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(71) Applicant: **KABUSHIKI KAISHA SHINWA GIKEN**
61 Usazaki-Minami 2 chome
Shirahama-cho Himeji(JP)

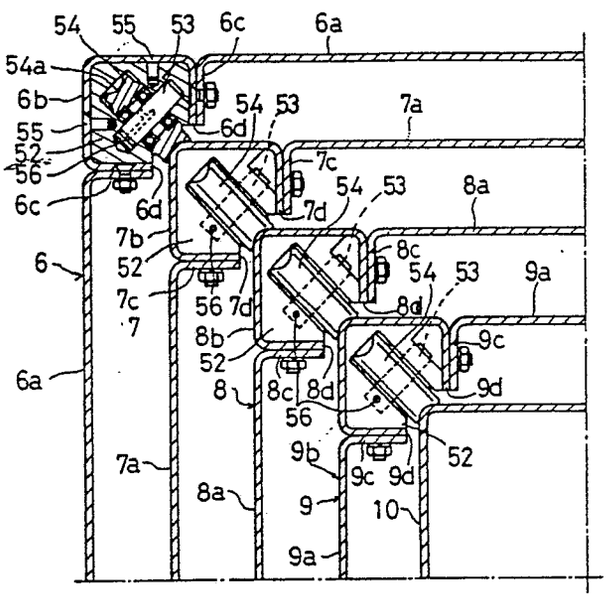
(72) Inventor: **Takada, Shigetoshi**
61 Usazaki-Minami 2 chome
Shirahama-cho Himeji(JP)

(74) Representative: **Arthur, Bryan Edward et al**
Withers & Rogers 4 Dyer's Buildings Holborn
London EC1N 2JT(GB)

(54) Guidance means for an extendable beam of an overhead traveling crane.

(57) Separate beam (6-10) which make up an extendable multiple beam (5) attached to a crab (4) of an overhead traveling crane are provided with roller supporting members (52) inside at their corners (6b-9b). Each roller supporting member (52) is provided with one or more rollers (54) which are in touch with a corner of another separate beam situated directly inside. When the inside beam moves upwards or downwards to let the multiple beam (5) extend or retract, the rollers (54) roll on the corner of the inside beam to lead the movement. The roller supporting members (52) can be detached easily from the separate beams to inspect or exchange the rollers or other parts.

FIG. 1



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GUIDANCE MEANS FOR EXTENSION OF AN EXTENDABLE MULTIPLE BEAM OF AN OVERHEAD TRAVELING CRANE

BACKGROUND OF THE INVENTION

The present invention relates to an overhead taveling crane with a crab and more particulary to a guidance means for the extension of a beam which is attached to the crab to hang a carrier and comprises a number of movable beams.

A extendable multiple beam attached to the crab usually comprises a beam fixed under the crab and a number of beams inserted movably into the fixed beam one after the other in order of size. A guidance means is usually interposed between the fixed and movable beams to let the movable beams smoothly go up and down in the fixed beam.

The guidance means has typically a structure as illustrated in Figure 5. A pair of guidance rollers 72 are supported rotatably by a pair of brackets 71 at each top corner of an inside beam 70. The rollers roll on an inner surface of an outside beam 60 when the extendable beam is extended or retracted. The beam 60 may be provided with additional rollers at lower positions if necessary.

The guidance roller 72 rolls around a bolt 73 which horizontally extends through the bracket 71. A nut 74 prevents the bolt from falling out of the bracket. The bolt 73 and nut 74 may be replaced by a split pin.

Because of the large number of elements to be arranged in a narrow space between the inside and outside beams 70 and 60, the maintenance of the guidance means such as the inspection or exchange of the elements is difficult.

SUMMARY OF THE INVENTION

A general object of the present invention is to provide a guidance means for the extension of the multiple beam of which maintenance can be easily achieved. According to the invention, the fixed and movable beams are provided with a roller supporting member at least at the bottom inside each corner. The roller supporting member bears a number of rollers, which roll on a ridge of a beam directly inside the beam to let the inside beam smoothly go up or down.

The roller supporting member can be detached from the beam and drawn underneath out of the beam together with the roller beared by the member. After the roller, as well as other elements attached to the member, is inspected or exchanged, the supporting member is inserted in the beam along the ridge to be fixed again inside the corner.

