be associated with the inner and/or outer face of said structural elements.

9. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises supporting elements for supporting the ladder steps, which can be associated with said structural elements by the same assembling screws

of the structural elements and by means further screws to be engaged in the middle holes.

10. A metal ladder according to one or more of the preceding claims, characterized in that said structural elements are provided with bent portions in order to make curved or helical ladders. 5
11. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises step supporting brackets for supporting wood ladder steps, and which can be applied to the inner face of the structural elements. 10
12. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover sheet metal bearing elements for supporting marble steps. 15
13. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover threaded bushings for affixing said brackets or the bearings or supporting elements to said structural elements. 20
14. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover a tubular rod, provided with a throughgoing hole for engaging therein restraining screws for holding a plate-like element forming said ladder step. 30
15. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover a bearing foot element, constituted by two spaced portions and fork arranged, which can be connected to the end portion of the structural element and extending from a base element. 35
16. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover, for making helical ladders, a structural elements having mutually slanted portions. 40
17. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover an inner structural element for a helical ladder, having a central portion thereof to which are connected a front and rear lugs which are mutually slanted with respect to the central portion. 50
18. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover a starting inner structural element for a helical ladder, having a central body therefrom a slanted rear lug extends. 55
19. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover an end inner structural element having a central body therefrom a slanted front lug extends.
20. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover an outer structural element for a helical ladder, being provided with a central body to which are connected a front arm and a rear arm respectively ending with a front lug and a rear lug which are mutually slanted.
21. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover a starting outer structural element having a central body therefrom a rear arm extends, which ends with a rear slanted lug.
22. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover an end outer structural element having a central body therefrom a front arm extends ending with a slanted front lug.
23. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover a fitting inner structural element having a central body arranged with a coplanar relationship with a front arm ending with a front lug, a slanted rear lug being moreover provided.
24. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover a fitting outer structural element having a central body therefrom extends a front arm coplanar with the central portion and a front lug, a slanted rear arm being moreover provided ending with a slanted rear lug.
25. A metal ladder, according to one or more of the preceding claims, characterized in that said plate-like element, constituting the ladder step, is provided with milled portions for coupling with a step rise.
26. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover plate-like elements constituting the supporting base for a coating forming said ladder step.
27. A metal ladder, according to one or more of the preceding claims, characterized in that said ladder comprises moreover a sheet metal plate-like element forming in a single body a plate, at the step tread, and a further plate, at the step rise.

Patentansprüche

1. Eine leicht zusammenzubauende Metalleiter, die eine Vielzahl modularer Tragbauteile umfaßt, die als im wesentlichen untereinander gleiche, strukturelle Metallblechteile gebildet sind, wobei durch diese Strukturbauteile Löcher zur Befestigung der Stufen der Leiter gebildet sind, dadurch gekennzeichnet, daß jedes dieser Strukturbauteile im wesentlichen kreuzförmig ist, wobei diese Kreuzform vier Arme einschließt, bei deren Endbereichen weitere Löcher für die Montage bereitgestellt sind und diese Strukturbauteile für die gegenseitige Befestigung mittels Schrauben, die in die Befestigungslöcher eingeführt werden, entworfen sind, um Gitterstrukturen bereitzustellen, die die Ständer der Leiter darstellen. 5
2. Eine Metalleiter nach Anspruch 1, dadurch gekennzeichnet, daß die zwei horizontalen Arme dieser Strukturbauteile in Höhenrichtung zueinander versetzt sind. 10
3. Eine Metalleiter nach den vorhergehenden Ansprüchen, dadurch gekennzeichnet, daß die zwei vertikalen Arme dieser Strukturbauteile auf einer gemeinsamen Linie liegen und entlang deren gemeinsamer Achse Mittellöcher zwischen den jeweiligen Befestigungslöchern gebildet sind. 15
4. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese vertikalen Arme dieser Strukturbauteile mittels eines gekrümmten Beschlags an den horizontalen Armen befestigt sind. 20
5. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Metalleiter ferner ein Fußbauteil umfaßt, das mit dem unteren vertikalen Arm des Strukturbauteiles verbunden werden kann und das Bodenteil dieser Gitterstrukturen bildet. 25
6. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem strukturelle Endbauteile umfaßt, die im wesentlichen wie die anderen Strukturbauteile gefertigt sind, jedoch ohne einen der horizontalen Arme. 30
7. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter ferner Verstärkungsplatten zur Befestigung an der inneren und/oder äußeren Seite dieser Strukturbauteile umfaßt. 35
8. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem Tragplatten umfaßt, die aufrecht das Treppengeländer tragen und die an der inneren und/oder äußeren Seite dieser Strukturbauteile befestigt werden können. 40
9. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem Tragbauteile zum Tragen der Leiterstufen umfaßt, die mit diesen Strukturbauteilen über dieselben Befestigungsschrauben der Strukturbauteile und über weitere Schrauben, die in die Mittellöcher eingefügt werden, verbunden werden können. 45
10. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Strukturbauteile mit gekrümmten Bereichen ausgestattet sind, um Bogen- oder Wendeltreppen herzustellen. 50
11. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter Tragspangen umfaßt, die hölzerne Leiterstufen tragen und an der inneren Seite dieser Strukturbauteile befestigt werden können. 55
12. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter ferner Tragbauteile aus Metallblech umfaßt, um Marmorstufen zu tragen.
13. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem Gewindebuchsen umfaßt, um diese Spangen, Lager oder Tragbauteile an diesen Strukturbauteilen zu befestigen.
14. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem eine Rohrstange mit einem durchgehenden Loch umfaßt, in das Befestigungsschrauben eingefügt werden können, um ein Plattenbauteil aufzunehmen, das diese Leiterstufe bildet.
15. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein tragendes Fußbauteil umfaßt, das aus zwei versetzten und gegabelten Bereichen gebildet ist, die am Endbereich des Strukturbauteiles befestigt werden können und sich von einem Grundbauteil aus erstrecken.
16. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem für die Herstellung von Wendeltreppen Strukturbauteile mit zueinander geneigten Bereichen umfaßt.

17. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein inneres Strukturbauteil für eine Wendeltreppe mit einem mittleren Bereich besitzt, an dem vordere und hintere Ansätze befestigt sind, die in bezug auf den mittleren Bereich geneigt sind. 5
18. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein inneres Ausgangsbauteil für eine Wendeltreppe mit einem mittleren Körper umfaßt, von dem aus sich ein geneigter, hinterer Ansatz erstreckt. 10
19. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein inneres Abschlußbauteil mit einem mittleren Körper umfaßt, von dem aus sich ein geneigter, vorderer Ansatz erstreckt. 20
20. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein äußeres Strukturbauteil für eine Wendeltreppe umfaßt, das mit einem mittleren Körper ausgestattet ist, an dem ein vorderer und ein hinterer Arm angeschlossen sind, die jeweils mit einem vorderen und einem hinteren Ansatz enden, die zueinander geneigt sind. 25
21. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein äußeres Ausgangsbauteil mit einem mittleren Körper umfaßt, von dem aus sich ein hinterer Arm erstreckt, der mit einem geneigten, hinteren Ansatz endet. 30
22. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein äußeres Abschlußbauteil mit einem mittleren Körper umfaßt, von dem aus sich ein vorderer Arm erstreckt, der mit einem geneigten, vorderen Ansatz endet. 40
23. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein inneres Verbindungsbauteil mit einem mittleren Körper umfaßt, der koplanar zu einem mit einem Vorderansatz endenden, vorderen Arm angeordnet ist, wobei ferner ein geneigter, hinterer Ansatz bereitgestellt ist. 50
24. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein äußeres Verbindungsbauteil mit einem mittleren Körper umfaßt, von dem sich ein koplanar zum mittleren Bereich

angeordneter, vorderer Arm und ein Vorderansatz erstreckt, wobei ferner ein geneigter, hinterer Arm bereitgestellt ist, der mit einem geneigten, hinteren Ansatz endet.

25. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß dieses Plattenbauteil, das die Leiterstufe bildet, mit gefrästen Bereichen zur Verbindung mit einem Stich ausgestattet ist. 5
26. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem Plattenbauteile umfaßt, die den Tragsockel für eine Auflage darstellen, die diese Leiterstufe darstellt. 10
27. Eine Metalleiter nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß diese Leiter zudem ein Plattenbauteil aus Metallblech umfaßt, das in einem Körper vereint eine Platte am Stufentritt und eine weitere Platte am Stich bereitstellt. 20

Revendications

1. Échelle métallique facilement assemblée comprenant une pluralité d'éléments porteurs modulaires formés d'éléments de structure de plaques métalliques, sensiblement égaux les uns aux autres, des orifices étant formés à travers lesdits éléments de structure pour fixer les échelons de l'échelle, caractérisée en ce que chacun desdits éléments de structure présente une configuration sensiblement en forme de croix, ladite configuration en forme de croix comprenant quatre bras à proximité des portions d'extrémité desquelles sont prévus d'autres orifices pour l'assemblage, lesdits éléments de structure étant prévus pour une connexion mutuelle au moyen de vis, engagées dans les orifices d'assemblage, dans le but de définir des structures en treillis constitutives des montants de l'échelle. 30
2. Échelle métallique, selon la revendication 1, caractérisée en ce que les deux bras horizontaux desdits éléments de structure sont décalés l'un de l'autre dans la direction de la hauteur. 45
3. Échelle métallique, selon les revendications précédentes, caractérisée en ce que les deux bras verticaux desdits éléments de structure sont alignés mutuellement et en ce que des orifices intermédiaires sont formés le long de leur axe commun entre les orifices d'assemblage respectifs. 50
4. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que les-

aits bras verticaux desdits éléments de structure sont reliés aux bras horizontaux par un élément de raccord courbé.

5. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle métallique comprend par ailleurs un élément pied qui peut être associé avec le bras vertical inférieur de l'élément de structure, constituant l'élément inférieur desdites constructions en treillis. 5
6. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus des éléments de structure d'extrémité qui sont sensiblement réalisés comme les autres éléments de structure, sans l'un des bras horizontaux. 10
7. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus des plaques de renfort destinées à être associées avec la face intérieure et/ou extérieure desdits éléments de structure. 15
8. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus des plaques de support pour supporter les bras de l'échelle, et qui peuvent être associées avec la face intérieure et/ou extérieure desdits éléments de structure. 20
9. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend des éléments de support pour supporter les échelons de l'échelle, qui peuvent être associés avec lesdits éléments de structure par les mêmes vis d'assemblage des éléments de structure et au moyen d'autres vis destinés à être engagées dans les orifices intermédiaires. 25
10. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que lesdits éléments de structure sont équipés de portions coudées pour réaliser des échelles courbées ou en hélice. 30
11. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend des brides de fixation de support d'échelon pour supporter des échelons de l'échelle en bois, et qui peuvent être appliquées sur la face intérieure des éléments de structure. 35
12. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus des éléments porteurs en feuille métallique pour supporter des échelons en marbre. 40

13. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus des douilles filetées pour attacher desdites brides de fixation ou les éléments porteurs ou supports auxdits éléments de structure. 45
14. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus une barre tubulaire, munie d'un orifice traversant pour un engagement dans celui-ci de vis de maintien pour tenir un élément de type plaque formant ledit échelon d'échelle. 50
15. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément pied porteur, constitué par deux portions espacées et disposées en fourche, qui peuvent être reliées à la portion d'extrémité de l'élément de structure et s'étendant à partir d'un élément de base. 55
16. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus, pour la réalisation d'échelles en hélice, des éléments de structure présentant des portions mutuellement inclinées. 60
17. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément de structure intérieur pour une échelle en hélice, présentant une portion centrale à laquelle sont reliées une oreille avant et une oreille arrière qui sont mutuellement inclinées par rapport à la portion centrale. 65
18. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément de structure intérieur de départ pour une échelle en hélice, ayant un corps central à partir duquel s'étend une oreille arrière inclinée. 70
19. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément de structure intérieur d'extrémité présentant un corps central à partir duquel s'étend une oreille avant inclinée. 75
20. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément de structure extérieur pour une échelle en hélice, qui est muni d'un corps central auquel sont reliés un bras avant et un bras arrière se terminant respectivement par une oreille avant et une oreille arrière qui sont mutuellement inclinées. 80

21. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément de structure extérieur de départ présentant un corps central à partir duquel s'étend un bras arrière, qui se termine par une oreille arrière inclinée. 5
22. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément de structure extérieur d'extrémité présentant un corps central à partir duquel s'étend un bras avant se terminant par une oreille avant inclinée. 10
23. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément de structure intérieur de raccord présentant un corps central disposé en relation coplanaire avec un bras avant se terminant par une oreille avant, une oreille arrière inclinée étant de plus prévue. 15
20
24. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément de structure extérieur de raccord présentant un corps central à partir duquel s'étend un bras avant coplanaire avec la portion centrale et une oreille avant, un bras arrière incliné se terminant par une oreille arrière inclinée étant de plus prévu. 25
30
25. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ledit élément de type plaque, constituant l'échelon de l'échelle, est équipé de portions crénelées pour un couplage avec une contremarche. 35
26. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus des éléments de type plaque constituant la base de support pour un revêtement formant ledit échelon d'échelle. 40
27. Échelle métallique, selon l'une ou plus des revendications précédentes, caractérisée en ce que ladite échelle comprend de plus un élément de type plaque en feuille métallique formant une plaque en un seul bloc, sur la marche de l'échelon, et une autre plaque, sur la contremarche de l'échelon. 45
50

