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(54) **MARIONETTE**  
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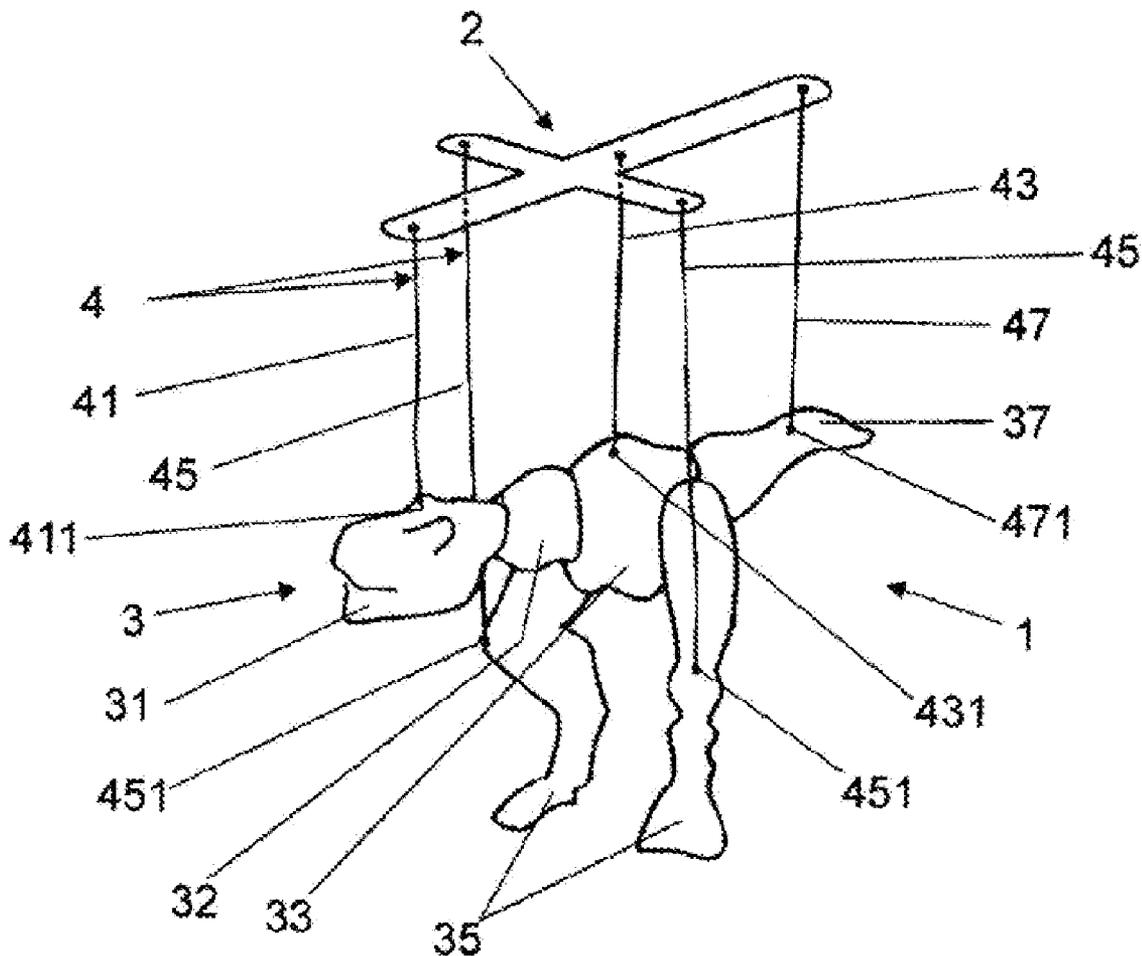
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(57) **ABSTRACT**  
A marionette **1** includes a **FIG. 3** having a number of segments, at least two segments connected by steering strings with a control device **(2)**. At least one active segment is connected with the control device **(2)** by the steering string exiting the surface of this segment at the steering point. An adjacent segment comprises a convex contact surface. Connectors **(5, 81)** exit these segments at the connecting points **(51, 55)** which are displaceable with regard to each other. A centroid of the convex contact surface **(71, 731, 75)** is located below the connecting point **(51, 531, 55)** of the convex contact surface. In a predefined free overhang position of the figure 3, a straight line **(312, 3321, 3322, 352)** extending between the connecting point **(51, 531, 532, 55)** of the active segment **(31, 33, 35)** and the steering point extends above the segment center of gravity.

**Publication Classification**

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**A63J 19/00** (2006.01)



