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(54) **A guardrail system**

(57) The present invention provides a guardrail system for scaffolding and mobile towers, in particular a guardrail system which facilitates the safe construction of a guardrail about a level of a scaffold construction above the level at which an operator is standing, the guardrail system comprising a frame (12) which is substantially rectangular in shape, a pair of upper couplings (14) and a pair of lower couplings (16) extending from the frame, the couplings being operable to secure the

frame between a pair of scaffolding support members by advancing the upper couplings in a first direction into engagement with the pair of support members to define a pivot axis extending between the pair of upper couplings, and rotating the guardrail system, relative to the scaffold, about said pivot axis such that the pair of lower couplings are advanced in a second direction, substantially opposite to the first direction, into engagement with the support members.

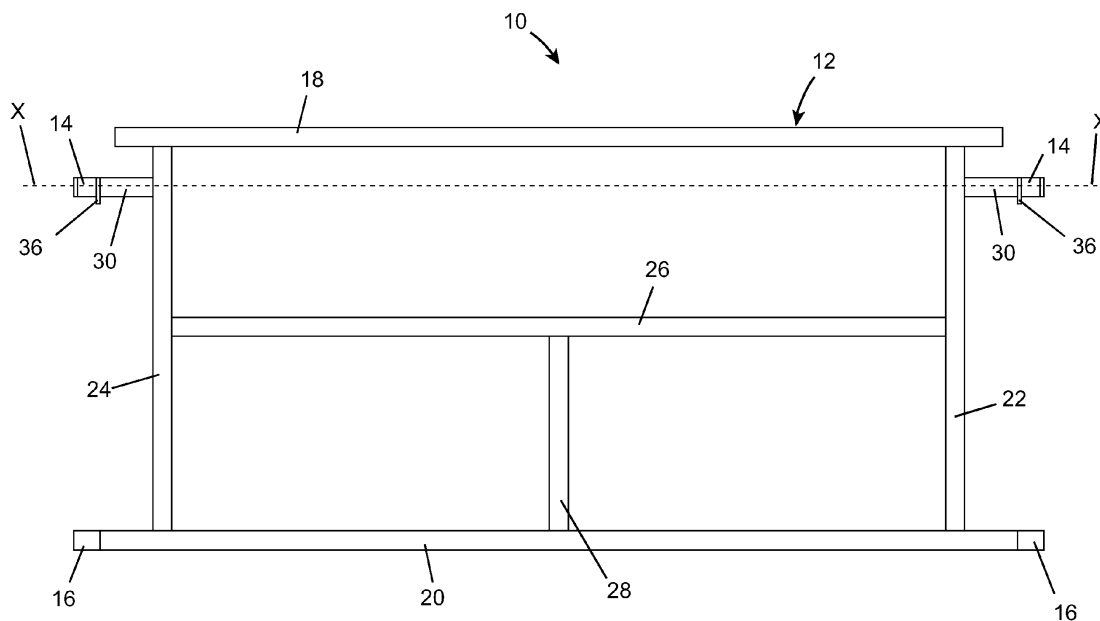


Fig. 1

Description

Field of the Invention

[0001] This invention relates to a guardrail system for scaffolding and mobile towers, in particular a rail system which facilitates the safe construction of a guardrail about a level of a scaffold construction above the level at which an operator is standing, thereby ensuring that as the scaffold increases in height the uppermost level being constructed can be provided with a guardrail by an operator located on the level below. This ensures that when the operator(s) then ascends to this uppermost level the entire perimeter thereof is already enclosed by the guardrail.

Background of the Invention

[0002] Scaffolding and mobile towers are commonly used during construction or any associated works, or for safe access where work at height is required, providing a temporary work platform that can be easily assembled and disassembled on site. Such towers comprise a modular system of frames, each frame conventionally comprising at least two vertical bars having a plurality of horizontal bars extending between the vertical bars. The ends of the vertical bars are adapted to form a "plug-and-socket" arrangement with other frames, allowing for the construction of a structure through the interlocking arrangement of various frames as required. Platforms, boards or planks can be positioned between suitable horizontal bars as required, to create different levels to support operators during use.

[0003] A condition of various health and safety regulations is that, as towers are being constructed, a worker cannot stand on any work surface (platform or level) of the tower unless that platform is suitably guarded by a guardrail to prevent against possible falls. In general, this means that the guardrails for a given level are installed by a worker while sitting in the open trapdoor of the platform placed at that level. This construction method for standard guardrails has meant that such an operation can be relatively awkward.

[0004] Such problems have lead to the development of advance guardrail systems, such as the BetaGuard® system of Turner Access Limited (www.turner-access.co.uk), which allow the relatively easy installation of an advance guardrail for a higher working level while a worker is safely positioned on the preceding level.

[0005] It is an object of the invention to provide an alternative guardrail design that provides for relative ease of use, and which can be installed while a worker is on a preceding lower level.

Summary of the invention

[0006] According to a first aspect of the present invention there is provided a guardrail system comprising a

frame; a pair of upper couplings and a pair of lower couplings extending from the frame, the couplings being operable to secure the frame between a pair of support members; characterised in that pair of upper couplings are adapted to be advanced onto the respective support member from a first direction and the pair of lower couplings are adapted to be advanced onto the respective support member from a second direction substantially opposite to the first direction.

[0007] Preferably, the couplings are oriented to secure the frame between a pair of substantially vertical support members.

[0008] Preferably, each coupling comprises a hook.

[0009] Preferably, each coupling comprises an open face through which the respective support member is receivable, the open face of the upper couplings facing in a first direction, and the open face of the lower couplings facing in a second direction substantially opposite to the first direction.

[0010] Preferably, at least one of the lower couplings is adapted to be releasably locked to the respective support member.

[0011] Preferably, the system comprises a latch mechanism in operative association with at least one of the lower couplings, in order to releasably lock the at least one lower coupling to the respective support member.

[0012] Preferably, the latch mechanism is operable to automatically lock the at least one lower coupling to the respective support member once the at least one lower coupling has been advanced onto the support member.

[0013] Preferably, the latch mechanism is spring biased into the locked state.

