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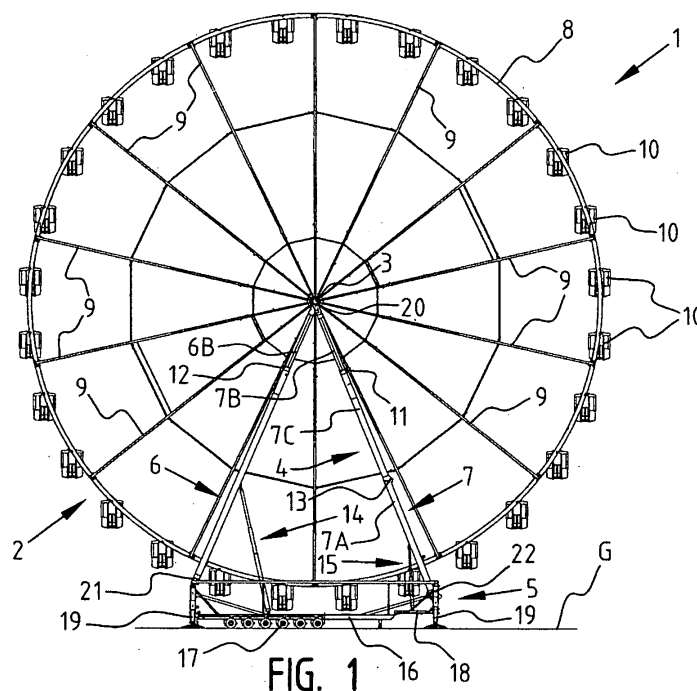
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8449 EC Terband (NL)(72) Inventor: **Knijpstra, Hette**
8449 BA Terband (NL)(74) Representative: **Bartelds, Erik et al**
Arnold & Siedsma
Sweelinckplein 1
2517 GK The Hague (NL)(54) **Upright support structure for a fairground attraction, in particular a ferris wheel**

(57) The invention relates to an upright support structure for a fairground attraction, comprising a base and two collapsible masts which each extend obliquely upward from an outer end of the base and which are mutually connected at their upper outer ends and there form a bearing for suspension of a moving part of the fairground attraction. Each masts consists of at least two pivotally connected segments. Some of the segments are pivotable about an axis which is parallel to an upright main plane defined by the masts and the base. One of

the masts can consist of more than two segments, some of which are pivotable about an axis which lies perpendicularly of the upright main plane defined by the masts and the base. Each mast can further be pivotally connected at its lower end to the base and the support structure can comprise means for erecting and collapsing the masts, for instance a hydraulic actuator. The invention further relates to a fairground attraction formed by one or more of such upright support structures and a moving part suspended therefrom, in particular a Ferris wheel or swing.

**FIG. 1****EP 2 055 362 A1**

Description

[0001] The invention relates to an upright support structure for a fairground attraction, comprising a base and two masts which each extend obliquely upward from an outer end of the base and which are mutually connected at their upper outer ends and there form a bearing for suspension of a moving part of the fairground attraction, wherein the masts are collapsible and each consist of at least two segments connected pivotally to each other. Such an upright support structure is known from patent publication EP 1 642 627 A1.

[0002] Described in this older document are two variants of an upright support structure for a fairground attraction, such as a Ferris wheel or a swing, one in which the upper ends of the masts are detachable and one in which they are permanently connected to each other. In both variants the two masts and the base form a triangular support structure, wherein the base forms the short side of the triangle and the two masts form the two long sides.

[0003] In the first variant there are two masts, which are each connected pivotally with their bottom end to an outer end of a base and which each consist of two segments pivotally connected to each other. The pivot axes of the two masts here lie transversely of the main plane of the Ferris wheel, and thus run horizontally. In the collapsed or folded position the segments rest on each other. The upper ends of the two masts lie far apart in the collapsed situation. During erection of this support structure one of the masts is first partially raised, after which the upper ends of the two masts are carried toward each other and mutually connected. The two masts are then raised further until the pivot connections are straight and the two segments of each mast lie mutually in line.

[0004] This variant has the drawback that mutually connecting the upper ends of the two masts is time-consuming and arduous work, which must take place some height above the base. Furthermore, working with separate mast parts which must be connected to each other on site is not exactly without danger. The larger fairground attractions become, the greater the loads also become and thereby also the importance of good connections. Repeatedly detaching the masts from each other and connecting them to each other entails a risk of the connection wearing or inadvertently not being formed properly, whereby the support structure could collapse.

