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(54) **TRANSFORMABLE CONSTRUCTION TOY**

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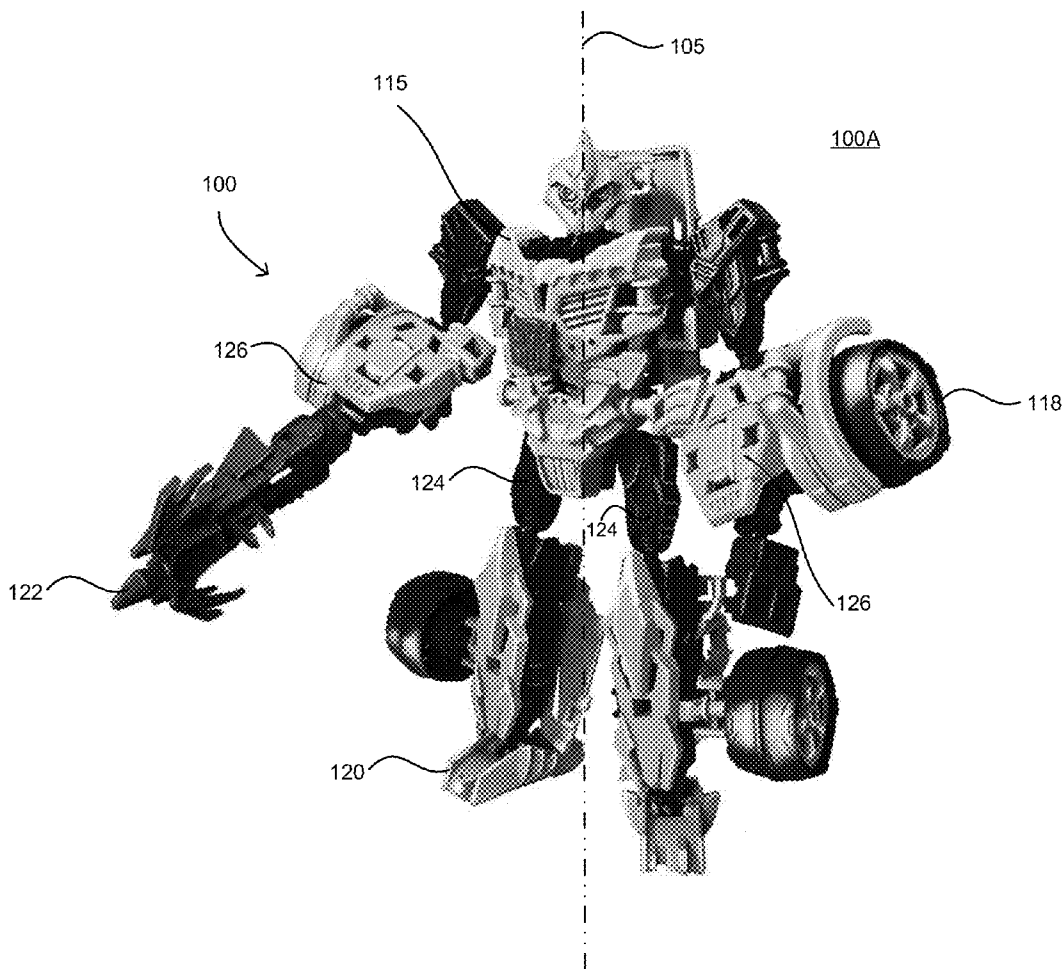
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USPC **446/102**

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- (60) Provisional application No. 61/835,558, filed on Jun. 15, 2013.

(57) **ABSTRACT**
A toy construction set includes a plurality of interconnecting toy construction pieces, the pieces being connectable to build a toy that reversibly transforms between a first toy form and a second toy form, the first toy form defining a longitudinal axis in a first plane and the second toy form defining a longitudinal axis in a second plane that has a surface normal that is different from a surface normal of the first plane; and a bidirectional transformation module. The bidirectional transformation module includes a body defining a first connector and a second connector, the first connector coupled to a first piece included in the plurality of interconnecting toy construction pieces, and the second connector coupled to a second piece included in the plurality of interconnecting toy construction pieces; and a flexible portion between the first and second connectors.