[0014] Preferably, at least one of the upper couplings comprises a stop which is shaped and dimensioned to cooperate with a connector of the respective support member in order to resist the horizontal translation of the coupling once the guardrail system has been secured between the pair of support members.

[0015] Preferably, the stop is positioned such as to be brought into cooperative engagement with the connector as the pair of lower couplings are advanced onto the respective support member.

[0016] Preferably, the stop comprises a lug which extends beyond at least one side of the coupling.

[0017] Preferably, the lug is formed integrally with the coupling.

[0018] Preferably, the pair of upper couplings define a first axis about which the system is pivotable, and the pair of lower couplings define a second axis substantially parallel to the first axis.

[0019] Preferably, the frame is substantially rectangular in shape, the pair of upper couplings and the pair of lower couplings projecting beyond a perimeter of the rectangle defined by the frame.

[0020] Preferably, the frame comprises at least one internal reinforcing member.

[0021] Preferably, the first and second axes of the frame are spaced from one another such that with the

upper couplings seated on the pair of supports above an upper pair of connectors, the lower couplings, when seated on the pair of supports, will be located below a lower pair of connectors.

[0022] The suitable arrangement of the couplings of the guardrail system allows for the installation of the guardrail system by seating the upper couplings on the vertical bars of a pair of opposed sides of scaffolding or mobile tower frames, which upper couplings then define a horizontal pivot axis about which to rotate the guardrail system into position from a lower level of the scaffolding or mobile tower. This system allows for the already installed opposed scaffolding or mobile tower frames to provide support for the installation of the guardrail system, which can be accomplished with relative ease.

[0023] The particular orientation of the couplings allows for the rotation of the guardrail system about the pivot axis, such that the lower couplings are advanced towards and engage a lower section of the pair of supports of the scaffolding.

[0024] In addition, the components of the guardrail system can be configured such that the guardrail system may be used as a structural element of the tower, to provide sufficient tower stiffness to satisfy appropriate design regulations. In this regard, the guardrail system of the invention can act as a combination of both a guardrail and structural brace.

[0025] According to a second aspect of the present invention there is provided a method of installing a guardrail system according to the first aspect of the invention onto a scaffold or mobile tower, the method comprising the steps of:

advancing the upper couplings in a first direction into engagement with a pair of support members of the scaffold or mobile tower to define a pivot axis extending between the pair of upper couplings, and rotating the guardrail system, relative to the scaffold or mobile tower, about said pivot axis such that the pair of lower couplings are advanced in a second direction, substantially opposite to the first direction, into engagement with the support members.

[0026] Preferably, the method comprises locking at least one of the lower couplings to the respective support member once engaged therewith.

[0027] Preferably, the method comprises automatically locking the at least one lower coupling to the respective support member once engaged therewith.

[0028] Preferably, the method comprising engaging the pair of upper couplings to the support members at a position directly above a pair of upper connectors located on the support members, and engaging the pair of lower couplings to the support members at a position directly below a pair of lower connectors located on the support members.

[0029] The use of this method provides a relatively simple two-step procedure for the installation of the guardrail

system, which utilises the existing scaffold or mobile tower structure as a support for the act of installation.

[0030] As used herein, the term "connector" is intended to mean a fitting used to secure a horizontal cross member to a vertical support member of a scaffold construction such as a mobile tower or the like.

Brief description of the drawings

[0031]

Figure 1 illustrates a front elevation of a guardrail system according to an embodiment of the present invention;

Figure 2 illustrates a front elevation of the guardrail system of figure 1, when mounted between a pair of vertical support members of a scaffold or tower frame;

Figure 3 illustrates a sectioned view of one of the vertical support members shown in figure 2, with a coupling of the guardrail system engaged thereabout;

Figure 4 illustrates a perspective view of the coupling illustrated in figure 3;

Figure 5 illustrates an end elevation of a scaffold tower with the guardrail system of the present invention in an initial stage of engagement therewith;

Figure 6 illustrates the arrangement of figure 5 with the guardrail system in a more advanced stage of engagement with the scaffold tower; and

Figure 7 illustrates the arrangement of figures 5 and 6 with the guardrail system fully engaged with the scaffold tower.

Detailed description of the drawings

[0032] Referring now to the accompanying drawings there is illustrated a guardrail system, generally indicated as 10, for use on scaffold constructions, such as a mobile scaffold tower T as seen in figures 2 and 5 to 7. The system 10 preferably forms a structural component of the tower T or other scaffold structure, but the primary purpose thereof is to allow an perimeter guardrail to be constructed at the uppermost level of the tower T from the level below, for reasons of health and safety as detailed above.

[0033] The system 10 comprises a frame 12, which in the embodiment illustrated is substantially rectangular in shape, and formed from any suitable material. It is preferred that the frame 12 is formed from a light yet strong material, in order to provide sufficient structural integrity to the tower T, while being light weight enough to be

handled by operators constructing the tower T. For this reason aluminium is a preferred material for the manufacture of the frame 12, although it will of course be appreciated that any other suitable material may be employed.

[0034] The system 10 further comprises a pair of upper couplings 14 and a pair of lower couplings 16 mounted to the frame 12, the configuration and operation of which will be described in greater detail hereinafter. The frame 12 itself, in the embodiment illustrated, is formed from an upper rail 18 and a substantially parallel lower rail 20, mounted between which are a pair of vertical bars 22, 24. The bars 22, 24 may be secured to the rails 18, 20 in any suitable manner, for example by welding or mechanical fixings. The frame 12 further comprises a horizontal cross member 26 and a vertical post 28 extending between the cross member 26 and the lower rail 20. In use the upper rails 18 and the horizontal cross member 26 form the guardrails of the system 10, and while the positioning of same may be varied, in many jurisdictions their presence and positioning is governed by official regulations/legislation. The cross member 26 and post 28 also provide stiffness and therefore structural integrity to the system 10. It will however be appreciated that the arrangement of the various components making up the frame 12 may be significantly varied, in particular to suit intended applications or functionality, or indeed regulatory requirements.