[0005] In a second variant shown in this earlier patent publication the two masts are permanently connected at their upper ends. The connecting operation with all its drawbacks is hereby dispensed with. In this second variant each mast is also pivotally connected at its lower end to an outer end of the base, and it once again consists of two segments which are again pivotable about a horizontal axis. In the collapsed situation the top segments of the two masts lie alongside each other and connected at their top ends. During erection of this support structure the bottom segments of the two masts are first successively partially raised. One of the two masts is then raised

so far that its pivot connections are straightened and the two segments lie mutually in line. The other mast is then further raised and straightened. In order to make this sequence of movements possible the masts must cross each other, i.e. they cannot lie in the same plane.

[0006] This variant thus has the drawback that the support structure does not lie in a single plane, which results in eccentricities and associated concentrations of load. The support structure must hereby take a relatively heavy form, while the risk of collapse remains greater than is desirable.

[0007] The invention therefore has for its object to provide a support structure of the above described type, wherein these drawbacks do not occur. According to the invention this is achieved in an upright support structure as described in the preamble in that at least some of the segments are pivotable about an axis which is substantially parallel to an upright main plane defined by the masts and the base. By allowing the segments to pivot about an axis which is parallel to the main plane, the pivoting movement takes place outside this plane so that there is no necessity for crossing structures. Eccentricities and the large moments of force associated therewith are thus avoided so that it is possible to suffice with a relatively light support structure.

[0008] One of the masts preferably consists of more than two segments, some of which are pivotable about an axis which lies substantially perpendicularly of the upright main plane defined by the masts and the base. This mast can thus be collapsed and erected by a pivoting movement in the main plane.

[0009] When the segment which supports the upper end of the mast is pivotable about an axis which is substantially parallel to the upright main plane defined by the masts and the base, and the segments situated between the top segment and the base are pivotable about an axis lying substantially perpendicularly of the main plane, the bottom segments can be folded down onto each other on the base, after which the top segment can be placed alongside thereof.

[0010] In order to enable erection of the support structure without external aids, it is recommended that each mast is pivotally connected at its lower end to the base and the support structure comprises means for erecting and collapsing the masts. A compact and efficient construction is then obtained when the erecting and collapsing means comprise at least one hydraulic actuator arranged between the base and one of the masts. It is of course also possible to envisage mechanical erecting and collapsing means, such as electrically driven screw spindles, gear transmissions and the like.

[0011] In a support structure wherein one of the masts has two segments and the other mast has three segments, the hydraulic actuator is then preferably arranged between the base and the mast with the two segments. This prevents the hinge in the mast with three segments being excessively loaded.

[0012] A preferred embodiment of the upright support

structure according to the invention is further provided with means for urging to a straightened position the segments of the one mast which are pivotable about the axis running perpendicularly of the main plane. These segments do after all tend to sag under the influence of their weight, whereby an unstable construction would be obtained. When the straightening means comprise at least one hydraulic actuator arranged between the base and this mast, they can also play a supporting part in erecting of the support structure.

[0013] In order to create a stable structure without having to perform diverse operations for this purpose at a great height above the ground, the support structure can be provided with remotely controllable means for locking at least some of the pivoting connections in their erected position. The masts can thus be fixed in their straightened position. A simple solution is achieved when the locking means comprise at least one driven locking pin co-acting with openings in the segments connected by the hinge. These locking pins can for instance be operated hydraulically, although an electric or pneumatic drive can also be envisaged.

[0014] In order to optimize the stability of the upright support structure each mast preferably has a cross-sectional form tapering from the base toward the upper outer end transversely of the upright main plane defined by the masts and the base.

[0015] In the support structure wherein the one mast has two segments and the other mast has three segments, the segment of the mast with two segments which is connected to the base, the segment connected to the base and the segment of the mast with three segments connected thereto for pivoting about an axis lying perpendicularly of the main plane preferably each consist of two legs together enclosing an acute angle. It is thus not only the support structure as a whole which has a triangular form, but also each individual mast.

[0016] In order to ensure that the legs move as a whole, it is recommended that the legs are connected to each other at the position of the pivot axis lying perpendicularly of the main plane and close to their upper ends. An A-frame is thus formed for each mast. The hydraulic actuator of the erecting and collapsing means can here engage on the connection between the legs.