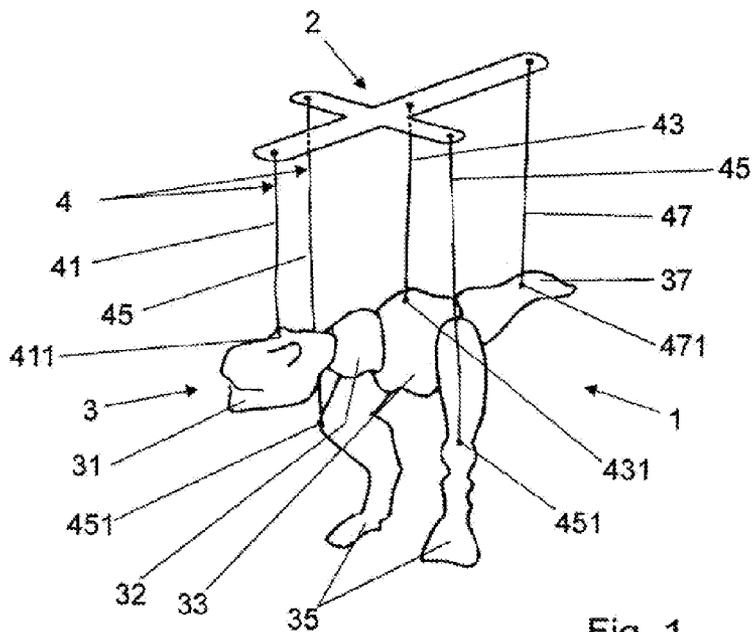


Fig. 1

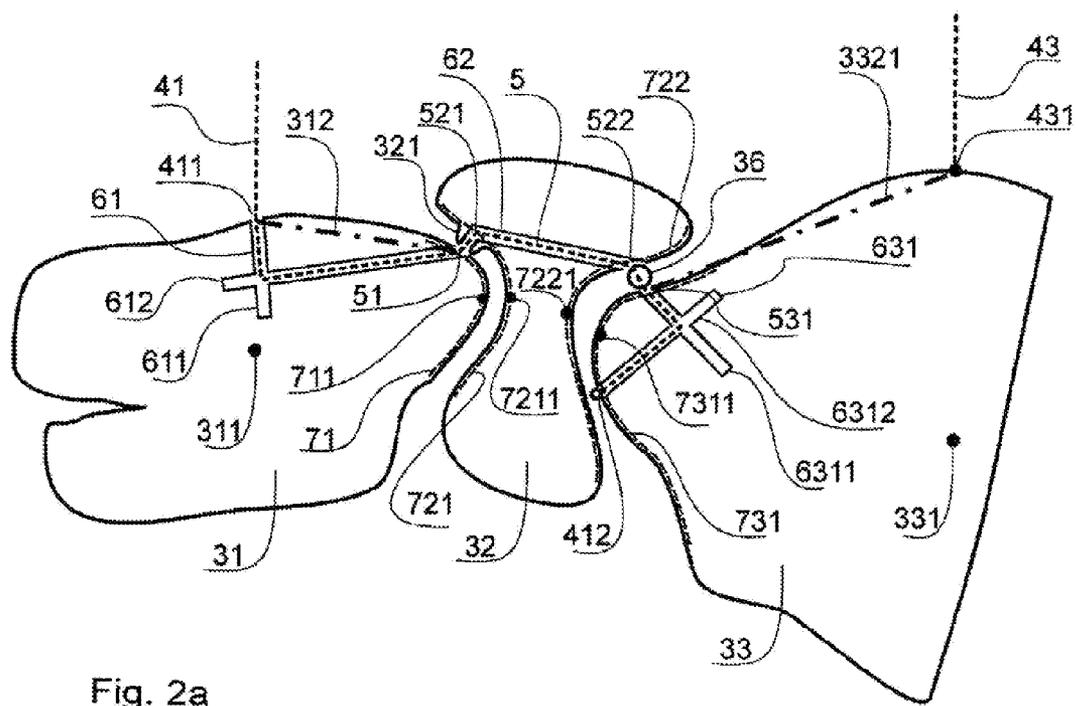


Fig. 2a

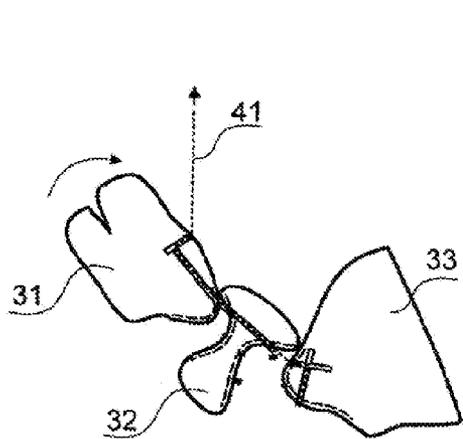


Fig. 2b

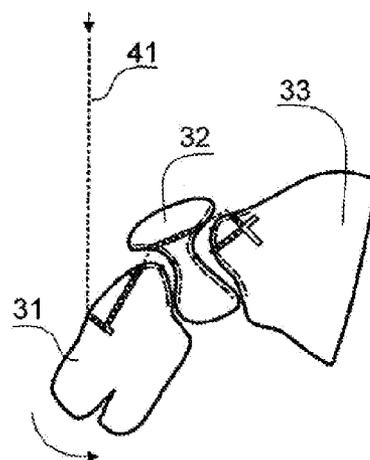


Fig. 2c

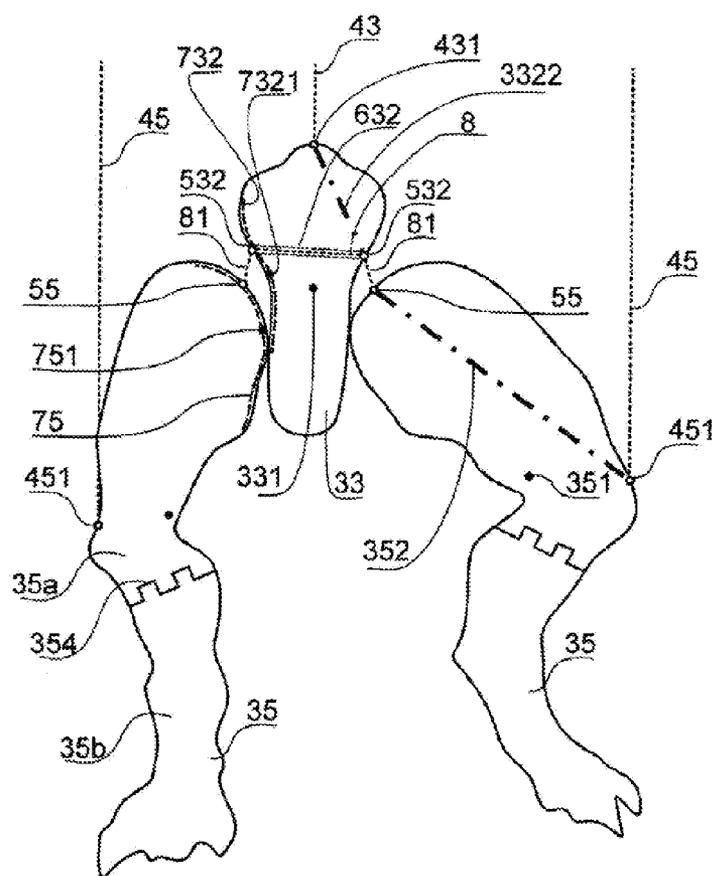


Fig. 3a

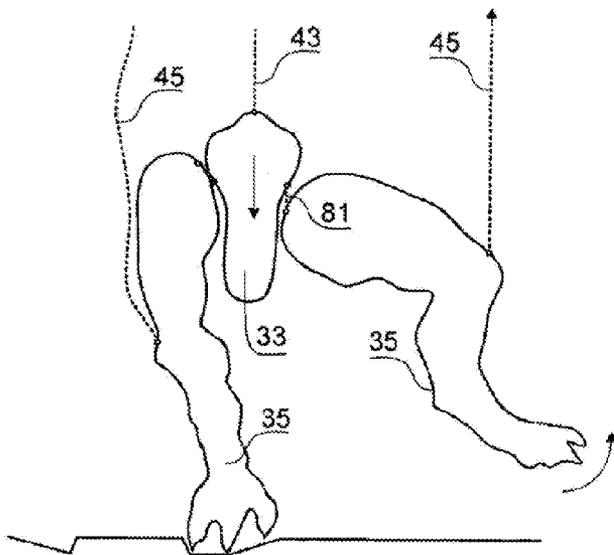


Fig. 3c

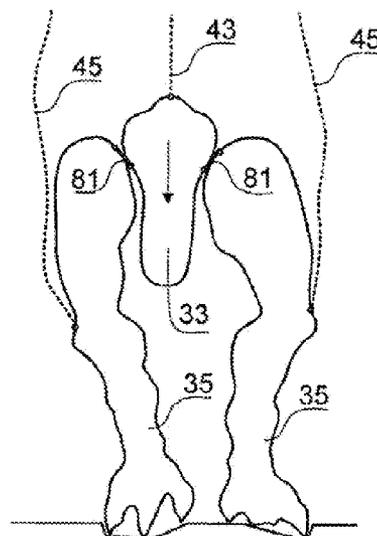


Fig. 3b

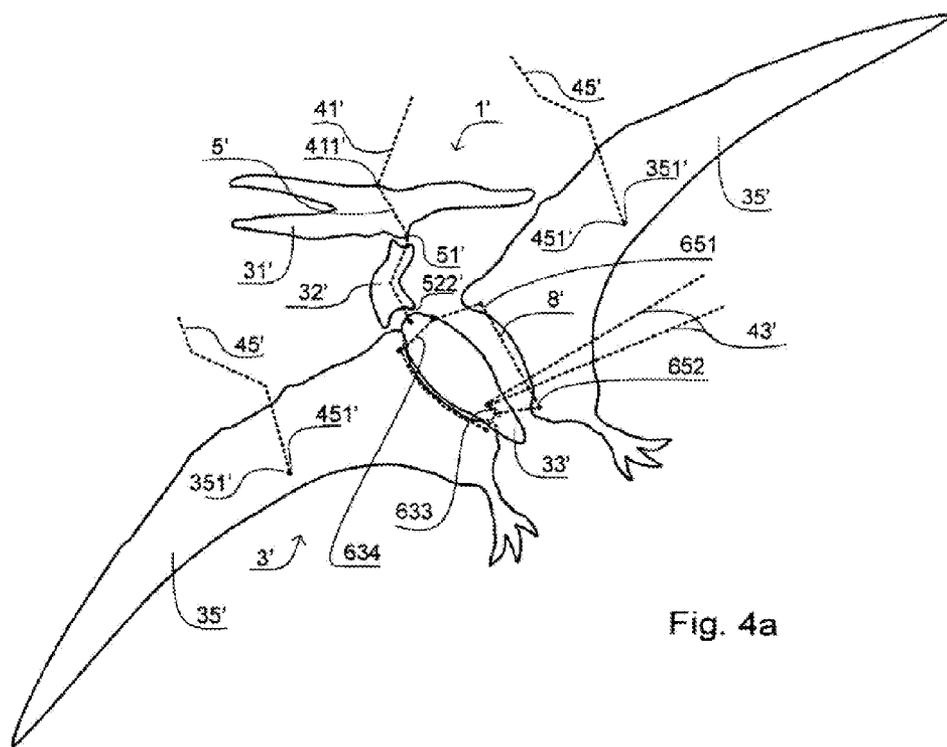


Fig. 4a

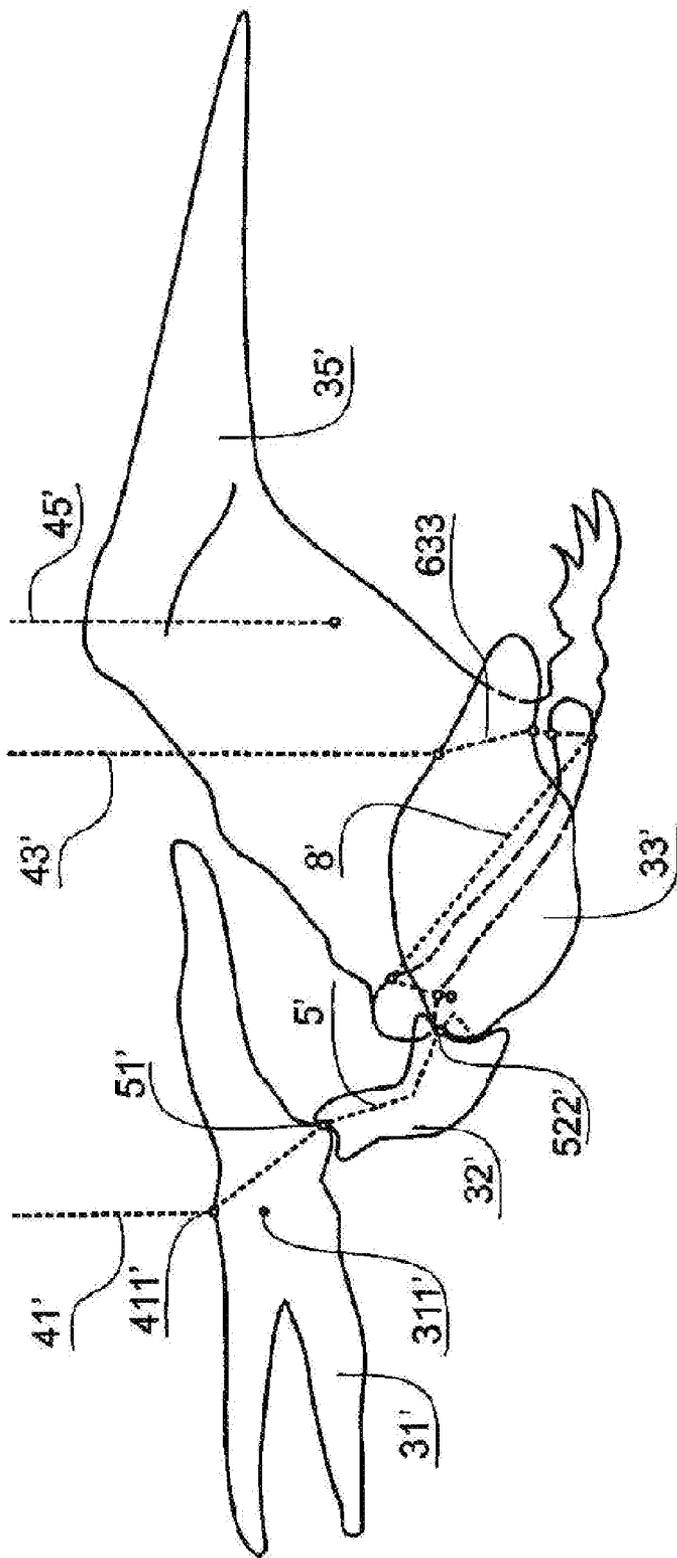


Fig. 4b

**MARIONETTE****CROSS REFERENCE TO RELATED APPLICATIONS**

**[0001]** This application is a National Stage of PCT International Patent Application no. PCT/PL2010/000129, filed 30 Dec. 2010, the contents of which are hereby incorporated by reference.