[0035] Referring now to figures 3 and 4 an enlarged view of one of the upper couplings 14 is shown, in isolation from the frame 12. In use the upper couplings 14 are secured to the frame 12 via a short standoff 30, while the lower coupling 16 are secured directly to either end of the lower rail 20. It will of course be appreciated that the exact mounting of the couplings 14, 16 to the frame 12 may be significantly varied, while maintaining the functionality of the invention as set out hereinafter.

[0036] Each of the couplings 14, 16 comprise a main body 32 which in the embodiment illustrated is hook shaped, and defines an open face 34 which is shaped and dimensioned to receive a vertical support member M of the scaffold tower T during use, again as will be described hereinafter in detail. One of the support members M is shown in section in figure 3, fully engaged within the upper coupling 14.

[0037] The upper and lower couplings 14, 16 are essentially identical, except for the provision of a stop in the form of a lug 36 provided on each of the upper couplings 14, the reason for which is described in detail below. The lug 36 is preferably formed integrally with the body 32 of the upper couplings 14, which in the embodiment illustrated are cast from aluminium or other suitable material.

[0038] The fitting of the rail system 10 will now be described in detail, and for illustrative purposes is shown being fitted to the scaffold tower T. Thus referring in particular to figures 2 and figures 5 to 7 it can be seen that the tower T is composed of four of the vertical support

members M, each defining a corner of the tower T, with an array of horizontal members H connecting the opposed pairs of support members M. Connectors C secure the horizontal members H to the vertical support members M in conventional fashion. Each pair of vertical support members M and corresponding horizontal members H are generally pre-fabricated units, and there is thus no requirement, on site, to connect the horizontal members H to the vertical members M. The initial build of the tower T thus begins with a pair of the pre-fabricated frames of vertical members M and horizontal members H. A base level is then constructed as per the manufacturers instructions, in order to secure the pair of pre-fabricated frames to one another. Flooring panels (not shown) can then be laid between opposed pairs of the horizontal members H1, in order to provide a first flooring level on which an operator can stand. This level is then enclosed by mounting a rail system 10 at the front and rear thereof, the mounting process being described below with respect to the next level of the tower T. The height difference between flooring levels in normally approximately two meters, which in the embodiment illustrated corresponds to five horizontal members H.

[0039] To construct the next level of the tower T, more flooring panels (not shown) are laid between the horizontal members H2. For illustrative purposes the second flooring level on the horizontal members H2 is shown spaced from the first flooring lever H1 by a gap of only two horizontal members H, but as indicated above, in practice this would normally be a gap of five horizontal members H. Before installing the second flooring level the rail system 10 of the invention enables an operator to provide a perimeter guard rail safely enclosing this next level, but from the lower level defined by the horizontal members H1. The steps in this process are illustrated in figures 5 to 7.

[0040] An operator, standing inside the tower T at level H1, initially manoeuvres the rail system 10 such that the pair of upper couplings 14 are located inboard of the tower T, while the lower couplings 16 remain on the outside thereof. The upper and lower couplings 14, 16 are oriented such that the open face 34 of the upper couplings 14 face the support members M to which the rail system 10 is to be secured, and likewise the open face 34 of the lower couplings 16 also face the support members M, when the rail system 10 is in the position shown in figure 5. Thus it will be appreciated that the open face 34 of the upper couplings 14 face the opposite direction to the open face 34 of the lower couplings 16.

[0041] The upper couplings 14 are then advanced towards the support members M, in a first direction A shown in figure 5, until the upper couplings 14 are fully seated around the support members M as illustrated in figure 6. Figure 3 illustrates one of the upper couplings 14 with the respective support member M fully seated therein. It is important to note that the upper couplings 14 should be positioned on the support members M directly above a pair of the connectors C, the reason for which is de-

scribed hereinafter.

[0042] The pair of upper couplings 14 then define a substantially horizontal pivot axis X (shown in Figure 1) about which the rail system 10 can be pivoted by the operator, such that the lower couplings 16 are advanced towards the support members M in a second direction B shown in figure 6, until the lower couplings 16 fully engage the support members M. It is important to note that the spacing between the upper and lower couplings 14, 16 is preferably such that with the upper couplings 14 mounted directly above the upper set of connectors C, the lower couplings 16 are then located directly beneath a lower set of the connectors C, as is illustrated in figure 7.

[0043] It can also be seen, in particular from figure 7, that once the rail system 10 is connected in position on the tower T the lug 36 of each of the upper couplings 14 projects downwardly to overlap with the perspective connector C. This ensures that the rail system 10 cannot be pivoted inwardly out of position about the pair of lower couplings 16, as the lugs 36 will foul the connectors C, preventing displacement of the upper couplings 16 from their position on the support members M. Each of the lugs 36 are positioned such that during rotation of the rail system 10 about the pivot axis X the lug 36 is moved into a position co-operating with, and effectively engaging, the respective connector C in order to prevent the subsequent displacement of the upper couplings 14 once the rail system 10 is engaged on the tower T.

[0044] In order to prevent a similar displacement of the lower couplings 16 from the support members M, once the rail system 10 is in position on the tower T, the system 10 is locked in position by the provision of a locking mechanism (not shown) associated with at least one of the lower couplings 16. This locking mechanism is adapted to releasably lock the at least one lower coupling 16 to the support member M. The locking mechanism is preferably spring loaded and automatically engages once the lower couplings 16 are fully seated on the support members M. The locking mechanism is also preferably designed to be manually disengagable, and from a position on the lower level H1 of the tower T. It is for this reason that it is preferable that the locking mechanisms are only provided on the lower couplings 16, as these will be easily accessible from the lower level H1 of the tower T by an operator positioned therein.