[0017] In order to be able to form a large fairground attraction the upright support structure must be as high as possible. According to a preferred embodiment, the segment of the mast with two segments which is connected to the base has for this purpose substantially the same length as the base. In addition, the segment which supports the upper end of the mast and which is pivotable about the axis running parallel to the main plane is preferably substantially half the length of the base. With a base having a length in the order of over 20 metres it is thus possible to construct a Ferris wheel which is over 50 metres high.

[0018] In order to enable operation of the fairground attraction at different locations it is recommended that

the base is displaceable and comprises a frame which is placed on an undercarriage and which is provided with means for attaching thereof to a tractive vehicle. The attraction can thus be transported by road from fairground to fairground, where it can be erected quickly and safely as a result of the above described construction.

[0019] The invention also relates to a fairground attraction formed by at least one upright support structure as described above and a moving part suspended therefrom, in particular a Ferris wheel or swing.

[0020] In respect of stability such a fairground attraction is preferably provided with two mutually parallel upright support structures arranged with intermediate spacing and between which the moving part is suspended.

[0021] The invention is now elucidated on the basis of two embodiments, wherein reference is made to the accompanying drawing, in which corresponding components on either side of the fairground attraction are designated with the same reference numerals, respectively with or without accent, and corresponding components in other embodiments have reference numerals increased by 100. In the drawing:

Fig. 1 shows a front view of a fairground attraction with an upright support structure according to a first embodiment of the invention in erected position, Fig. 2 shows a side view of the fairground attraction of fig. 1,

Fig. 3A-3E show side views of the different steps of erecting the support structure according to the embodiment of fig. 1 and 2,

Fig. 4 shows a front view of a second embodiment of the support structure in collapsed position,

Fig. 5 shows a side view of the support structure of fig. 4, and

Fig. 6 shows a front view of an additional base part in its transport position when loaded with components of the attraction.

[0022] A fairground attraction 1, in this case a Ferris wheel, comprises a moving part 2, the actual wheel, which is suspended for rotation about a shaft 3 between two upright support structures 4 (fig. 1, 2). Wheel 2 is constructed from a number of spokes 9 which extend radially from shaft 3 and are connected at their ends by ring segments, which together form an outer ring 8 of wheel 2. Suspended between the two outer rings 8, 8' are gondolas 10 in which passengers can sit.

[0023] Each upright support structure comprises a base 5 and two masts 6, 7. Each mast 6, 7 extends obliquely upward from an outer end 21, 22 of base 5. Masts 6, 7 are connected to each other at their upper ends 20 and there form a bearing for rotation shaft 3 of wheel 2. Masts 6, 7 are collapsible and each consist of a number of segments pivotally connected to each other.

[0024] In the shown example mast 6 consists of two segments 6A, 6B, while mast 7 consists of three segments 7A, 7B and 7C. According to the invention some

of these segments are here pivotable about an axis substantially parallel to an upright main plane defined by masts 6, 7 and base 5. These segments can thus pivot outside the main plane, thereby achieving a favourable progression of the erecting and collapsing movement without parts of support structure 4 having to cross each other.

[0025] In the shown example the top segments 6B, 7B of the two masts 6, 7 are each pivotable about an axis 11, 12 parallel to the main plane. Conversely, the segments 7A and 7C situated between top segment 7B of mast 7 and base 5 are pivotable about an axis 13 lying substantially perpendicularly of the main plane.

[0026] Each mast 6, 7 is here further connected pivotally at its lower end 21, 22 to base 5. Support structure 4 is provided with means for erecting and collapsing masts 6, 7, which erecting and collapsing means here take the form of a hydraulic actuator 14. This hydraulic actuated 14 is arranged between base 5 and bottom segment 6A of the mast 6 consisting of two segments.

[0027] In order to prevent sagging of segments 7A, 7C of mast 7, which are pivotable about the axis 13 running perpendicularly of the main plane, support structure 4 is also provided in the shown example with means for urging these segments 7A, 7C to a straightened position. These straightening means are formed here by a hydraulic actuator 15 arranged between base 5 and mast 7. Although the straightening means could also be formed by an actuator - hydraulic or otherwise - which would act directly on the two segments 7A, 7C around their pivot connection 13, the use of an actuator 15 between base 5 and bottom segment 7A has the additional advantage that this actuator 15 can also play a part in erecting the segments. In this way the hydraulic actuator 14 of the erecting and collapsing means can have smaller dimensions than would otherwise be necessary. This actuator 14 is otherwise still considerably larger and stronger than actuator 15 of the straightening means.