**TECHNICAL FIELD**

**[0002]** The invention relates to a marionette comprising a figure having a number of segments, wherein at least two segments are connected by means of steering strings with a control device and at least two segments are substantially rigid.

**BACKGROUND**

**[0003]** Various marionettes are known from the state of art.

**[0004]** U.S. Pat. No. 1,901,707 discloses a marionette toy comprising a figure having a shape of the human body consisting of a plurality of molded rigid sections connected with a plurality of strings wherein the segments are threaded on the strings and form spheroid joints.

**[0005]** U.S. Pat. No. 4,048,749 discloses a hand operated puppet which is operable from overhead puppet strings with the generally articulated figure of a bird. A plurality of styro-foam and fabric balls are strung together to form the legs and body with strips of fake fur attached to the body balls, and feathers on the head. The segments of the puppet are slidably threaded on a string and connected with hands and a neck which freely collocates along a catenary curve.

**[0006]** U.S. Pat. No. 4,425,388 discloses a flight simulating mobile device. According to this invention any of a variety of different bird, butterfly or like flying creatures may be fabricated of plastic or like material, readily assembled, and balanced in such manner that when suspended in air current the same provides a realistic replication of a creature in flight. The device has a shape of a bird having wings attached via hinges enabling for a rotational movement of each wings in one pivotal axis.