55

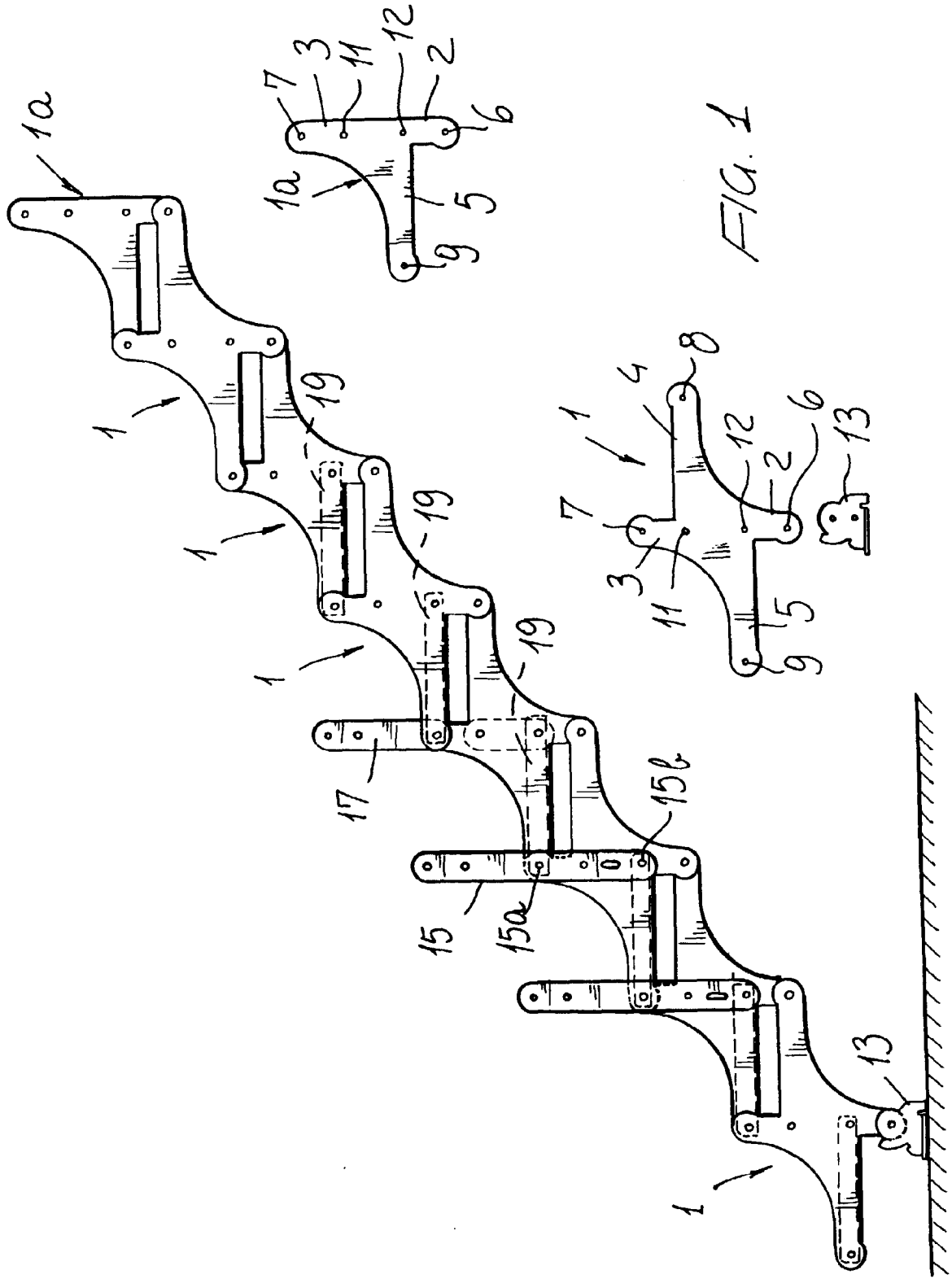
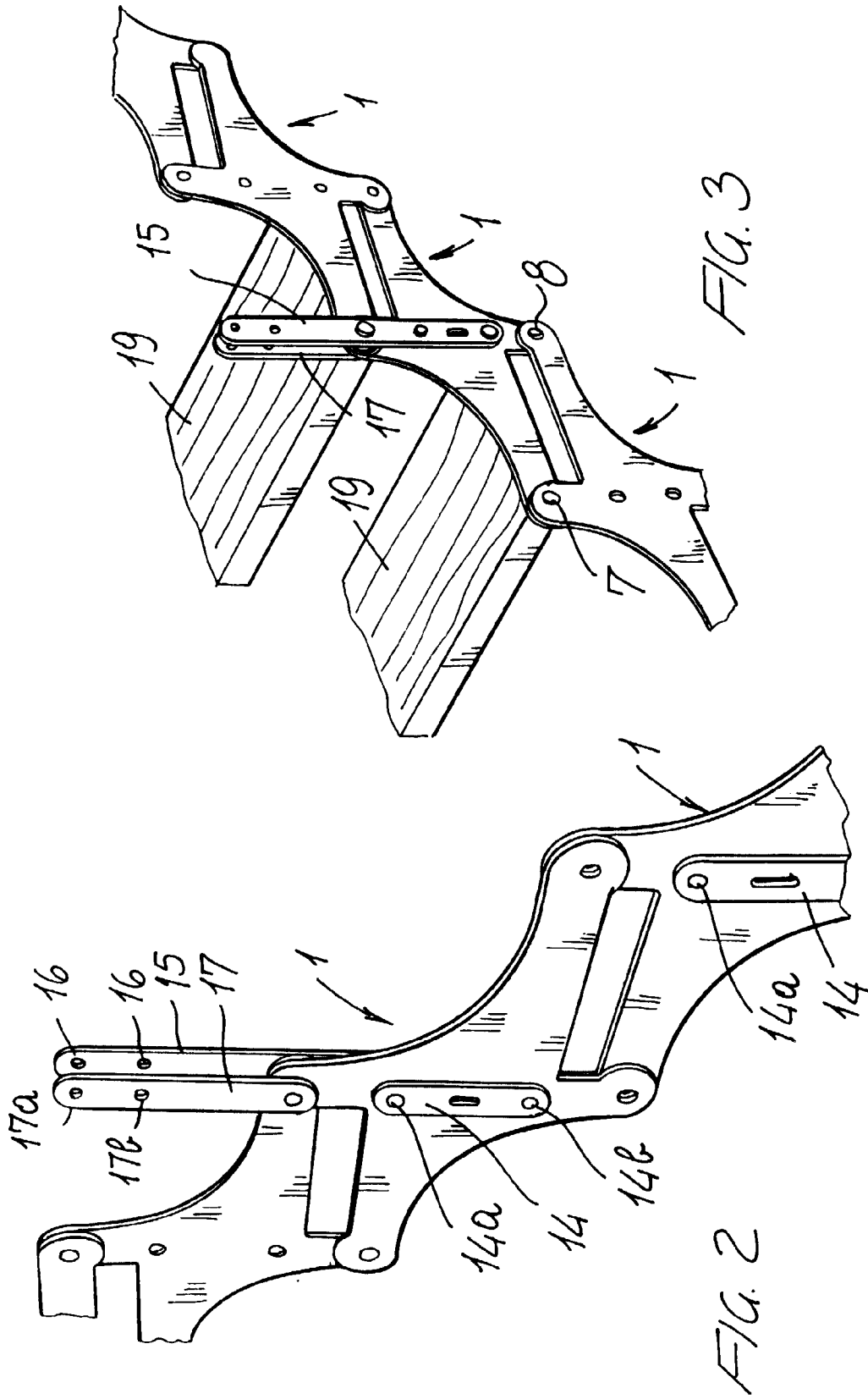
