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(54) Cantilever gate

(57) A process for manufacturing a cantilever gate, which gate (1) comprises a supporting beam (3) and an upper structure (4) mounted on the supporting beam (3), which supporting beam (3) is brought into a bent state before the mounting of the upper structure (4). The resulting curve is fixed by means of at least one stiffening member (14,15) rigidly connected with the supporting beam (3) over a substantial part of the length of the supporting beam (3). The supporting beam (3) is then completed to a cantilever gate (1) of which the upper structure (4) is mounted on the concave side of the curved supporting beam (3). The supporting beam (3) has a tubular section with longitudinal flanges between which a stiffening member (14,15) can be arranged.

EP 0 761 926 A1

Description

The invention relates to a process for manufacturing a cantilever gate, in particular a gate suitable for use in wide passages, which gate comprises a supporting beam and an upper structure mounted on the supporting beam, as well as to a supporting beam suitable for use of the process and to a gate manufactured by means of such a supporting beam.

Such a gate designed as a sliding gate and provided with two running surfaces extending in the longitudinal direction of the supporting beam, which cooperate with supporting rollers stationarily arranged beside the gate, is described in EP-A-0 128 248.

A problem occurring with long cantilever gates, that is to say long-span gates, is that the gate tends to sag under the self-weight so that the free end comes to lie closer to the ground than the supported end, which is undesirable. One of the drawbacks of a sagging gate is that the ground clearance must be chosen relatively large so as to prevent jamming. Another drawback is that in case of a sagging gate a lock that may be arranged on the gate cannot properly function any longer.

According to EP-A-0 128 248 the sagging of a cantilever gate can be obviated by using a hollow supporting beam in which above the longitudinal axis one or more pretensioned wires are arranged which, upon assembly of the gate, are subjected to a tensile stress and then secured to anchoring means at the ends of the supporting beam. The supporting beam can thus be pretensioned in such a manner that under the influence of the self-weight the sagging is at least partly prevented. A drawback of this known technique is that tensioning of the wires usually has to take place on the building site, which requires special tools. Another drawback is that in the course of time the pretensioned wires will stretch so that it is necessary to retension or even replace them. Furthermore, it is rather difficult to rigidly secure ends of wires so that elongation can occur. Moreover, a problem could occur with the structure known from EP-A-0 128 248 when the supporting beam is composed of two or more sections positioned behind each other in the longitudinal direction of the gate. On the upper side of the supporting beam such sections would be drawn against each other by the pretensioned wires, but on the lower side a slit could be formed.

Similar problems occur with the cantilever sliding gate known from EP-A-0 513 554, which likewise comprises a hollow supporting beam having pretensioned wires arranged therein.

Furthermore, EP-A-0 628 698 discloses a supporting beam for a cantilever gate comprising a lower and an upper hollow tube section. The tube sections are spaced apart in the vertical direction and are connected together on both sides by means of side plates. The supporting beam is built up while in the longitudinal direction the upper tube section is subjected to a tensile stress and/or the lower tube section is compression-stressed. After applying the side plates the pretension is removed, with the result that the upper section is slightly shortened and/or the lower section is elongated. Thus an upward curve of the free end of the supporting beam is formed, which curve can compensate for the downward deflection occurring in the operating condition as a result of the weight of the cantilever gate.

A drawback of this known technique is that an elastic change of length of a tube section can best be obtained by exerting a tensile stress in the longitudinal direction. In that case, however, it is not possible to build up a supporting bam from several sections. It is also quite possible that as a result of, e.g., a usually not disturbung weak spot at least part of the elongation of the tube section proves to be not elastic but permanent, which is not manifest until assembly of the gate.

It is an object of the invention to remove the above drawbacks and, in general, to provide an easily manufactured but effective cantilever gate with compensation for sagging under the influence of the self-weight, as well as a process for manufacturing such a gate. According to the invention a process of the above type is characterized in that before assembly of the upper structure the supporting beam is brought into a bent state in such a manner that, seen in the operating position of the supporting beam, the resulting curve lies in a substantially vertical plane; that the resulting curve is fixed by means of at least one stiffening member rigidly connected with the supporting beam over a substantial portion of the length of the supporting beam; and that the supporting beam is then completed to a cantilever gate, with the upper structure being assembled on the concave side of the curved supporting beam.

A supporting beam suitable for use in the process according to the invention is characterized in that the supporting beam comprises a substantially closed tubular section having a front longitudinal side and a back longitudinal side, an upper wall and a lower wall, near which upper wall and/or lower wall flanges are provided for jointly receiving a stiffening member to be inserted between the flanges.

The invention will hereinafter be described in more detail with reference to the accompanying drawings.

