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(54) **MAGNETIC JOINTS AND TOY FIGURINES MADE THEREFROM**

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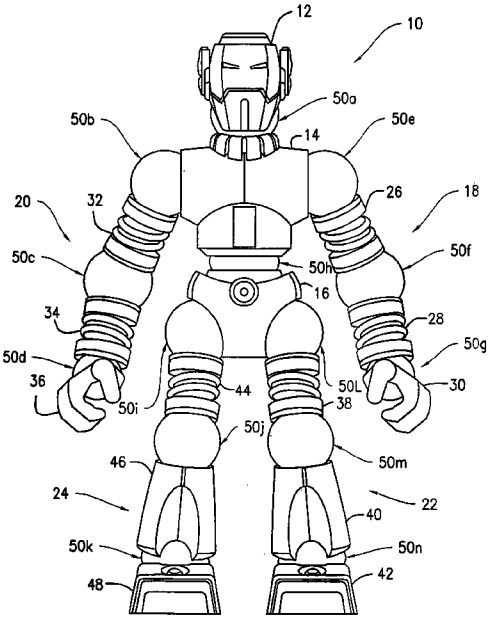
(52) **U.S. Cl.** **446/97**

(57) **ABSTRACT**

Magnetic joints for toy figurines are provided. In one embodiment, the magnetic joint comprises a socket which is formed in a first figurine component and includes a ring magnet, and a ferromagnetic, hemispherical portion attached to a second figurine component, wherein the ring magnet receives and is magnetically coupled to the ferromagnetic, hemispherical portion. In another embodiment, the magnetic joint comprises a socket which is formed in a first figurine component and includes a magnet having a recess, a ferromagnetic, hemispherical portion attached to a second figurine component, and an O-ring positioned between the magnet and the ferromagnetic, hemispherical portion. In another embodiment, the magnetic joint comprises a flexible socket attached to a first figurine component and having a magnet positioned therein, and a ferromagnetic, hemispherical portion attached to a second figurine component and magnetically coupled with the flexible socket. In another embodiment, the magnetic joint comprises a socket attached to a first figurine component, a ferromagnetic, hemispherical portion attached to a second figurine component and magnetically coupled with the socket, and a switch extending through an aperture formed in the ferromagnetic, hemispherical portion, wherein the switch is activated when the first figurine component is coupled to or uncoupled from the second figurine component.