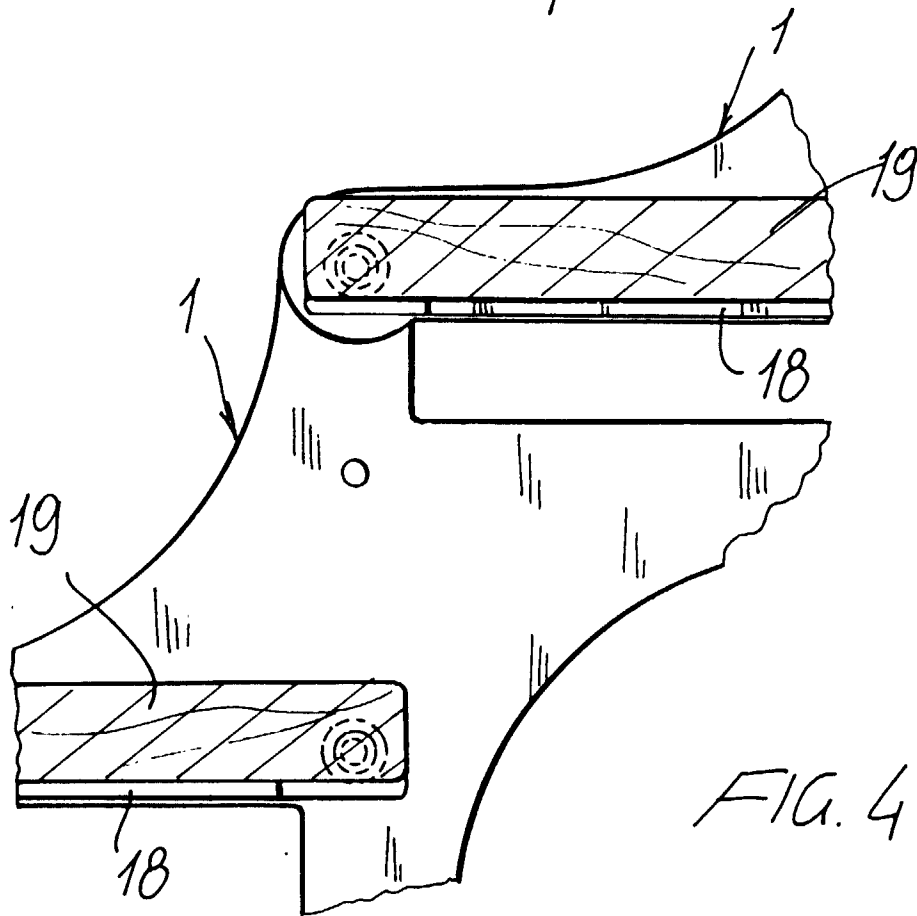
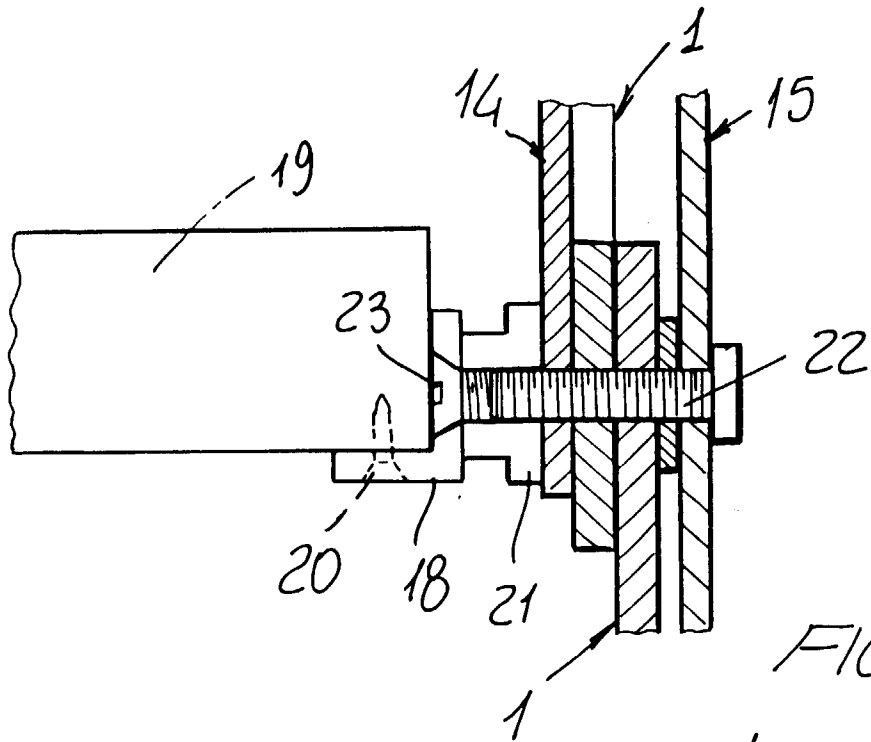