Fig. 1 diagrammatically shows an example of a sliding gate to be constructed by using the invention;
Fig. 2 diagrammatically illustrates, in a number of steps, an example of a process for manufacturing a supporting beam;
Fig. 3 diagrammatically shows a modification of the process of Fig. 2;
Fig. 4 diagrammatically shows, in cross-section, an example of a supporting beam section to be used for a gate according to the invention; and
Fig. 5 diagrammatically shows an example of a method of gripping a supporting beam.

Fig. 1 diagrammatically shows an example of a gate

1 to be constructed by using the invention. The gate shown is a sliding gate cantilevered in a portal construction 2, shown in the closed position. However, the invention is also applicable to other types of gates, such as a swinging gate. The gate 1 comprises a supporting beam 3, provided with an upper structure 4. In this example the upper structure 4 comprises a number of bars 5 and an upper beam 6. At the free end the gate is provided with an end part 7 which, in the closed position, rests against a column 8 or the like and can be connected therewith, if desired, by means of a lock construction. Depending on the length of the desired span of the gate, the supporting beam 3 can be composed of one or more parts. The supporting beam is preferably manufactured from an extruded aluminium section.

The invention is based on the principle of mechanically precurving the supporting beam and fixing the precurve by means of one or more strips or stiffening members in such a manner that the sagging occurring during operation as a result of the self-weight is substantially compensated by the precurve.

Fig. 2 illustrates, in a number of steps, an example of a process according to the invention for manufacturing a supporting beam 3 for a cantilever gate according to the invention. Fig. 2 shows a long-span gate of which the supporting beam is composed of two parts 10,11 located behind each other.

In a first step A the parts 10 and 11 are connected together by means of dowel pins 12 in accurate alignment, as indicated by an arrow 13.

In step B the resulting supporting beam 3 built up from several parts is provided with one or more stiffening members which, in the present example, are strip-shaped. The strip-shaped stiffening members can be arranged on the upper side of the supporting beam or on the lower side of the supporting beam or both on the upper side and on the lower side. However, it is also possible to arrange stiffening members on the side surfaces of the supporting beam, if required in combination with stiffening members on the upper side and/or lower side. In the example shown two stiffening members 14,15 are used which are arranged on respectively the upper side and the lower side of the beam 3, as symbolized by arrows 16. The stiffening members will often have a length which completely or nearly completely corresponds to the length of the supporting beam 3, but, if desired, may also be slightly shorter. When a single stiffening member is used, this will anyhow extend over a substantial part of the length of the supporting beam. When using two stiffening members, that is to say that a stiffening member is located both on the upper side and on the lower side of the supporting beam, one of the stiffening members may, if desired, be considerably shorter than the supporting beam, depending on the sizes of the design.

The supporting beam is preferably provided with means for receiving the stiffening members. These may be, e.g., flanges of the supporting beam section forming a receiving slot, into which the stiffening members can be inserted. This is further illustrated in Fig. 3.

After the supporting beam 3 has been provided with the stiffening members 14,15, the lower stiffening member is secured, in step C, to the supporting beam in an area indicated by arrows 18 on both sides of the seam 17 between the beam parts 10 and 11. For this purpose, e.g., (self-tapping) screws or rivets may be used, as indicated at 19. In step D the upper stiffening member 14 is then secured to the supporting beam 3 near one end of the supporting beam by means of screws 20 or the like, as indicated by an arrow 21. Steps C and D may also be carried out in reverse order. Subsequently, the supporting beam is bent, in such a manner that the end that is free in the final operating condition undergoes an upward movement with respect to the other end. The bending of the supporting beam can take place in different ways, e.g. by means of a three-point bending machine. A very simple method is shown in steps E and F of Fig. 2, according to which the supporting beam is gripped (22,23) at one end 25 (in this example the end where the upper stiffening strip is already secured), and then the bending force 24 is exerted on the other end. This may even take place on the building site, e.g. by means of a rack-and-pinion jack, e.g. a car lifting jack.

In step G the upper stiffening member 14 is secured starting at the gripped end 25 of the supporting beam 3, as indicated by arrows 27. The working direction is indicated by an arrow 28. During the securing of the stiffening member the supporting beam is held in the bent position. After the stiffening member 14 has been secured over the entire length as described, it at least partly fixes the curve of the supporting beam.

In the example shown a second stiffening member is applied on the lower side, which is further secured in step H while the supporting beam is still held in the curved position by means of the gripping 22,23 and the bending force 24. As indicated by arrows 29,30, the lower stiffening member 15 is secured by arranging screws 31 or the like while gradually working from the part already secured on both sides of the seam 17 to the two ends 25,26.

