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(54) Safety fence for placement on an elevator car

(57) The invention relates to a safety fence intended for placement on an elevator car, comprising at least one horizontal guide, which is mounted between vertical columns installed on the elevator car.

The object of the invention is to provide an improved safety fence for an elevator, which on the one hand directly provides a safe working environment for elevator mechanics who need to carry out work on the elevator (in the elevator shaft), but which also prevents hazardous situations that may occur when the elevator is unexpectedly and undesirably set going. According to the invention, the safety fence is provided with means that enable movement of the fence towards the elevator car.

These aspects on the one hand provide a working environment that is safe for elevator mechanics from the outset, whilst on the other hand the possibility of movement of the fence prevents unsafe situations, such as the elevator mechanics getting trapped between the guide and the ceiling of the elevator shaft.

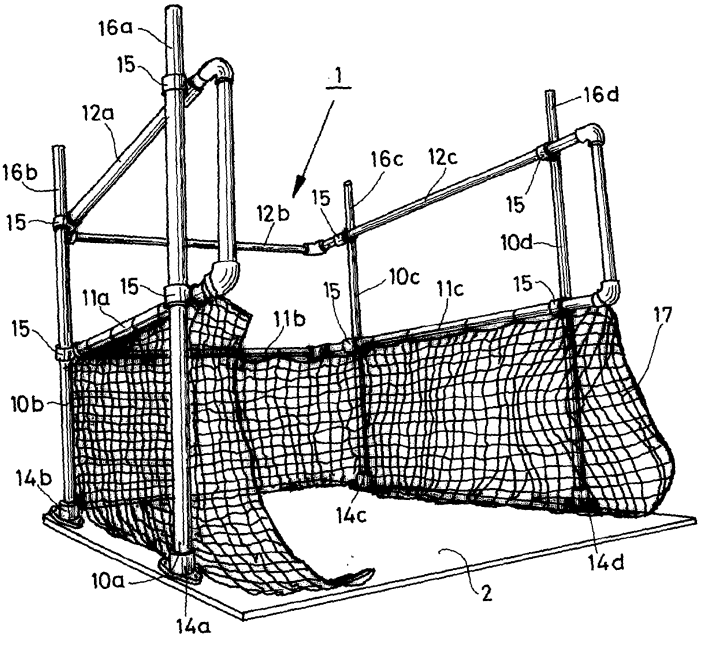

FIG.1

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Description

[0001] The invention relates to a safety fence intended for placement on an elevator car, comprising at least one horizontal guide, which is mounted between vertical columns installed on the elevator car.

[0002] To be able to carry out work on top of the elevator car in the shaft of an elevator system in a safe manner, legal regulations prescribe that a safety fence having a specified height be installed on the elevator car along the walls of the elevator shaft. One or two elevator mechanics can carry out work in the elevator within the safety fence on the elevator car.

[0003] Previously, the elevator mechanics first installed the safety fence on the elevator car before starting the work to be carried out in the elevator shaft, and after completion of the work the safety fence was dismounted again and removed from the elevator. Accordingly, a situation existed during the mounting and dismounting of the safety fence in which the service personnel in question was temporarily unprotected, in the absence of another form of protection, while present on the elevator car.

[0004] According to the tightened legal regulations, it is now forbidden to set foot on or leave the roof of the elevator car if a safety fence is not present already. This implies that a safety fence must be permanently present on every elevator car, so that service personnel will be able to directly enter a protected place to work on the elevator car in the elevator shaft for carrying out maintenance work rather than be present temporarily on an unsafe and consequently dangerous roof or ceiling of the elevator car, as was previously the case when a safety fence needed to be installed first.

[0005] A drawback of installing a permanent safety fence on the elevator car in an elevator shaft is that the service personnel may get trapped between the fence and the roof of ceiling of the elevator shaft when the elevator car with the service personnel present thereon is moved upwards. Apart from constituting a hazard for the service personnel, such a trapped situation may also lead to damage to the drive unit of the elevator.