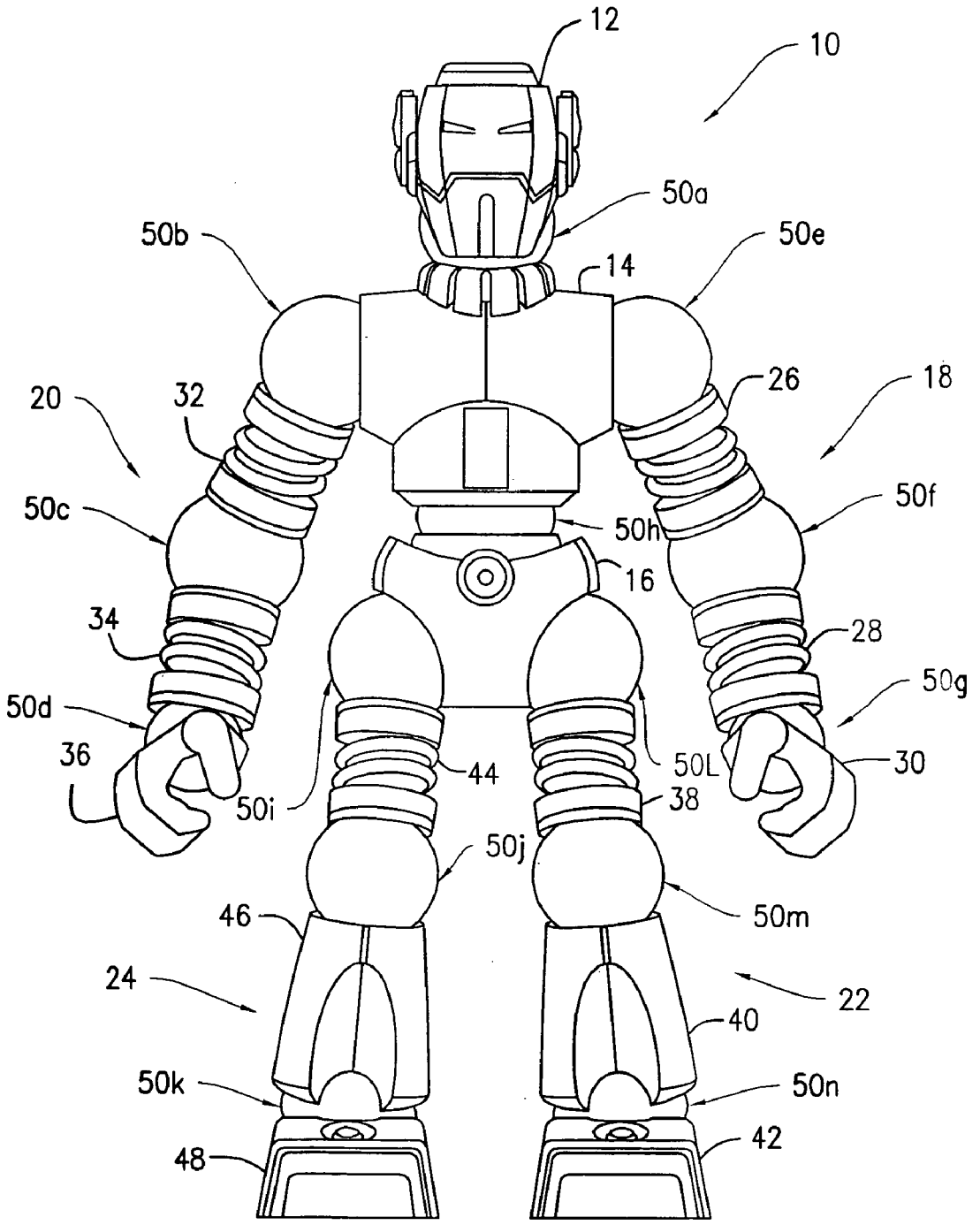

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FIG. 1

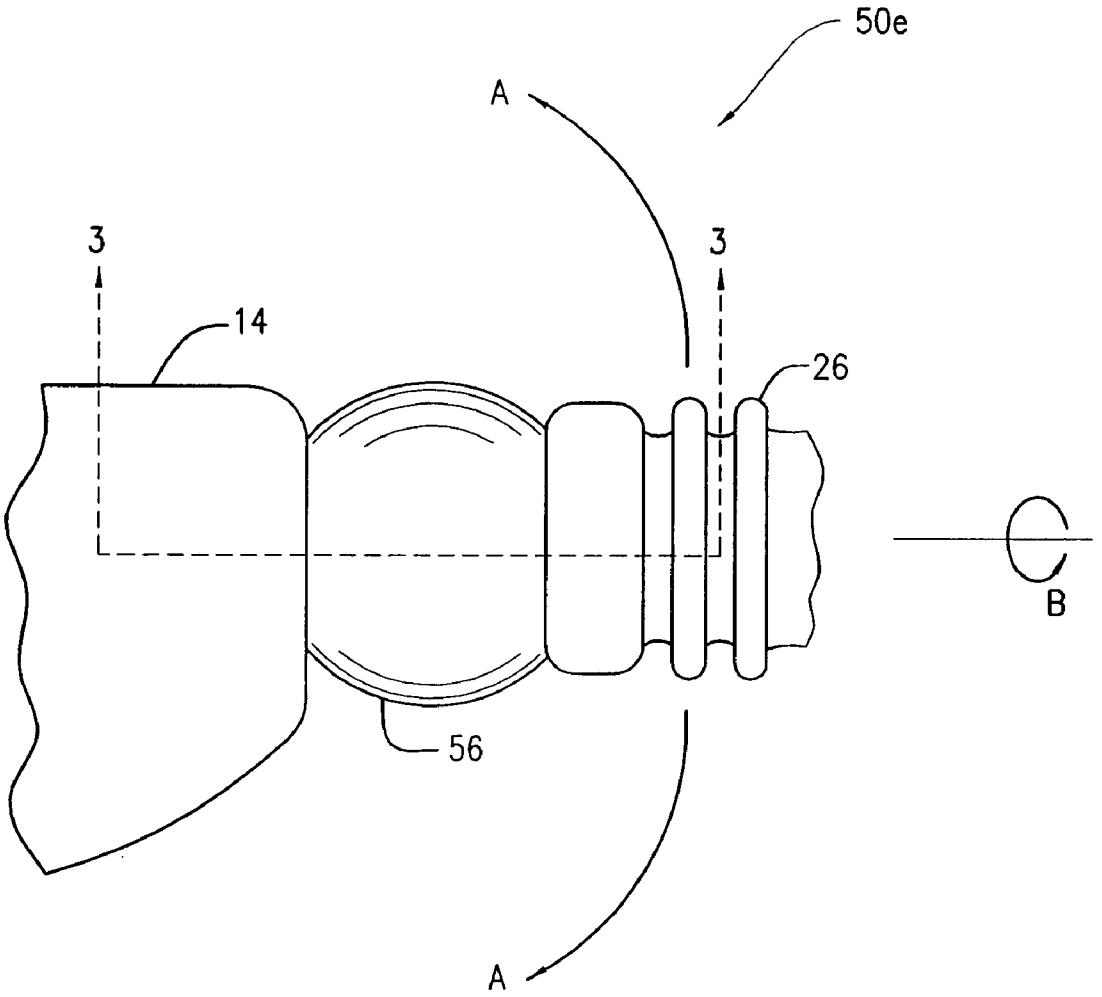

