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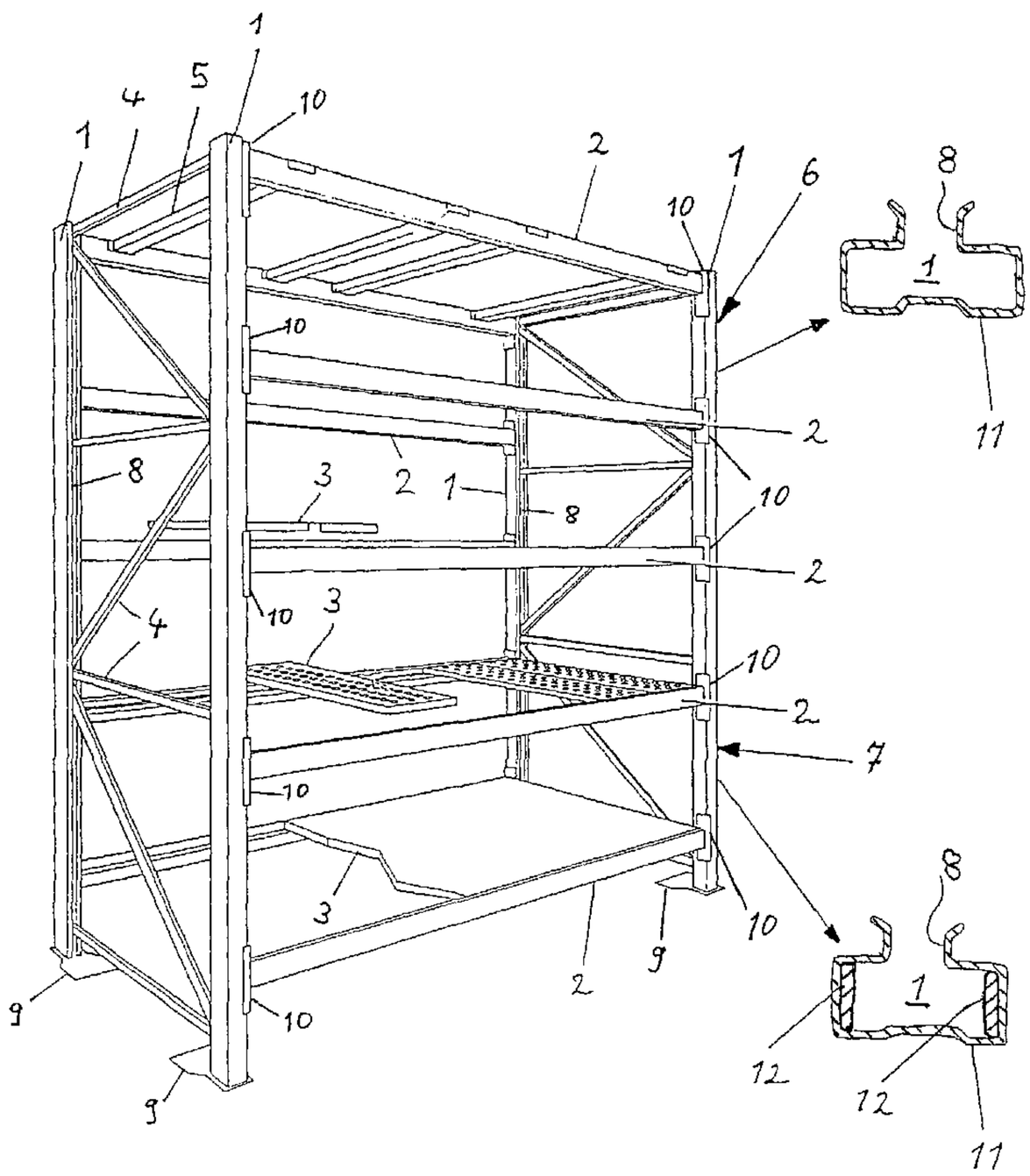

(57) Abrégé/Abstract:
The shelving comprises a structural shelving member having a profile bar (11) made of sheet metal. The profile bar (11) is reinforced by y reinforcement strip (12) over part of the length of the structural shelving member. This part of the structural shelving member can be subjected to higher loads. Since the reinforcement strip (12) does not extend over the entire length of the structural member, the capability to carry higher loads is archieved at relatively low weight. The structural shelving member is e.g. a shelving column (1), wherein reinforcement strips (12) are provided in a lower portion (7) of the column. An upper

(21) 2 392 358

(13) A1

(57) Abrégé(suite)/Abstract(continued):
portion (6) of the column does not comprise a reinforcement strip. Or the structural member can be a transverse shelving crossbar (2), wherein a reinforcement strip is then provided in the centre portion.