Other objects and aspects of the present invention will become apparent from the following description when taken with reference to the accompanying drawings, in which:

Figure 1 is a cross-sectional view of an extendable multiple beam of the present invention.

Figure 2 is a front view of a girder carrying a crab to which the extendable multiple beam of the present invention is applied.

Figure 3 is a plan view of the girder crab as illustrated in Figure 2.

Figure 4 is a vertical sectional view of the crab with the extendable multiple beam of the present invention.

Figure 5 is a cross-sectional view of an extendable multiple beam of the prior art.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Figure 2 illustrates an overhead traveling crane with a crab to which the extendable multiple beam of the present invention is attached. A pair of rails 1 are set up in a building H. A girder 2 is mounted on the rails 1 to be movable on the rails. Figure 3 illustrates the girder 2. Another pair of rails 3 are set up on the girder 2 and a crab 4 runs on the rails 3. An extendable multiple beam 5 is attached to the crab 4 as illustrated in Figures 2 and 4. The multiple beam 5 consists of a beam 6, which is fixed under the crab 4, and four movable beams 7-10. The cross-sections of the fixed and movable beams are similar to each other though the size of the cross-sections becomes smaller from beam to beam. The cross-section of the beams is formed square in this embodiment. The movable beams 7-10 are inserted in the fixed beam 6 and movable beams 7-9 respectively so that the former ones can go up and down in the latter ones. Additionally, a carrier 12 is attached to the bottom of the multiple beam 5 by way of a rotating and raising device 11.

The structure of the multiple beam 5 is described below in more detail with reference to Figure 4. A pair of threaded shafts 13 extend through the fixed beam 6 from the top to the bottom by way of a pair of nuts 14 respectively, which nuts are both fixed to the outer surface of the first movable beam 7. When the shafts 13 are rotated by motors 15 set up on the roof of the multiple beam 5, the nuts 14 and accordingly the

first movable beam 7 are driven up or down in the fixed beam 6.

The bottom 16 of the first beam 7 is connected to the roof 20 of the second movable beam 8 by way of a pair of eyebolts 19, chains 17, sprockets 18 on the roof of the first movable beam 7, and eyebolts 21. As a result, when the first beam 7 goes up or down, the second beam 8 proceeds twice as fast as the first beam in the same direction.

Another threaded shaft 23 is suspended through the second, third and fourth movable beams 8, 9 and 10. The shaft 23 is rotated by a motor 25 set up on the roof 20 of the second beam 8. The third beam 9 is provided with a nut 24 on its roof. The nut 24 is engaged with the shaft 23 to climb or descend the shaft together with the third beam 9 when the shaft is rotated.

The bottom 26 of the second beam 8 is connected to the roof 30 of the fourth beam 10 by way of a pair of eyebolts 29, chains 27, sprockets 28 on the roof of the third movable beam 9 and eyebolts 31. The fourth beam 10 thereby goes up or down twice as fast as the third beam 9 in the same direction. Additionally, a guidance board 32 is rotatably provided at the bottom end of the threaded shaft 23, with guidance rollers 33 on its periphery which can roll on the inner surface of the fourth beam 10. The equipment of the guidance board 32 and guidance rollers 33 is well known to those skilled in the art and not described in detail.

Figure 1 is a cross-sectional view of the extendable multiple beam 5. The structure of the beam 5 is described below in detail with reference to Figure 1.

The fixed beam 6 for instance comprises wall members 6a and corner members 6b. The members 6a and 6b have flanges 6c and 6d respectively, by which they are connected to each other.

A roller supporting member 52 formed to fit well the inside of the corner member 6b is inserted in each of the corner members 6b. It is fastened to the corner member 6b in a detachable manner at a predetermined position, for example by means of screws 55 which are driven into the supporting member from outside the corner member.

The roller supporting member 52 is provided with a number of rotatable shafts 53 which horizontally cross diagonals of the beam 6. Each of the shafts 53 bears also rotatably a guidance roller 54, which rolls on a ridge of the first movable beam 7.

Preferably the periphery 54a of the roller 54 is cut into V-shape to hold firmly the ridge of the beam 7 to prevent the beam from rotation in relation to the fixed beam 6 with the smallest number of the rollers 54. The interval between the rollers 54 in the roller supporting member is determined so that the swinging of the beam 7 in the fixed beam 6 is effectively prevented, 1m for example.