[0028] For the purpose of fixing the different pivot connections the support structure 4 can be further provided with remotely controllable locking means (not shown here). These locking means can for instance comprise for each pivot connection a locking pin driven hydraulically or otherwise and co-acting with openings in the pivotable segments.

[0029] Each mast 6, 7 has transversely of the upright main plane defined by masts 6, 7 and base 5 a cross-sectional form which tapers from base 5 to the upper outer end 20. In the shown example both the bottom segment 6A of mast 6 and the bottom two segments 7A, 7C of mast 7 consist of two legs 23 and 24 respectively 23A, 23B and 24A, 24B. The pairs of legs 23 and 24, respectively 23A, 23B and 24A, 24B enclose in each case an acute angle with each other. Legs 23A, 23B and 24A, 24B of mast 7 are further connected by a transverse beam 25 at the position of their pivot axes 13. These legs are also connected to each other close to their upper ends. The same is the case for legs 23 and 24 of mast

6, which are likewise connected by a transverse beam 25 at the position of pivot axis 13 of the other mast 7, and are directly connected to each other at their top end. The lower part of each mast 6, 7 is thus in fact formed by an A-frame.

[0030] The top segment 6B, 7B of each mast 6, 7 also tapers in upward direction, and moreover inclines toward wheel 2 relative to the A-frame. A sufficiently substantial intermediate space is hereby created on either side between wheel 2 and the upright support structures 4, while it is still possible to suffice with a shaft 3 which is hardly any longer than the width of wheel 2 and which can thus be given a relatively light construction.

[0031] In order to increase as much as possible the surface area over which the loads of fairground attraction 1 are distributed in ground G, and to also maximize the width of support structure 4 in order to be able to withstand lateral loads, each base 5 is also provided on either side with spacers with jacks 19. Further arranged between bases 5, 5' of the two support structures 4, 4' on either side of wheel 2 is a central base 5", which will be discussed in more detail hereinbelow.

[0032] In the shown example fairground attraction 1 can be displaced in its entirety. For this purpose base 5 is embodied in the form of a frame 16 which is placed on an undercarriage 17 and which is provided with means 18 for attaching thereof to a tractive vehicle (not shown here). These attaching means 18 are here formed by a swan-neck so that base 5 can be attached to a truck as a trailer. During transport the base 5 not only carries the collapsed masts 6, 7 but also other parts of the fairground attraction. Also provided for in the shown example is that bases 5, 5' of support structures 4, 4', in the form of trailers, also each transport the segments of outer ring 8 of wheel 2 (fig. 4, 5). The central base 5", likewise in the form of a trailer, is adapted to transport spokes 9 of wheel 2 (fig. 6). Three trailers can thus suffice for the transport of wheel 2 and support structures 4.

[0033] Fig. 4 otherwise shows an alternative embodiment of support structure 104, wherein the position of the two masts 106, 107 is reversed relative to the orientation of base 105. Mast 106 with the two segments 106A, 106B is here attached with its lower end 121 to the front side (the side with swan-neck 118) of base 105, while mast 107 with the three segments 107A, 107B, 107C is arranged at the rear at the position of undercarriage 117.

[0034] The lengths of the different segments 6A, 6B, 7A, 7B, 7C is chosen such that a relatively high support structure 4 can be erected without base 5, which must after all be transported by road, having to be excessively long. A maximum length of a drawn combination in the order of 25 metres applies for transport by road in most European countries. This includes the length of the truck, so that the base in the form of a trailer can be a maximum of about 22 metres long.

[0035] In the shown example the bottom segment 6A of mast 6 has substantially the same length as base 5. This entails the bottom and middle segments 7A, 7C of

the other mast 7 together also having to be roughly the same length as base 5. In the shown example they are the same length, and each about half the length of base 5. The top segments 6B, 7B of the two masts are here further almost half the length of base 5. The overall length of each mast 6, 7 is thus almost one and a half times the length of base 5. Because masts 6, 7 are positioned obliquely, the height of shaft 3 above the base is eventually roughly equal to the length of base 5.