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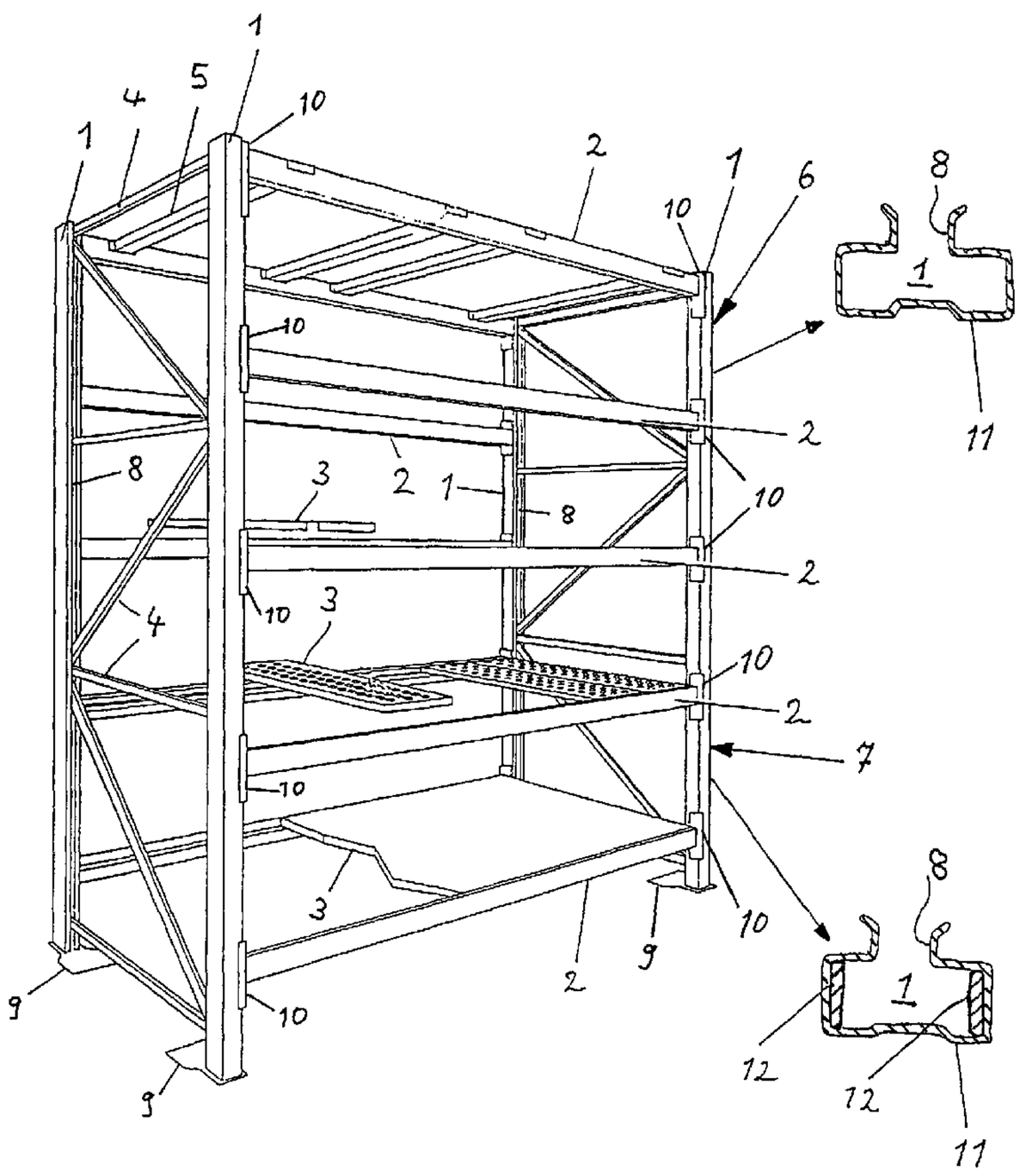

(57) Abstract: The shelving comprises a structural shelving member having a profile bar (11) made of sheet metal. The profile bar (11) is reinforced by y reinforcement strip (12) over part of the length of the structural shelving member. This part of the structural shelving member can be subjected to higher loads. Since the reinforcement strip (12) does not extend over the entire length of the structural member, the capability to carry higher loads is archieved at relatively low weight. The structural shelving member is e.g. a shelving column (1), wherein reinforcement strips (12) are provided in a lower portion (7) of the column. An upper portion (6) of the column does not comprise a reinforcement strip. Or the structural member can be a transverse shelving crossbar (2), wherein a reinforcement strip is then provided in the centre portion.

WO 02/024030 A1

SHELVING

Description

The invention relates to a structural member for shelving (structural shelving member), particularly to a column or transverse crossbar for steel shelving.

Ordinary shelving comprises an arrangement of vertical columns (uprights) and horizontal crossbars (connecting bars) and brackets or other rods carrying palettes or shelves for storage of goods.

Structural members of various profiles have been used for the columns, transverse crossbars and other rods of such shelving. The term "profile" is used hereunder to designate the shape of the structural member in a cross-sectional area perpendicular to the length of the member.

Such structural members can be manufactured from flat roller-milled sheet metal which is metal-formed by roll-forming (continuous bending by means of rolls) to form the structural member of the desired profile. The profile is the same over the entire length of the structural member. An example for roll-forming of structural members from sheet metal is disclosed in EP-A-0 715 974.