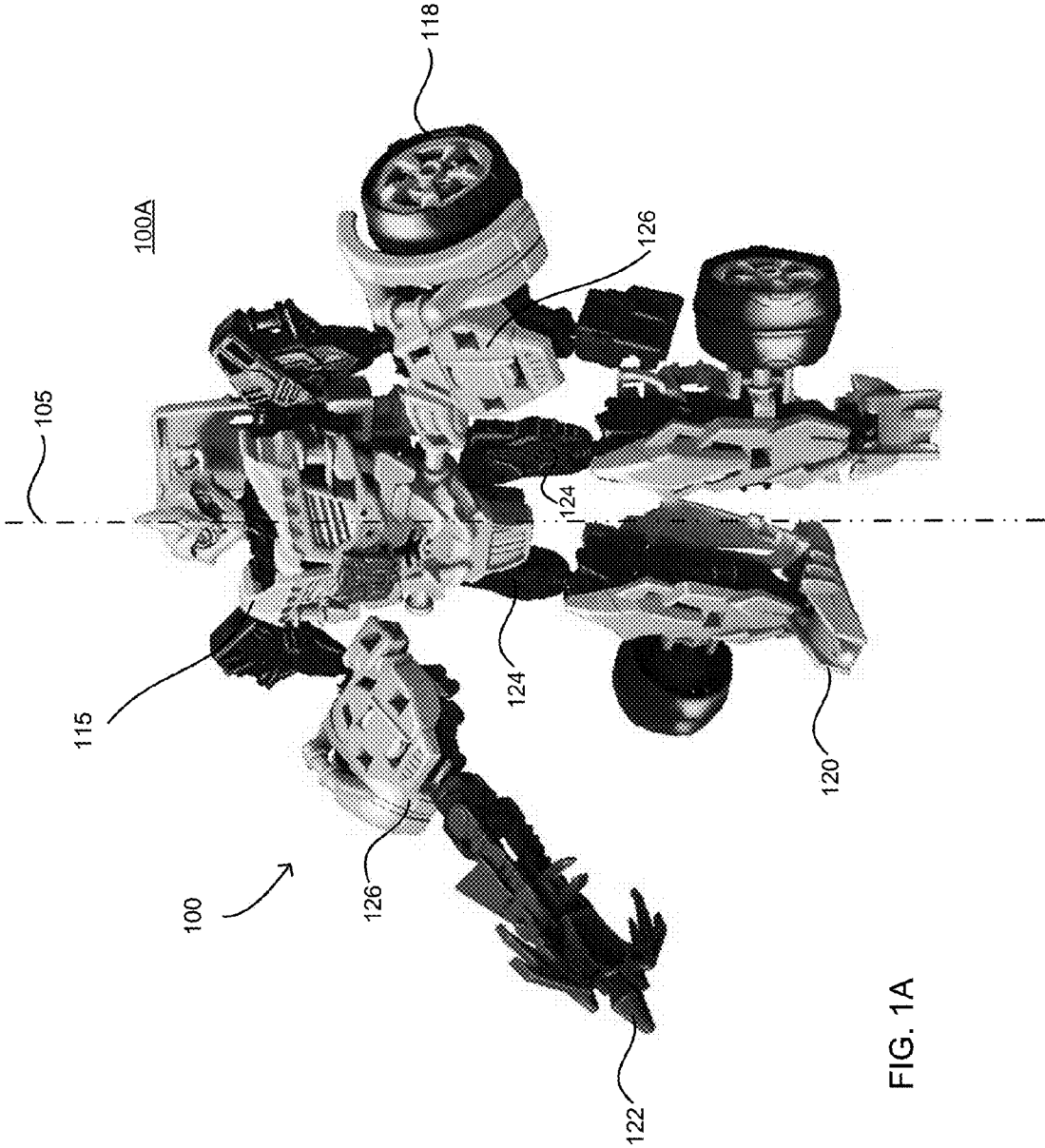


FIG. 1A

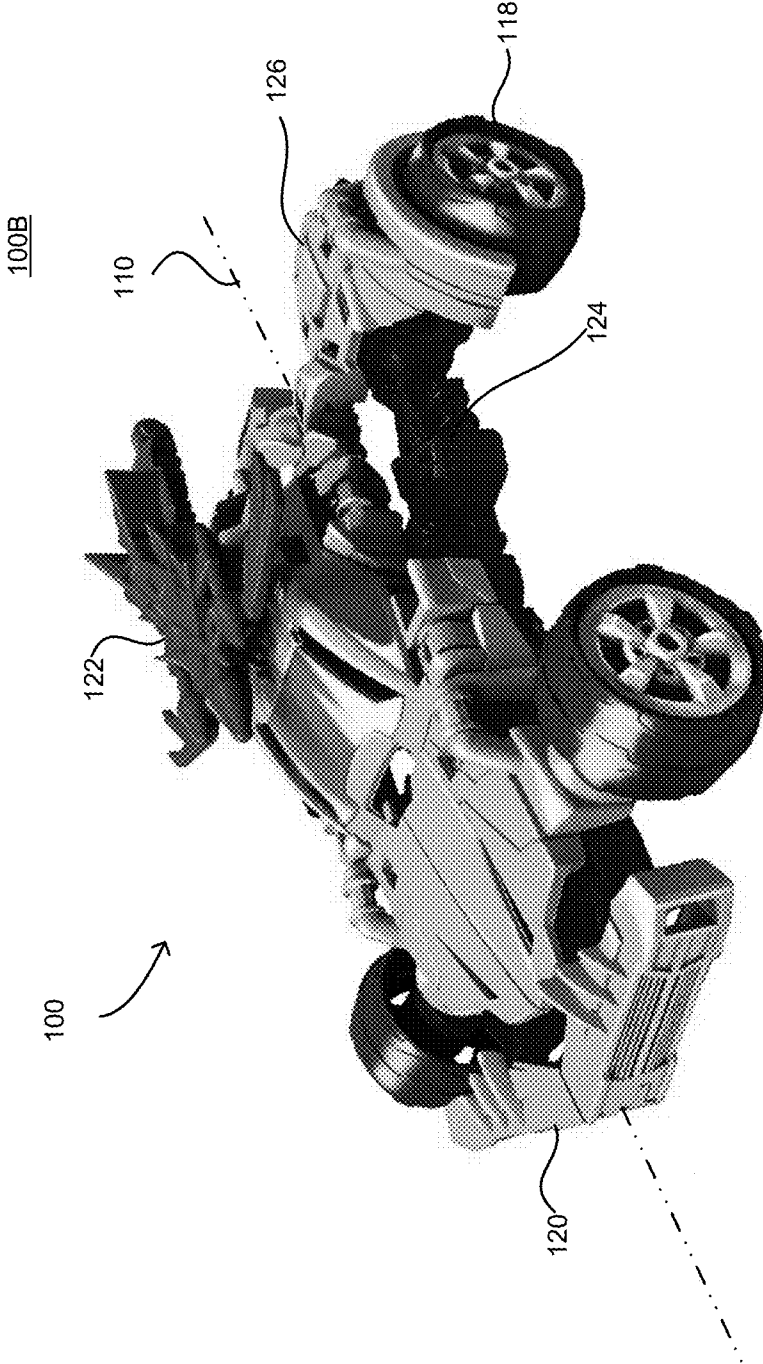


FIG. 1B

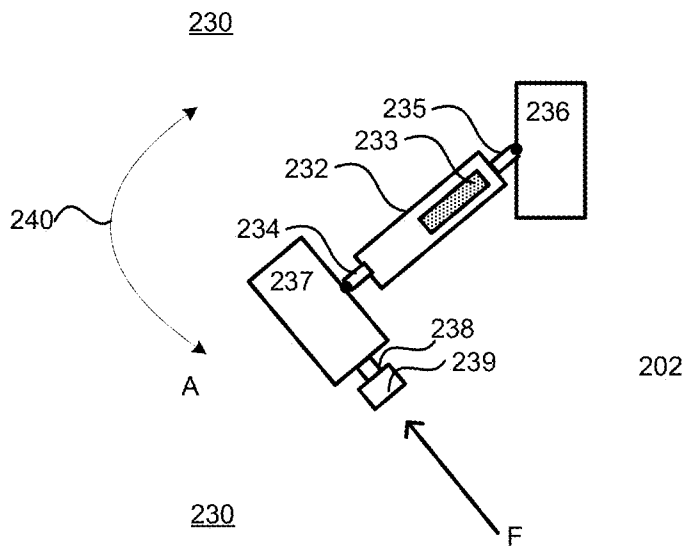


FIG. 2A

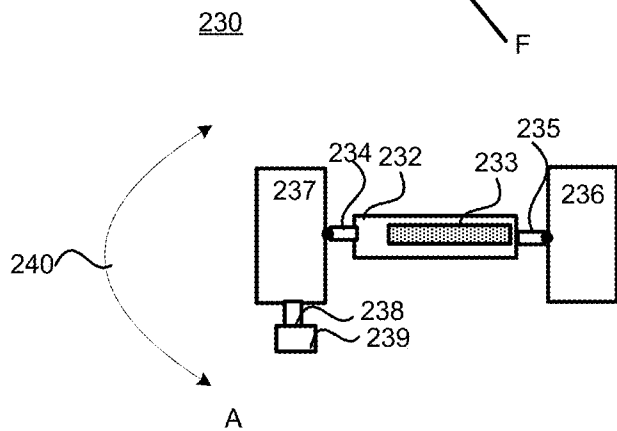


FIG. 2B

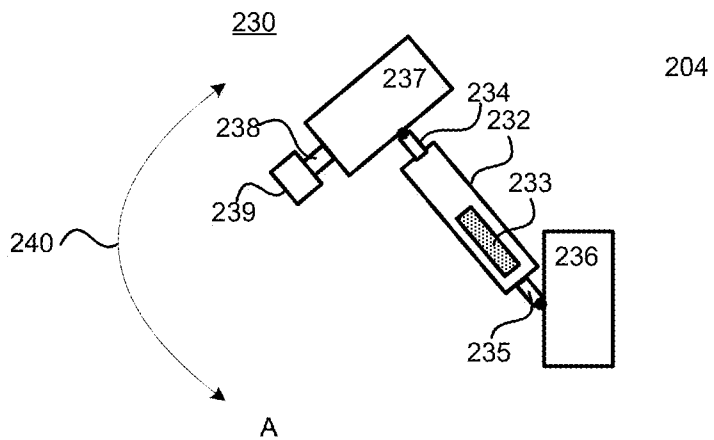


FIG. 2C

330

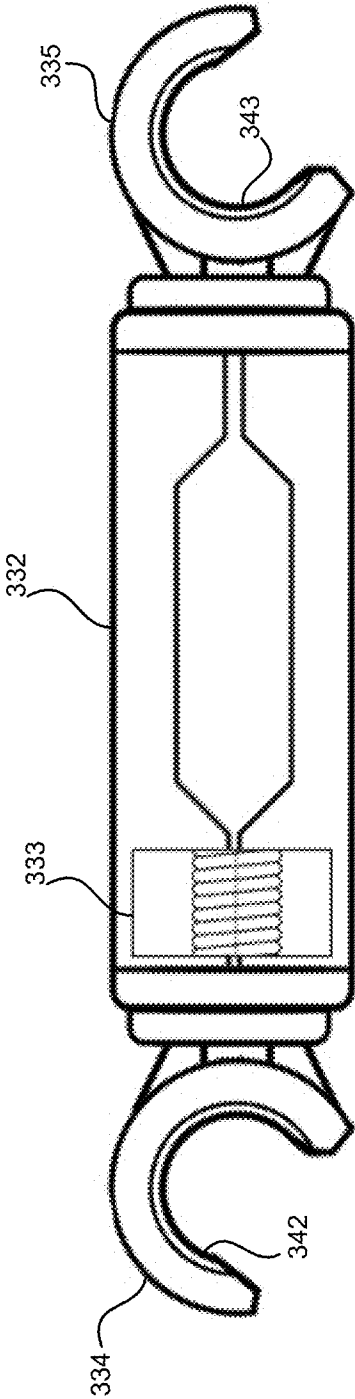


FIG. 3A

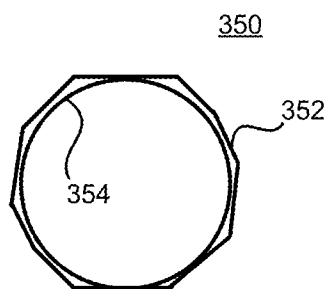


FIG. 3B

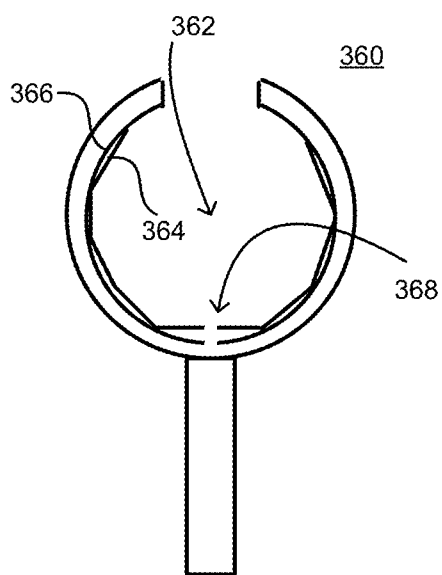


FIG. 3C

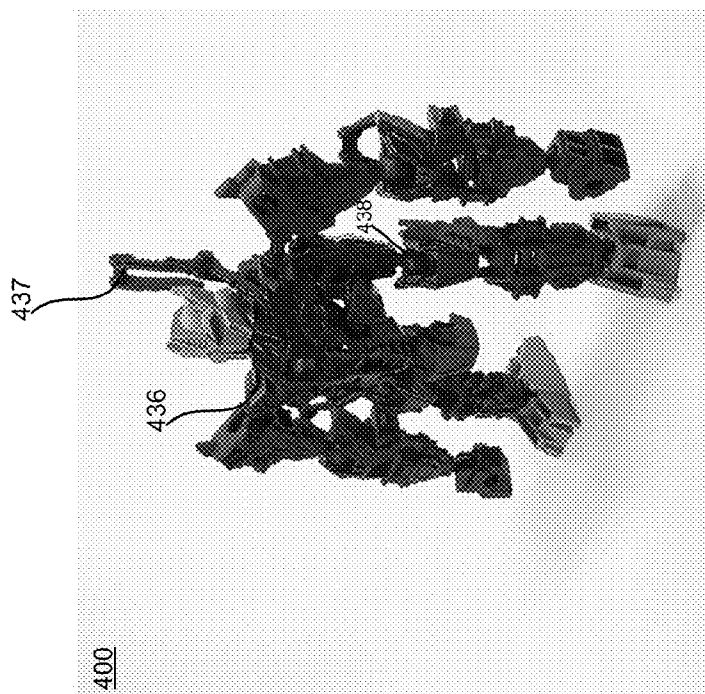


FIG. 4B

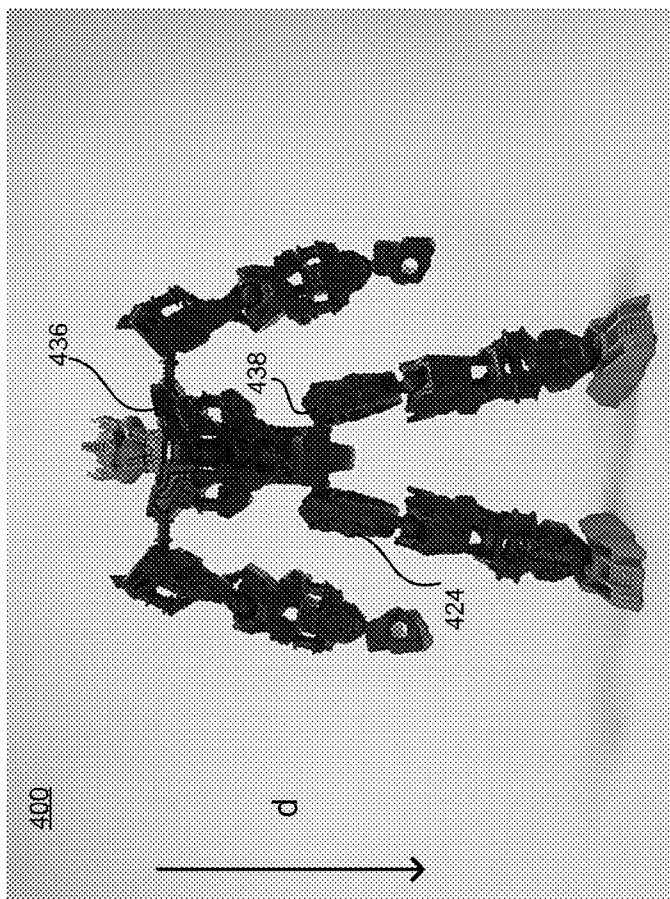


FIG. 4A

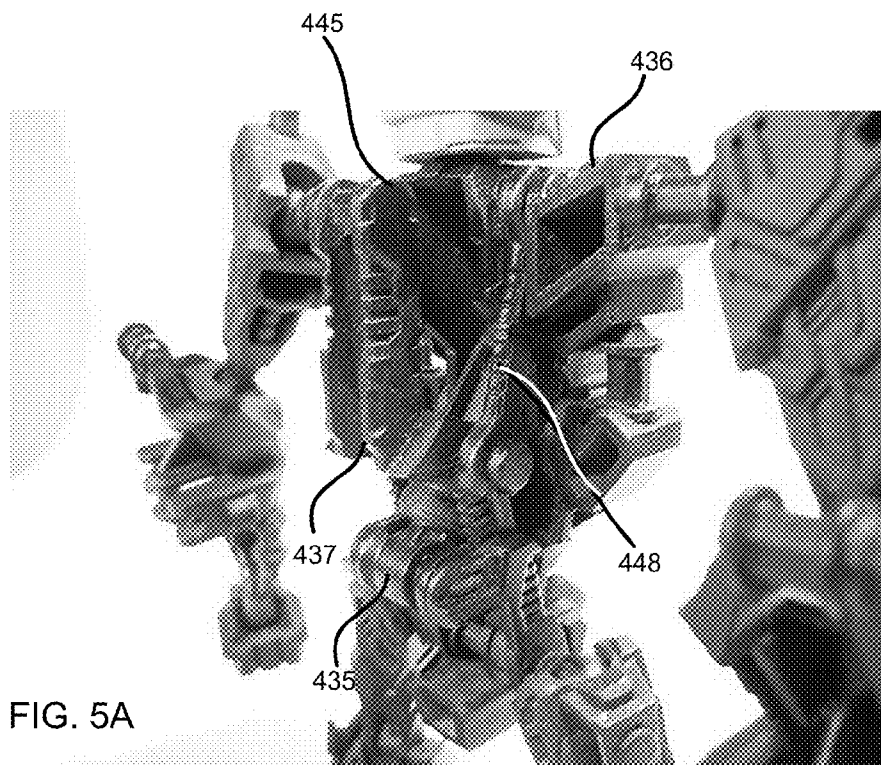


FIG. 5A

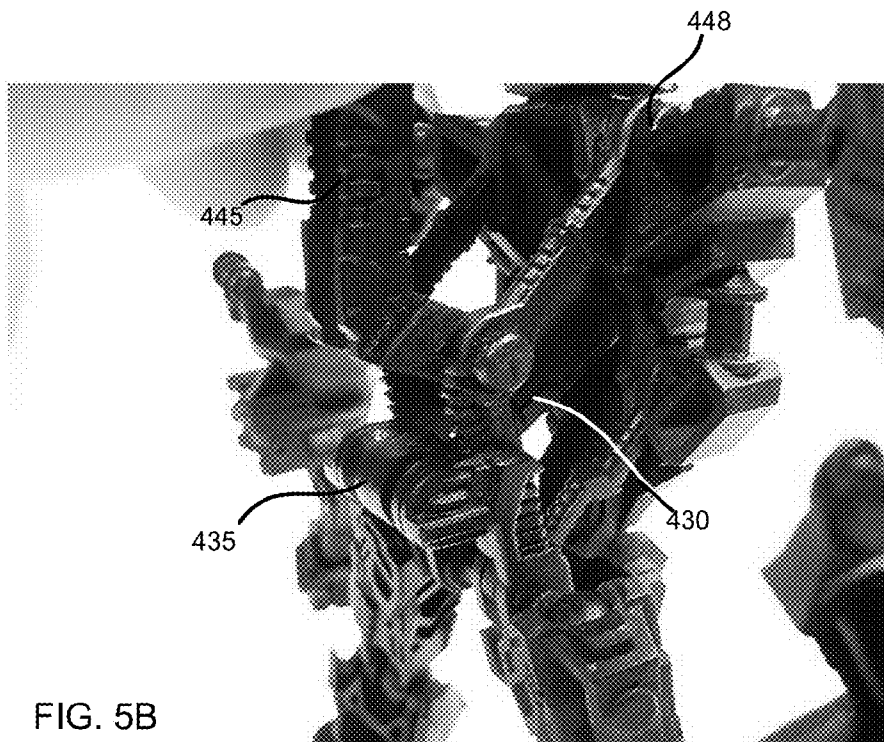


FIG. 5B

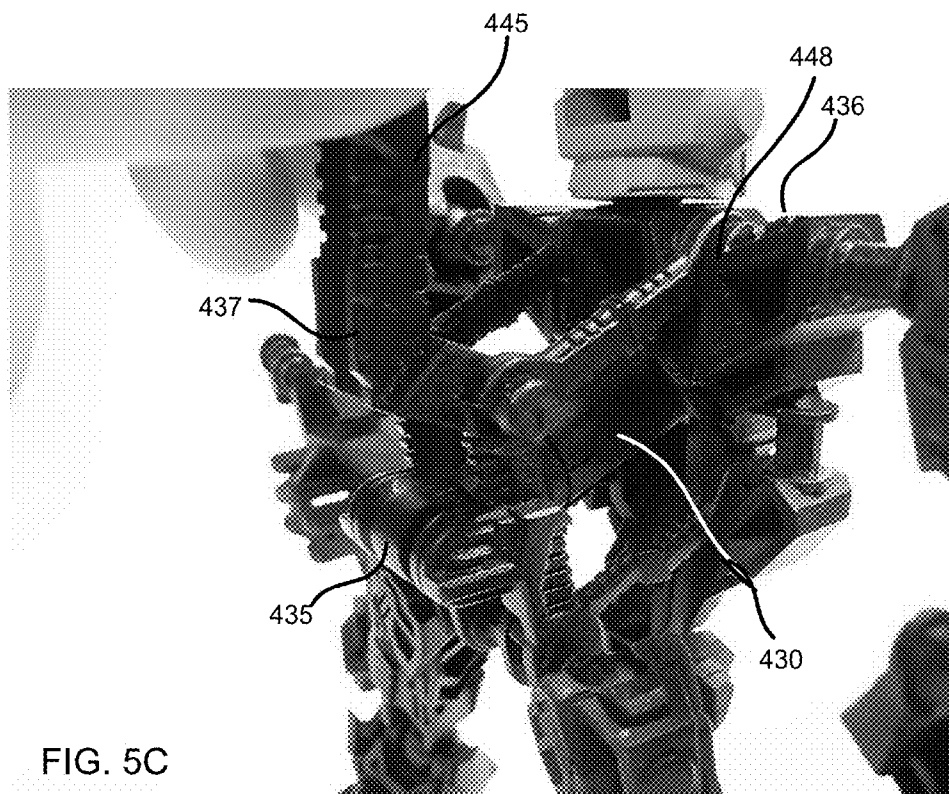


FIG. 5C

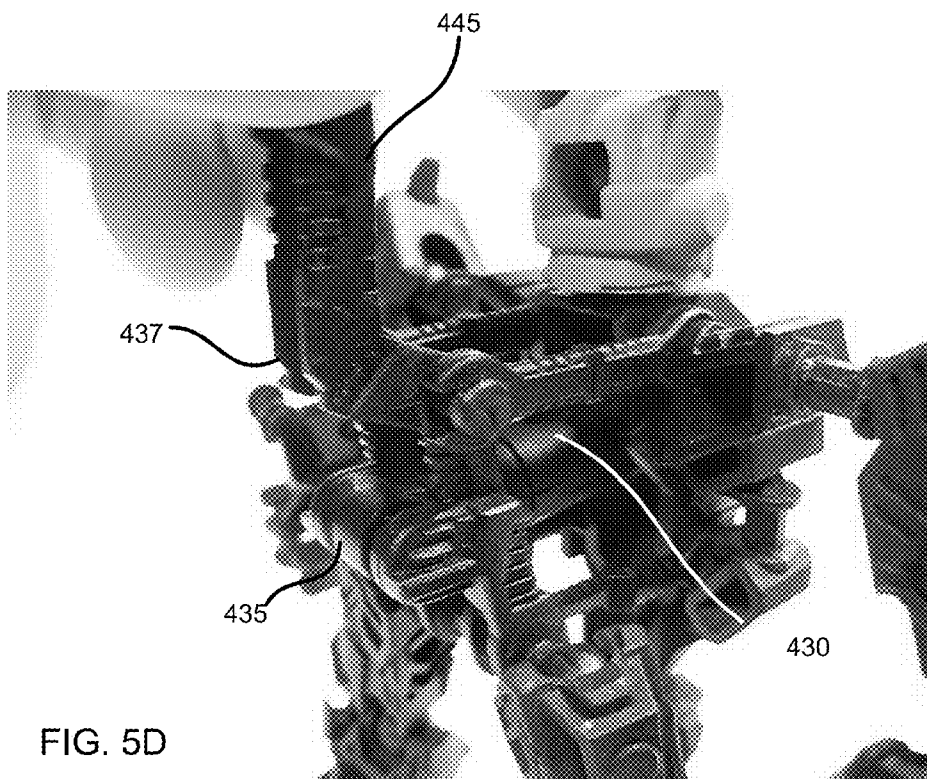


FIG. 5D

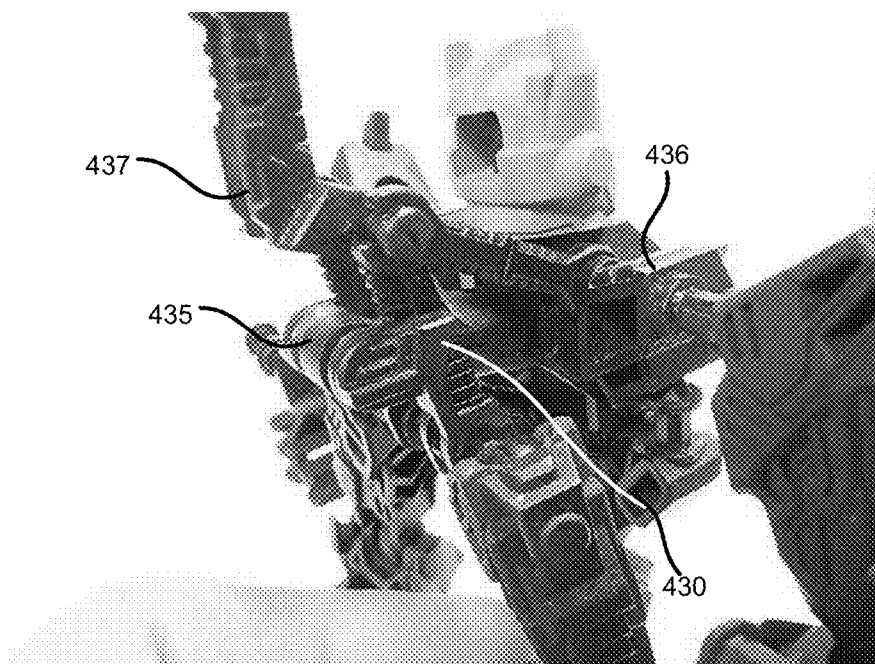


FIG. 5E

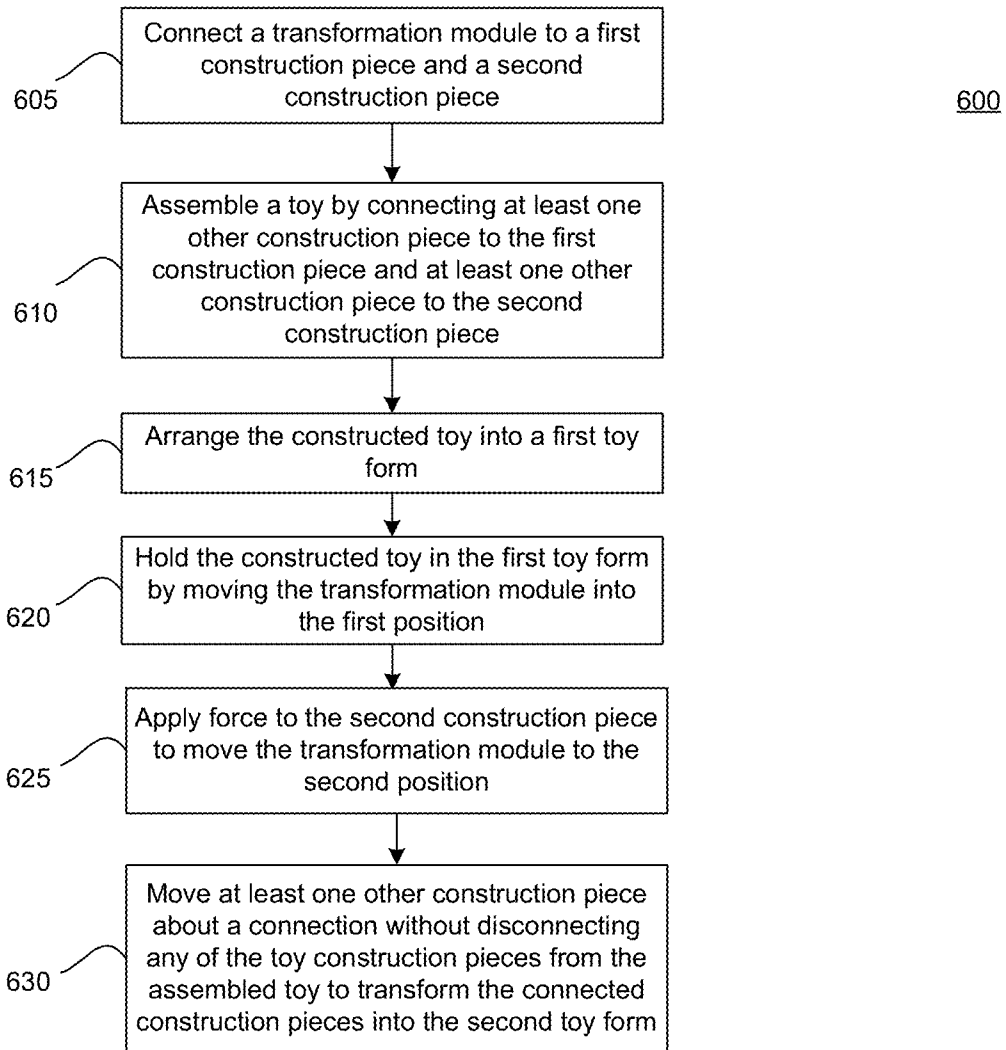


FIG. 6

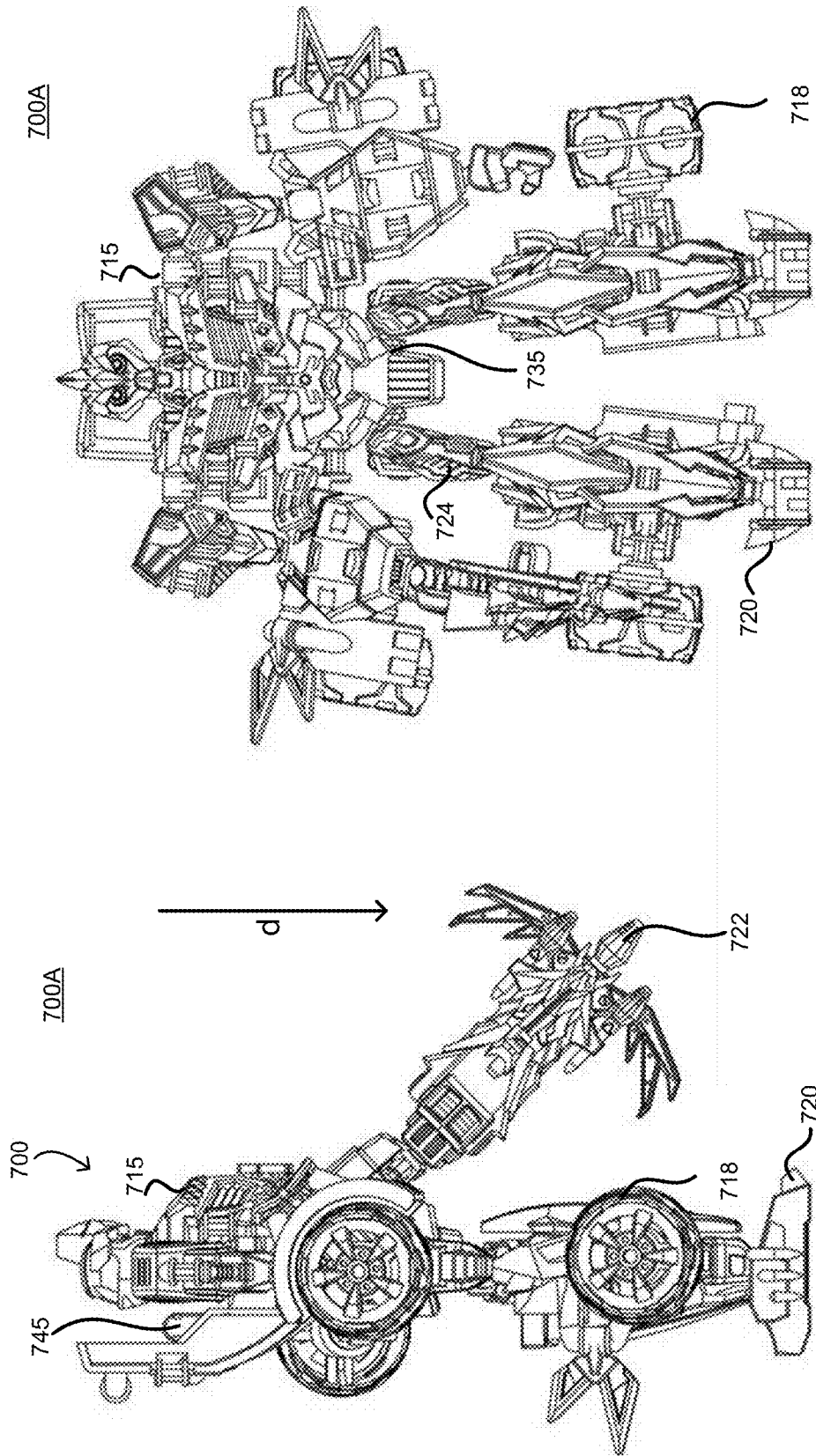


FIG. 7B

FIG. 7A

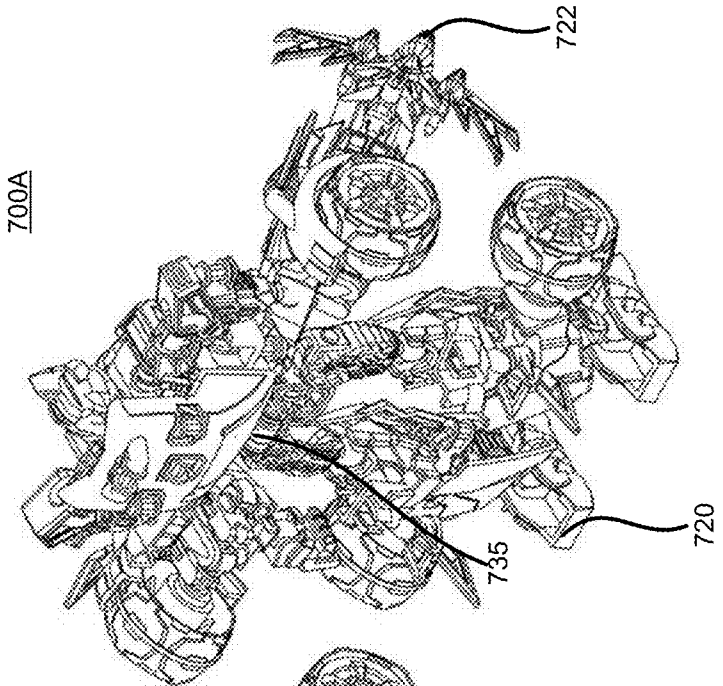


FIG. 7D

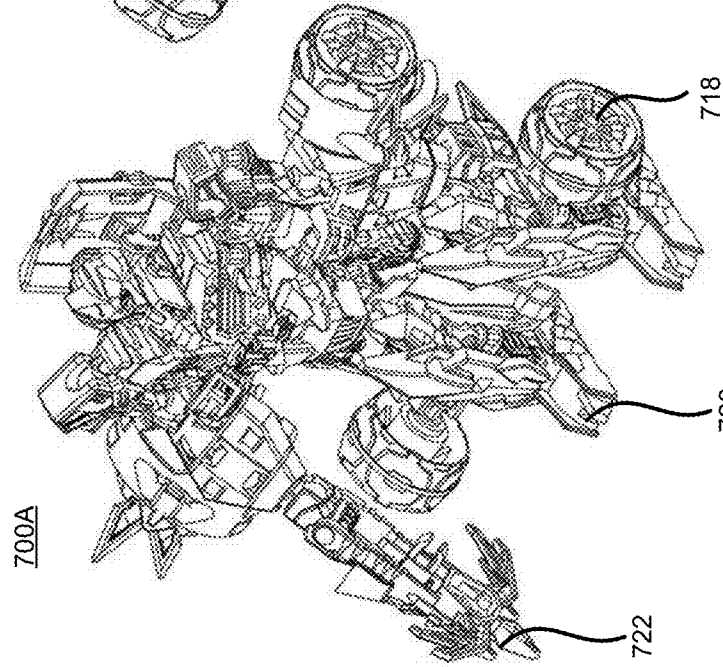


FIG. 7C

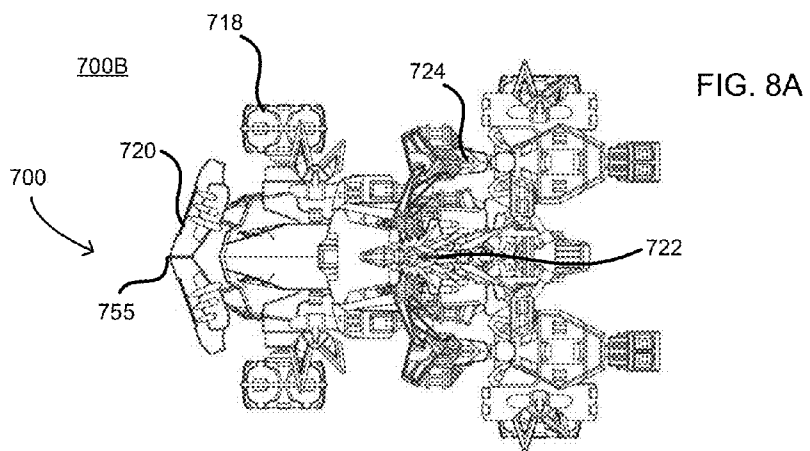


FIG. 8A

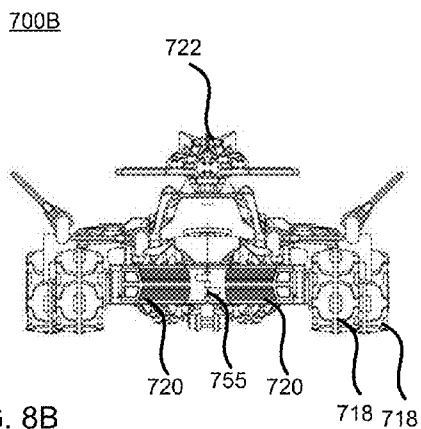


FIG. 8B

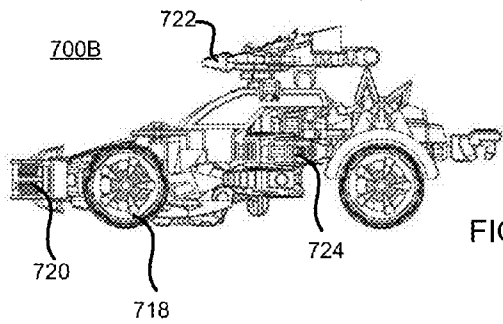


FIG. 8C

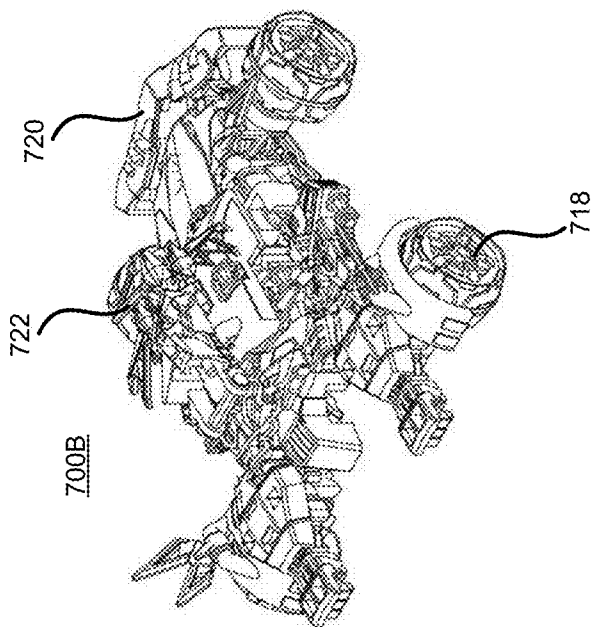


FIG. 8E

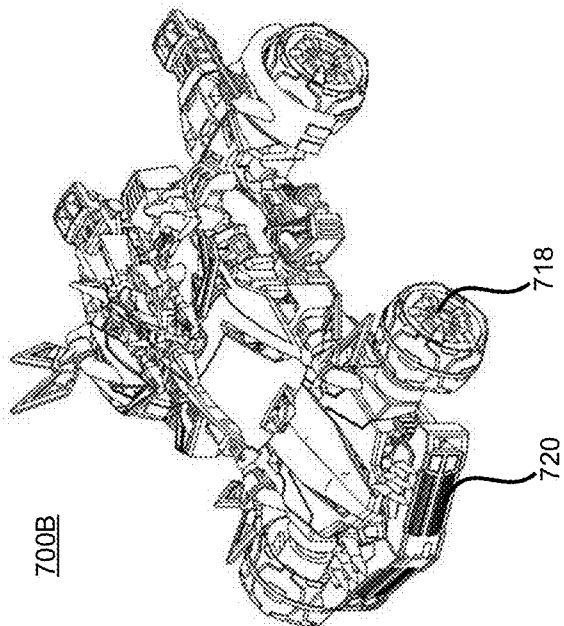


FIG. 8D

TRANSFORMABLE CONSTRUCTION TOY