[0036] Erection of support structure 4 according to the invention takes place as follows. From the collapsed transport position (fig. 3A) segment 6A of mast 6 is first moved upward to some extent by operating hydraulic actuator 14. Segments 7A, 7C of mast 7 are also simultaneously moved slightly upward by hydraulic actuator 15. Top segments 6B, 7B hereby come to lie wholly clear, after which they can be pivoted about their axes 11, 12 to the folded-out position (fig. 3B). Hinges 11, 12 are fixed in this folded-out position. Because axes 11, 12 are parallel to the main plane, the pivoting movement of segments 6B, 7B takes place transversely of this plane, here therefore upward from the plane of the drawing.

[0037] In this position of support structure 4 the main shaft 3 can further be attached to upper ends 20 of the two masts 6, 7, which are then still situated relatively close to the ground G. When fairground attraction 1 is suspended between two support structures 4, they must both be moved to the position shown in fig. 3B before main shaft 3 can be placed. From this moment the two support structures 4 must then be further erected in synchronous manner.

[0038] Hydraulic actuators 14, 15 are then still driven synchronously, whereby segments 6A and 7A are urged upward, wherein segments 6B, 7B and 7C situated therebetween are co-displaced. The pivoting connection 20 of the upper ends of masts 6, 7 is here opened increasingly further, while conversely the hinge 13 between segments 7A and 7C of mast 7 is closed increasingly further (fig. 3C, 3D).

[0039] Once support structure 4 has been fully erected, hydraulic actuator 14 is switched off. Hydraulic actuator 15 remains operative a little longer in order to urge the segments 7A, 7C, which tend to sag under the influence of their weight, to the fully straightened position in which hinge 13 is fully closed. This pivot connection is then fixed by the locking means. Pivoting connection 20 between the upper outer ends of masts 6, 7 could also be fixed in similar manner, as could the pivot connections between the lower outer ends 21, 22 of masts 6, 7 and base 5. This is however not necessary per se, as the triangular form of the erected support structure 4 is inherently stable. Both hydraulic actuators 14, 15 can then be made pressureless. It is otherwise possible to envisage also locking actuators 14, 15 by way of extra security. Support structure 4 is then ready for suspending of wheel 2 thereon (fig. 3E).

[0040] The invention thus makes it possible in rapid and safe manner to construct a relatively large fairground