[0006] The object of the invention is to provide an improved safety fence for an elevator, which on the one hand directly provides a safe working environment for elevator mechanics who need to carry out work on the elevator (in the elevator shaft), but which also prevents hazardous situations that may occur when the elevator is unexpectedly and undesirably set going. According to the invention, the safety fence is provided with means that enable movement of the fence towards the elevator car.

[0007] These aspects on the one hand provide a working environment that is safe for elevator mechanics from the outset, whilst on the other hand the possibility of movement of the fence prevents unsafe situations, such as the elevator mechanics getting trapped between the guide and the ceiling of the elevator shaft.

[0008] According to a further aspect of the invention, the moving means can be placed in a first operating position, in which they prevent movement of the fence towards the elevator car, and a second operating position, in which they enable movement of the fence towards the elevator car. As a result, the elevator mechanics will not be able to lower the fence on their own account in the first, normal operating position, since this might lead to unsafe situations.

[0009] In a functional embodiment, the moving means comprise a controllable gas spring mounted in each of the columns, with the moving means furthermore comprising a releasing element for releasing the gas pressure valve in the piston rod of the gas spring. By releasing the gas pressure valve, the gas spring can be placed in the second operating position, and the column (the fence) can be moved towards the roof of the elevator car.

[0010] More specifically, the moving means furthermore comprise a housing, which is provided at a first end thereof with a first bore having a first, large diameter, which first bore merges into a second bore having a second, small diameter in the housing, wherein the housing provided with the first bore is arranged around the piston rod and wherein the releasing element is movably accommodated in the first and the second bore.

[0011] As in a special embodiment the releasing element is provided with a pin extending into the second bore and with a widened end accommodated in the first bore, which widened end abuts against the gas pressure valve in the piston rod in the first bore on the one hand and against the transition of the first bore to the second bore on the other hand, actuation of the releasing element (the pin) can readily be transmitted to the gas pressure valve, which releases the piston rod for movement within the cylinder of the gas spring.

[0012] In another embodiment, the second bore merges into an open, third bore having a third, large diameter in the housing, said means furthermore comprising a contact element accommodated in the third bore, which is connected to the releasing element at a position located some distance away from the transition between the second and the third bore. This, too, makes it possible to transmit actuation of the releasing element (the pin) to the gas pressure valve in an effective manner.

[0013] More specifically, the distance between the contact element and the transition between the second and the third bore is smaller than the distance between the widened end and the piston rod. In this way the forces that are exerted when the piston rod is depressed (and the fence is lowered) will not be diverted to the internal components (the gas pressure valve) in the piston rod when the gas pressure valve is depressed or actuated in the second operation position, but said forces will be diverted to the piston rod itself via the transition between the second and the third bore of the housing.

[0014] Furthermore, the length of the contact element may be adjustable, so that the safety fence may also be adjusted for use in situations in which the ceiling of the elevator shaft is not flat.

[0015] For the sake of safety and in order to obtain a complete screening of the moving parts, the moving means furthermore comprise a sleeve extending around the piston rod and the cylinder of the gas spring, which sleeve is connected to the releasing element.

[0016] The invention will now be explained in more detail with reference to a drawing, in which:

Figure 1 shows a first embodiment of a safety fence according to the invention;
Figure 2 shows a first embodiment of the moving means according to the invention;
Figure 3 shows a detail view of figure 2; and
Figure 4 shows another embodiment of a safety fence according to the invention.

[0017] For a better understanding of the invention, like parts will be indicated by the same numerals in the description of the figures below.

[0018] Figure 1 schematically shows an embodiment of a safety fence suitable for placement on the elevator car in an elevator.

[0019] The safety fence is indicated by numeral 1 in figure 1, whilst numeral 2 indicates the roof or ceiling of the elevator car.

[0020] The safety fence 1 is built up of a number of vertical columns (four in this case) 10a-10d, between which at least one horizontal guide, two horizontal guides 11-12 disposed one above the other in this embodiment, are mounted. The horizontal guides 11-12 are configured as tubular elements 11a-11b-11c and 12a-12b-12c, respectively. Each column 11a-11-d is fixed to the roof or ceiling 2 of the elevator car (not shown) via suitable supports 14a-14d. The horizontal members 11a-11c and 12a-12c, respectively, are connected to the vertical columns 10a-10d by means of suitable connecting elements 15, which are known per se.