Also preferably, a passage 56 is provided to supply lubricant such as grease between the supporting member 52 and each shaft 53 as well as each shaft 53 and guidance roller 54. The passages are open to the air by way of nipples not illustrated in the drawing.

The movable beams 7-9 also comprise wall members 7a-9a and corner members 7b-9b respectively. The supporting member is also inserted and fixed in the corner members 7b-9b to direct the movement of the beams 8-10 respectively.

A rotating and raising device 11 attached to the bottom of the fourth movable beam 10 comprises motors 34 and 35 to rotate and raise a carrier 12. The carrier 12 comprises a frame 36 equipped with vacuum absorption devices 37, as well as lifting magnets not illustrated in the drawings, at the bottom.

The girder 2 is equipped at both ends with motors 39 to drive the girder, as illustrated in Figure 3. The crab 4 is equipped with a motor 40 to drive the crab, a vacuum pump 41 and vacuum tank 42 for the vacuum absorption devices 37, and a control board 44. Electricity is supplied to the vacuum pump 41, as well as to the motors 15, 25, 34, 35, 39 and 40, as well known to those skilled in the art. Such supply of electricity is controlled by means of the control board 44 on the crab 4 which is capable of radio traffic with a control panel 43 in the operator's hands.

A number of rotary encoders are used to detect the position of the carrier 12 during the operation. A rotary encoder 46 is attached to the girder 2 and geared to a rack 45 which is laid along one of the rails 1. Signals are provided from the encoder to indicate the positions of the girder 2 on the rails 1. Another rotary encoder 48 is attached to the crab 4 and geared to another rack 47 which is laid along one of the rails 3. Signals are also provided from the encoder to indicate the positions of the crab 4 on the rails 3. Two other rotary encoders 49 and 50 are geared with the sprockets 18 and 28 on the first and third movable beams 7 and 9 respectively to determine the height of the carrier 12.

The rotating and raising device 11 also comprises a rotary encoder 51 to detect the inclination of the carrier 12. Another is attached to the bottom of the beam 10 to detect the rotation of the carrier, though not illustrated in the drawings. Every information obtained by the rotary encoders are displayed on the control panel 43.

As described above, the movement of the movable beams 7-10 is directed by the guidance rollers 54. The members 52 which support the rollers 54 are fixed in the corner members 6b-9b of the beams 6-9 with the screws 55. The members are able to be detached from the corner members

easily by loosening the screws. The inspection or exchange of the rollers 54 is thus easily achieved by detaching and extracting the members 52 beneath out of the corner members. After the maintenance works have been completed, they are again inserted in the corner members and fixed at the original positions with screws. The maintenance of the guidance rollers as well as of other elements pertaining to the rollers, which is a very difficult work in the prior art, can be dealt with very easily as a result.

Claims

1. A device attached to a first one of separate beams, which have polygonal cross-sections similar to each other and are combined to make up an extendable multiple beam attached to a crab of an overhead traveling crane, to lead the movement of a second separate beam situated directly inside the first beam, comprising:
a roller supporting member fixed inside the first beam along a corner of it at a predetermined position in an easily detachable way;
a shaft rotatably supported in the roller supporting member so that its axis horizontally crosses a diagonal of the first beam at a right angle;
a roller rotatably supported by the shaft which rolls on a corner of the second beam when the second beam moves upwards or downwards in the first beam.

2. A device as recited in Claim 1 in which the circumpherencial side of the roller is shaped to fit well with the corner of the second beam on which the roller rolls, so that the roller can hold the corner firmly;

3. A device as recited in Claim 1 or 2 in which the roller supporting member contains a plurality of the rollers arranged at predetermined intervals in the member.