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application No. 61/835,558, filed on Jun. 15, 2013 and titled TRANSFORMABLE CONSTRUCTION TOY, which is incorporated herein by reference in its entirety.

TECHNICAL FIELD

[0002] This disclosure relates to a transformable construction toy.

BACKGROUND

[0003] Children enjoy playing and interacting with toys and building elements. Toy construction sets are made up of a plurality of building elements or toy construction pieces, which interconnect with each other to form an assembled toy.

SUMMARY

[0004] In one general aspect, a toy construction set includes a plurality of interconnecting toy construction pieces, the pieces being connectable to build a toy that reversibly transforms between a first toy form and a second toy form, the first toy form defining a longitudinal axis in a first plane and the second toy form defining a longitudinal axis in a second plane that has a surface normal that is different from a surface normal of the first plane; and a bidirectional transformation module. The bidirectional transformation module includes a body defining a first connector and a second connector, the first connector coupled to a first piece included in the plurality of interconnecting toy construction pieces, and the second connector coupled to a second piece included in the plurality of interconnecting toy construction pieces; and a flexible portion between the first and second connectors. The transformation module is movable between a first position and a second position, and the transformation module holds the toy in the first toy form when in the first position and holds the toy in the second toy form when in the second position.

[0005] Other implementations can include the following features.

[0006] The first toy form can be a vehicle, the second toy form can be a human-like figure, and the surface normal of the first plane can be perpendicular to the surface normal of the second plane.

[0007] The flexible portion can be a spring.

[0008] The toy can reversibly transform between the first toy form and the second toy form without disconnecting any of the plurality of interconnecting pieces from each other.

[0009] The first connector of the transformation module can be releasably coupled to the first piece, and the second connector of the transformation module can be releasably coupled to the second piece.

[0010] The first and second positions can be the only positions in which the transformation module holds the toy.

[0011] When moved from the first position to the second position, the flexible portion of the bidirectional transformation module can apply a force that has at least a component along a direction toward the first position, and when moved from the second position to the first position, the flexible portion of the bidirectional transformation module can apply a force that has at least a component along a direction that is toward the second position.

[0012] The surface normal of the first plane can be perpendicular to the surface normal of the second plane.

[0013] The first connector of the bidirectional transformation module can be connected to the first piece included in the plurality of interconnecting toy construction pieces at a connection point, and, to move between the first position and the second position, the transformation module can rotate about the connection point. The second piece can define a graspable portion that receives force, and the transformation module can move between the first and second position in response to the received force. The first and second connectors of the bidirectional transformation module can connect to the first and second pieces, respectively, with a snap connection. The snap connection can be a c-clip connected to a corresponding axel.

[0014] The flexible portion can be at least partially enclosed in the body.

[0015] The body can be cylindrical, and the first and second connectors can be c-clips that connect to corresponding axels on the first and second pieces, respectively.