FIG. 1





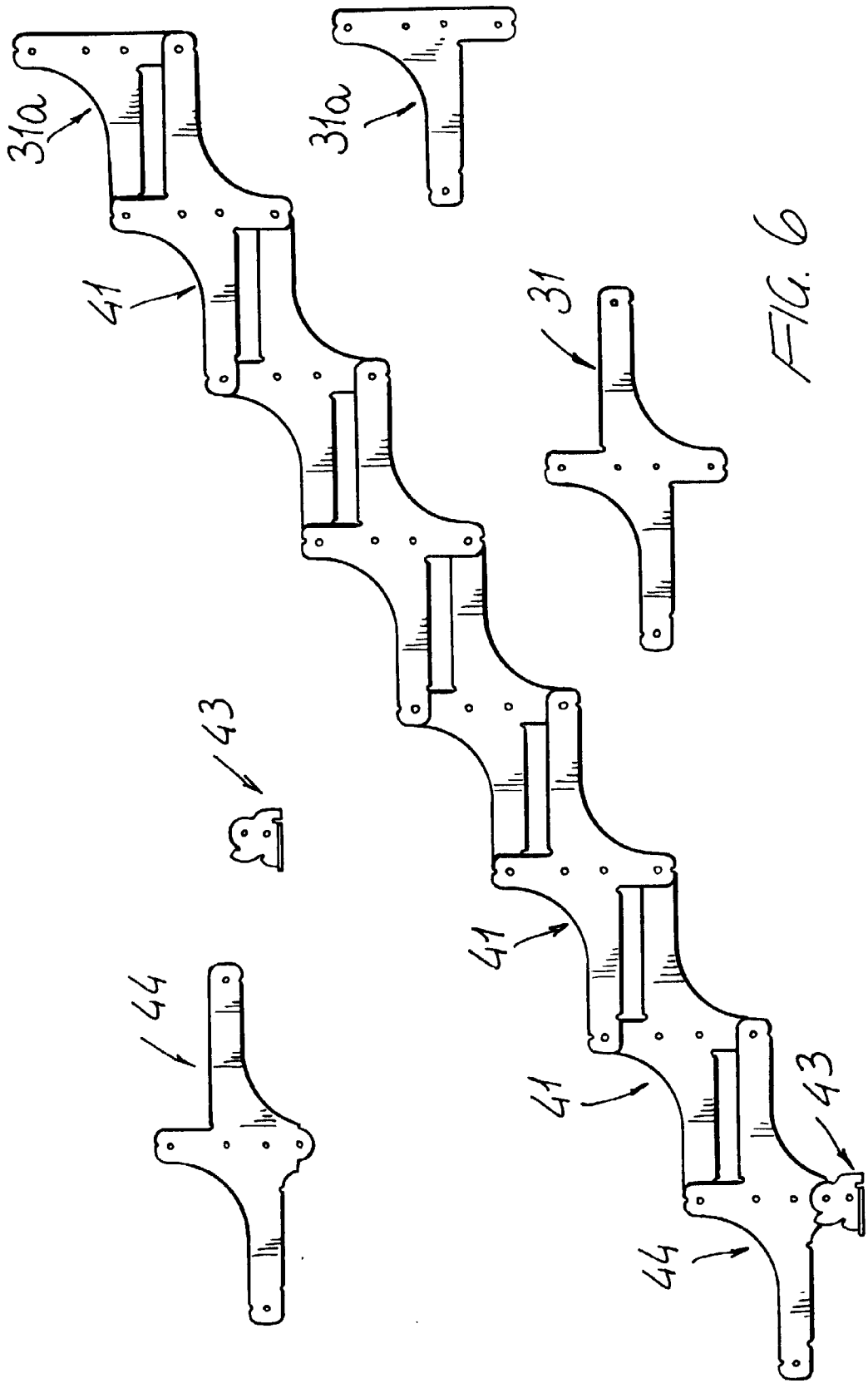
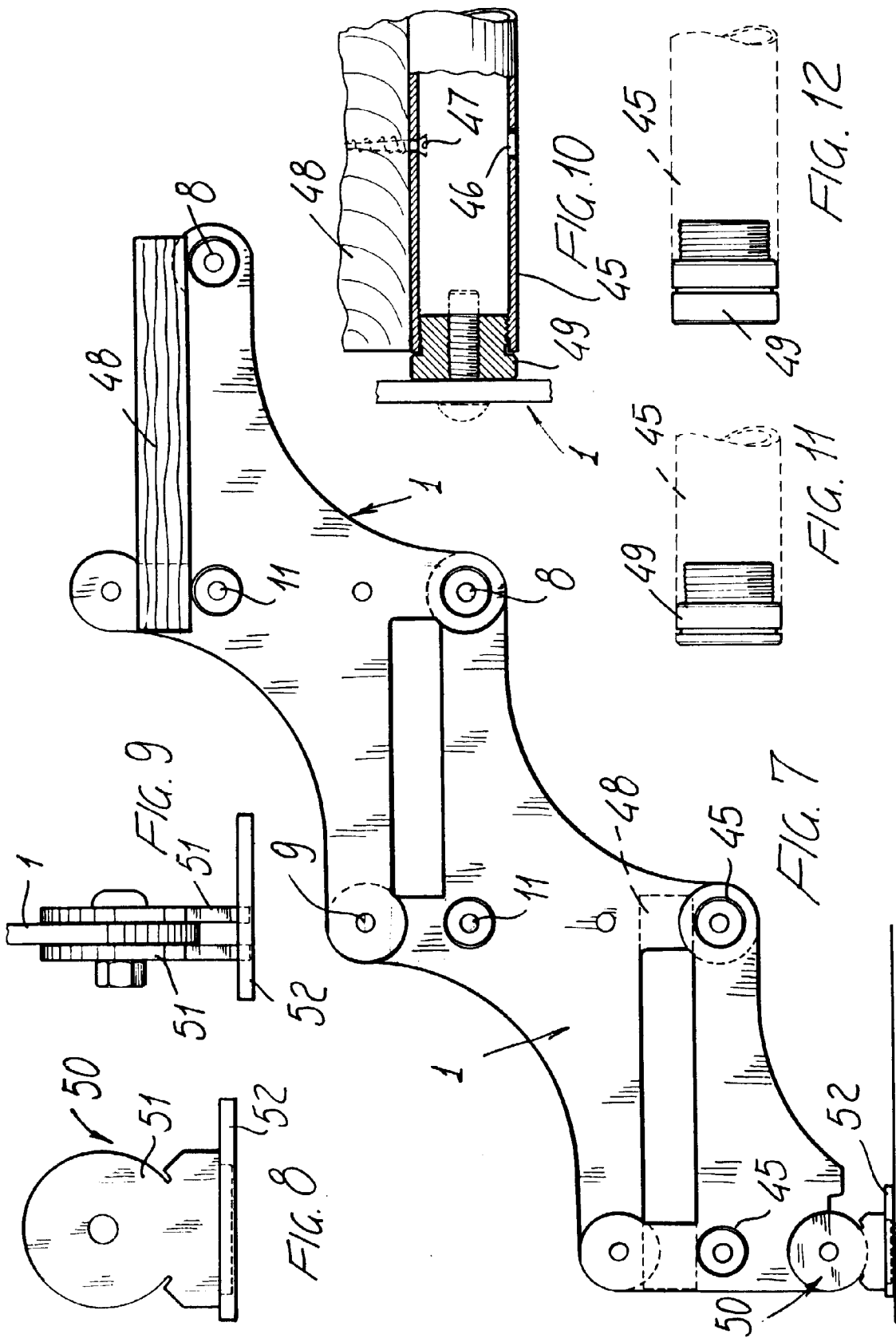