FIG. 2

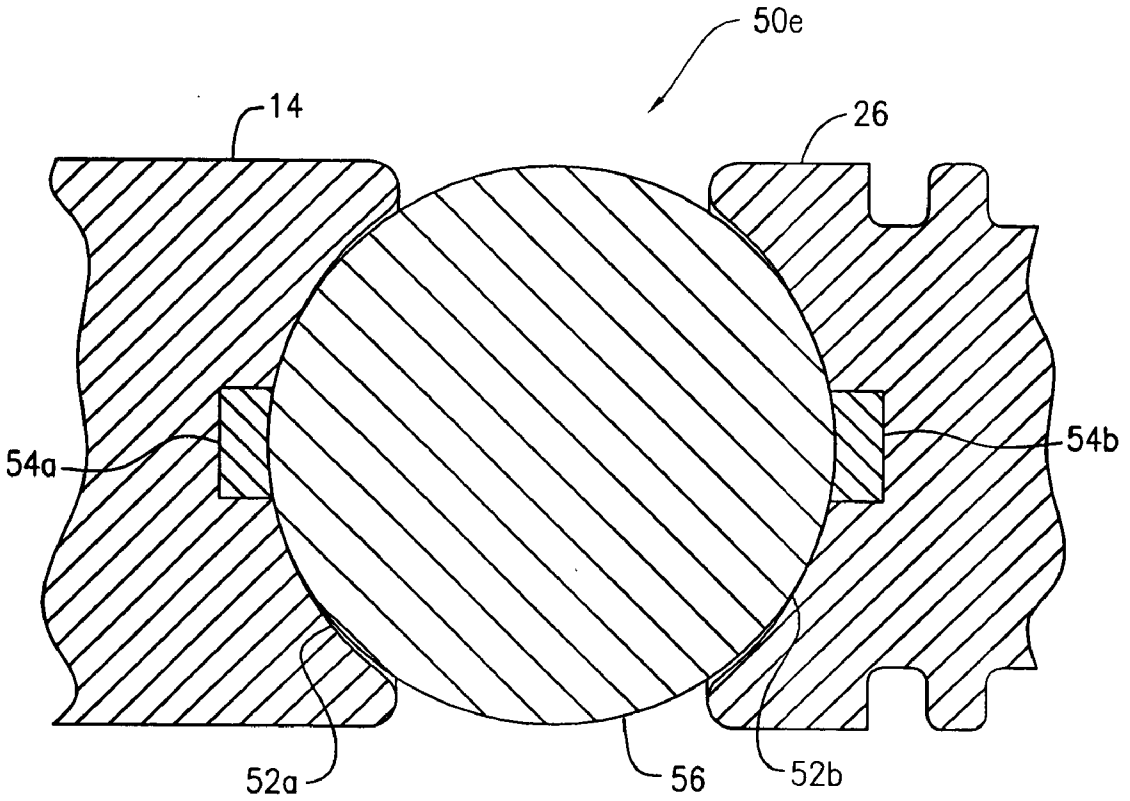

FIG. 3

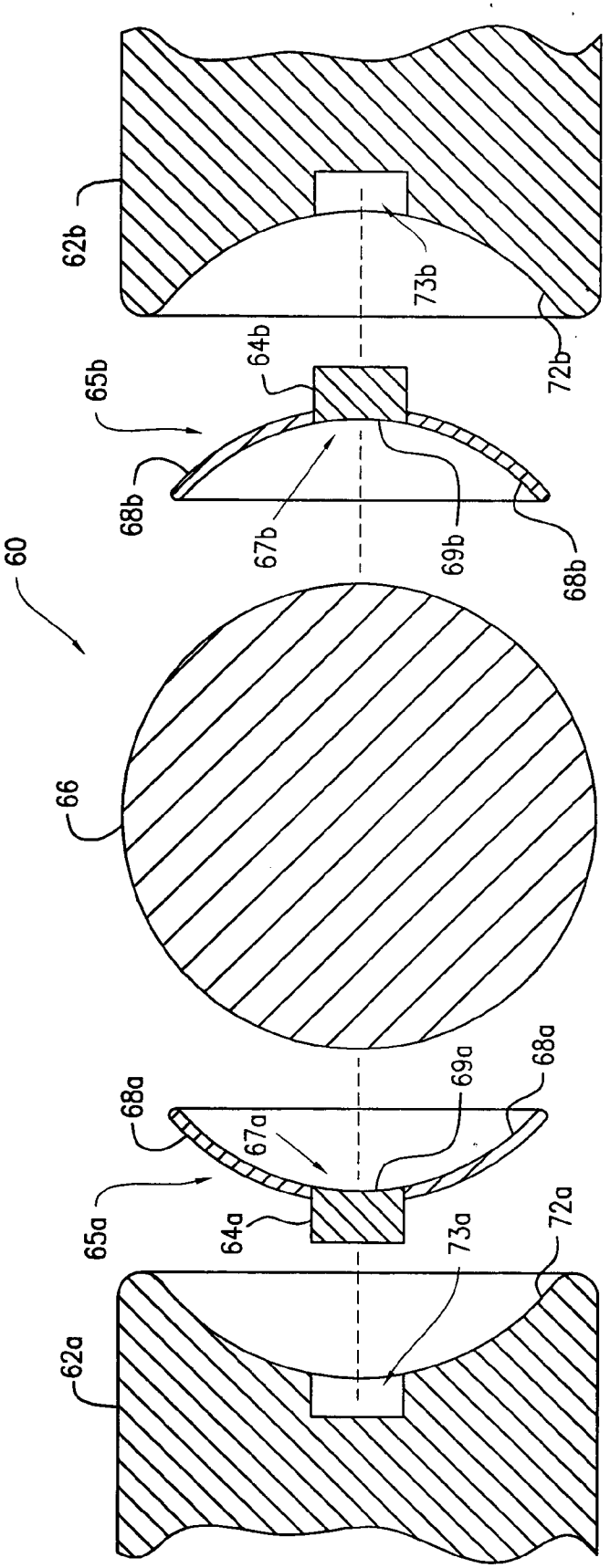
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FIG. 4a

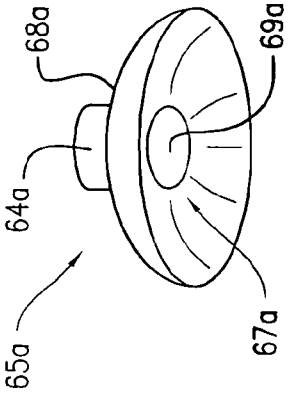
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FIG. 4b