In step I the gripping is removed. It can be seen that the curve applied is maintained by the stiffening members acting as fixing members.

When properly choosing the precurve, the supporting beam, if used in a cantilever gate exactly assumes a straight or substantially straight shape under the influence of the self-weight of the gate.

By way of alternative, it is also possible in principle to fasten the stiffening member or the stiffening members with a suitable glue.

It is further possible to effect the desired precurve of the supporting beam by gripping it at one end and leaving the other end clear. The free end will then move downwards so that the supporting beam assumes a bent shape, as shown in Fig. 3A. In step B of Fig. 3 the bent shape is fixed by means of a strip-shaped stiffening

member 32. In step C the supporting beam with fixed precurve is reversed so that the originally downward curve changes into an upward curve. With the precurved supporting beam in the position as shown in step 3C, which supporting beam could, if desired, also be provided with a fixing member on the upper side, a cantilever gate can then be constructed.

The stiffening members may be manufactured from any suitable material type, but preferably the same material is used as for the supporting beam itself. Problems with different coefficients of expansion, as they may occur, e.g., with the construction according to EP-B-0 128 248 or EP-A-0 513 554 are then prevented.

Fig. 4 diagrammatically shows, in cross-section, an example of an extruded aluminium section suitable for use as a supporting beam for a sliding gate according to the invention. The supporting beam shown comprises a closed tubular part 40 of which one longitudinal side 41 forms the sight side facing outwards (seen from the area to be closed). The other longitudinal side 42 is provided with sections 43 and 44 laterally extending in substantially horizontal direction, which sections 43 and 44 form running surfaces for stationary supporting rollers mounted on one or more fixed portals and/or supports. To prevent wear, the running surfaces may be provided with a layer of wear resistant material. Since mostly the upper running surface is most heavily loaded, only the upper running surface is provided, in the example shown, with a strip of stainless steel 45, inserted into longitudinal slots 46,47 of the aluminium section.

The space between the running surfaces can be advantageously used for gripping the supporting beam during the bending thereof. The upper and the lower side where the stiffening members must be arranged will then remain clear. This is diagrammatically shown in Fig. 5, which, in a stylized form, shows the supporting beam 3, a gripping member 75 and the space 76 between the running surfaces.

The supporting beam section is further provided, in this example under the lower running surface 44, with a rack 48 for driving the gate by means of a driven pinion mounted on a portal or support. The rack must extend over substantially the entire length of the supporting beam and can advantageously consist of a number of rack sections which, in the longitudinal direction, are fastened behind each other on a supporting strip, as shown at 49. The supporting strip 49 can be inserted into suitable slots in the extruded section. It is sufficient if the supporting strip is rigidly connected at one end with the supporting beam. Any problems caused by different coefficients of expansion of the rack member and the aluminium supporting beam are thus prevented.

In this example the supporting beam section further comprises a chamber 50 located beside the lower running surface 44, in which chamber 50, e.g., means may be provided, such as projections or the like capable of operating a limit switch for switching off the drive of the gate when it reaches an ultimate position.

In this example the supporting beam section is provided with four hollow spaces 51 through 54 in which, if necessary, dowel pins can be arranged to connect two supporting beam parts together. The hollow spaces may further serve to mount cover members at the ends of the supporting beam. For this purpose the hollow spaces could, e.g., be threaded at the ends.

In the supporting beam section shown the tubular part 40 is bounded on the upper side by a substantially flat upper wall 55 and on the lower side by a substantially flat lower wall 56. On both sides of the supporting beam section, at a short distance from the upper wall and at a short distance from the lower wall, flanges 57,58 and 59,60 are formed which extend parallel to the upper and the lower wall, respectively. The flanges 57,58 along with the upper wall and corresponding parts of the relevant side wall of the supporting beam section form a slot which, in this example, is located above the upper wall and is partly open on the upper side. In principle, such a slot may also be formed on the lower side of the upper wall.

Similarly, the flanges 59,60 along with the lower wall 56 form a slot which, in this example, is located under the lower wall and is partly open on the lower side. In principle, this slot could also be located on the upper side of the lower wall.

The stiffening strips 14 and 15 are inserted into the slots and, e.g. as described before, fastened by means of screws 61,62 or the like.

At the location of the (screw) connections between the flanges 55 and/or 56 and the strips 14 and/or 15 the supporting beam section may be thickened, if desired, by means of longitudinal ribs, as shown at 63.

The supporting beam section further comprises, on the upper side on both sides, two longitudinally extending lips 65,66. The lips can cooperate with a cover section 67 which, in the example shown, is provided at the two longitudinal edges with slots formed between two flanges 68 and two flanges 69, respectively, which can receive exactly the free edges of the lips 65,66.