[0021] The safety net 17 that is stretched between the horizontal members and the columns is optional and does not form part of the invention.

[0022] As described above, in order to prevent hazardous situations, such as personnel getting trapped between the fence and the ceiling or roof of the elevator shaft when the elevator car is operated or moves unexpectedly and undesirably, the safety fence is according to the invention provided with means 16a-16d that enable movement of the entire fence 1 towards the elevator car 2.

[0023] Figure 2 and figure 3 (detail view) show a first embodiment of such moving means 16.

[0024] The moving means 16 are mounted in the column 10, preferably in or on ends of each column 10a-10d remote from the elevator car.

[0025] In another embodiment, the moving means 16 may be provided at the location of the supporting elements 14a-14d as shown in figure 1.

[0026] As figure 2 shows, each column 10 is configured as a gas spring consisting of a cylinder 101 and a piston 102 that is slidably accommodated in the cylinder 101. As is known with gas pressure cylinders, a gas pressure valve (not shown) is mounted in the cylinder 102, which gas pressure valve must be opened in order to enable the piston 102 to slide into the cylinder 101. The gas pressure valve in the gas spring is opened by depressing a releasing pawl 103, which opens the gas pressure valve in the cylinder 102 upon being depressed. Thus the piston 102 can be slid into the cylinder 101.

[0027] According to the invention, a releasing element 22 is provided, which is capable of depressing the releasing pawl 103 by its movement for the purpose of releasing the gas pressure valve in the piston rod 102 of the gas spring.

[0028] More specifically, the moving means 16 comprise a housing 21, which is provided near a first end thereof with a first bore 21 a having a first, large diameter, which first bore 21 a merges into a second bore 21 b having a second, small diameter in the housing 21. The housing 21 having the first bore 21 a is provided over the free end 102a of the piston rod 102 in that case. To that end, the piston rod 102 has a diameter equal to the internal diameter of the first bore 21 a.

[0029] As is clearly shown in figure 2 and (in more detail) in figure 3, the releasing element 22 is movably accommodated in the first bore 21 a and the second bore 21 b. The releasing element 22 is provided with a pin 22b, which extends through the second bore 21 b, and with a widened end 22a, which is accommodated in the first bore 21 a, in such a manner that the widened end 22a abuts against the releasing pin 103 of the gas pressure valve in the piston rod 102 on the one hand and against the transition from the first bore 21 a to the second bore 21 b on the other hand. In this situation, the pistons 102 are in the maximally extended position, in which the releasing pin 103 of the gas pressure valve is not depressed.

[0030] The releasing element 22 furthermore comprises a contact element 25, which is provided with a springing abutment element 26. The contact element may be connected to the transmission element 23 via a bore 24.

[0031] In this embodiment, the housing 21 is furthermore provided with a third bore 21 c, which has a diameter larger than that of the second bore 21 b. The transmission element 23, which is fixedly connected to the pin 22 of the releasing element 22, moves within the bore 21 c when a force is exerted on the contact element 25, whilst the releasing element 22 moves through the second bore 21 b and the widened end 22a depresses the releasing pawl of the gas pressure valve of the gas spring.

[0032] The housing 21, and in particular the bores 21 a and 21 c, is so configured or dimensioned that the transmission element 23 will be supported on the wall portion A of the transition from the second bore 21 b to the third bore 21 c with its contact surface 23a when the releasing pawl 103 of the gas pressure valve of the gas spring is fully depressed by the releasing element 22. In other words, forces exerted on the contact element 25 via the

transmission element 23 can thus be directly transmitted to the housing 21, which is attached to the piston rod 102 by means of a nut 27. Since the forces exerted on the contact element 25 are transmitted to the piston rod 102 via the housing 21, the releasing pawl 103 is not unnecessarily loaded and thus damaged.

[0033] The spacing between the abutment surface 23a of the transmission element 23 and the wall transition A is to that end smaller than the spacing between the bottom side of the widened end 22a (which rests on the releasing pawl 103) and the upper side of the piston rod 102.