**[0007]** Other marionette arrangements comprising rigid segments are disclosed for example in the following U.S. patents: U.S. Pat. No. 2,113,839; U.S. Pat. No. 6,827,626; U.S. Pat. No. 2,202,677; U.S. Pat. No. 2,238,455; U.S. Pat. No. 2,662,338; U.S. Pat. No. 3,195,265; U.S. Pat. No. 4,690,655 and U.S. Pat. No. 5,254,029.

**[0008]** Figures of prior art marionettes generally comprise rigid segments with articulated limbs, wherein means connecting adjoining segments such as strings or joints are either visible or masked for example by clothes of a marionette.

**[0009]** In other solutions of this kind limbs of a figure are soft or made of many articulated segments. In general they collocate along a catenary curve and in a direction opposite to the direction of natural genuflection, wherein an appropriate weight is most commonly placed in a rigid foot segment to which a steering string is attached. Although such solutions provide an aesthetic appearance of a marionette figure and its good movement capabilities they may not accurately reflect the movement of the animal they depict.

**[0010]** On the other hand known marionettes that accurately reflect the quality of their real originals are provided with control arrangements that are complicated and thus difficult to operate.

**[0011]** In general known marionettes do not provide sufficient freedom in designing a shape of marionette figure which freedom is strongly restricted by the necessity for providing appropriate movement capabilities of a figure.

**SUMMARY OF THE INVENTION**

**[0012]** Therefore an object of the present invention was to provide a marionette the construction of which would substantially increase the freedom in developing new and original shapes of the figure in comparison with the prior art solutions, wherein such a marionette would also have a relatively simple construction and would be easier to operate.

**[0013]** According to the present invention there is provided a marionette as described in the outset, wherein a connection between at least one active segment, which is connected with the control device by means of the steering string exiting the surface of this segment at the steering point, and an adjacent segment comprises a convex contact surface on one of these segments and a connection means exiting the surfaces of these segments at the connecting points, wherein said connecting points are displaceable with regard to each other, a centroid of said convex contact surface is located below the connecting point of the segment comprising this surface, and in the predefined free overhang position of the figure straight line between the connecting point of said active segment and the steering point of this segment extends above the gravity centre of this segment.

**[0014]** A “free overhang position” according to the present invention denotes a state of a marionette in which its figure is in a predetermined initial configuration, freely hanged in the air on steering strings with no segments resting on any supporting surface wherein a control device is oriented in its primary, in most cases substantially horizontal, position.

**[0015]** The term “contact surface” according to the present invention is a set of points on the surface of a segment in which the segment contacts the adjacent segment connected therewith for the whole range of possible mutual movements between these segments.

**[0016]** The term “centroid” should be according to the invention understood as a geometric centre of the shape of a contact surface.

**[0017]** The term “steering point” according to the present invention is a point in which a steering string is led out from the volume of a segment or a point in which a steering string is attached to the surface of a segment.

**[0018]** The term “connection point” means a point in which connection means are led out from the volume of a segment or a point in which connection means are attached to the surface of a segment.

**[0019]** The term “connection means” should be understood as any means enabling for connecting adjacent segments in such a manner that their connection points are displaceable with regard to each other, such as string or chain.

**[0020]** The term “active segment” in particular denotes according to the present invention an outermost active segment connected solely with one passive segment.

**[0021]** In a preferred embodiment of a marionette according to the present invention a centroid of a contact surface on the other segment of said connection is located below the connecting point of this segment comprising this contact surface.

**[0022]** Said connection between two segments of a marionette advantageously comprises a convex contact surface on

one of these segments, and a concave contact surface on the other segment of said connection.

**[0023]** A steering string of at least one active segment exits the surface of this segment at a steering point advantageously located in the surroundings of the vertical axis crossing the gravity centre of this segment.

**[0024]** According to the present invention at least, one active segment is preferably disposed slidably on a string and in the predefined free overhang position of a figure presses its adjacent segment.

**[0025]** Preferably a connection between two segments comprises a distancing element disposed on the connection means between these segments.

**[0026]** At least one segment preferably comprises two axial channels crossing each other for a string.

**[0027]** In some embodiments it may be advantageous that at least one of segments of a figure is/are provided with at least one sound emitting device and/or light emitting device and/or camera to register the surrounding of the figure which is/are advantageously controlled by manipulator.

**[0028]** A figure of a marionette according to the present invention is advantageously assembled from a set of pieces, and in particular a set of pieces forming a construction puzzle wherein in particular said pieces are advantageously connected by means of a releasable frictional connection.

**[0029]** According to one of the preferred embodiments a marionette figure includes at least one base segment depicting the body of the figure and at least two side segments adjacent to said base segment and connected with a control device.

**[0030]** Said side segments may advantageously depict legs of a marionette figure and between said base segment and said side segments a loose part of a string is preferably disposed.

**[0031]** Side segments of a marionette according to the present invention may also preferably depict wings of a marionette figure, wherein said base segment is connected with said side segment by means of a string in at least two points and said side segment is preferably slidably disposed on this string.

**[0032]** The solution according to the present invention minimizes friction forces generated in joint connections between particular segments of a marionette figure.

**[0033]** In a result of this according to the present invention in a free overhang position segments always form the same predefined by a designer figure of a marionette, i.e. segments are self-aligned into a predefined overhang position by gravitational force.