According to the invention the cover section 67 serves as a mounting section for the upper structure and is therefore provided with a tubular rib 70 which extends in the longitudinal direction of the section in the middle thereof and on the side facing away from the supporting beam section. For this reason the tubular rib 70 and the rest of the cover section can be rather easily manufactured by extrusion in one operating cycle.

The tubular rib can serve to fasten at least partly hollow bars of the upper structure, as shown in Fig. 4. First of all, parts of the tubular rib are removed so that only a number of short sections remain spaced apart. Preferably, the sections are approximately square in horizontal cross-section, but the exact shape is connected with the internal shape of the bars to be used. Subsequently, a bar 71 having an adapted inner cross-section is slid on each short section. Preferably, the side walls of the tubular ribs have a slightly convex shape

which is depressed when a bar is pressed on a short section. The bars can thus be mounted with a solid gripping connection. It is also possible to arrange from below along the vertical axis a self-tapping screw pulling downwards the upper wall of a short section so that the side walls tends to bulge, with the result that the bar is fastened grippingly again.

The upper section, not shown, of the gate can be similarly or differently fastened to the bars.

In the example shown the supporting beam section further comprises on the outside near the upper wall 55 a longitudinal hollow space 72 which, e.g., may serve to mount illumination elements therein.

Furthermore, in the example shown a lower chamber 73 is formed on the lower side of the lower wall 56 because the outer wall 41 continues beyond the lower wall with a flange 74 bent inwards at some distance from the lower wall. The chamber 73 may serve to receive an electric line extending through the supporting beam which, e.g., may have the form of a voltage rail or the form of an endless chain provided with electric cables. These structures are known per se and are therefore not described here in more detail.

It is observed that after the foregoing various modifications are obvious to those skilled in the art. Thus, in order to align interconnected sections of a supporting beam, other suitable coupling members and/or coupling pieces could be used, instead of or beside dowel pins. Furthermore, if desired, the rack may consist of a single continuous strip which is directly inserted into the extruded section and secured in one or more places. When using one or more supporting strips, these may each be provided with one or more rack sections. Each supporting strip may be secured in one or more places. Furthermore, as observed before, stiffening members may also be used on or in the side surfaces of the supporting beam, whether or not in combination with stiffening members on the lower and/or the upper side of the beam. Stiffening members on or in the side surfaces must be arranged on both sides of the supporting beam. If desired, the side surfaces may be provided with receiving supports or the like for the stiffening members. Such modifications are deemed to fall within the scope of the invention.

Claims

1. A process for manufacturing a cantilever gate, in particular a gate suitable for use in wide passages, which gate comprises a supporting beam and an upper structure mounted on the supporting beam, characterized in that before assembly of the upper structure the supporting beam is brought into a bent state in such a manner that, seen in the operating position of the supporting beam, the resulting curve lies in a substantially vertical plane; that the resulting curve is fixed by means of at least one stiffening member rigidly connected with the supporting beam over a substantial portion of the length of the supporting beam; and that the supporting beam is then completed to a cantilever gate, with the upper structure being assembled on the concave side of the curved supporting beam.

2. A process according to claim 1, characterized in that the supporting beam is brought into the bent state by means of a multi-point bending device.

3. A process according to claim 1, characterized in that the supporting beam is brought into the bent state by gripping the supporting beam at one end, with the side of the supporting beam forming the upper side in the operating position facing downwards, and with the supporting beam deflecting downwards under the self-weight.

4. A process according to claim 1, characterized in that the supporting beam is brought into the bent state by gripping the supporting beam at one end, with a bending force being exerted at the other end by means of a rack-and-pinion jack.

5. A process according to any of the preceding claims, characterized in that the at least one stiffening member is a strip-shaped member.

6. A process according to claim 5, characterized in that the at least one strip-shaped member is made of the same material as the supporting beam.

7. A process according to any of the preceding claims, characterized in that the at least one stiffening member is fastened to the supporting beam with screws or the like, which are arranged starting from one of the ends of the stiffening member and working in the direction of the other end of the stiffening member.

8. A process according to any of the preceding claims, characterized in that the at least one stiffening member is secured with glue.

9. A process according to any of the preceding claims, which comprises the use of a supporting beam consisting of at least two longitudinally interconnected sections, characterized in that the sections are connected together by means of dowel pins; that before bending the supporting beam at least on or near the side of the supporting beam which in the operating position forms the lower side of the supporting beam, at least one stiffening member bridging the seam between the sections is arranged, which is secured on both sides of the seam in a relatively small area.