[0045] When it is necessary to disassemble the tower T, or simply remove one or more of the rail systems 10 therefrom, this can then be easily achieved by an operator safely located on the level H1 below where the rail system 10 is located. This ensures the safety of the operator during removal of the rail system 10, as the lower level on which the operator is located will be fully enclosed by one or more of the rail systems 10 or other scaffold based rails. The removal of the rail system 10 is simply a reversal of the steps described above for mounting same on the tower T. Thus the operator will initially disengage the locking mechanisms (not shown) of the lower couplings 16, and then pivot the rail system 10

outwardly about the horizontal axis X defined by the upper couplings 14. This will displace the lower couplings 16 out of engagement with the pair of vertical support members M. The rotation of the rail system 10 outwardly about the upper couplings 14 will also result in the lugs 36 of the upper couplings being rotated upwardly out of engagement with the corresponding connectors C. This then allows the upper couplings 14 to be displaced out of engagement with the pair of vertical support members M, by displacing the rail system 10 inwardly towards the centre of the tower T, in a direction opposite to that of direction A shown in Figure 5. At this point the rail system 10 is disengaged from the tower T, and can be set aside.

[0046] It will therefore be appreciated that the guardrail system 10 of the present invention enables the straightforward preparation of the required guardrail protection for the next level of the scaffolding or mobile tower T, thus providing a greater degree of safety to operators operating on the tower T.

[0047] The guardrail system 10 also provides structural integrity to the tower T, forming an integral component thereof. In addition, the dimensions of the system 10, whereby the upper couplings 14 are seated directly above an upper set of the connectors C, and the lower couplings 16 directly below a lower set of the connectors C, the guardrail system 10 can resist forces applied to the tower T, which would otherwise result in bending or swaying of the tower T.

[0048] Thus the use of the guardrail system 10 of the present invention provides for a guardrail construction of relatively easy installation, and which also replace the horizontal and diagonal braces of a standard mobile tower.

Claims

1. A guardrail system comprising a frame; a pair of upper couplings and a pair of lower couplings extending from the frame, the couplings being operable to secure the frame between a pair of support members; **characterised in that** pair of upper couplings are adapted to be advanced onto the respective support member from a first direction and the pair of lower couplings are adapted to be advanced onto the respective support member from a second direction substantially opposite to the first direction.
2. A guardrail system according to claim 1 in which the couplings are oriented to secure the frame between a pair of substantially vertical support members.
3. A guardrail system according to claim 1 or 2 in which each coupling comprises a hook.
4. A guardrail system according to any preceding claim in which each coupling comprises an open face through which the respective support member is re-

ceivable, the open face of the upper couplings facing in a first direction, and the open face of the lower couplings facing in a second direction substantially opposite to the first direction.

5. A guardrail system according to any preceding claim in which at least one of the lower couplings is adapted to be releasably locked to the respective support member. 5
6. A guardrail system according to any preceding claim in which the system comprises a latch mechanism in operative association with at least one of the lower couplings, in order to releasably lock the at least one lower coupling to the respective support member. 10
7. A guardrail system according to claim 6 in which the latch mechanism is operable to automatically lock the at least one lower coupling to the respective support member once the at least one lower coupling has been advanced onto the support member. 15
8. A guardrail system according to any preceding claim in which the latch mechanism is spring biased into the locked state. 20
9. A guardrail system according to any preceding claim in which at least one of the upper couplings comprises a stop which is shaped and dimensioned to cooperate with a connector of the respective support member in order to resist the horizontal translation of the coupling once the guardrail system has been secured between the pair of support members. 25
10. A guardrail system according to any preceding claim in which the stop is positioned such as to be brought into cooperative engagement with the connector as the pair of lower couplings are advanced onto the respective support member. 30
11. A guardrail system according to claim 9 or 10 in which the stop comprises a lug which extends beyond at least one side of the coupling. 35
12. A guardrail system according to any preceding claim in which the pair of upper couplings define a first axis about which the system is pivotable, and the pair of lower couplings define a second axis substantially parallel to the first axis. 40
13. A guardrail system according to any preceding claim in which the frame is substantially rectangular in shape, the pair of upper couplings and the pair of lower couplings projecting beyond a perimeter of the rectangle defined by the frame. 45
14. A guardrail system according to any preceding claim in which the first and second axes of the frame are 50

spaced from one another such that with the upper couplings seated on the pair of supports above an upper pair of connectors, the lower couplings, when seated on the pair of supports, will be located below a lower pair of connectors.

15. A method of installing a guardrail system according to any of claim 1 to 14 onto a scaffold or mobile tower, the method comprising the steps of:

advancing the upper couplings in a first direction into engagement with a pair of support members of the scaffold or mobile tower to define a pivot axis extending between the pair of upper couplings, and rotating the guardrail system, relative to the scaffold or mobile tower, about said pivot axis such that the pair of lower couplings are advanced in a second direction, substantially opposite to the first direction, into engagement with the support members.