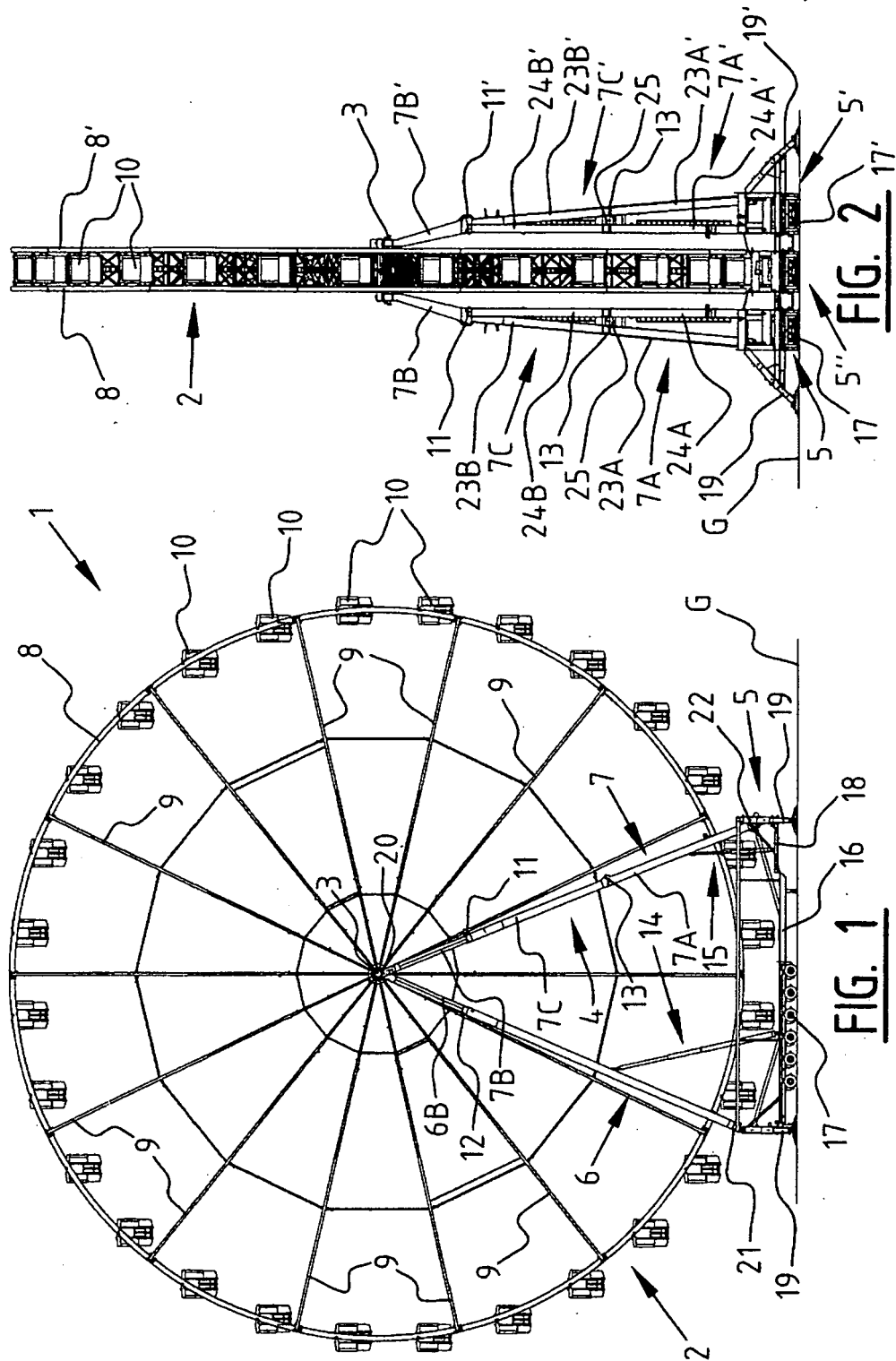
attraction from a relatively compact base. Although the invention is described above with reference to a number of embodiments, it will be apparent that it is not limited thereto. The form and dimensions of the masts and of the segments used therein can thus be varied. More segments than shown here could also be applied per mast, while the form and orientation of some hinges could also be chosen differently. The segments can further be moved in a manner other than by the hydraulic actuators shown here, for instance by means of electrically driven mechanisms or even using an external crane. The form and dimensions of the base can also be varied. Nor does the base necessarily have to be displaceable.