4. An extendable multiple beam comprising a number of separate beams having polygonal cross-sections similar to each other, one having the largest cross-section is fixed under a crab of an overhead traveling crane and the others are inserted inside the fixed beam in order of size of their cross-sections, wherein each of the separate beams except the one situated innermost comprising:
a number of wall members each having flanges on both sides;
the same number of corner members each having flanges on both sides, which flanges are bound together with the flanges of the wall members to make up the separate beam;
the same number of roller supporting members inserted in the corner members respectively and fixed at a predetermined position in an easily detachable way;
a shaft rotatably supported in each of the roller supporting members so that its axis horizontally crosses a diagonal of the separate beam at a right angle when the roller supporting member is fixed in the corner member;
a roller rotatably supported by the shaft which is in touch with a corner of another separate beam situated directly inside the beam and rolls on the corner when the inside beam moves upwards or downwards in the beam.

5. A device as recited in Claim 1 in which the circumpherencial side of the roller is shaped to fit well with the corner of the inside beam on which the roller rolls, so that the roller can hold the corner firmly;

6. A device as recited in Claim 1 or 2 in which the roller supporting member contains a plurality of the rollers arranged at predetermined intervals in the member.

FIG. 1

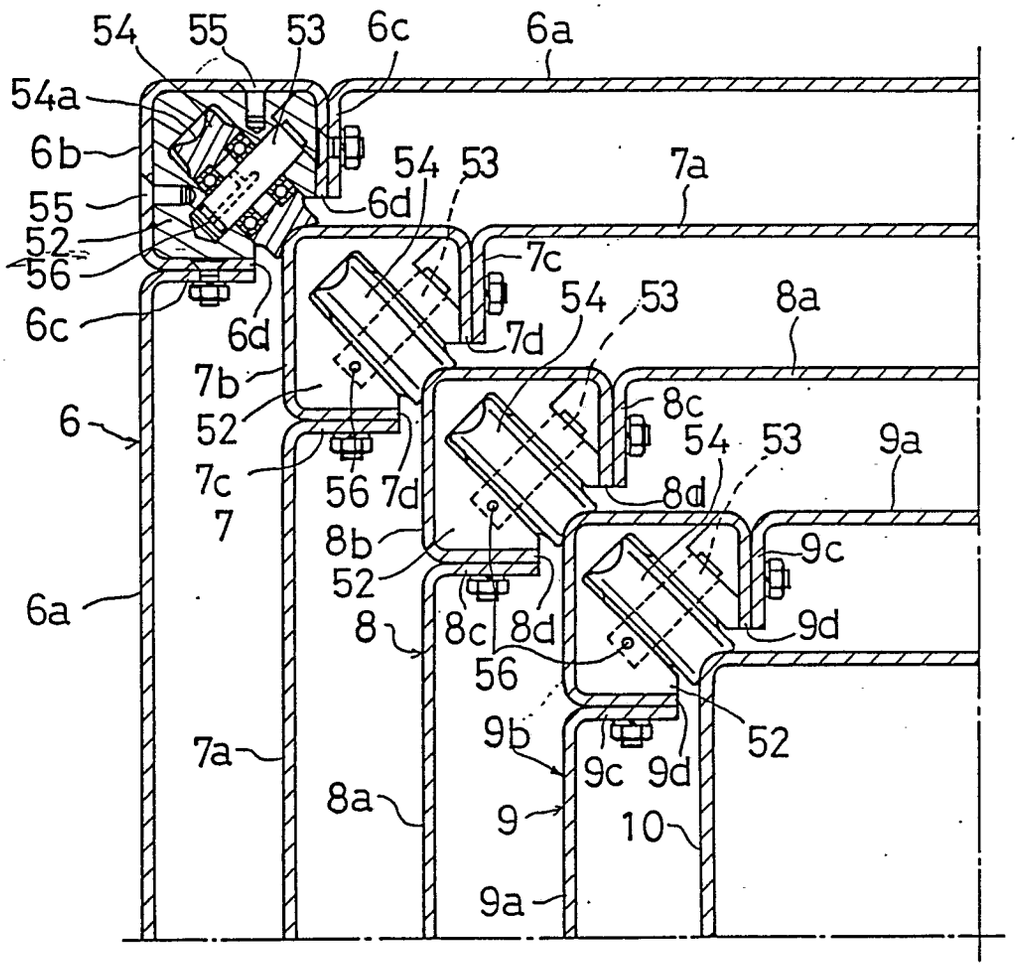
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FIG. 2