10. A process according to claim 9, characterized in that after the supporting beam has been brought into the bent state the at least one stiffening member bridging the seam is secured by arranging fastening means, starting at the relatively small area and working towards both ends of the stiffening member.

11. A process according to any of the preceding claims, used in a hollow space extending in the longitudinal direction of the supporting beam, and bounded on the upper and the lower side by running surfaces for one or more stationarily arranged supporting rollers, characterized in that upon bending the supporting beam the gripping of the supporting beam at least partly takes place by means of means arranged between the running surfaces.

12. A process according to any of the preceding claims, characterized in that a supporting beam is used provided with at least one longitudinally extending slot for receiving a stiffening member.

13. A process according to any of the preceding claims, characterized in that a supporting beam is used provided on the upper side with means for receiving a mounting element for the upper structure to be inserted in the longitudinal direction of the supporting beam.

14. A process according to claim 13, characterized in that the mounting element is provided on the upper side with a longitudinally extending tubular rib, that parts of the tubular rib are removed so that a number of spaced short sections remains, the horizontal cross-section of the section being such that the sections can grippingly engage with the hollow space of an associated at least partly hollow bar.

15. A process according to claim 14, characterized in that after the mounting of the bars the sections are expanded by means of a draw bolt extending from the lower side of the mounting element through each section.

16. A supporting beam for manufacturing a cantilever gate according to any of claims 1 through 15, characterized in that the supporting beam comprises a substantially closed tubular section having a front longitudinal side and a back longitudinal side, an upper wall and a lower wall, near which upper wall and/or lower wall means are provided for receiving a stiffening to be inserted.

17. A supporting beam according to claim 16, characterized in that means for receiving a stiffening member are located at and/or in the upper wall and/or lower wall.

18. A supporting beam according to claim 16 or 17, characterized in that means for receiving a stiffening member are provided at and/or in the side walls of the supporting beam.

19. A supporting beam according to claim 17, characterized in that said means are arranged in such a manner that above the upper wall and/or below the lower wall they form a partly open slot into which a stiffening member can be inserted and held, which can be connected with the upper wall and/or the lower wall, respectively.

20. A supporting beam according to claim 18, characterized in that the upper wall and/or the lower wall is provided with thickened longitudinal ribs for arranging fastening means.

21. A supporting beam according to any of the preceding claims, characterized in that near the upper wall and the lower wall on the back longitudinal side a laterally projecting flange is arranged to form a running surface for one or more supporting rollers.

22. A supporting beam according to claim 21, characterized in that at least one of the running surfaces is provided with a wear resistant material.

23. A supporting beam according to claim 22, characterized in that the wear resistant material comprises a strip of stain steel inserted into a longitudinal slot.

24. A supporting beam according to any of claims 16 through 23, characterized in that a rack extending in the longitudinal direction of the supporting beam is mounted on the lower side of the supporting beam.

25. A supporting beam according to claim 24, characterized in that the rack is mounted by means of at least one loose metal strip inserted into a slot formed in the supporting beam and secured at at least one end.

26. A supporting beam according to any of claims 16 through 25, characterized in that the supporting beam is provided on the front with a longitudinally extending hollow space for mounting illumination elements.

27. A supporting beam according to any of claim 16 through 26, characterized in that the supporting beam is provided on the back with a longitudinally extending hollow space in which are mounted operating members for one or more limit switches to be arranged beside the gate.

28. A supporting beam according to any of claims 16

through 27, characterized in that the supporting beam is provided with lips extending above the upper wall upwards and slightly outwards, the free longitudinal edges of the lips leaving an intermediate space clear into which a cover section is inserted which also serves as a mounting section for the upper structure of the gate.

29. A supporting beam according to claim 28, characterized in that the cover section is provided on the upper side with mounting elements to which an at least partly hollow bar can be grippingly fastened.

30. A supporting beam according to claim 29, characterized in that the mounting elements are expandable by means of a draw bolt substantially vertically extending through the mounting elements from the lower side of the cover section.

31. A supporting beam according to claim 28 or 29, characterized in that the mounting elements are formed by removing parts of a tubular rib formed on the cover section.

32. A supporting beam according to any of claims 16 through 31, characterized in that the front longitudinal side extends beyond the lower wall downwards and inwards to form a longitudinally extending chamber for receiving electric lines.

33. A supporting beam according to any of claims 16 through 32, characterized in that the supporting beam is a section extruded from aluminium.