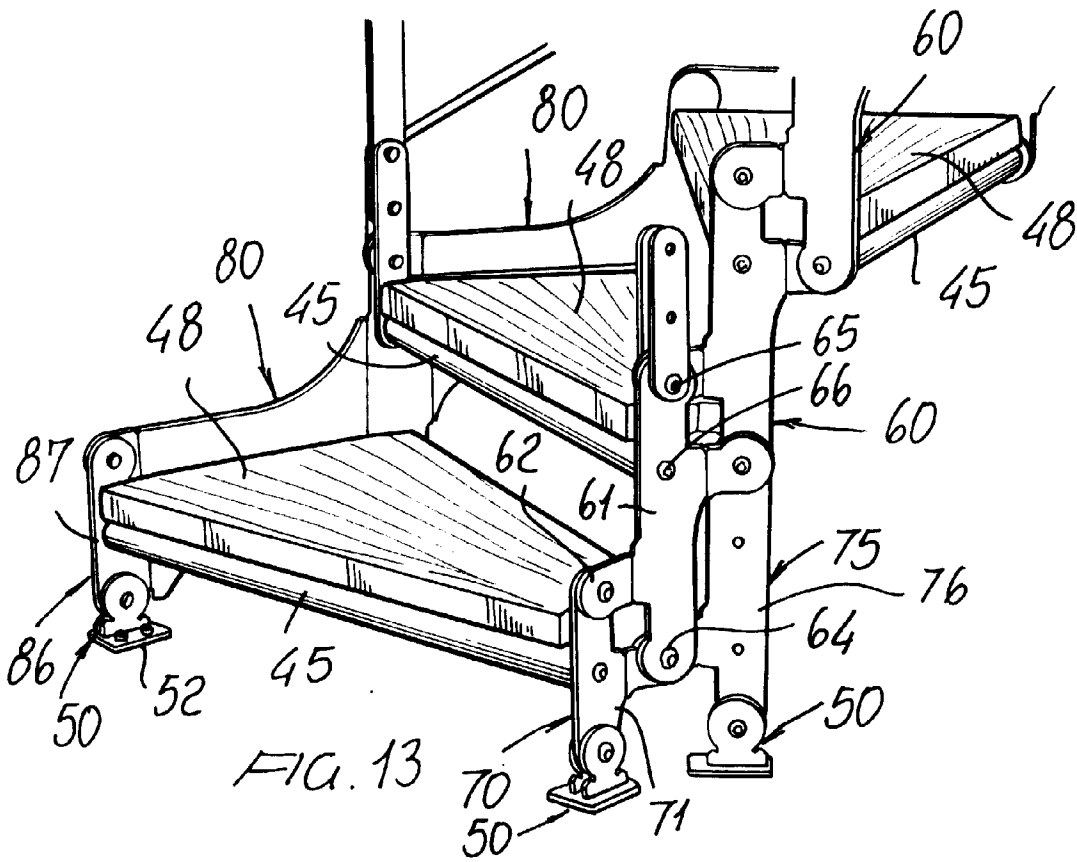
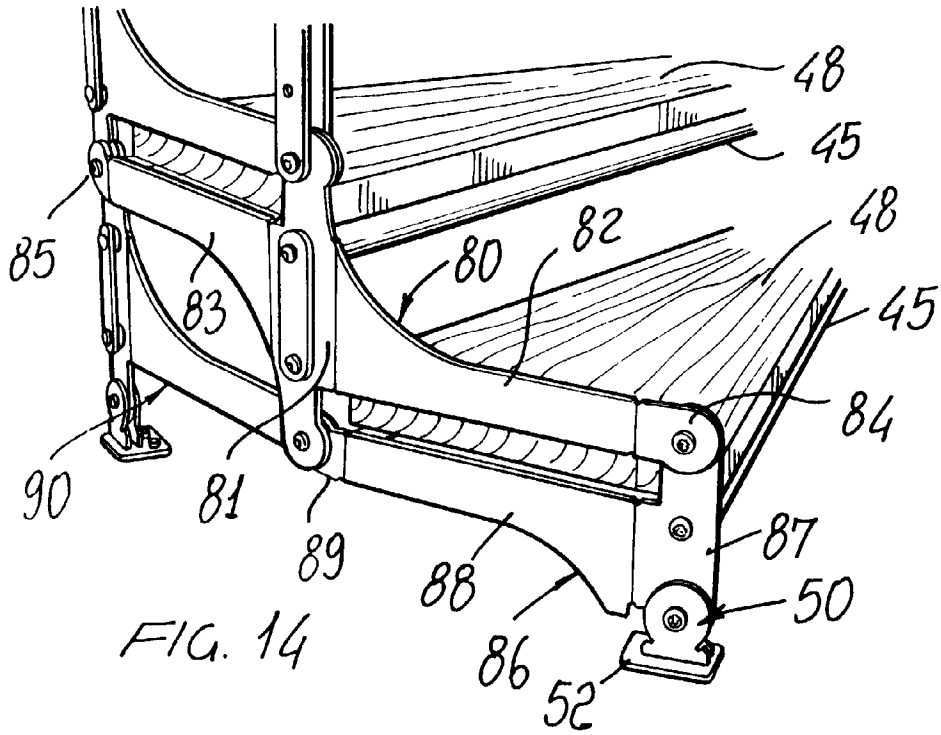