[0016] A piece that does not include a transformation module also can connect the first and second toy construction pieces.

[0017] The plurality of interconnecting toy construction pieces can connect to each other with a snap connection. The snap connection can be one or more of a ball-and-socket connection and a c-clip connection.

[0018] At least some of the plurality of toy construction pieces can be connectable at articulating joints.

[0019] In another general aspect, a toy construction set includes a plurality of interconnecting toy construction pieces including at least a first piece, a second piece that defines an articulating joint, and a third piece connected to the articulating joint by a snap connection, the plurality of toy construction pieces connected as a toy that reversibly transforms between a first toy form and a second toy form without disconnecting any of the pieces; and a bidirectional transformation module. The bidirectional transformation module is movable between a first position and a second position, and the module includes a body defining a first connector and a second connector, the first connector coupled to the first piece included in the plurality of interconnecting pieces, and the second connector coupled to the second piece included in the plurality of interconnecting pieces; and a flexible portion between the first and second connectors. The toy is configured to be held in the first form when the bidirectional transformation module is in the first position, the toy is configured to be held in the second form when the bidirectional transformation module is in the second position, and movement of the transformation module from the first position to the second position moves the first and second pieces relative to each other to allow the third piece to rotate about the articulating joint such that the third piece extends in a different direction in the second toy form than in the first toy form.

[0020] Implementations can include the following feature.

[0021] In the second toy form, the third piece can extend from the second piece in a direction that is opposite from the direction that the third piece extends from the second piece in the first toy form.

[0022] In another general aspect, a method of transforming a toy constructed from a plurality of interconnected construction pieces from a first toy form to a second toy form includes connecting a transformation module that is movable between first and second positions to a first toy construction piece and

a second toy construction piece; assembling a toy by connecting at least one other toy construction piece to the first toy construction piece and at least one other toy construction piece to the second toy construction piece; arranging the constructed toy into a first toy form, the first toy form defining a longitudinal axis that is parallel to a first plane; holding the constructed toy in the first toy form with the transformation module in the first position; applying force to the second construction piece to move the transformation module to the second position; and moving at least one other construction piece about a connection without disconnecting any of the toy construction pieces from the assembled toy to transform the connected construction pieces into the second toy form.

[0023] Implementations can include one or more of the following features.

[0024] The second toy construction piece can define a graspable portion, and the method can also include applying force to the graspable portion of the second construction piece to move the transformation module to the first position; and moving at least one other construction piece about a connection without removing any of the toy construction pieces from the assembled toy to transform the connected construction pieces into the first toy form.

[0025] Moving at least one other toy construction piece about a joint can include rotating the at least one other toy construction piece about the joint.

[0026] In another general aspect, a toy construction set includes a plurality of temporarily and repeatably interconnectable toy construction pieces, the pieces being connectable to build a toy that reversibly transforms between a first toy form and a second toy form, the first toy form defining a longitudinal axis in a first plane and the second toy form defining a longitudinal axis in a second plane that has a surface normal that is different from a surface normal of the first plane; and a bidirectional transformation module having a plurality of connectors configured to be temporarily and repeatably coupled to one or more of the toy construction pieces. The transformation module is movable between a first stable equilibrium position and a second stable equilibrium position through an unstable equilibrium position such that the transformation module holds the toy in the first toy form when in the first stable equilibrium position and holds the toy in the second toy form when in the second stable equilibrium position.

[0027] Implementations of any of the techniques described above can include a transformation module for use in an existing transformable toy, a toy construction piece, a set of two or more toy construction pieces packaged together with or without other toy construction pieces or a transformation module, a toy assembly that transforms from a first toy form into a second toy form and back again, a kit for a toy assembly that includes a transformation module, a toy construction set or system, a system that includes a toy assembly, a device, and/or a method or process for using a toy assembly.

[0028] The details of one or more implementations are set forth in the accompanying drawings and the description below. Other features will be apparent from the description and drawings, and from the claims.

DRAWING DESCRIPTION

[0029] FIG. 1A is a plan view of an exemplary transformable toy in a first toy form.

[0030] FIG. 1B is a plan view of the transformable toy of FIG. 1A in a second toy form.

[0031] FIGS. 2A-2C are block diagrams of an exemplary transformation module that moves between a first position (FIG. 2A) and a second position (FIG. 2C) through an unstable position (FIG. 2B).

[0032] FIG. 3A is a side cross-sectional view of an exemplary transformation module.

[0033] FIG. 3B is an exemplary faceted rod.

[0034] FIG. 3C is an exemplary faceted c-clip that connects to the rod of FIG. 3B.

[0035] FIG. 4A is a perspective view of an exemplary transformable toy in a first toy form.

[0036] FIG. 4B is a perspective view of the transformable toy of FIG. 4A with a shifted torso.

[0037] FIGS. 5A-5E is a series of side-perspective views of a transformation module of the transformable toy of FIG. 4A moving from a first position to a second position.

[0038] FIG. 6 is a flowchart of an exemplary process for transforming a toy from a first toy form to a second toy form.

[0039] FIG. 7A is a side view of another exemplary transformable toy in a first toy form.

[0040] FIG. 7B is a front view of the transformable toy of FIG. 7A.

[0041] FIG. 7C is a front perspective view of the transformable toy of FIG. 7A.

[0042] FIG. 7D is a back perspective view of the transformable toy of FIG. 7A.

[0043] FIG. 8A is a top view of the transformable toy of FIG. 7A in a second toy form.

[0044] FIG. 8B is a front view of the transformable toy of FIG. 8A.

[0045] FIG. 8C is a side view of the transformable toy of FIG. 8A.

[0046] FIG. 8D is a side-perspective view of transformable toy of FIG. 8A.

[0047] FIG. 8E is a side-perspective view of the transformable toy of FIG. 8A.

DESCRIPTION

[0048] A transformation module for a transformable construction toy is disclosed. The transformation module assists in transforming the toy from a first toy form or play mode into a second toy form or play mode, and vice versa. The transformable construction toy is a toy construction set that is assembled from a plurality of toy construction pieces, which can connect with each other temporarily and repeatably. The transformable toy transforms or converts between two or more toy forms or play modes. The toy forms are visually, functionally, and/or geometrically distinct from each other. The toy forms can extend along different directions and occupy different volumes of space. For example, a toy form can be a character, a human-like form, an animal-like form, a robot, a type of object, a vehicle, or a machine. Thus, the transformable toy can transform from, for example, a robot or a human-like action figure into a car or plane.

[0049] The disclosed transformation module is connected to two of the toy construction pieces and assists a user of the transformable toy with transforming the toy from the first toy form into the second toy form. The transformation module slides, shifts, switches, or otherwise moves between two stable equilibrium positions and through an unstable equilibrium position. In the first stable position, the transformation module holds the transformable toy in the first toy form. In the second stable position, the transformation module holds the transformable toy in the second toy form. And, when the

transformation module is displaced or disturbed from the first stable equilibrium position, it will return back to the first stable equilibrium position as long as the displacement or disturbance does not take it through the unstable equilibrium position. The transformation module allows the user to smoothly transform the transformable toy from the first toy form to the second toy form, and vice versa, without disconnecting or otherwise removing any of the toy construction pieces from the assembled toy. In other words, once assembled from the toy construction pieces, the transformable toy can transform and repeatedly retransform without being disassembled.

[0050] Moving the transformation module from the first position to the second position shifts the relative locations of the two toy construction pieces that are connected to the transformation module. This relative movement also can assist in the transformation by providing space for other toy construction pieces to move about their respective connection points so the toy construction pieces can be positioned in different orientations to form the second toy form.

[0051] Referring to FIGS. 1A and 1B, a plan view of an exemplary transformable toy 100 is shown. The transformation of the toy 100 from a first toy form 100A (FIG. 1A) to a second toy form 100B (FIG. 1B) changes the toy visually (from an action figure to a vehicle) and geometrically (from an object that extends vertically to one that extends horizontally). None of the toy construction pieces that form the toy 100 are disconnected to transform from the first toy form 100A to the second toy form 100B or vice versa. The toy 100 is assembled by connecting toy construction pieces to each other to form a toy. The toy construction pieces connect to each other at articulating joints.

[0052] FIG. 1A shows the toy in the first toy form 100A. In this example, the first toy form 100A is a human-like figure or robot that has a longitudinal axis 105 in a vertical plane. In the first toy form, the transformable toy 100 nominally stands upright, occupying a volume that extends in the vertical direction.

[0053] FIG. 1B shows the toy 100 in the second toy form 100B. In the second toy form 100B, the toy 100 is a vehicle. The vehicle rests and moves along a non-vertical surface, nominally extending along a horizontal direction. The vehicle defines a longitudinal axis 110 that is in a plane that is different from the plane that contains the axis 105. In this example, the axis 105 of the first toy form 100A is perpendicular to the axis 110 of the second toy form 100B.

[0054] The toy 100 includes a plurality of toy construction pieces, such as a torso plate 115, wheels 118, flat bottom pieces 120, an ornament 122, structures 124, and shields 126. The toy construction pieces are connected to each other at articulating joints. The articulating joints can be snap fit connections, such as ball-and-socket connections or c-clips that snap over corresponding rods. The assembled toy 100 can include both ball-and-socket connections and c-clip connections. Furthermore, the articulating joints can have a geometric feature to hold two toy construction pieces that are connected at an articulating joint in a fixed relationship. For example, the c-clip and rod can be faceted (FIGS. 6A and B) to provide additional friction between the c-clip and the corresponding rod. The geometric feature can be separate from the articulating joint.

[0055] The toy construction pieces can be used differently in the different toy forms 100A and 100B. For example, the flat bottom pieces 120 are feet in the toy form 100A and a

bumper in the toy form 100B. The structures 124 are leg-like elements in the toy form 100A and horizontal support elements in the toy form 100B. The toy 100 also includes a transformation module, similar to the modules described below and shown in FIGS. 2A-2C, 3, and 5A-5E.

[0056] Referring to FIGS. 2A-2B, a transformation module 230 is shown moving from a first position 202 (FIG. 2A) to a second position 204 (FIG. 2C). The transformation module 230 is a bidirectional transformation module because it can move from the first position 202 to the second position 204, and from the second position 204 to the first position 202.