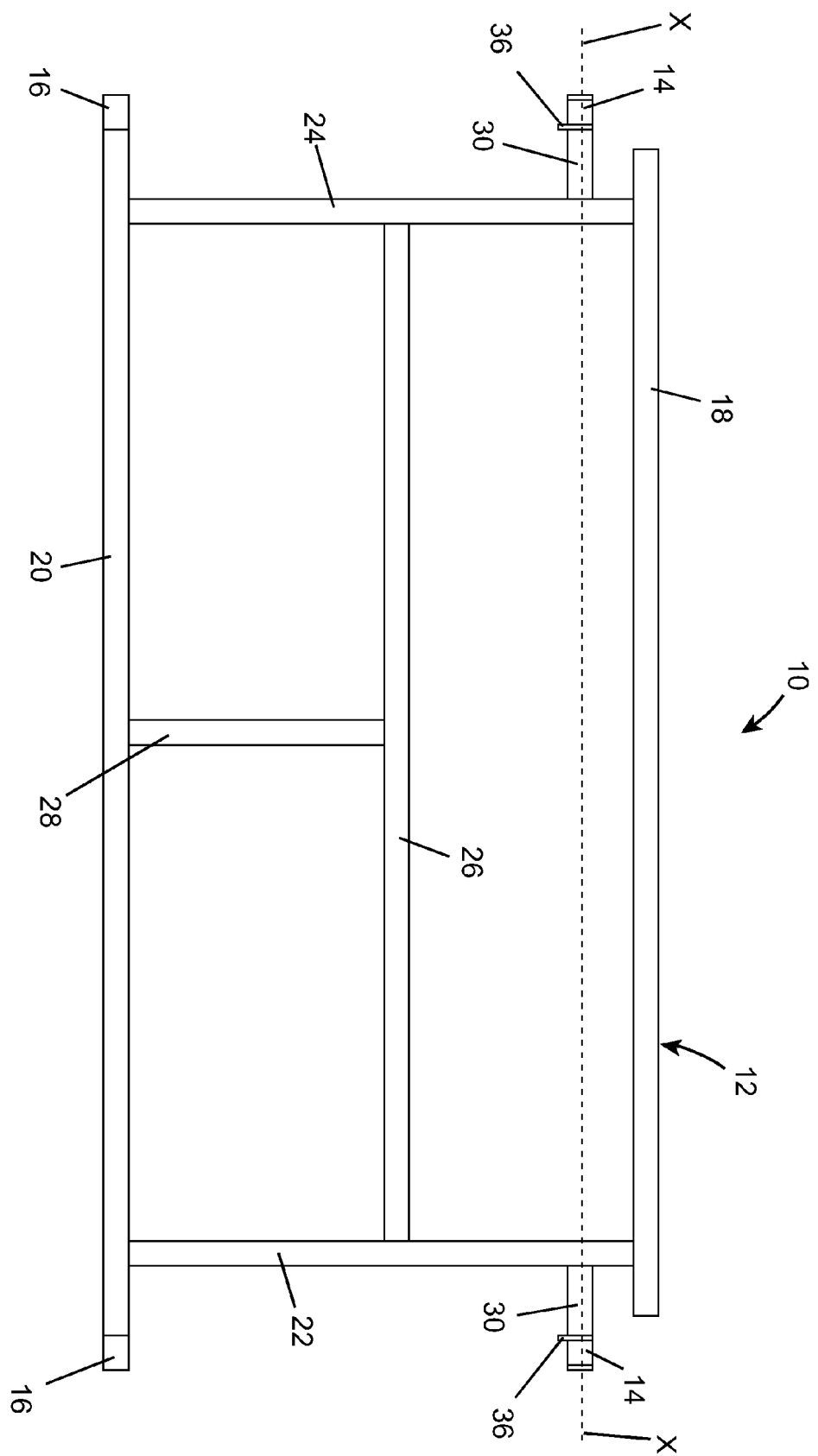


Fig. 1

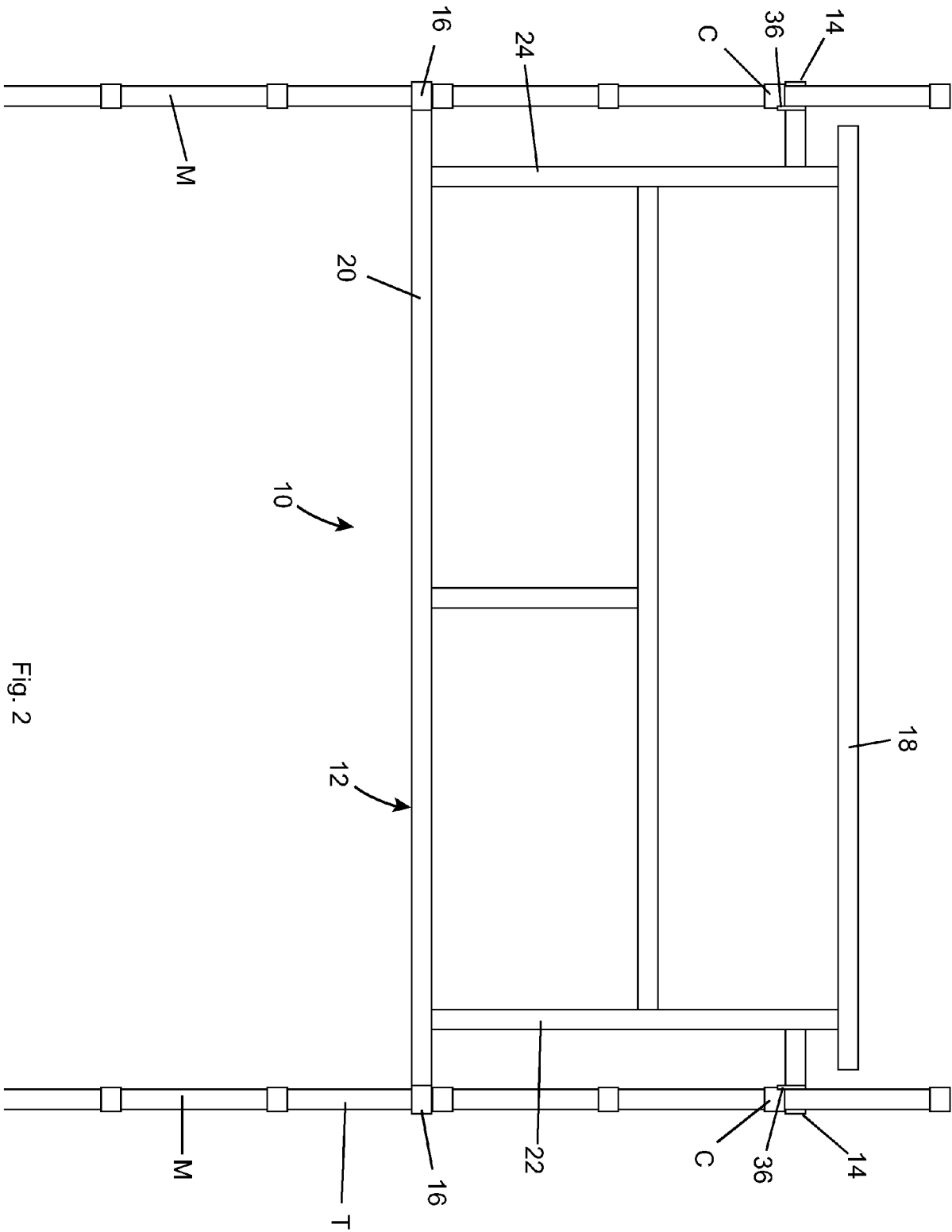


Fig. 2

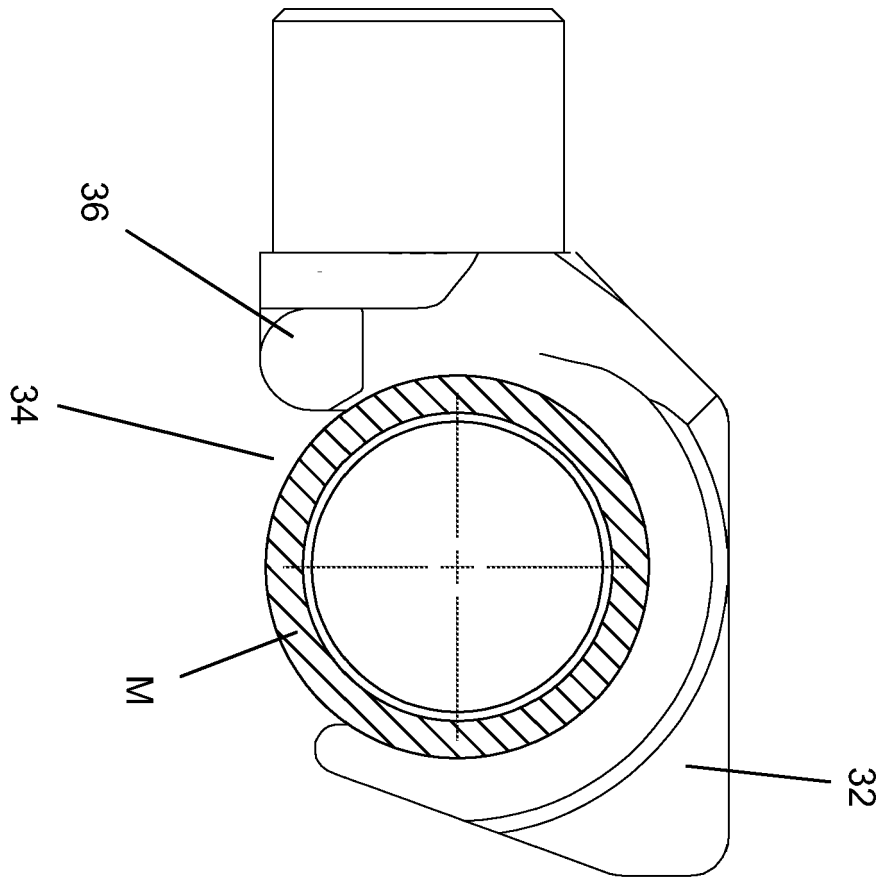


Fig. 3

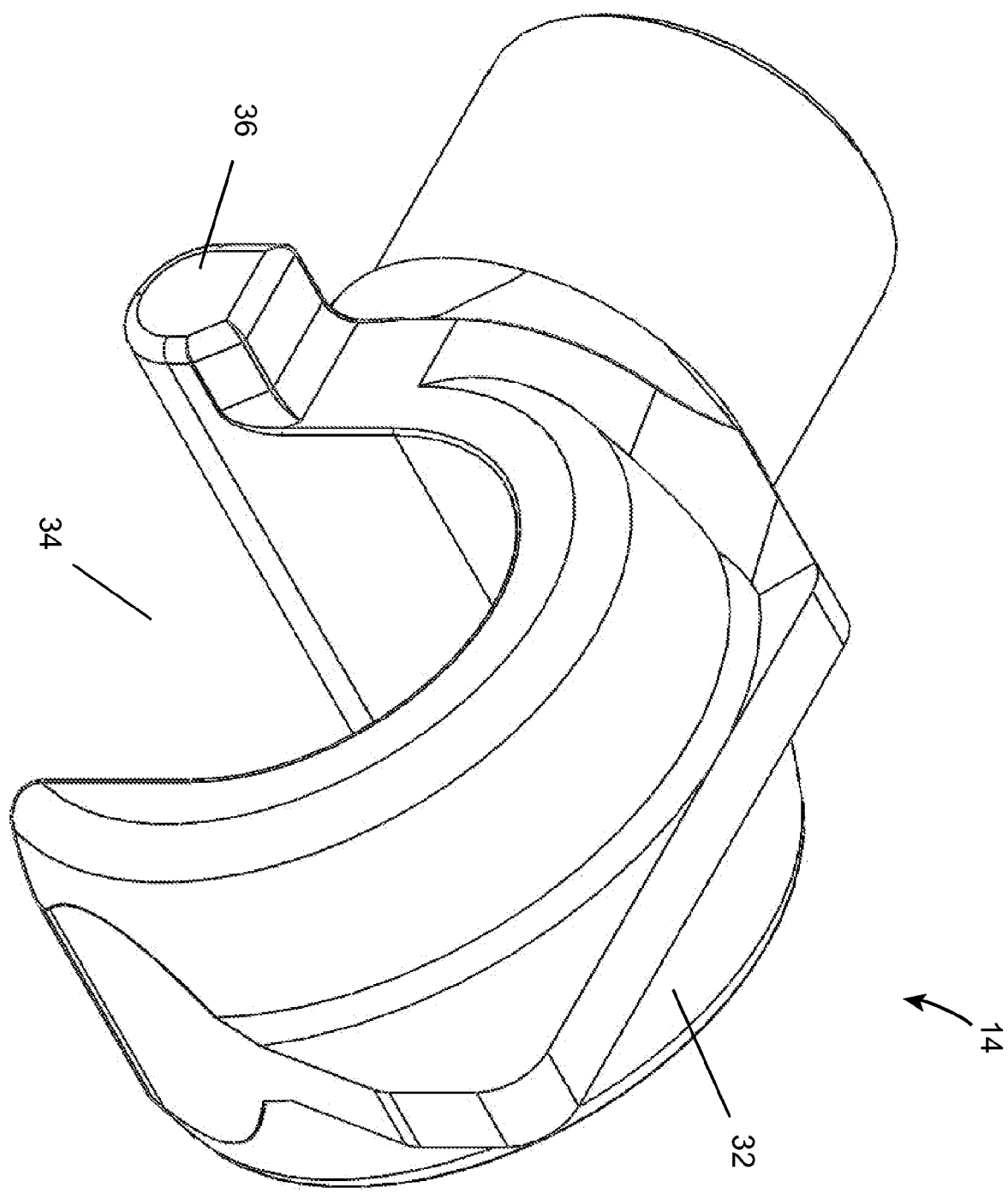


Fig. 4