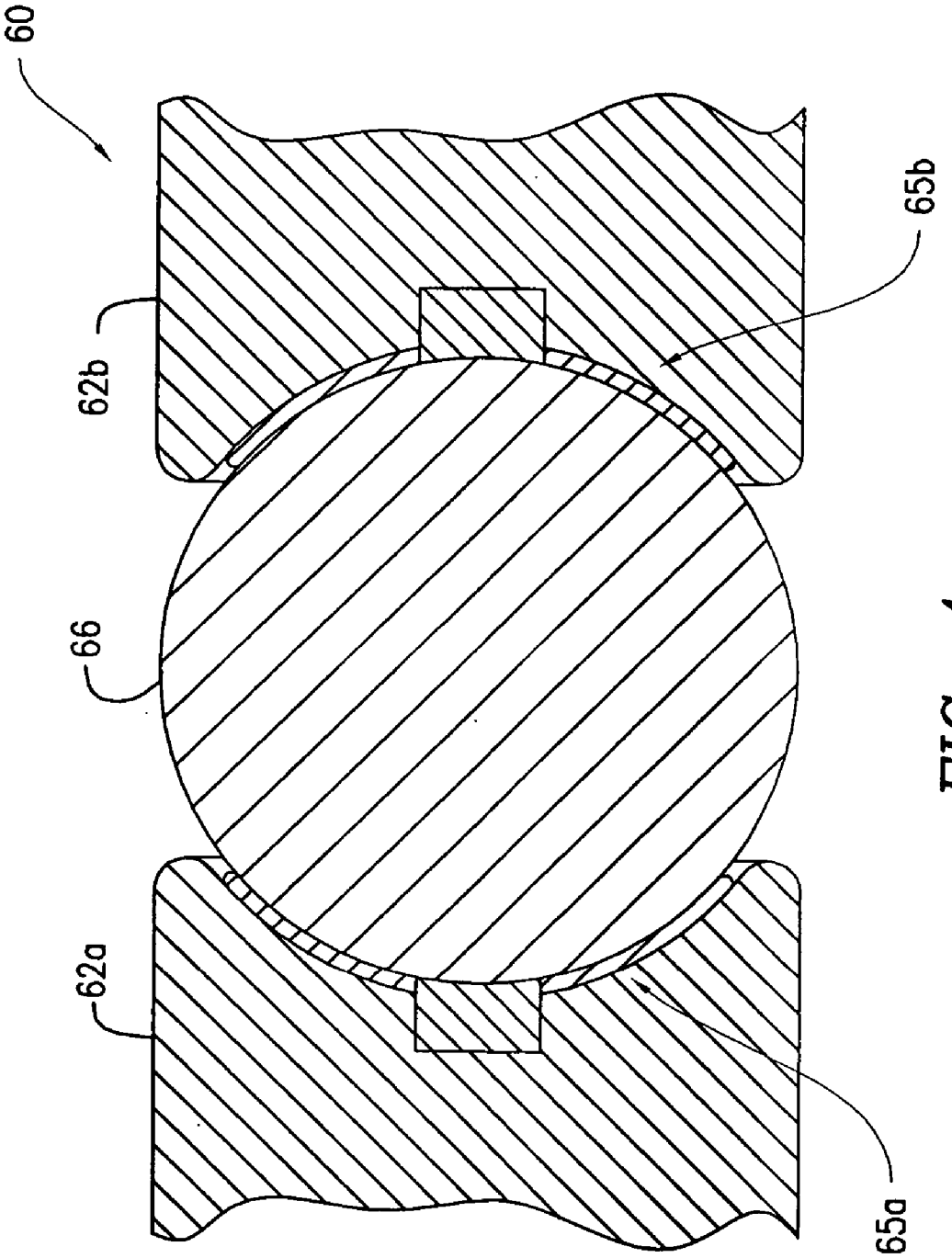

FIG. 4c

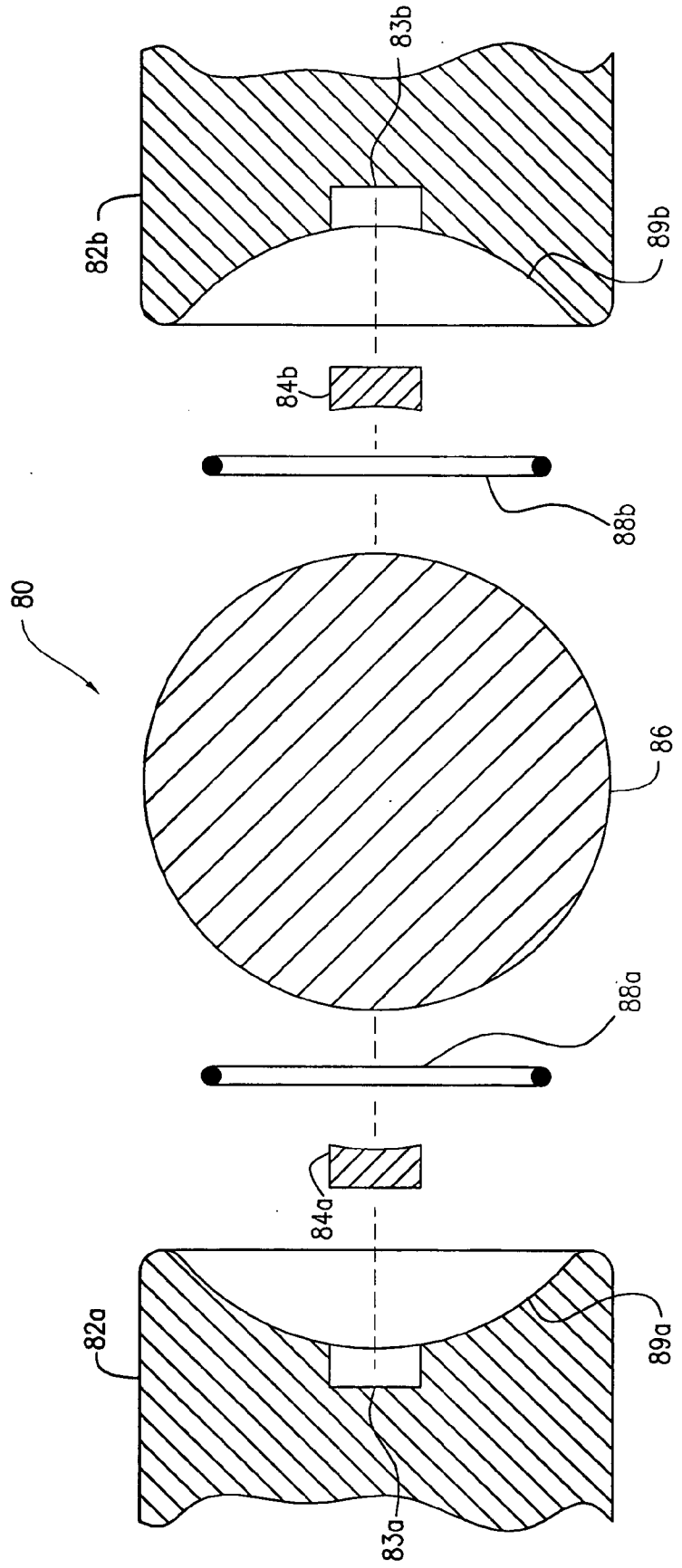