[0057] The transformation module 230 includes a body 232 that defines connectors 234, 235 on either end of the body 232. The connector 234 connects to a first toy construction piece 236 and the connector 235 connects to a second toy construction piece 237. The body 232 partially or completely encloses an elastic portion 233. The elastic portion 233 provides tension as the transformation module 230 moves from the first position 202 to the second position 204 and as the transformation module 230 moves from the second position 204 to the first position 202. The elastic portion 233 helps to maintain the transformation module 230 in the first or the second position. Further, when force is applied to the toy construction piece 237, the elastic portion 233 pushes the transformation module from the first position 202 to the second position 204, or vice versa.

[0058] The toy construction pieces 236 and 237 are part of a larger transformable toy, such as the toy 100, and the pieces 236 and 237 can be any toy construction piece from the assembled toy. For example, the first toy construction piece 236 can be the torso plate 115 of FIG. 1A. The connector 234 can connect to a portion on the back of the torso plate 115. The second toy construction piece 237 can be a construction piece that defines a joint 238 where a third toy construction piece 239 connects with a snap connection. The third toy construction piece 239 can be, for example, the structure 124 of FIG. 1A.

[0059] Referring to FIG. 2A, the transformation module 230 is in the first position 202. A force "F" is applied to the toy construction piece 237 to move the toy construction piece 237 relative to the toy construction piece 236. Referring also to FIG. 2B, in response to the force "F," the toy construction piece 237 moves along an arc "A" and the transformation module 230 rotates about the connection point between the connector 235 and the first toy construction piece 236. As the transformation module 230 moves toward the midpoint 240 of the arc "A," the elastic portion 233 expands longitudinally, gaining potential energy. After the transformation module 230 passes the midpoint 240, the elastic portion 233 begins to contract, pulling the toy construction piece 237 toward the second position 204. Referring also to FIG. 2C, the transformation module 230 is urged into the second position 204 by the contracting elastic portion 233 and is held stably at the second position 204 until a force acts on either or both of the toy construction piece 236, 237.

[0060] Accordingly, the transformation module 230 assists in moving the toy construction pieces 236, 237 relative to each other as the transformation module 230 moves back and forth between the positions 202 and 204. In some implementations, the positions 202 and 204 are the only stable positions of the transformation module 230. That is, when the transformation module 230 is in a position other than the position 202 or 204, the module 230 does not hold the toy construction piece 236 and 237 in a fixed spatial relationship. The toy

construction pieces 236 and 237 are held in a fixed spatial relationship when the transformation module 230 is in the first position 202 or the second position 204.

[0061] Referring to FIG. 3A, a side cross-sectional view of another exemplary transformation module 330 is shown. The transformation module 330 is similar to a piston. The transformation module 330 includes a body 332, a spring 333, a connector 334, and a connector 335. The body 332 encloses the spring 333. The connectors 334 and 335 are used to connect the transformation module 330 to two toy construction pieces. In the example shown, the connectors 334 and 335 are c-clips. The c-clips 334 and 335 have inner walls 342 and 343, respectively, each of which receives and holds a rod. Although the c-clip holds the rod, the c-clip and rod can rotate relative to each other when force is applied to the c-clip and/or the rod. In the example of FIG. 3A, the inner walls 342 and 343 are smooth.

[0062] Referring to FIGS. 3B and 3C, an example of a faceted rod (FIG. 3B) that is received and held by a faceted c-clip (FIG. 3C) is shown. A rod 350 defines facets 352 on a surface 354. The rod 350 is received in a faceted opening 362 that is defined by a c-clip 360. The c-clip 360 defines facets 364 on a surface 366. The c-clip 360 also defines a gap 368 at the midpoint of an arc defined by the surface 366. The gap 368 can provide for additional play and can help the rod 350 be received in the opening 362 without damaging the c-clip 360.

[0063] The c-clip 360 can be used as one or more of the connectors 334 and 335 on the transformation module 330, or on the toy construction pieces that connect to each other with c-clips. In these implementations, the rods that connect to the c-clips can have corresponding facets, similar to those of the rod 350. The presence of the facets provides a temporary lock in position between the elements held by the rod 350 and the c-clip 360, allowing the elements that are connected by the rod 350 and the c-clip 360 to be held in a fixed spatial relationship to each other. Movement of the rod 350 relative to the c-clip 360 makes a click-like sound that can increase play value.

[0064] Referring to FIGS. 4A and 4B, another exemplary transformable toy 400 is shown. FIG. 4A shows the transformable toy 100 in a first toy form, with a transformation module 430 (shown in FIGS. 5A-5E) connected between a torso toy construction piece 436 and a second toy construction piece 437. FIG. 4B shows the transformable toy 100 after the process of transforming to a second toy form has begun and the transformation module 430 is in the second position. Placing the transformation module 430 in the second position (FIG. 4B) causes the torso toy construction piece 436 to shift downward relative to the position of the torso toy construction piece 436 when the transformation module is in the first position (FIG. 4A). The movement of the transformation module 430 to the second position also causes the second toy construction piece 437 to move relatively upward.

[0065] Referring to FIGS. 5A-5E, the movement of the transformation module 430 from the first position to the second position is shown. FIGS. 5A-5E show a series of side perspective views of the transformable toy 400. Referring to FIG. 5A, the transformation module 430 is in the first position. The transformation module 430 is connected between the torso toy construction piece 436 and the second toy construction piece 437, with the connection 435 of the transformation module 350 connecting to the toy construction piece 437. In this example, in addition to the transformation module 430 connecting the torso 436 and the second 437 toy con-

struction pieces, struts 448 also connect the torso 436 and the second 437 toy construction pieces. The second toy construction piece 437 defines a graspable portion 445. A user can grip or otherwise manipulate the graspable portion 445 to apply force to the second toy construction piece 437 to initiate movement of the transformation module 430 from the first position to the second position.

[0066] Referring to FIG. 5B, a user manipulates the graspable portion 445 to begin the movement of the transformation module 430. Referring to FIGS. 5C and 5D, the user continues to manipulate the graspable portion 445 to move the transformation module 430 toward the second position. Referring to FIG. 5E, the transformation module 530 is in the second position.

[0067] Referring to FIG. 6, a flow chart for an exemplary procedure 600 is shown. The procedure 600 is used to transform a toy that is constructed from a plurality of interconnected toy construction pieces from a first toy form to a second toy form. The first toy form can be, for example, a human-like figure or a robot, and the second toy form can be, for example, a vehicle, such as a car or a plane. The procedure 600 can be performed on the transformable toy 100 or 400 discussed above. The procedure 600 can also be performed on transformable toys that are similar to the toys 100 and 400. The procedure 600 is discussed with reference to the transformable toy 400.

[0068] The transformation module 430 is connected to the torso toy construction piece 436 and the second toy construction piece 437 (605). Once connected, the transformation module 430 is between the torso toy construction piece 436 and the second toy construction piece 437. The transformation module 430 is movable between a first position (FIG. 5A) and a second position (FIG. 5E).

[0069] A toy is assembled by connecting at least one other toy construction piece to the torso toy construction piece 436 and/or the second toy construction piece 437 (610). For example, a thigh piece 424 (FIG. 4A) can be connected to the second construction piece 437. The toy is arranged into a first toy form (615). For example, the toy can be arranged into a human-like figure, such as shown in FIG. 4A. To place the toy into the first toy form, the toy construction pieces are arranged as a human figure. For example, the thigh piece 424 is rotated about the ball-and-socket joint 438 to extend in the "d" direction (FIG. 4A) from the second toy construction piece 437. In this orientation, the thigh piece 424 functions as part of a leg.

[0070] The toy is held in the first toy form by moving the transformation module 430 into the first position (620). If the transformation module 430 is already in the first position, then the toy is held in the first toy form by keeping the transformation module 430 in the first position. Similar to the transformation module 230 discussed above with respect to FIG. 2A-2C, the transformation module 430 can have two stable positions. One of the stable positions can be the first position shown in FIG. 5A, and the other stable position can be the second position shown in FIG. 5E. When the transformation module 430 is in a stable position, it holds the torso toy construction piece 436 and the second toy construction piece 437 relative to each other in a fixed spatial relationship. Thus, by moving the transformation module 430 to the first or second position, or by keeping or maintaining the transformation module 430 in the first or second position, the torso toy construction piece 436 and the second toy construction piece 437 are held in a fixed spatial relationship.

[0071] A force is applied to the second construction piece 437 to move the transformation module 430 to the second position (625). The force can be applied to the graspable portion 445 of the second construction piece 437. The force is a force that is sufficient to overcome the resistance of an elastic portion in the transformation module so that the transformation module 430 moves away from the first position and toward the second position. The relative movement of the torso toy construction piece 436 and the second toy construction piece 437 creates space for the thigh piece 424 to rotate and extend in a different direction.

[0072] The toy is transformed into the second toy form (630). The second toy form of the toy shown in FIG. 4A can be a vehicle. To transform the toy into the second toy form, at least one other construction piece is moved about a connection without disconnecting any of the toy construction pieces from the assembled toy. For example, the thigh piece 424 can be rotated about the joint 438 so that the thigh piece 424 (and the lower leg pieces connected to the thigh piece) extend in a direction that is different, for example, opposite, to the direction “d” that the thigh piece 424 extends when the toy 400 is in the first toy form. After the thigh piece 424 is rotated about the joint 438, the thigh piece can be used as a different element in the second toy form. For example, the second toy form of the toy 400 can be a vehicle, and the thigh piece 424 can be a horizontal support for the vehicle, similar to the use of the thigh piece 124 in the second toy form of the toy 100 (FIG. 1B).

[0073] The process 600 can be performed, partially or completely, in reverse to transform the toy from the second toy form to the first toy form. In this manner, the toy is reversibly transformable. In some implementations, one or more of the toy construction pieces are moved about their respective connections to the other toy construction pieces before force is applied to move the transformation module (625). This is because, when in a toy form, the transformation module 430 can be obscured by one or more of the toy construction pieces. Thus, the initial moving of other toy construction pieces can allow the user to access and move the transformation module.