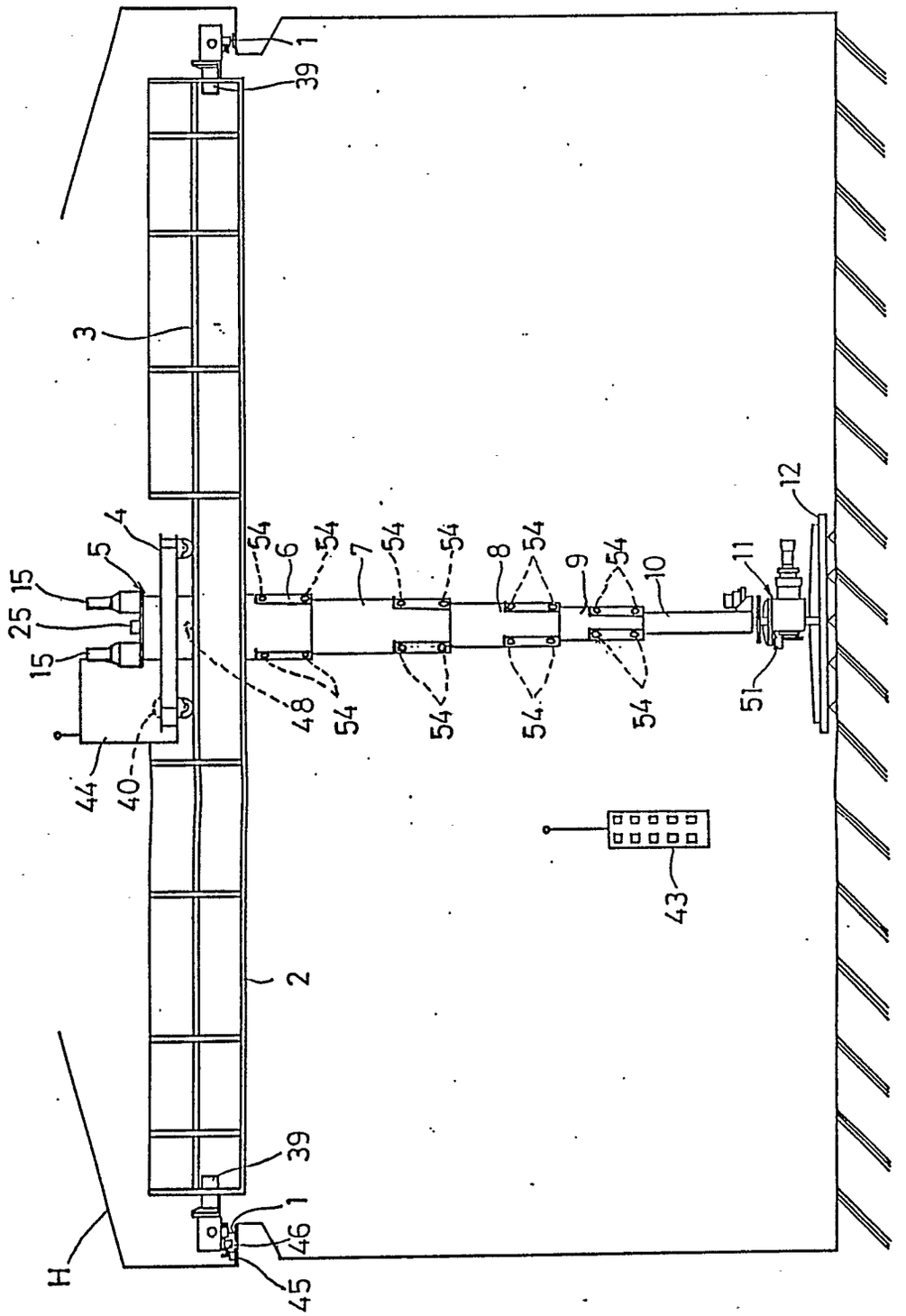