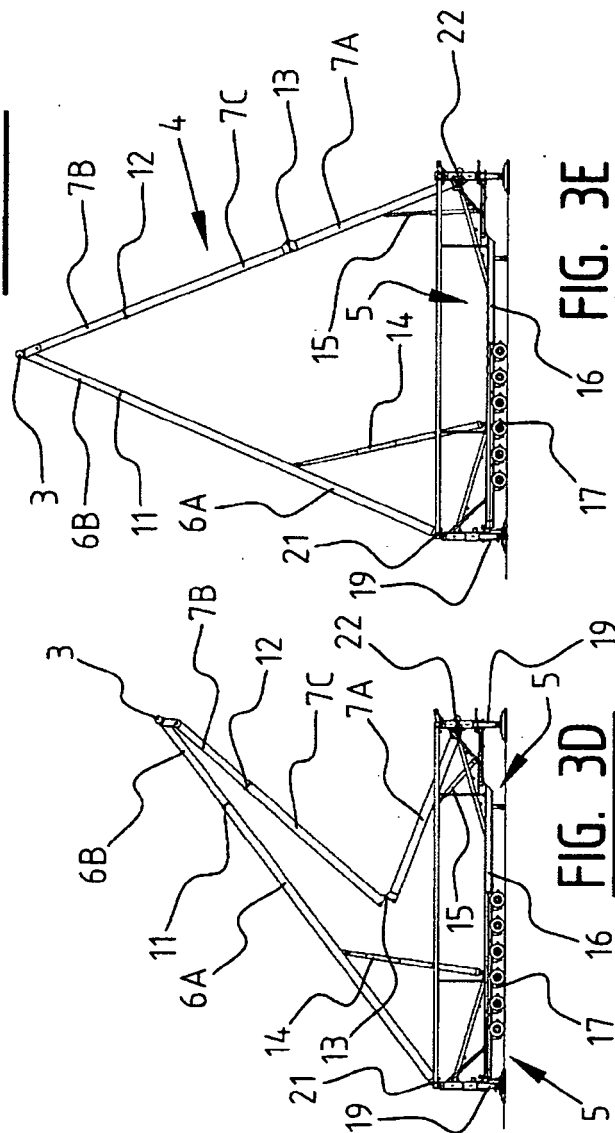
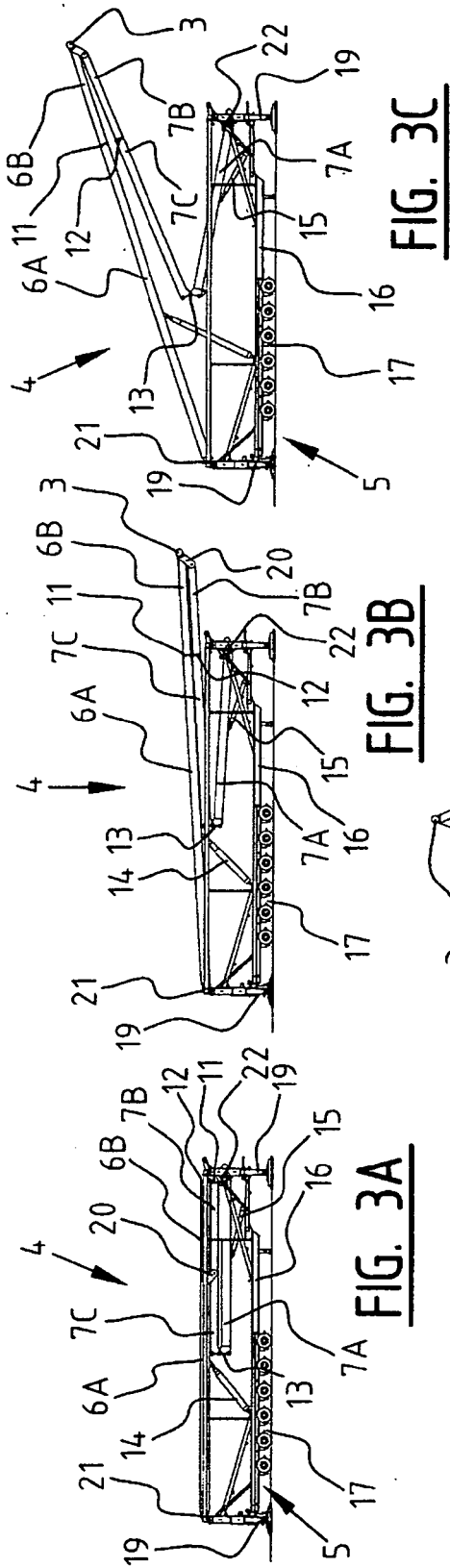
[0041] The scope of the invention is therefore defined solely by the appended claims.

Claims

1. Upright support structure for a fairground attraction, comprising a base and two masts which each extend obliquely upward from an outer end of the base and which are mutually connected at their upper outer ends and there form a bearing for suspension of a moving part of the fairground attraction, wherein the masts are collapsible and each consist of at least two segments connected pivotally to each other, **characterized in that** at least some of the segments are pivotable about an axis which is substantially parallel to an upright main plane defined by the masts and the base.
2. Upright support structure as claimed in claim 1, **characterized in that** one of the masts consists of more than two segments, some of which are pivotable about an axis which lies substantially perpendicularly of the upright main plane defined by the masts and the base.
3. Upright support structure as claimed in claim 2, **characterized in that** the segment which supports the upper end of the mast is pivotable about an axis which is substantially parallel to the upright main plane defined by the masts and the base, and the segments situated between the top segment and the base are pivotable about an axis lying substantially perpendicularly of the main plane.
4. Upright support structure as claimed in any of the foregoing claims, **characterized in that** each mast is pivotally connected at its lower end to the base and the support structure comprises means for erecting and collapsing the masts.
5. Upright support structure as claimed in claim 4, **characterized in that** the erecting and collapsing means comprise at least one hydraulic actuator arranged between the base and one of the masts.