[0074] Referring to FIG. 7A-7D, another exemplary transformable toy 700 is shown in a first toy form 700A. The toy 700 reversibly transforms between the first toy form 700A and a second toy form 700B (FIGS. 8A-8E). FIG. 7A shows the transformable toy 700 in the first toy form 700A from the side, FIG. 7B shows the transformable toy 700 in the first toy form 700A from the front, FIG. 7C is a front perspective view of the transformable toy 700 in the first toy form 700A, and FIG. 7D is a back perspective view of the transformable toy 700 in the first toy form 700A. FIGS. 8A-8E show views of the toy 700 in the second toy form 700B. For the toy 700, the first toy form 700A is a human-like form or a robot. The second toy form 700B is a vehicle.

[0075] Referring to FIGS. 7A-7D, the toy 700 is assembled from a plurality of toy construction pieces that are connected to each other. The toy construction pieces include a torso plate 715, wheels 718, flat bottom pieces 720, an ornament 722, and a thigh piece 724. In the first toy form 700A, the flat bottom pieces 720 function as feet and the ornament 722 functions as a weapon. The toy construction pieces are connected together with ball and socket joints and/or c-clips that couple to corresponding axels. The toy 700 includes a transformation module with a connector 735. The connector 735 connects to a toy construction piece 737 that defines a graspable portion 745. Applying force to the graspable portion 745

causes the transformation module to move from a first position to a second position and vice versa.

[0076] Moving the transformation module from the first position to the second position moves the torso plate 715 relative to the graspable portion 745. The torso piece 715 shifts downward in the direction “d” (FIG. 7A). Because the second position of the transformation module is stable, the transformation module holds the torso plate 715 in a fixed position relative to the toy construction piece 737 and the graspable portion 745. Moving the torso piece 715 in this manner provides room for the thigh piece 724 and the flat-bottom pieces 720 to rotate about the joint 738 that connects the thigh piece 724 to the toy construction piece 737. The thigh piece 724 and the flat-bottom piece 720 are rotated and positioned along a direction that is opposite to the direction “d.” Additional toy construction pieces are also moved relative to their connection points until the second toy form is generated. None of the toy construction pieces need to be removed or disconnected for the toy to transform from the first toy form to the second toy form.

[0077] Referring to FIG. 8A-8E, the toy 700 in the second toy form 700B is shown. The second toy form 700B is a vehicle. FIG. 8A shows the toy 700 in the second toy form 700B from above. FIG. 8B shows the toy 700 from the front, and FIG. 8C shows the toy 700 from the side. FIG. 8D is a side-front perspective view of the toy 700, and FIG. 8E is a side-back perspective view of the toy 700. As compared to the first toy form 700A, the second toy form 700B has a different visual appearance and geometric arrangement. Additionally, the first and second toy forms 700A, 700B define longitudinal axes and occupy volumes that are in different planes. The first toy form 700A has a longitudinal axis in a vertical plane, and the second toy form 700B has a longitudinal axis in a horizontal plane. Further, the toy construction pieces that form the toy 700 have different functions in the second toy form 700B than in the first toy form 700A. For example, the flat-bottom pieces connect to each other at a non-articulating joint 755 to form a bumper for the vehicle of the second toy form 700B.

[0078] Other implementations are within the scope of the following claims.

[0079] For example, the transformation module 430 can be connected between any two of the toy construction pieces in the transformable toy 400. The first toy form or the second toy form can be a form that resembles an animal or a building. To move the transformation module 230 or 430 from the first position to the second position, or vice versa, force can be applied to the first or second toy construction piece.

[0080] The transformation module 230 can be movable between more than two stable equilibrium positions.

[0081] The toy construction pieces can connect at connections that are not articulating joints. For example, the toy construction pieces can connect with a post that is received in a corresponding recess and held in frictional engagement but does not articulate. The toy construction pieces can connect at articulating joints other than ball-and-socket and c-clip joints. For example, the toy construction pieces can connect by post and corresponding recesses.

What is claimed is:

1. A toy construction set comprising:

a plurality of interconnecting toy construction pieces, the pieces being connectable to build a toy that reversibly transforms between a first toy form and a second toy form, the first toy form defining a longitudinal axis in a first plane and the second toy form defining a longitudi-

nal axis in a second plane that has a surface normal that is different from a surface normal of the first plane; and a bidirectional transformation module comprising:

- a body defining a first connector and a second connector, the first connector coupled to a first piece included in the plurality of interconnecting toy construction pieces, and the second connector coupled to a second piece included in the plurality of interconnecting toy construction pieces; and
- a flexible portion between the first and second connectors, wherein

the transformation module is movable between a first position and a second position, and

the transformation module holds the toy in the first toy form when in the first position and holds the toy in the second toy form when in the second position.

2. The toy construction set of claim 1, wherein the first toy form comprises a vehicle, the second toy form comprises a human-like figure, and the surface normal of the first plane is perpendicular to the surface normal of the second plane.
3. The toy construction set of claim 1, wherein the flexible portion comprises a spring.
4. The toy construction set of claim 1, wherein the toy reversibly transforms between the first toy form and the second toy form without disconnecting any of the plurality of interconnecting pieces from each other.
5. The toy construction set of claim 1, wherein the first connector of the transformation module is releasably coupled to the first piece, and the second connector of the transformation module is releasably coupled to the second piece.
6. The toy construction set of claim 1, wherein the first and second positions are the only positions in which the transformation module holds the toy.
7. The toy construction set of claim 1, wherein, when moved from the first position to the second position, the flexible portion of the bidirectional transformation module applies a force that has at least a component along a direction toward the first position, and when moved from the second position to the first position, the flexible portion of the bidirectional transformation module applies a force that has at least a component along a direction that is toward the second position.
8. The toy construction set of claim 1, wherein the surface normal of the first plane is perpendicular to the surface normal of the second plane.
9. The toy construction set of claim 1, wherein the first connector of the bidirectional transformation module is connected to the first piece included in the plurality of interconnecting toy construction pieces at a connection point, and, to move between the first position and the second position, the transformation module rotates about the connection point.
10. The toy construction set of claim 9, wherein the second piece defines a graspable portion that receives force, and the transformation module moves between the first and second position in response to the received force.
11. The toy construction set of claim 10, wherein the first and second connectors of the bidirectional transformation module connect to the first and second pieces, respectively, with a snap connection.
12. The toy construction set of claim 11, wherein the snap connection is a c-clip connected to a corresponding axel.

13. The toy construction set of claim 1, wherein the flexible portion is at least partially enclosed in the body.

14. The toy construction set of claim 1, wherein the body is cylindrical, and the first and second connectors are c-clips that connect to corresponding axels on the first and second pieces, respectively.

15. The toy construction set of claim 1, wherein a piece that does not include a transformation module also connects the first and second toy construction pieces.

16. The toy construction set of claim 1, wherein the plurality of interconnecting toy construction pieces connect to each other with a snap connection.

17. The toy construction set of claim 16, wherein the snap connection is one or more of a ball-and-socket connection and a c-clip connection.

18. The toy construction set of claim 1, wherein at least some of the plurality of toy construction pieces are connectable at articulating joints.

19. A toy construction set comprising:

- a plurality of interconnecting toy construction pieces comprising at least a first piece, a second piece that defines an articulating joint, and a third piece connected to the articulating joint by a snap connection, the plurality of toy construction pieces connected as a toy that reversibly transforms between a first toy form and a second toy form without disconnecting any of the pieces; and

a bidirectional transformation module movable between a first position and a second position, the module comprising:

- a body defining a first connector and a second connector, the first connector coupled to the first piece included in the plurality of interconnecting pieces, and the second connector coupled to the second piece included in the plurality of interconnecting pieces; and
- a flexible portion between the first and second connectors, wherein

the toy is configured to be held in the first form when the bidirectional transformation module is in the first position,

the toy is configured to be held in the second form when the bidirectional transformation module is in the second position, and

movement of the transformation module from the first position to the second position moves the first and second pieces relative to each other to allow the third piece to rotate about the articulating joint such that the third piece extends in a different direction in the second toy form than in the first toy form.

20. The toy construction set of claim 19, wherein, in the second toy form, the third piece extends from the second piece in a direction that is opposite from the direction that the third piece extends from the second piece in the first toy form.

21. A method of transforming a toy constructed from a plurality of interconnected construction pieces from a first toy form to a second toy form, the method comprising:

- connecting a transformation module that is movable between first and second positions to a first toy construction piece and a second toy construction piece;
- assembling a toy by connecting at least one other toy construction piece to the first toy construction piece and at least one other toy construction piece to the second toy construction piece;

arranging the constructed toy into a first toy form, the first toy form defining a longitudinal axis that is parallel to a first plane;

holding the constructed toy in the first toy form with the transformation module in the first position;

applying force to the second construction piece to move the transformation module to the second position; and

moving at least one other construction piece about a connection without disconnecting any of the toy construction pieces from the assembled toy to transform the connected construction pieces into the second toy form.

22. The method of claim **21**, wherein the second toy construction piece defines a graspable portion, and further comprising:

applying force to the graspable portion of the second construction piece to move the transformation module to the first position; and

moving at least one other construction piece about a connection without removing any of the toy construction pieces from the assembled toy to transform the connected construction pieces into the first toy form.

23. The method of claim **21**, wherein moving at least one other toy construction piece about a joint comprises rotating the at least one other toy construction piece about the joint.

24. A toy construction set comprising:

a plurality of temporarily and repeatably interconnectable toy construction pieces, the pieces being connectable to build a toy that reversibly transforms between a first toy form and a second toy form, the first toy form defining a longitudinal axis in a first plane and the second toy form defining a longitudinal axis in a second plane that has a surface normal that is different from a surface normal of the first plane; and

a bidirectional transformation module having a plurality of connectors able to be temporarily and repeatably coupled to one or more of the toy construction pieces, wherein the transformation module is movable between a first stable equilibrium position and a second stable equilibrium position through an unstable equilibrium position such that the transformation module holds the toy in the first toy form when in the first stable equilibrium position and holds the toy in the second toy form when in the second stable equilibrium position.

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