34. A gate built up by means of a supporting beam according to any of claims 16 through 33.

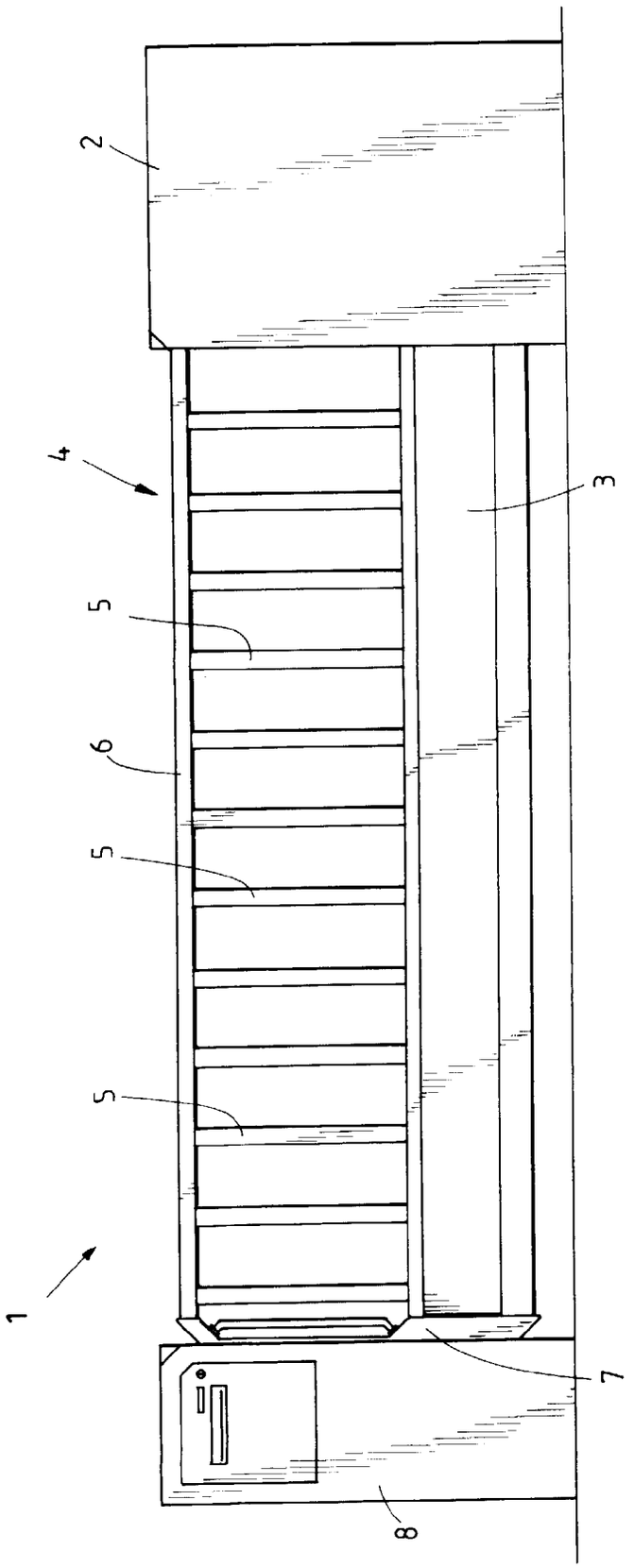

FIG. 1

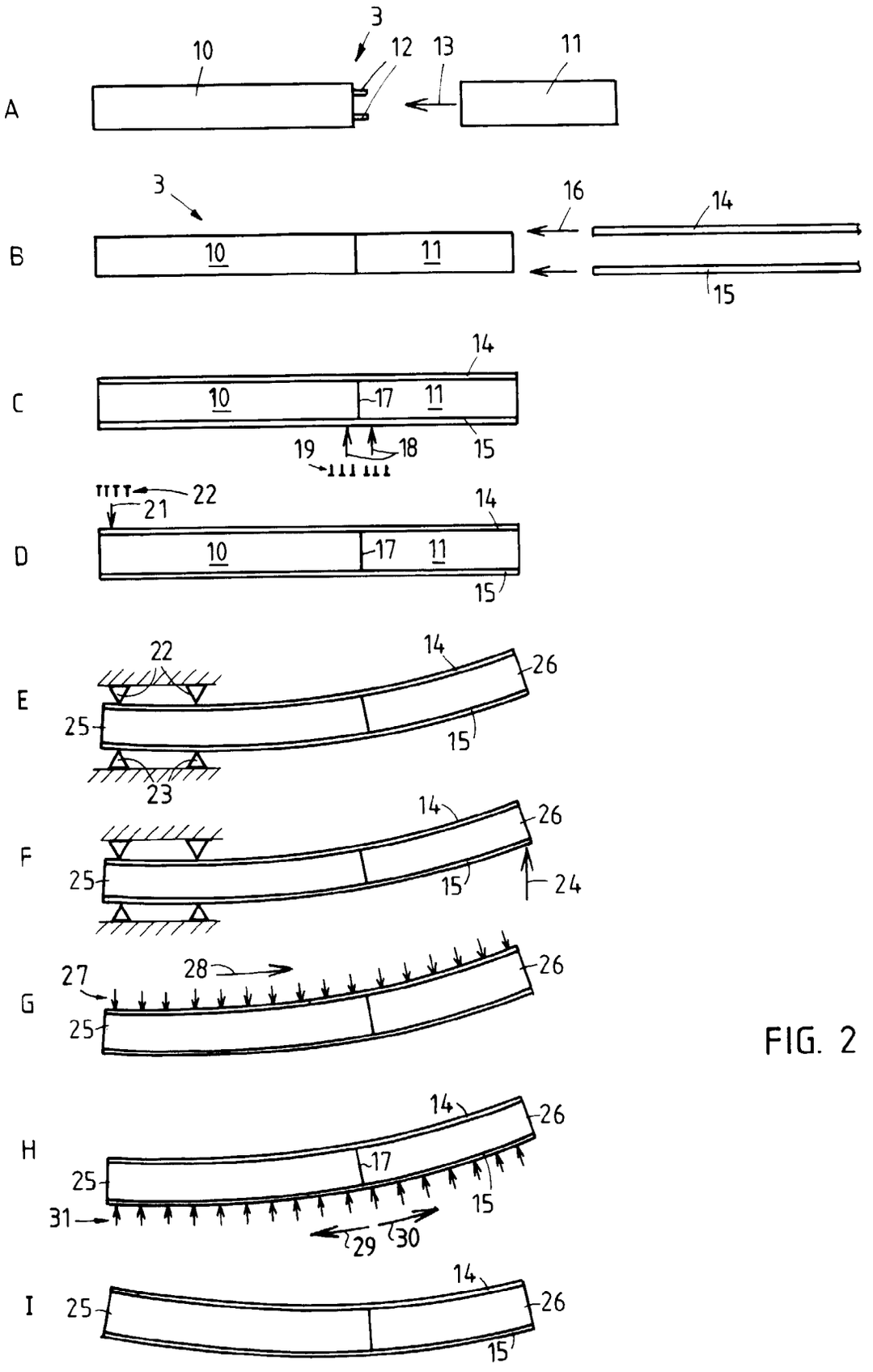