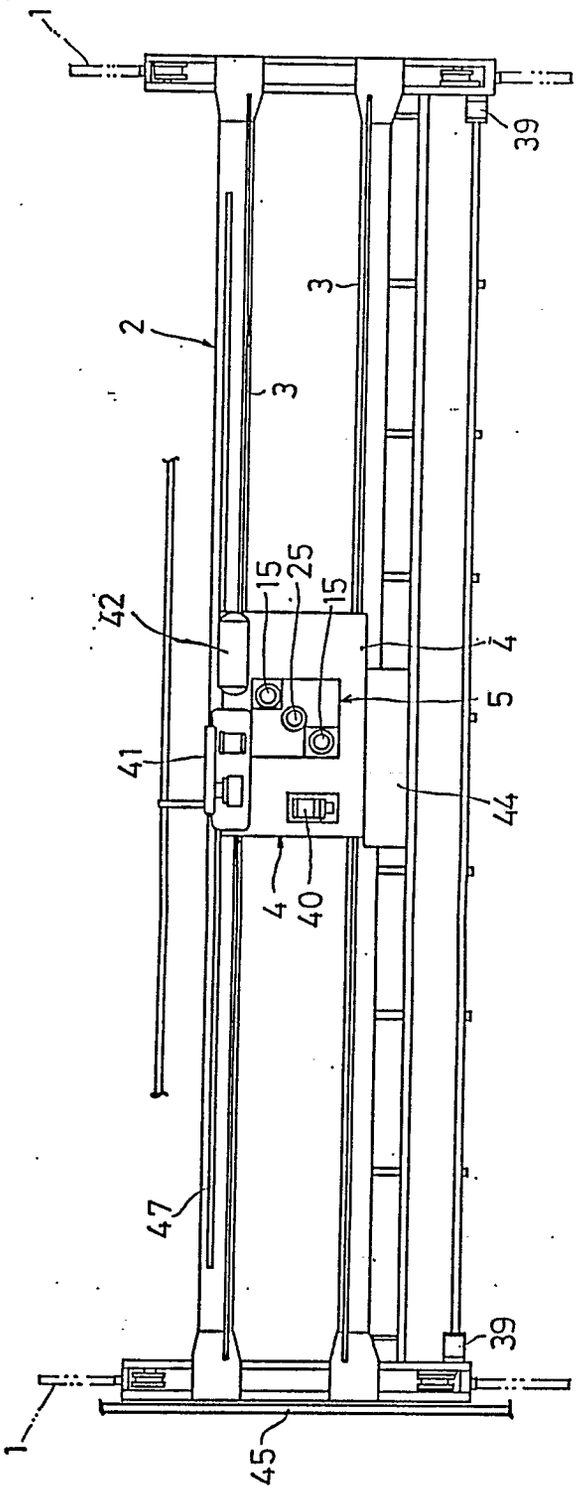