A large number of attempts for optimising the efficiency of use of material and the load carrying capability of such structural members are described in the literature. For example, DE-A-24 59 421 discloses a double-T-profile for use as a crossbar in steel shelving. This profile comprises parallel upper and lower flanges connected by a web. It is shaped from a single sheet metal in a way that the upper and lower flanges which are stressed relatively high consist of two layers of sheet metal whereas the web which is stressed relatively low consists of only a single layer of sheet metal. The two sheet metal layers of the upper and lower flanges are each obtained by folding from a single metal sheet. DE-A-24 21 918 shows a similar member having a separate strip of sheet metal inserted between the two layers of each of the

upper and lower flanges to further reinforce the structural member. Further structural members for shelving and made from single layer or multilayer sheet metal are shown in DE-C-26 28 537 and DE-A-30 02 401.

As opposed to the aforesaid documents, which disclose the manufacture of profiles with portions of different strength by use of a different number of sheet metal layers, WO 00/29138 discloses a method for manufacturing a structural member starting out from sheet metal having portions of different thickness. The sheet metal is obtained by welding two thinner sheet metal strips to the lengthwise edges of a thicker sheet metal strip. The two thinner strips are then bent to obtain a U-profile with thinner legs and a thicker web. The profile is the same over the entire length of the member. DE-C-195 25 347 and WO 99/05380 disclose structural steel members for use in car bodies and in buildings, which have reinforcement plates welded thereon. The one disclosed in WO 99/05380 is filled with concrete.

It is an object of the invention to provide a cost efficient structural shelving member with further optimised use of material and optimised load carrying capabilities. It is a further object to provide a manufacturing method for such a structural shelving member.

These objects are solved by the structural shelving member of claim 1 and the method of claim 9.

In optimising structural shelving members of the prior art, attention was mainly paid to optimising the profile which was kept the same over the entire length of the member. The invention, however, is based on the idea to impart different profiles to different portions in lengthwise direction of the structural shelving member. This takes into consideration that different lengthwise portions of a structural shelving member carry different loads. For example, the individual portions of a shelving column each carry only the load of the shelves above them and thus, the load decreases from the bottom to the top.

The structural shelving member comprises a profile bar. Different profile cross-sections of the structural shelving member are achieved by a reinforcement strip reinforcing the profile bar and extending along the length but only over a portion but not over the entire length of the profile bar or of the structural shelving member. This results also in an efficient use of material.

The reinforcement strip can be formed integrally connected with the profile bar. Preferably, however, both are separate pieces of sheet material which, during manufacturing of the structural shelving member, are commonly supplied and connected to each other.

Although steel shelving is usually disassembled for delivery and transport and is only assembled at its final destination to save transport volume, its high weight can cause shipping costs to exceed manufacturing costs. An efficient use of material in accordance with the invention lowers the weight of shelving in relation to its load carrying capability and thus reduces costs of manufacturing and transport.

The subclaims are directed to preferred embodiments of the invention.

Subclaims 2 to 4 relate to preferred ways of interconnecting the reinforcement strip and the profile bar.

An embodiment according to claim 5 has the particular advantage that the reinforcement strip does not affect the look of the shelving.

Claims 6 to 8 relate to more explicit embodiments of structural members for shelving combining an efficient use of material with high load carrying capability.

Claims 9 to 13 relate to economical methods for manufacturing a structural shelving member in accordance with the invention.

Preferred embodiments of the invention will now be described in connection with the drawings, wherein

Figure 1 shows heavy load shelving,

Figures 2 and 3 show a schematic representation of two different installations for manufacturing structural shelving members, and

Figure 4 shows a transverse cross bar.

The heavy load shelving shown in Figure 1 comprises vertical columns 1 interconnected by horizontal transverse crossbars 2 and horizontal and diagonal bracing struts 4. Shelves 3 and depthwise rods 5 used to deposit goods rest on the transverse cross bars 2. A foot plate 9 is welded to the bottom face of each column 1. An engagement plate 10 is welded to each side face of each transverse crossbar 2 and has hooks (not shown) for engagement with holes (not shown) in the columns 1. The columns 1, transverse crossbars 2, bracing struts 4 and depthwise rods 5 are different structural shelving members made of steel. Each portion of a shelving column 1 carries the part of the shelving load above itself. Thus, the buckle load on the column 1 increases from the top to the bottom of the column. This course of load is taken into account in the profile of the column 1.

Figure 1 also shows the profile of the column 1 in cross-section perpendicular to the length of the column at two positions. The column 1 comprises a profile bar 11 extending over its entire length. The profile bar is made by roll-forming from sheet metal and has the same hollow profile over its entire length. The hollow profile is not entirely closed because each column 1 has a slit 8 along the entire length of the column where the columns 1 face each other along the narrower sides of the shelving. The bracing struts engage the slits 8 and are fixed therein by welding or screwing.

The profile in the upper portion 6 of each column is exclusively defined by the profile bar 11. The lower portion 7 of the column 1, however, comprises two additional reinforcement strips 12 extending along the length of the column and fixed to two opposite inner walls of the profile bar 11. The

fixing can be made by welding, screwing, riveting, clinching or other positive or non-positive connections.

The reinforcement strips 12 are mounted to those inner walls of the profile bar 11 which are perpendicular to the wall having the slit 8. Hence, they reinforce the column 1 against buckling within the plane of the front face or rear face of the shelving, i.e. within the plane of the transverse cross-bars 2. This reinforcement is important because, other than the narrower side faces of the shelving, those front and rear faces have no or only few diagonal struts because these would obstruct access to the shelves. Further, the transverse crossbars 2 are often not very rigidly engaged with the columns 1 and thus their ability to support the columns is limited.