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FIG. 2

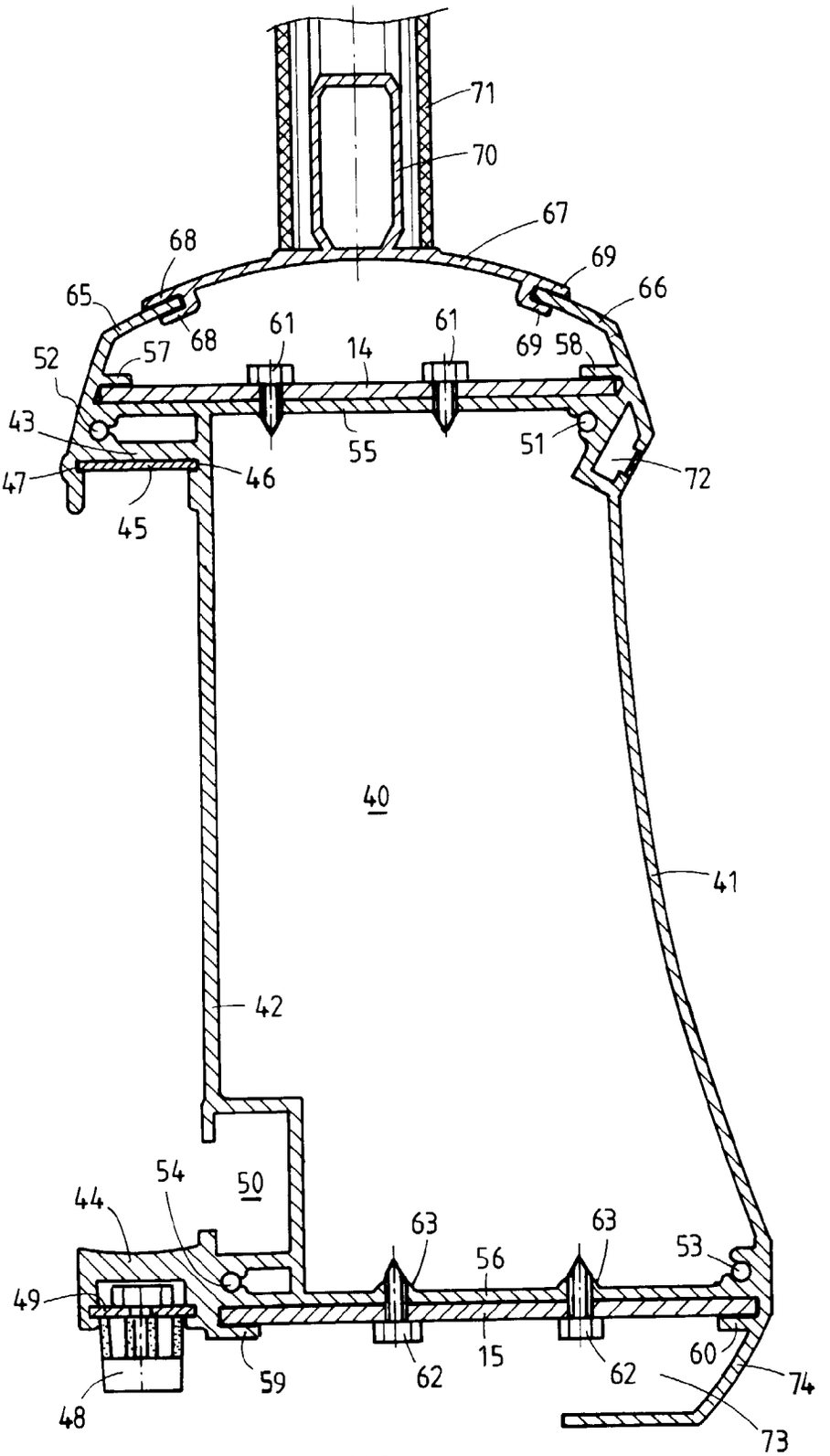
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FIG. 4