FIG.3



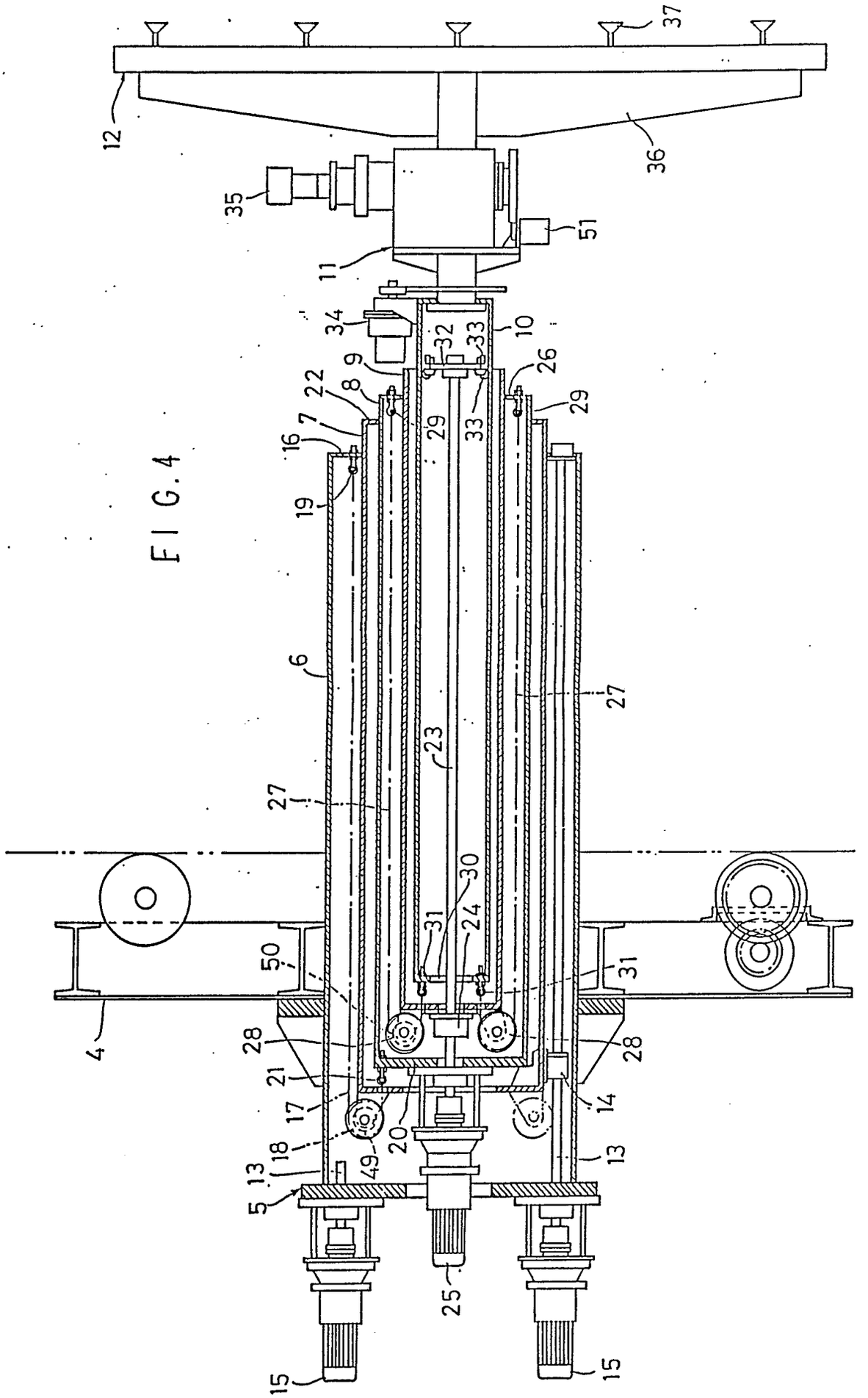

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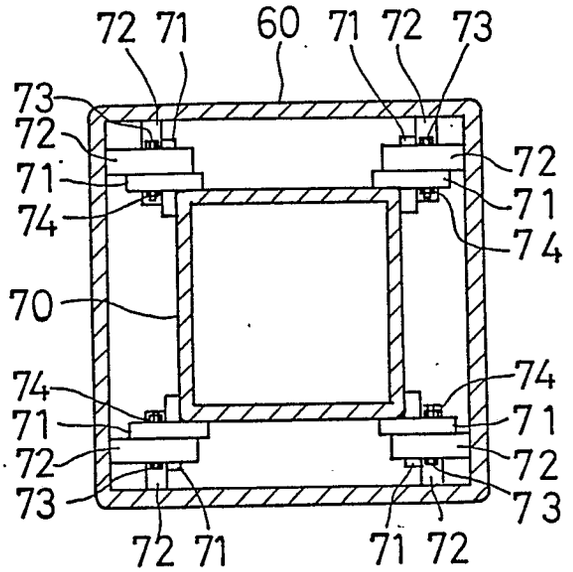
FIG.4

FIG. 5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EUROPEAN SEARCH REPORT

Application Number

EP 88 31 0543

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.4)
Y	DE-C-3 528 996 (MANNESMANN) * Figures; abstract; column 2, lines 8-40; column 3, lines 22-44 *	1	B 66 F 9/07
A		4	
Y	US-A-3 109 545 (HEDIN) * Figures; column 1, line 62 - column 2, line 3; column 2, lines 8-25; column 2, line 70 - column 3, line 62 *	1	
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A	GB-A- 782 070 (ALLMÄNNA SVENSKA ELEKTRISKA A.B.) * Figures; page 2, lines 22-41 *	1	
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A	US-A-3 082 881 (WIEGER) * Figures 2-4,5-7; Column 2, line 5 - column 3, line 46 *	1,4	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
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A	FR-A-1 527 526 (LEO GOTTWALD K.G.)		
A	US-A-3 095 945 (MITCHELL)		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14-02-1989	GUTHMULLER J.A.H.

CATEGORY OF CITED DOCUMENTS

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