**[0034]** Moreover active segments may be dislocated from the aligned predefined overhang position (constituting de facto an arrangement of unstable equilibrium) by applying very small forces acting on steering strings.

**[0035]** Structure of a connection according to the present invention enables for covering up the area of a joint between adjacent segments thereby making it invisible from the outside and making an impression of integrity of the shape of a marionette figure formed by a number of separate segments.

**[0036]** In comparison with a great majority of known marionettes having figures composed of rigid segments forming lower kinematic pairs, in a marionette according to the present invention figure segments are connected forming higher kinematic pairs.

**[0037]** A marionette according to the present invention provides for a designer considerably greater degree of freedom in developing new and original shapes of its figure in comparison with prior art solutions.

**[0038]** A solution of the present invention features superb motional properties making their movements very natural and truly imitative for real movements even when being steered with a use of a simple ordinary control device handled by a child, which a marionette is primarily designed for.

**[0039]** Finally a solution according to the present invention enables fast and easy collapsing a marionette into the rest position (taking much less space than in working position) and placing it inside an appropriate container for the purpose of storing and transporting, as well as fast and easy unpacking it from the container to put it into the working (free overhang) position.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0040]** These and other objects and advantages of the present invention will be fully apparent from the following description when taken in connection with the annexed drawings, in which:

**[0041]** FIG. 1 is a perspective view of the first exemplary embodiment of a marionette according to the present invention in a free overhang position,

**[0042]** FIG. 2a is a cross sectional view of the first exemplary embodiment of segment connection according to the present invention for the marionette of FIG. 1,

**[0043]** FIGS. 2b and 2c present schematic views of the connection of FIG. 2a in two terminal positions of the opposed dislocation of a head segment,

**[0044]** FIG. 3a is a front view of the second exemplary embodiment of segment connection according to the present invention for the marionette of FIG. 1,

**[0045]** FIG. 3b presents schematic view of the connection of FIG. 3a with leg segment steering strings being unstrained,

**[0046]** FIG. 3c presents schematic view of the connection of FIG. 3a with one leg segment raised up, and

**[0047]** FIGS. 4a. and 4b present the second embodiment of a marionette according to the present invention in a schematic perspective and side view respectively.

#### DETAILED DESCRIPTION OF THE INVENTION

**[0048]** As shown in FIG. 1, a marionette 1 comprises a multi-segment FIG. 3, which in the presented embodiment has a form of a dinosaur, and a control device 2. The control device 2 is made of plastic material and has a form of a four-armed cross-piece element which in the presented free overhang position is oriented horizontally.

**[0049]** The FIG. 3 comprises six rigid plastic segments depicting a head 31, a neck 32, a body 33, a tail 37 and two legs 35 of a dinosaur. Segments 31, 33, 35 and 37 to which in steering points 411, 431, 451, 471 respective steering strings 41, 43, 45 and 47 are attached, are active segments, whereas the segment 32 is a passive segment.

**[0050]** Generally according to the present invention a number of passive segments between the adjacent active segments is not restricted in any way; no passive segment may also be used.

**[0051]** The second ends of steering strings 4 are attached to the cross-controller 2, wherein the steering strings 41, 45 and 47 are attached to the outer ends of the controller arms and the steering string 43 is attached near the centre of the device 2.

**[0052]** The segments of marionette 1 are coupled via specific connections according to the present invention, the exemplary illustrative embodiments of which are presented in details in FIGS. 2a-2c and 3a-3c.

[0053] FIG. 2a presents a construction of a connection between two active segments 31 and 33 separated by the passive neck segment 32, wherein the construction is presented for the free overhang position shown in FIG. 1.

[0054] The head segment 31, the neck segment 32 and the body segment 33 are disposed slidably on the string 41, 5 which is conducted in through channels formed in these segments wherein the end of the string 41, 5 opposite to the end connected to the control device is blocked against being drawn into the internal channel 631, 6312 of the body segment 33 by means of a blocking element 412 fixed or formed on its end.

[0055] In this connection embodiment, the section of the string exiting the top surface of the head segment 31 forms the steering string 41 while the remaining length of the string forms a connecting string 5 coupling the head segment 31 with the neck segment 32 as well as the neck segment 32 with the body segment 33.

[0056] The connection string 5 connecting series of segments 31, 32, 33 is conducted via internal through channels 61, 62, 631 of the segments and exits their surfaces in the connecting points 51, 521, 522, 531.

[0057] The through channels 61, 631 of the head segment 31 and the body segment 33 are formed by pairs of perpendicular intersectional channels 611, 612, 6311, 6312 respectively.

[0058] Each of two connections presented in the drawings comprises two corresponding contact surfaces 71, 721, 722, 731, the centroids 711, 7211, 7221, 7311 of which are located below of respective connecting points 51, 521, 522, 531 located on these contact surfaces.

[0059] The contact surface comprises according to the present invention a set of points on the surface of a marionette figure segment in which the segment contacts the adjacent segment connected therewith for the whole range of possible mutual movements between these segments. For example in the presented marionette embodiment in the plane of the sectional view, the boundary points of the envelope circumference curve of the contact areas 71, 721, 722, 731 are the points of contact between the segments 31, 32, 33 in two extreme dislocations of the head segments as presented in FIGS. 2b and 2c.

[0060] In the presented embodiment the contact areas 71, 731 of the active segments 31, 33 are convex while the contact areas 721, 722 of the passive segment 32 are concave.