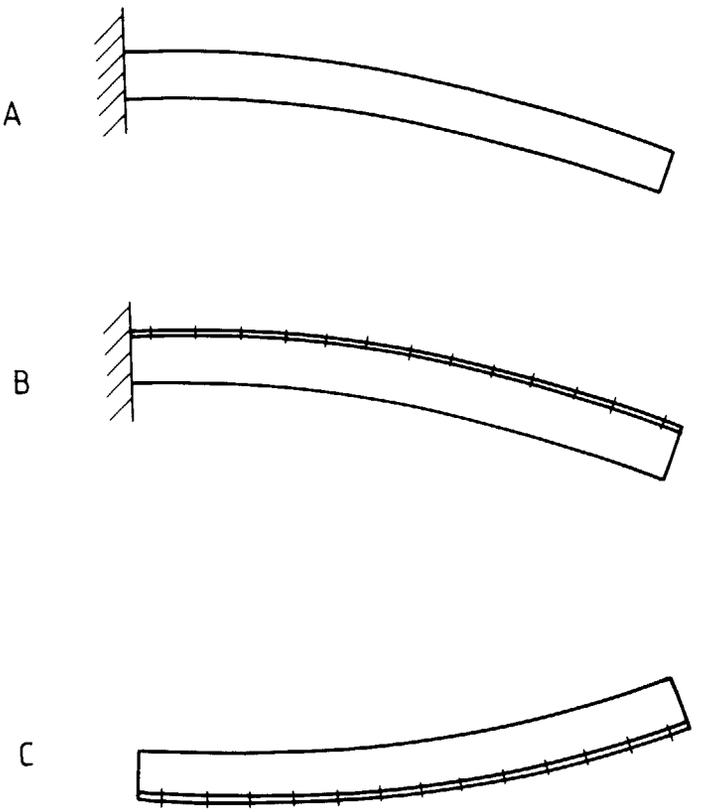

FIG. 3

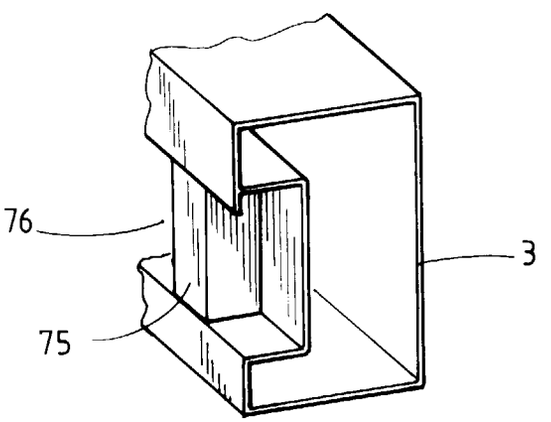

FIG. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 20 2514

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	EP-A-0 628 698 (RUIGROK FRANCISCUS BERNARDUS M) 14 December 1994 * column 3, line 49 - column 4, line 17; figure 1 * -----	1	E06B11/04
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) E06B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 November 1996	Peschel, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)