6. Upright support structure as claimed in claim 5, **characterized in that** one of the masts has two segments and the other mast has three segments, and the hydraulic actuator is arranged between the base and the mast with the two segments. 5
7. Upright support structure as claimed in any of the claims 2-6, **characterized by** means for urging to a straightened position the segments of the one mast which are pivotable about the axis running perpendicularly of the main plane. 10
8. Upright support structure as claimed in claim 7, **characterized in that** the straightening means comprise at least one hydraulic actuator arranged between the base and this mast. 15
9. Upright support structure as claimed in any of the foregoing claims, **characterized by** remotely controllable means for locking at least some of the pivoting connections in their erected position. 20
10. Upright support structure as claimed in claim 9, **characterized in that** the locking means comprise at least one driven locking pin co-acting with openings in the segments connected by the hinge. 25
11. Upright support structure as claimed in any of the foregoing claims, **characterized in that** each mast has a cross-sectional form tapering from the base toward the upper outer end transversely of the upright main plane defined by the masts and the base. 30
12. Upright support structure as claimed in claims 6 and 11, **characterized in that** the segment of the mast with two segments which is connected to the base, the segment connected to the base and the segment of the mast with three segments connected thereto for pivoting about an axis lying perpendicularly of the main plane each consist of two legs together enclosing an acute angle. 35 40
13. Upright support structure as claimed in claim 12, **characterized in that** the legs are connected to each other at the position of the pivot axis lying perpendicularly of the main plane and close to their upper ends. 45
14. Upright support structure as claimed in any of the claims 6-13, **characterized in that** the segment of the mast with two segments which is connected to the base has substantially the same length as the base. 50
15. Upright support structure as claimed in any of the claims 3-14, **characterized in that** the segment which supports the upper end of the mast and which is pivotable about the axis running parallel to the main plane is substantially half the length of the base. 55
16. Upright support structure as claimed in any of the foregoing claims, **characterized in that** the base is displaceable and comprises a frame which is placed on an undercarriage and which is provided with means for attaching thereof to a tractive vehicle.
17. Fairground attraction, comprising at least one upright support structure as claimed in any of the foregoing claims and a moving part suspended therefrom, in particular a Ferris wheel or swing.
18. Fairground attraction as claimed in claim 17, **characterized by** two mutually parallel upright support structures arranged with intermediate spacing and between which the moving part is suspended.





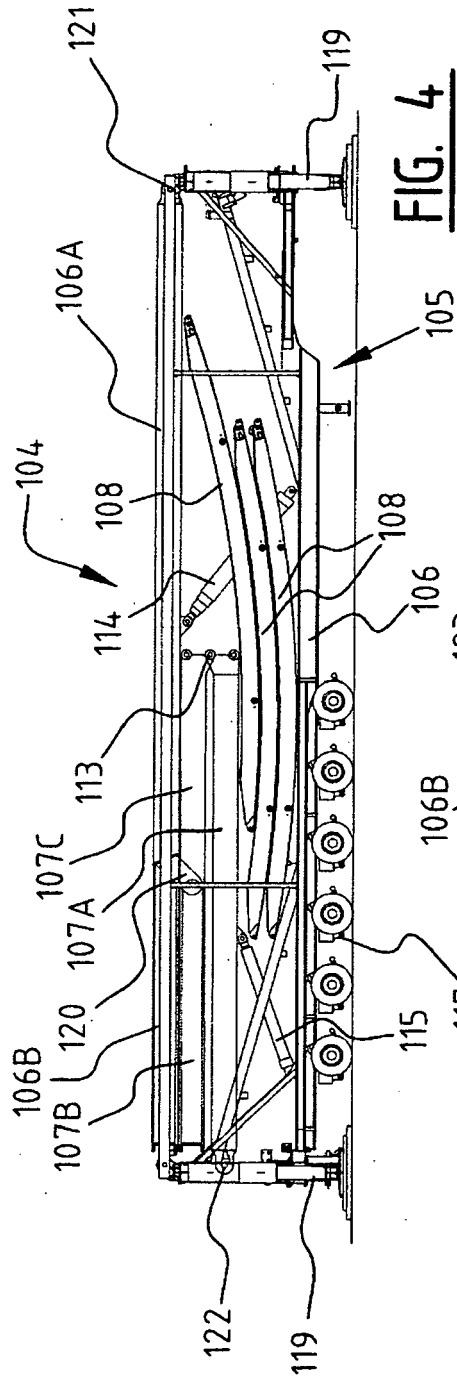


FIG. 4

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106B

107B

107C

107A

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Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT			
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Place of search Munich		Date of completion of the search 2 February 2009	Examiner Schut, Timen
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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