[0061] The connecting points 51, 521, 522, 531 located in the outlets of the through channels 61, 62, 631 located on the contact areas 71, 721, 722, 731 through which connecting sections of the string 41, 5 exit from the segments 31, 32, 33 (thus the outlets represent connection points according to the present invention), are placed above the respective centroids 711, 7211, 7221, 7311.

[0062] The outlet 411 of the channel 61 of the head segment 31 through which the steering string section 41 connected to the control device is led out (thus the outlet represents a steering point according to the present invention) is placed on the vertical axis running through the gravity centre 311 of the head segment 31.

[0063] Also the steering point 431 of the steering string 43 of the body segment 33 is located on the vertical axis running through the gravity centre 331 of the segment 33.

[0064] Locating a steering point in the surroundings of the vertical axis crossing the gravity center of a segment is not essential feature according to the present invention however

in some embodiments it may be advantageous for outermost active segments, especially for segments which do not contact ground and do not transmit a weight of figure, such as for example head, arm or wing segments.

[0065] The outlet of the through channel 62 of the passive segment 32 constituting the connecting point 521 on the contact area 721 is rimmed by a distancing collar 321. Between the marionette segments 32, 33 on the connecting string 5 a distancing slidable element in a form of a small bead 36 is threaded. Using distancing elements such as distancing collars or slidable distancing beads is optional according to the present invention.

[0066] For the active segments 31, 33, the straight lines 312, 3321 between their connecting points 51, 531 and their steering points 411, 431 extend over the centers of gravity 311, 331 of these segments.

[0067] An internal route of a segment through channel is not essential feature according to the present invention. A crucial requirement is however that a connecting/steering string exits the surfaces of these segments which are coupled by it at connecting points located above the centroids of contact surfaces of a connection between the segments.

[0068] FIG. 2b shows a structure of the connection of FIG. 2a where the head segment 31 is after risen up by pulling up its steering string 41. In consequence of a movement of the head segment 31 also the passive neck segment 32 has been dislocated. As shown the corresponding contact surfaces of the segments are set apart for a greater distance from each other while the steering/connecting string has been tensioned into a straight line-like form.

[0069] FIG. 2c shows a structure of the connection of FIG. 2a after moving the head segment 31 down by displacing its steering string 41 downwards. In comparison to FIG. 2b, except for dislocation of the passive neck segment 32, additionally a visible considerable increase of the length of the connection section of the steering/connecting string occurred between the neck segment 32 and the body segment 33 as well as between the neck segment 32 and the head segment 31.

[0070] Each of exemplary connections presented in FIGS. 2a-2c comprises one convex contact surface and corresponding one concave contact surface. However it should here be noted that crucial requirements according to the present invention are that a connection has to comprise at least one convex contact surface and that a centroid of this contact surface is located below the connecting point of the segment comprising this connecting surface. A shape of a corresponding contact surface and location of a connection point on the other segment are inessential for obtaining the advantageous results of the present invention. The other connecting surface would be for example flat, however concavity of the surface is very advantageous as it enables for hiding an area of a connection making an impression of figure integrity.

[0071] FIG. 3a presents a construction of a connection between the active body segment 33 and two active leg segments 35 of the FIG. 3 presented in FIG. 1 in a free overhang position. As shown, each leg segment 35 is connected to the body segment 33 via a connecting string 8. The ends of the connecting string 8 are fixedly attached to the leg segments 35 in connecting points 55 and the string 8 exits the surface of the body segment 33 in connecting points 532 forming external sections 81, which in a free overhang position are of equal lengths, and an internal section conducted via a horizontal transverse through channel 632 formed in the body segment 33.

[0072] In this connection configuration the connecting points 55, 532 are located above the centroids 7321, 751 of the corresponding contact surfaces 732, 75 of the segments 33, 35.

[0073] In this embodiment, as contrasted with the connection shown in FIGS. 2a-2c, both contact surfaces 75, 732 of each connection are convex.

[0074] Similarly to the connection embodiment of FIGS. 2a-2c, for each of segments 33, 35 the straight line 3322, 352 between the connecting points 532, 55 and the steering points 431, 451 extend over the centers of gravity 331, 351 of the segments 33, 35.

[0075] In this embodiment the leg segment 35 is composed of two pieces 35a, 35b connected with each other by means of a releasable frictional connection 354.

[0076] In other embodiments of a marionette figure according to the present invention, set of pieces of a segment is preferably designed to form a construction puzzle.

[0077] FIGS. 3b and 3c illustrate a functionality difference between the connection embodiments of FIGS. 2a-2c and FIG. 3. It is visible that owing to a fixed connection of the ends of the string 8 to the leg segments 35, the leg segments may transmit a weight of the body segment 33 on the ground. In FIG. 3b the structure of FIG. 3a (presented there in a free overhang position) is presented in a standing position with all steering strings 43, 45 being unstrained (what is represented by wavy lines) while the weight of the body segment 33 is transmitted on the ground by two strained connecting sections 81 of the connecting string 8 and the leg segments 35. In FIG. 3c the structure of FIG. 3a is presented in an intermediate phase of taking a step, the right leg segment 35 is lifted over the ground by pulling up its steering string 45. The steering strings 45, 43 of the remaining left leg segment 35 and body segment 33 are unstrained wherein the whole weight of the body segment 33 is transmitted on the ground by one strained left connecting section 81 of the connecting string 8 and the second left leg segment 35.