[0034] More in particular, the length of the contact element 25 is adjustable in order to thus gear the length of the various columns 10a-10d to the shape of the roof of the elevator shaft.

[0035] Figure 2 and figure 3 furthermore show the sleeve 20, which is attached to the housing 21 and which screens the piston rod 102 and fits over the cylinder 101.

[0036] Figure 4 discloses a further embodiment of a safety fence according to the invention. In this figure, too, like parts are indicated by the same numerals. According to the invention, the safety fence is in this case provided with additional actuating means 50, which are arranged for moving the gas springs 16a-16d from the first, locked operating position to the second operating position in order to thus enable movement of the safety fence in the direction of the elevator car 2. As indicated above, the gas springs are in principle locked, i.e. in the first operating position, and the releasing elements 26 must be depressed in order to move the safety fence 1 downwards towards the elevator car 2.

[0037] According to the invention, said lowering of the safety fence may also take place manually, using actuating means 50 comprising a lever 51 which is pivotally connected to the fence with a first end 51 a. The other end 51 b of the lever 51 is connected to a tensioning cable 52, which is guided along the fence via suitable guides 53 and which is connected to each releasing element 26 of the various gas springs 16a-16b by means of tensioning cable parts 52a-52b. A similar lever is likewise provided on the other side of the safety fence, which lever is connected to the releasing elements 26 of the other gas springs 16c-16d via an identical tensioning cable 52 and similar guides.

[0038] Actuation of the lever 51 causes the tensioning cable 52 to be tensioned and accordingly the various releasing elements to be depressed, so that the entire fence 1 can be moved down rectilinearly in the direction of the elevator car 2.

Claims

1. A safety fence intended for placement on an elevator car, comprising at least one horizontal guide, which is mounted between vertical columns installed on the elevator car, **characterised in that** the safety fence is provided with means that enable movement of the fence towards the elevator car.

2. A safety fence according to claim 1, **characterised in that** the moving means can be placed in a first operating position, in which they prevent movement of the fence towards the elevator car, and a second operating position, in which they enable movement of the fence towards the elevator car.

3. A safety fence according to claim 1 or 2, **characterised in that** the moving means comprise a controllable gas spring mounted in each of the columns.

4. A safety fence according to claim 3, **characterised in that** the moving means comprise a releasing element for releasing the gas pressure valve in the piston rod of the gas spring.

5. A safety fence according to claim 4, **characterised in that** the moving means furthermore comprise a housing, which is provided at a first end thereof with a first bore having a first, large diameter, which first bore merges into a second bore having a second, small diameter in the housing, wherein the housing provided with the first bore is arranged around the piston rod and wherein the releasing element is movably accommodated in the first and the second bore.

6. A safety fence according to claim 5, **characterised in that** the releasing element is provided with a pin extending into the second bore and with a widened end accommodated in the first bore, which widened end abuts against the gas pressure valve in the piston rod in the first bore on the one hand and against the transition of the first bore to the second bore on the other hand.

7. A safety fence according to claim 5 or 6, **characterised in that** the second bore merges into an open, third bore having a third, large diameter in the housing, said means furthermore comprising a contact element accommodated in the third bore, which is connected to the releasing element at a position located some distance away from the transition between the second and the third bore.

8. A safety fence according to claim 7, **characterised in that** the distance between the contact element and the transition between the second and the third bore is smaller than the distance between the widened end and the piston rod.