FIG. 6





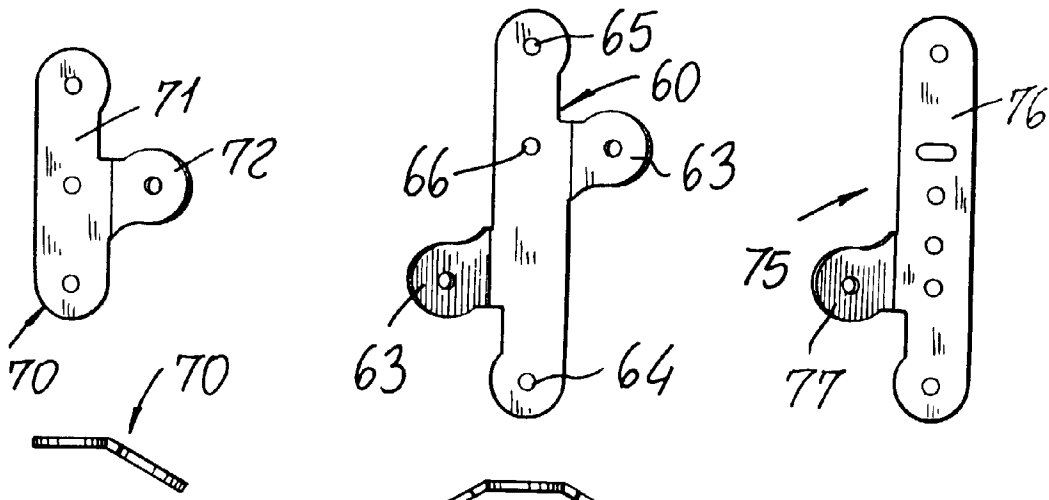


FIG. 15

FIG. 16

FIG. 17

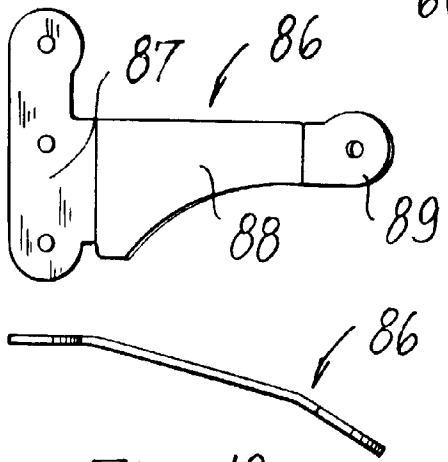


FIG. 18

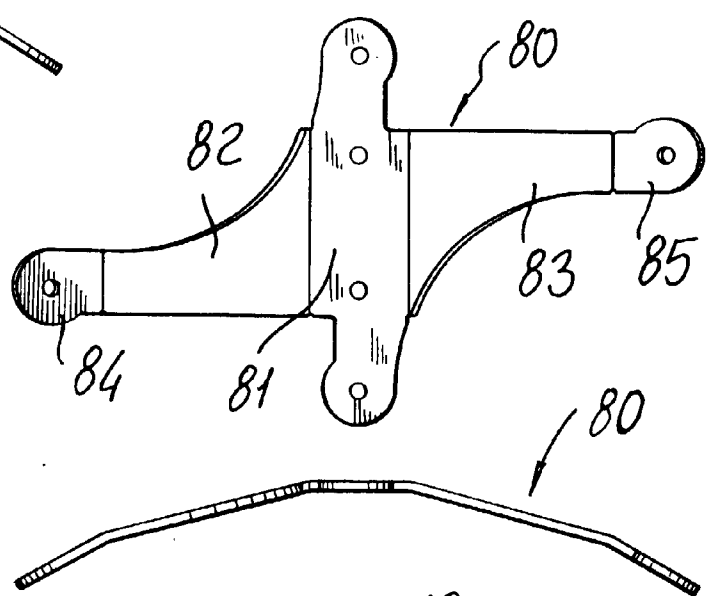


FIG. 19

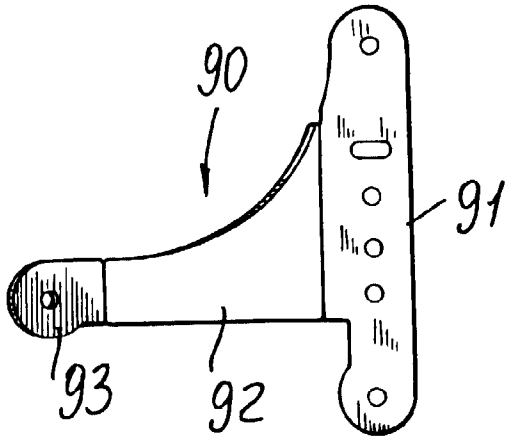


FIG. 20

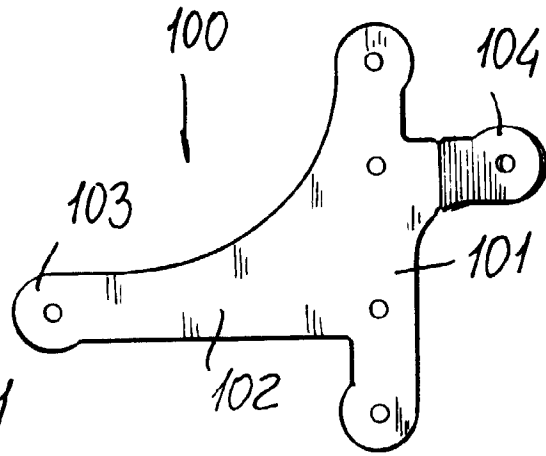
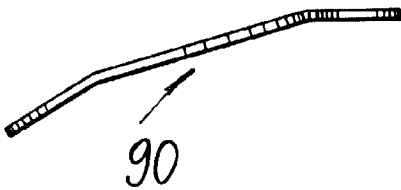


FIG. 21

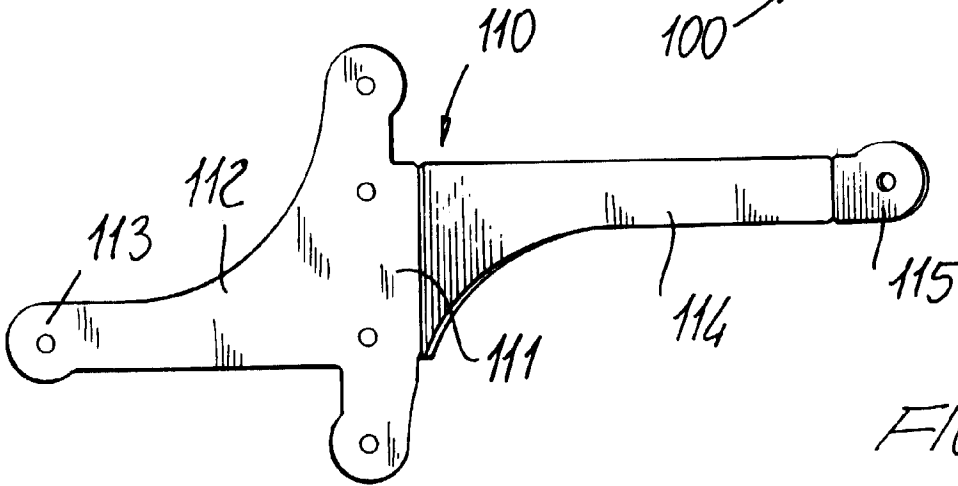
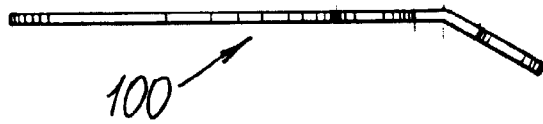


FIG. 22