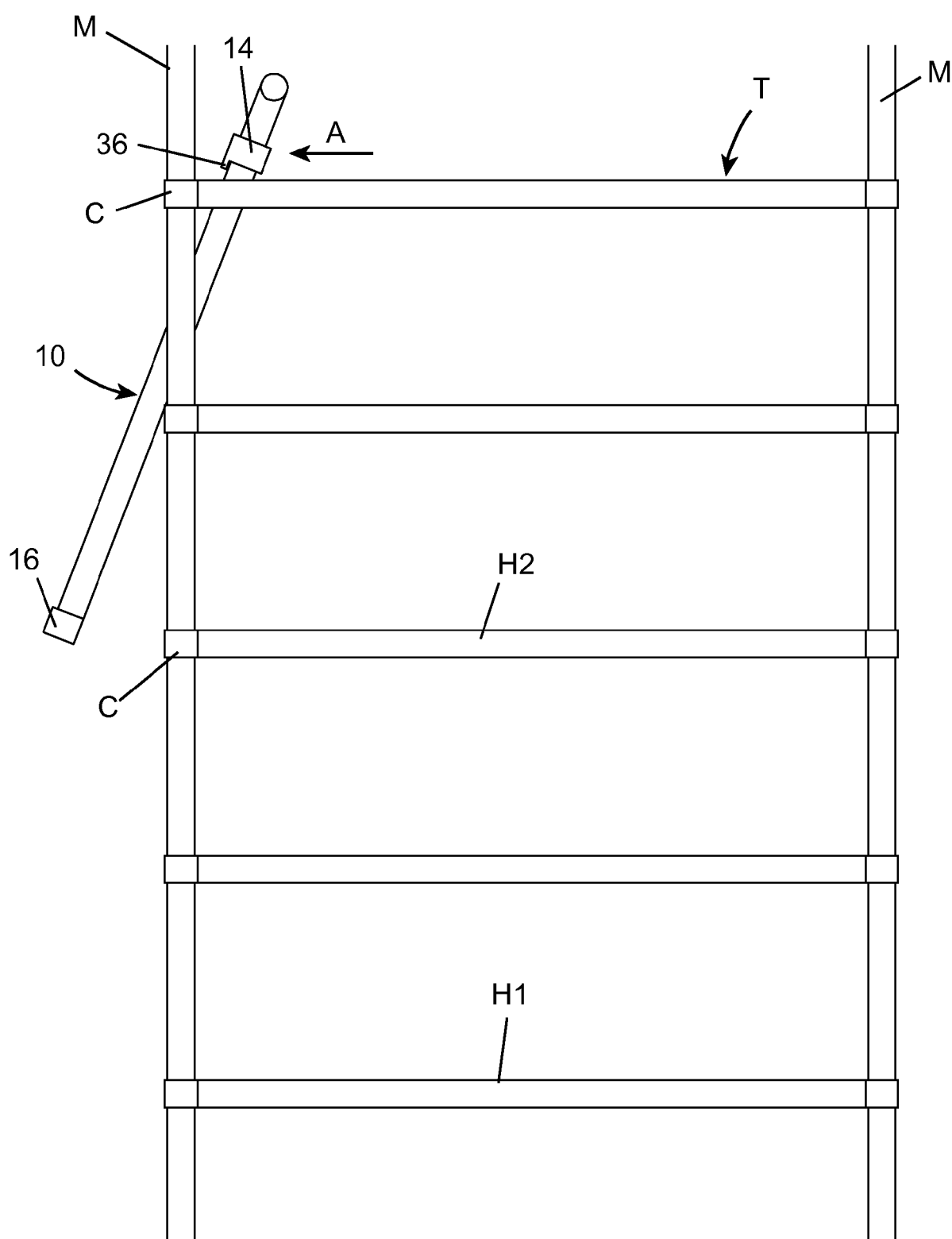


Fig. 5

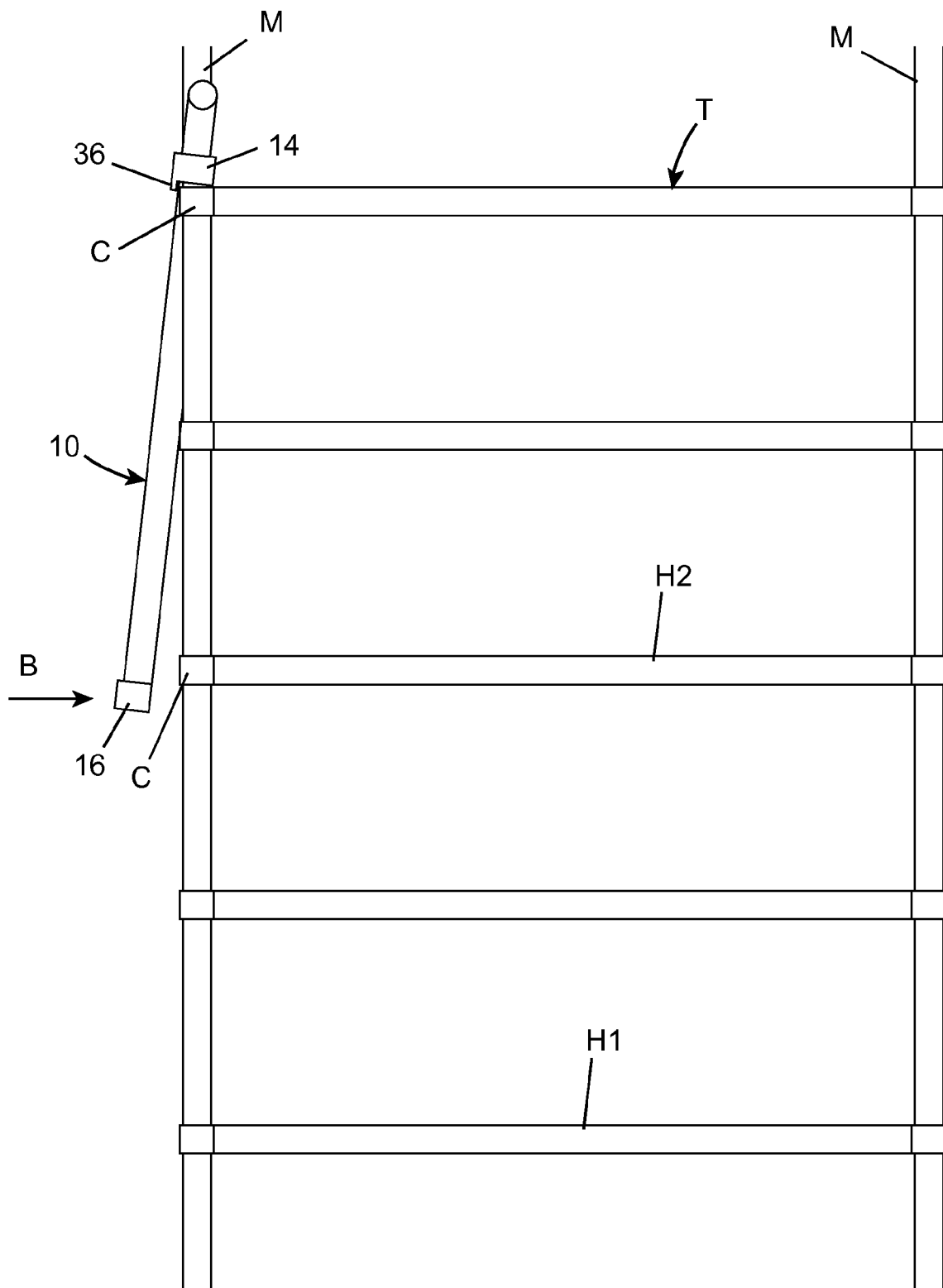


Fig. 6

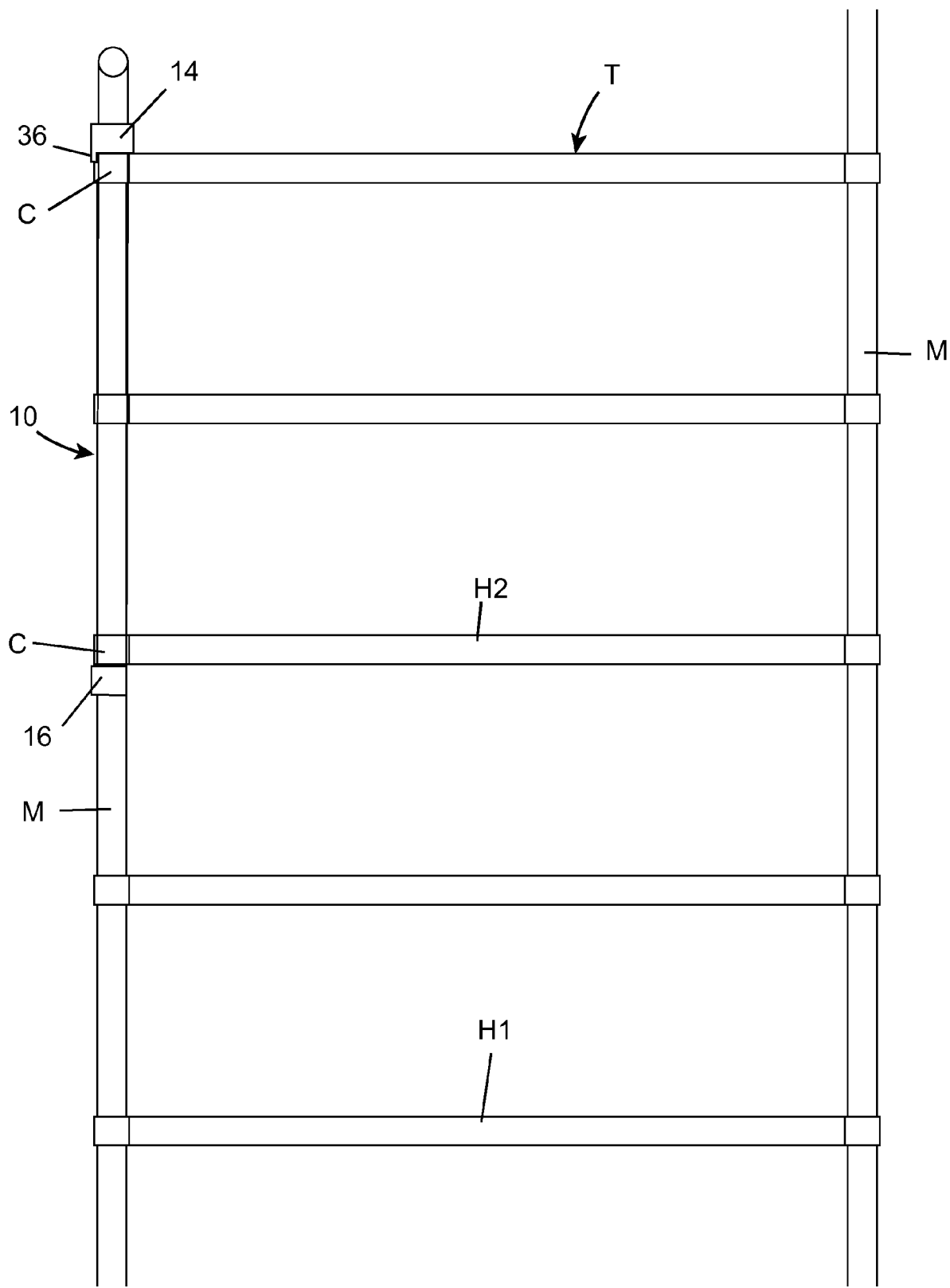


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 10 19 1168

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 24 February 2011	Examiner Scharl, Willibald
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 P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 10 19 1168

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The members are as contained in the European Patent Office EDP file on
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