9. A safety fence according to claim 7 or 8, **characterised in that** the length of the contact element is adjustable.

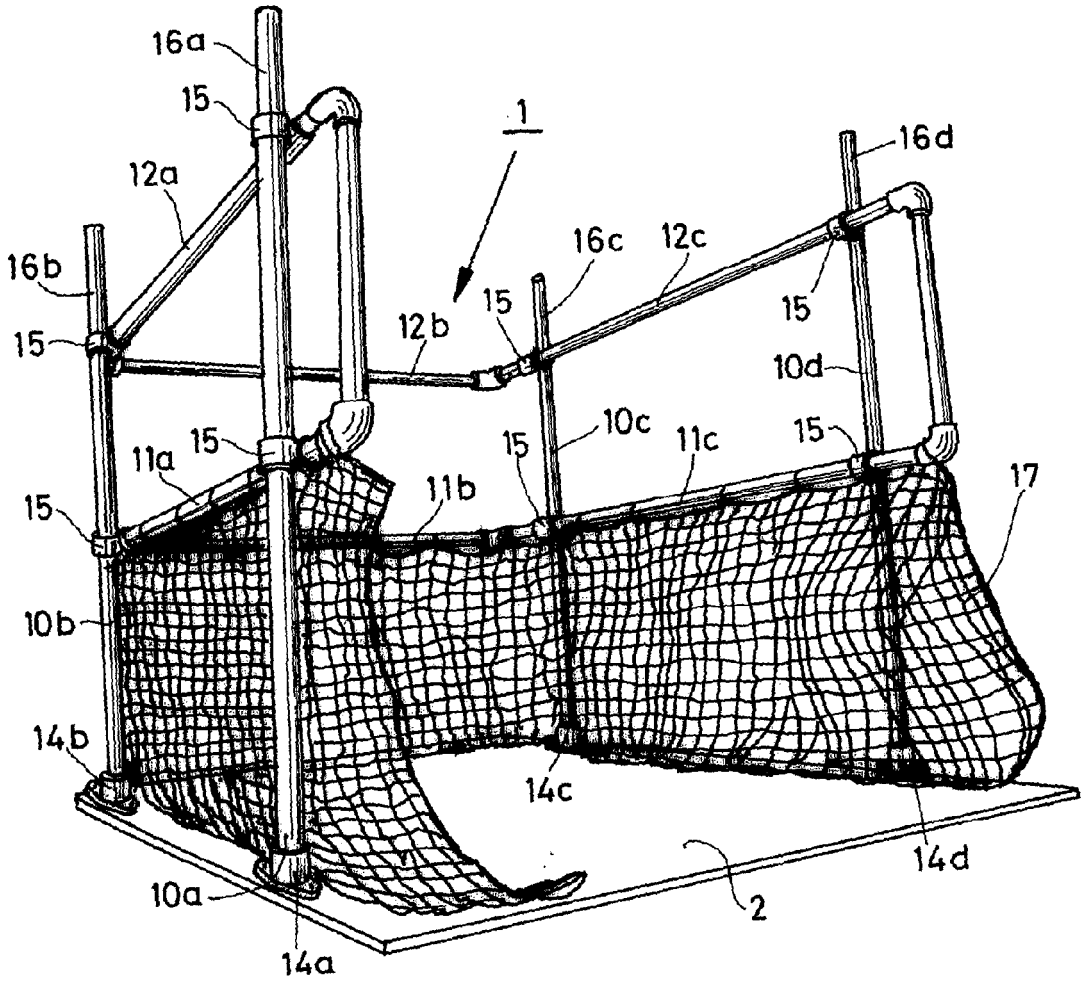
10. A safety fence according to any one or more of the

preceding claims, **characterised in that** the moving means furthermore comprise a sleeve extending around the piston rod and the cylinder of the gas spring, which sleeve is connected to the releasing element.

11. A safety fence according to any one or more of the claims 2-10, **characterised in that** actuating means are present for causing the moving means to move from the first operating position to the second operating position.

12. A safety fence according to claim 11, **characterised in that** said actuating means comprise a tensioning cable that is guided along the fence, which tensioning cable is connected to the releasing element of each gas spring.