In the present embodiment, the upper portion 6 without reinforcement strips 12 extends over 4/5 or more and the lower portion 7 having reinforcement strips 12 extends from the foot plate 9 over about 1/5 or less of the length of the shelving column. In heavy load shelving being 12 m high or more, the reinforcement strips have a length of up to about 2.5 m.

Figure 2 shows a schematic diagram of an installation for manufacturing the columns 1. Also shown is the profile section, respectively formed in the different steps of the manufacturing process. The installation comprises a levelling machine 21, having a coil 22 of a first sheet metal 23 and two coils, one 24 of which only being visible of a second sheet metal 25. The levelling machine 21 uncoils the sheet metals 23, 25 from the coils 22, 24, straightens them and supplies them parallel to each other in the same direction.

The installation further comprises connection and roll-forming means 26 in which individually cut strips of the second sheet metal 25 are connected to the first sheet metal 23 by welding or clinching. Prior to or after making the connection, the first sheet metal 23 is roll-formed to form the profile of the profile bar 11.

Cutting means 27 cut the first sheet metal 23 into pieces having the length of a column 1 which is longer than the strip of the second sheet metal 25 fixed thereto. Punching means 28 punch holes (not shown) into the first sheet metal 23 for engagement by the transverse crossbars 2 and for fixture of the bracing struts 4 by screwing. Eventually, a foot plate 9 (Figure 1) is welded to one end of the compound of first and second sheet metals 23, 25, where ends of the first and second sheet metals 23, 25 are flush. In the columns 1 thus manufactured, the first sheet metal 23 forms the profile bar 11 and the two strips of second sheet metal 25 form the reinforcement strips 12.

Figure 3 shows a modification of the installation of Figure 2. That modification comprises two different levelling machines 31, 32 for supplying the first sheet metal 23 and the second sheet metal 25 from opposite directions. As in the embodiment of Figure 2, the sheet metals 23, 25 are uncoiled from respective coils 22, 24 and are straightened. Roll-forming and cutting means 33 are provided for giving the first sheet metal 23 the profile of the profile bar 11, cutting it to the length of a column 1 and supplying it to connection means 34. The connection means 34 are supplied from the opposite direction with two parallel strips of the second sheet metal 25. These strips are inserted from the front side into the profile bar 11 made from the first sheet metal 23 and are cut to a shorter length than the profile bar 11 by the connecting means 34 to form the reinforcement strips 12. The reinforcement strips are fixed to mutually opposite inner faces of the profile bar 11 by welding or clinching.

Since the reinforcement strips 12 are shorter than the profile bars 11, a portion 7 of the column comprises reinforcement strips whereas another portion 6 is void of reinforcement strips.

Figure 4 shows a side view of the transverse crossbar 2 when the engagement plates 10 are not yet welded to its two ends. Also shown are cross-sections along lines A-A and B-B.

Similar to the column 1, the transverse crossbar 2 comprises a profile bar 41 and a reinforcement strip 42. The profile bar 41 extends along the entire length of the transverse crossbar 2 and shows a rectangular hollow profile in cross-section perpendicular to its lengthwise direction. The hollow profile is not entirely closed. Namely, the lower side of the profile bar 41 comprises a slit 43.

The reinforcement strip 42 is deposited on the bottom within the profile bar 41 where it covers the slit 43. The reinforcement strip 42 is welded at the slit 43 to the profile bar 41 and carries part of the load of the crossbar 2 in use. The length of the reinforcement strip 42 is about 1/5 the length of the crossbar 2. The adjacent end portions 45 each having 2/5 the length of the crossbar 2 comprise no reinforcement strips. Further reinforcement strips could, however, be provided at the outermost ends of the crossbar 2 to increase the rigidity of its connection to the engagement plate 10 and thus to the column 1.

The installation of Figure 2 or 3 can also be used for manufacturing the transverse crossbar 2, wherein one coil only is required to provide the second sheet metal.

In the above-described embodiments of the column 1 and the transverse crossbar 2, the reinforcement strip 12, 42 is made from sheet material separate from the sheet material of the profile bar 11, 41 and is fixed on its flat side to the latter. And the first and second sheet materials 23, 25 have the same metal composition and thickness and differ only by their width. However, different materials and/or different thicknesses could also be used. It is also conceivable to manufacture the reinforcement strip integrally with the profile bar by bending part of the sheet material of the profile bar to the location of the reinforcement strip.

Also other structural members used in shelving, such as the bracing struts 4 and depthwise rods 5 can have the structure shown in Figure 4. Preferably, the profile bar extends over the entire length of the structural shelving member

whereas the reinforcement strip extends over 1/20 or 1/10 to 1/5 or 1/2 the length of the structural shelving member or the profile bar. Thus, since the reinforcement strip does not extend over the entire length but is only provided where the load is largest, high strength can be achieved at relatively low weight. The profile bar is hollow except that it includes the reinforcement strip or strips. And the profile bar has a lengthwise slit, i.e. has an open profile which facilitates manufacturing by roll-forming. Heavy load shelving comprising structural shelving members according to the invention can typically carry 50% higher loads than conventional shelving having the same weight.