[0078] FIGS. 4a and 4b show second embodiment of a marionette V according to the present invention. The marionette FIG. 3' represents a pterosaur and comprises four active segments including a head segment 31', a body segment 33', and two similar side segments 35' representing wings of the pterosaur, and one passive neck segment 32'.

[0079] The head segment 31', the neck segment 32' and the body segment 33' are coupled via a string 5' forming connections in the similar manner as presented in FIGS. 2a-2c, wherein between the corresponding contact surfaces no distance element (neither a distancing collar nor a distancing bead) is arranged and the corresponding contact surfaces are directly contacting with each other.

[0080] The wing segments 35' are coupled to the body segment 33' via a second connecting string 8' of the steering strings 43' of the body segment 33'. The steering strings 43' of the body segment 33' are virtually the terminal sections of one string the middle section of which forming the connecting string 8' is conducted via appropriate through channels formed in the body segment 33' and in the wing segments 35' for coupling these segments with each other.

[0081] The segments 33', 35' are slidably disposed on the connecting string 8'. Each of the wing segments 35' is provided with one steering string 45' fixed to its top surface in the steering point 451' determined by the vertical axis running through the centre of gravity 351' of the segment 35', and comprises two channels 651, 652 for the connecting string 8'

wherein each channel 651, 652 is formed from two crossing sections oriented perpendicularly to each other.

[0082] The body segment 33' is provided with a substantially (slightly backhanded) vertical through channel 633 into which from the above the steering string 43' is introduced. The steering string 43', from now as the connecting string 8'/exits the body segment 33' through the bottom outlet of the channel 633 and enters the rear channel 652 of the left wing segment 35', and then runs through the front channel 651 of the segment 35'. After exiting the left segment 35' the connecting section 8' enters back to the body segment 33' via its transverse horizontal through channel 634. Further the string is led outside the body segment 33' and is conducted successively via front and rear channels 651, 652 of the right wing segment 35' and then is again introduced into the body segment 33' through the bottom outlet of the vertical channel 633, and finally is led out of the body segment 33' as the second steering string 43' connected to the control device.

[0083] In order to improve a functionality of a marionette according to the present invention their segments may be provided with sound and/or light emitting device(s) which preferably is(are) operated and controlled by manipulator. One of segments may also be provided with a camera to register the external environment which is also advantageously controlled by manipulator.

[0084] The above embodiments of the present invention are merely exemplary. The drawings are not necessarily to scale and some features may be exaggerated or minimized. It will be understood by persons skilled in the relevant art that various changes in the form and details can be made therein without departing from the spirit and scope of the invention. These and other factors however should not be considered as limiting the spirit of the invention, the intended scope of protection of which is indicated in appended claims.

1. A marionette comprising a figure having a number of segments, wherein at least two segments are connected by steering strings with a control device and at least two segments are substantially rigid, a connection between at least one active segment, which is connected with the control device by a steering string exiting a surface of the at least one active segment at a steering point, and an adjacent segment comprises

a convex contact surface located on one segment and a connector exiting surfaces of the segments at the connecting points,

wherein

said connecting points are displaceable with regard to each other,

a centroid of said convex contact surface is located below the connecting point of the segment having the convex contact surface, and

in a predefined free overhang position of the figure, a straight line located between the connecting point of said at least one active segment and the steering point of said at least one active segment extends above a center of gravity thereof.

2. The marionette according to claim 1, wherein a centroid of a contact surface on the adjacent segment of said connection is located below the connecting point thereof.

3. The marionette according to claim 1, wherein the connection between two segments comprises

a convex contact surface on one, segment connected to a concave contact surface on another segment.

4. The marionette according to claim 1, wherein the steering string of at least one active segment exits a surface thereof at the steering point located in an area surrounding a vertical axis crossing a center of gravity of the at least one active segment.

5. The marionette according to claim 1, wherein the at least one active segment is disposed slidably on a string, and in the predefined free overhang position of the figure, presses against the adjacent segment.

6. The marionette according to claim 1, further comprising disposed on the connector located between the connected segments.

7. The marionette according to claim 1, wherein at least one segment has two axial channels which cross each other for receiving a string.

8. The marionette according to claim 1, wherein at least one segment has at least one sound emitting device.

9. The marionette according to claim 1, wherein at least one segment has at least one light emitting device.

10. The marionette according to claim 1, wherein at least one segment has at least one camera.

11. The marionette according to claim 1, wherein the figure is assembled from a set of pieces.

12. The marionette according to claim 11, wherein said pieces are connected by a releasable frictional connection.

13. The marionette according to claim 1, further comprising at least one base segment depicting a body of the figure and at least two side segments adjacent to said base segment and connected with the control device.

14. The marionette according to claim 13, wherein said side segments depict legs of the figure and between said base segment and said side segments, a loose part of a string is disposed.

15. The marionette according to claim 13, wherein said side segments depict wings of the figure, wherein the base segment is connected with said side segment by a string in at least two points and said side segment is slidably disposed on the string.

16. The marionette according to claim 8 further comprising a manipulator for controlling the at least one sound emitting device.

17. The marionette according to claim 9 further comprising a manipulator for controlling the at least one light emitting device.

18. The marionette according to claim 11, wherein the set of pieces form a construction puzzle.

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