13. A safety fence according to claim 11, **characterised in that** said actuating means furthermore comprise at least one lever that is pivotally connected to the fence, which lever is connected to the tensioning cable.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15
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16d
12a
16b
16c
12c
15
15
12b
15
15
10d
10c
15
11a
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11c
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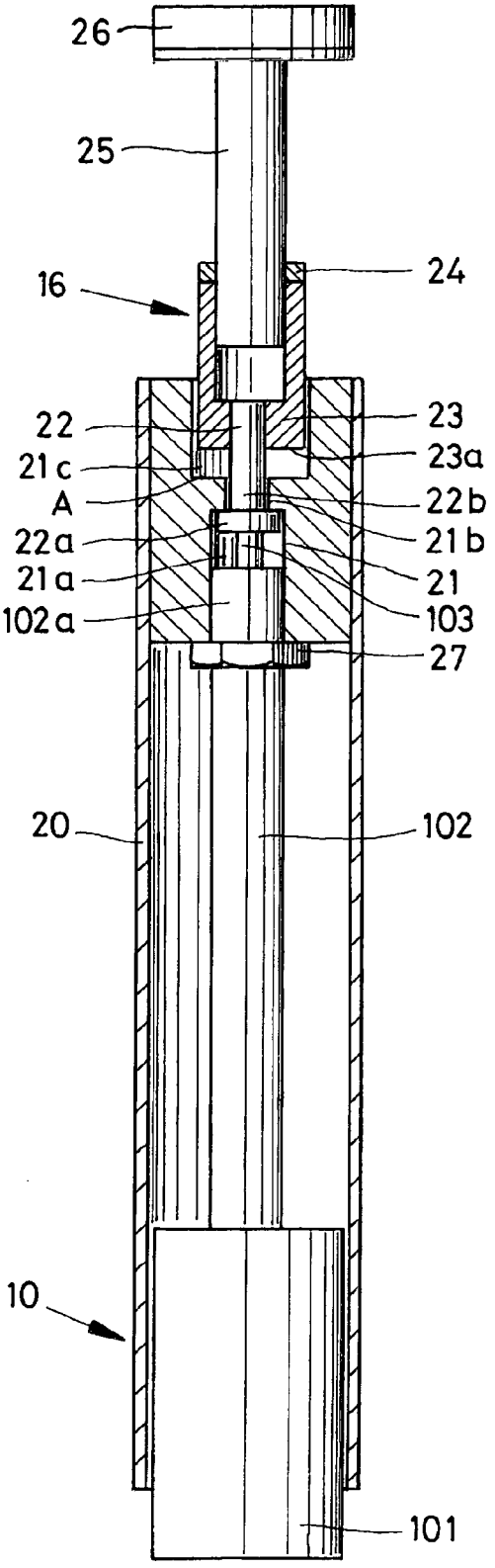
17
11b
15
10b
14b
14c
14d
10a
2
14a

FIG.1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25
16
24
22
23
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A
22b
22a
21b
21a
21
102a
103
27
20
102
10
101