AMENDED CLAIMS

[received by the International Bureau on 28 March 2002 (28.03.02);
original claims 1-13 replaced by amended claims 1-11 (3 pages)]

1. A shelving column, comprising:

a longitudinal hollow profile bar (11) formed from first sheet material (23) and

a pair of reinforcement strips (12) formed from second sheet material (25), each having a shorter length than the profile bar (11) and being mounted to opposite inner faces of the profile bar (11, 41) along a lower portion (7) of the column for reinforcing the same.

2. A transverse crossbar for shelving, comprising:

a longitudinal hollow profile bar (41) formed from first sheet material (23) and

a reinforcement strip (42) formed from second sheet material (25), having a shorter length than the profile bar (41) and being mounted to an inner face of the profile bar (11, 41) along a central portion (44) of the crossbar for reinforcing the same.

3. A shelving column or crossbar according to claim 1 or 2, wherein the reinforcement strip (12, 42) is connected to the profile bar (11, 41) by positive locking.

4. A shelving column or crossbar according to claim 1 or 2, wherein the reinforcement strip (12, 42) is connected to the profile bar (11, 41) by clinching.

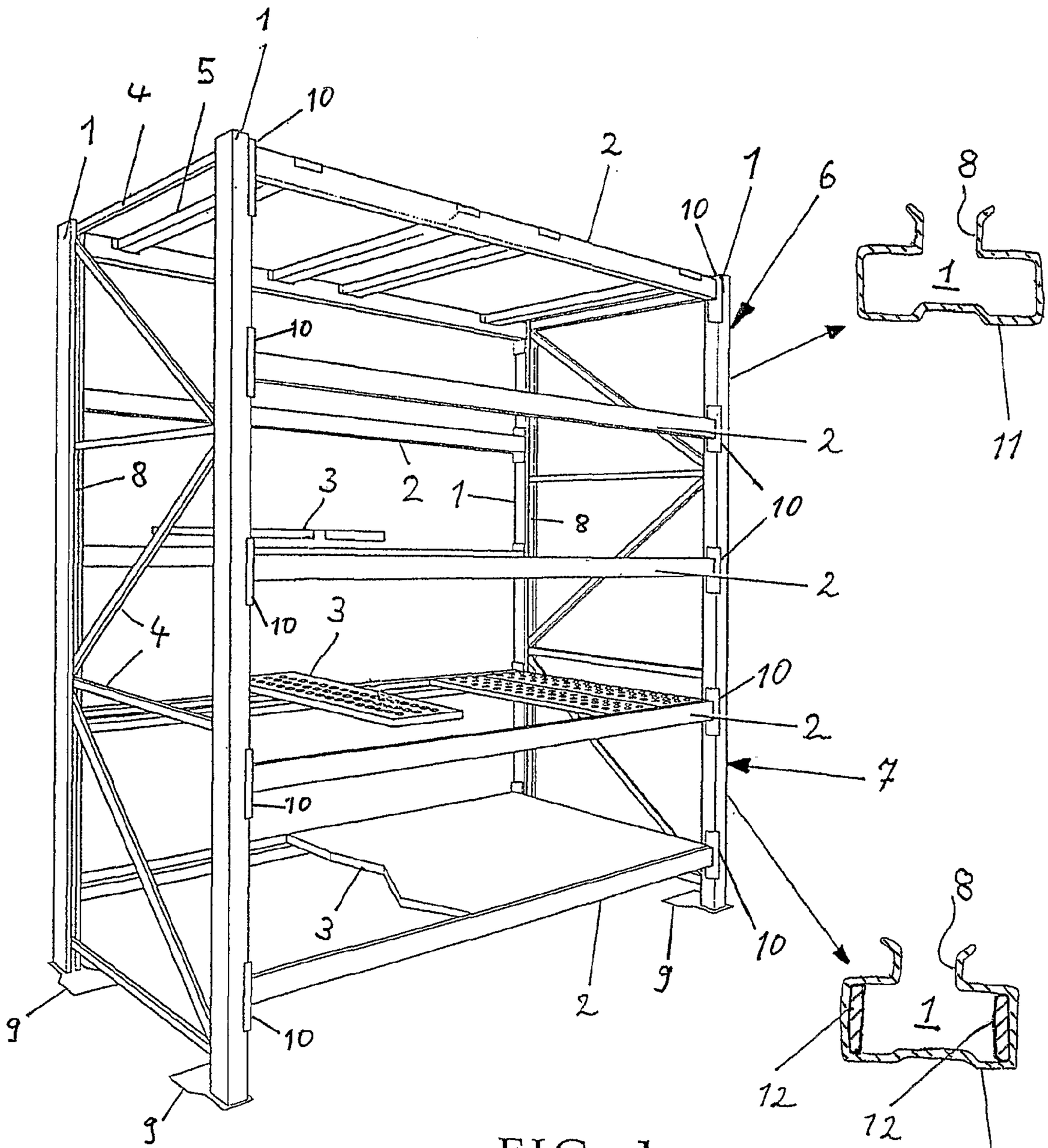

FIG. 1

FIG. 2

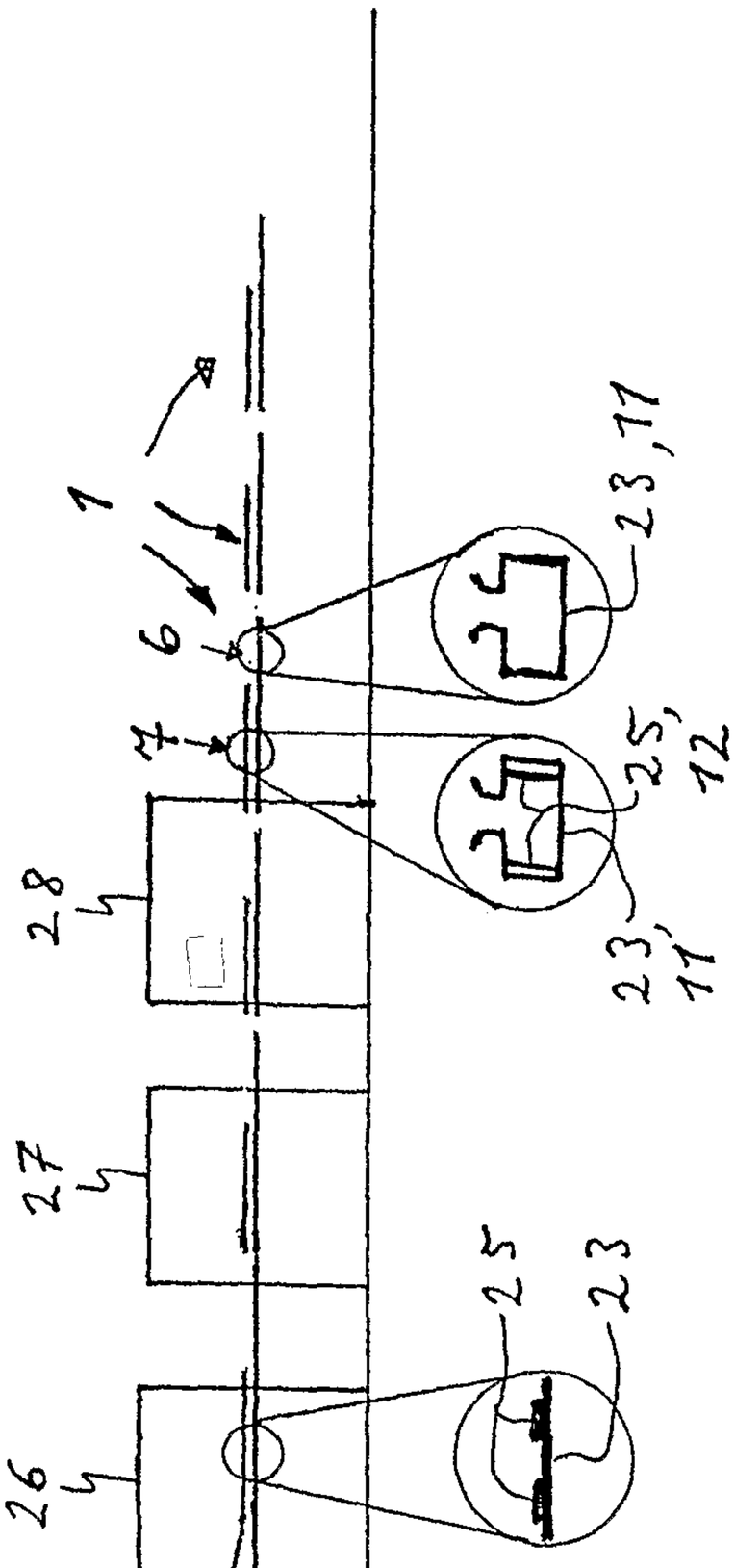
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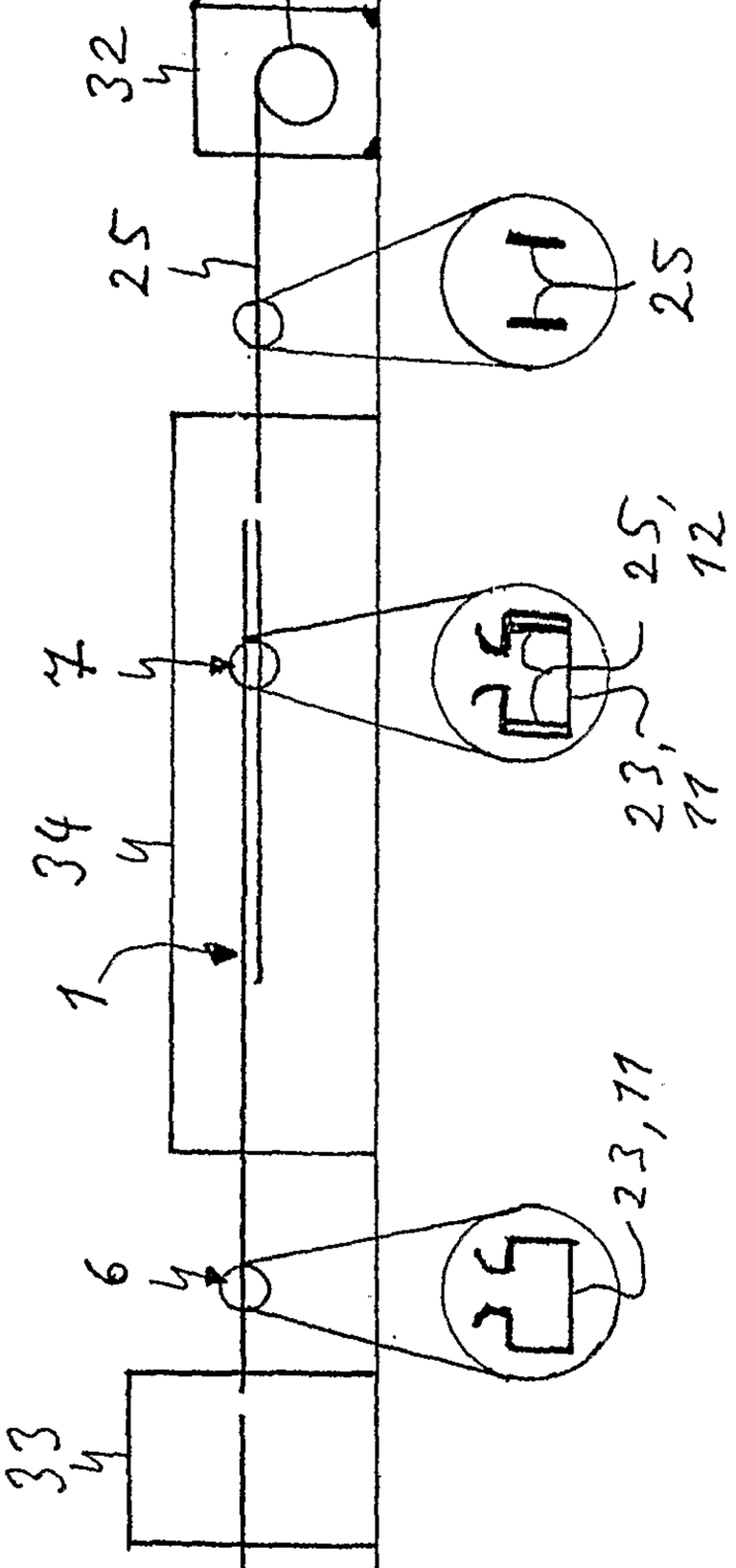
FIG. 3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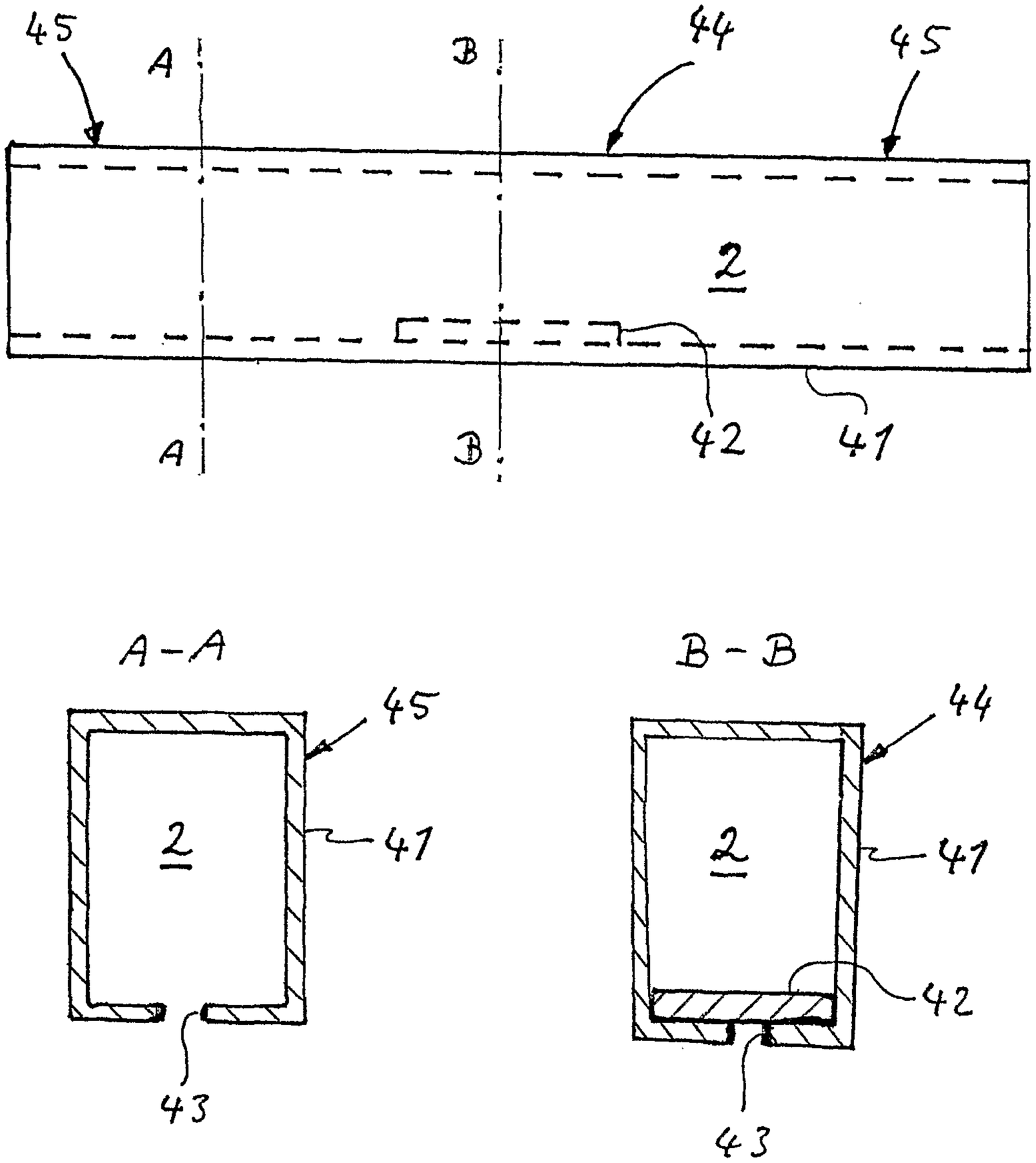
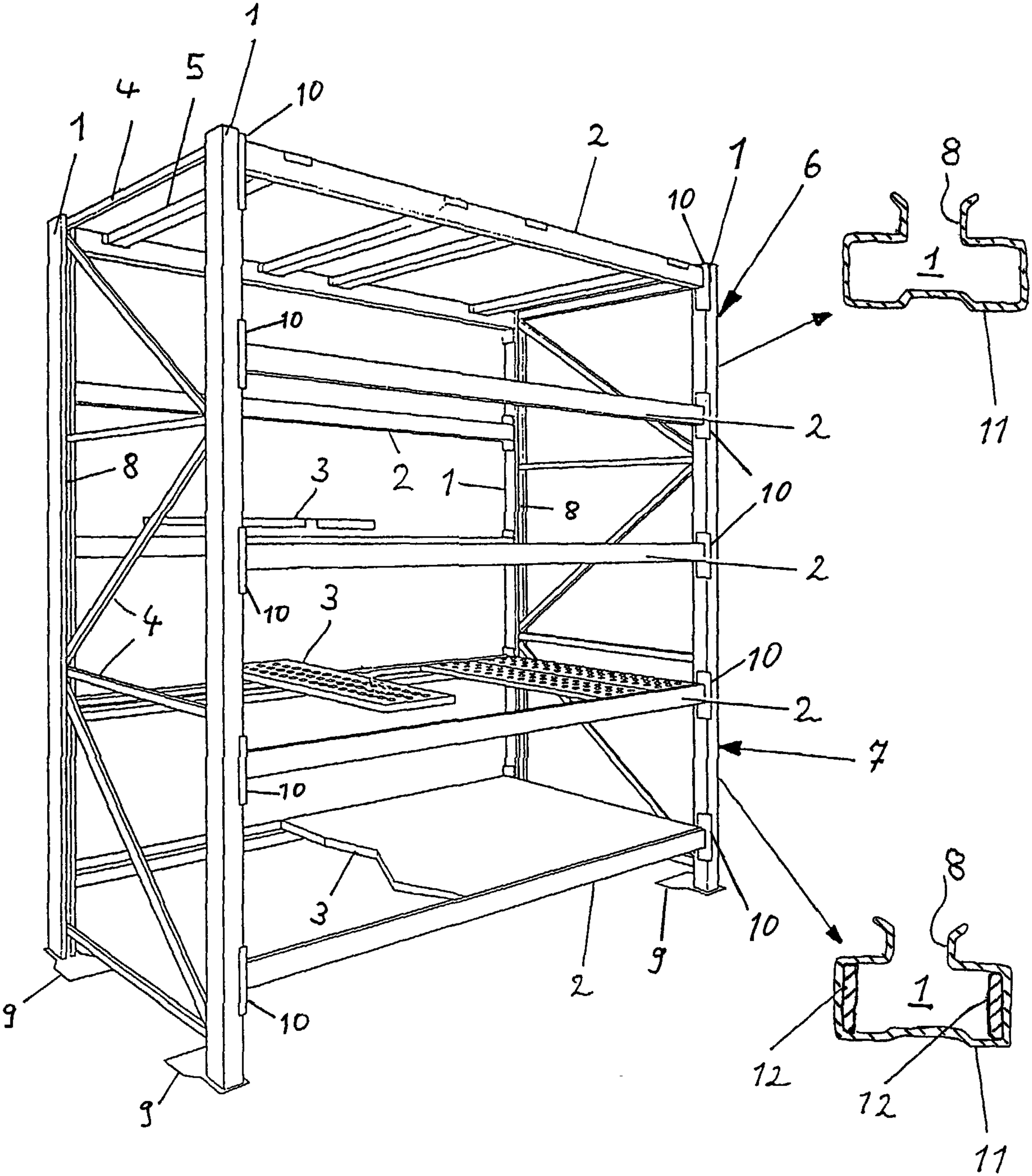


FIG. 4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