FIG. 2

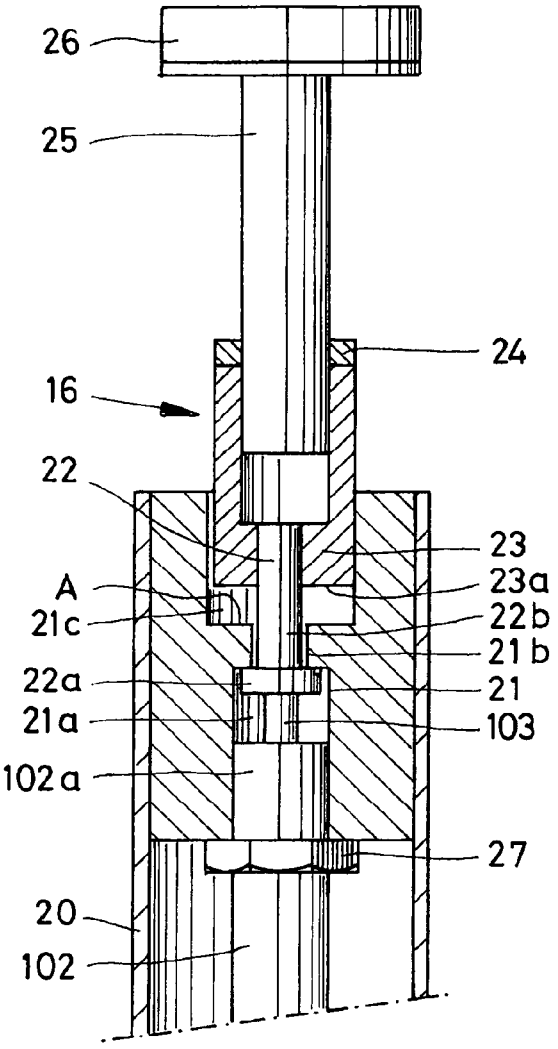
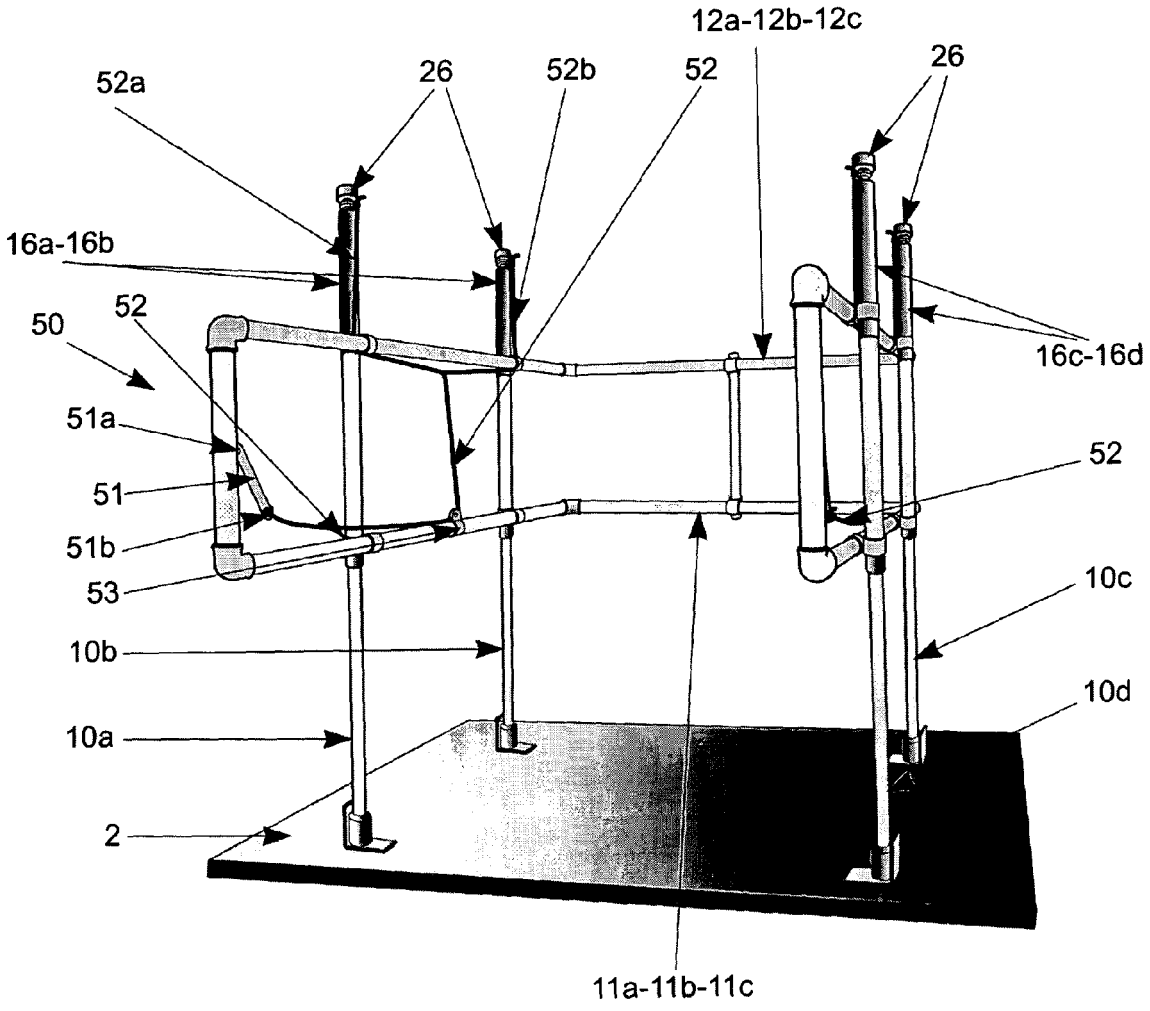

26
25
24
16
22
23
A
23a
21c
22b
21b
22a
21
21a
103
102a
27
20
102

FIG. 3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10d
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2
11a-11b-11c

Fig. 4