FIG. 5a

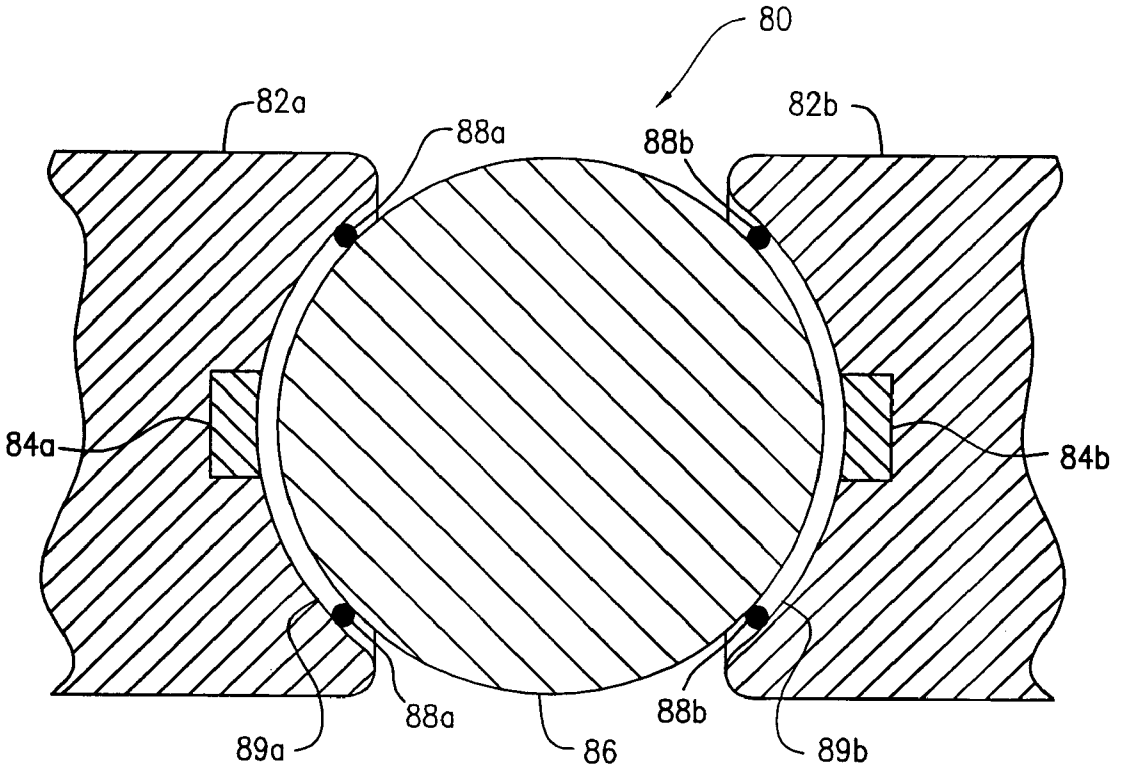

FIG. 5b

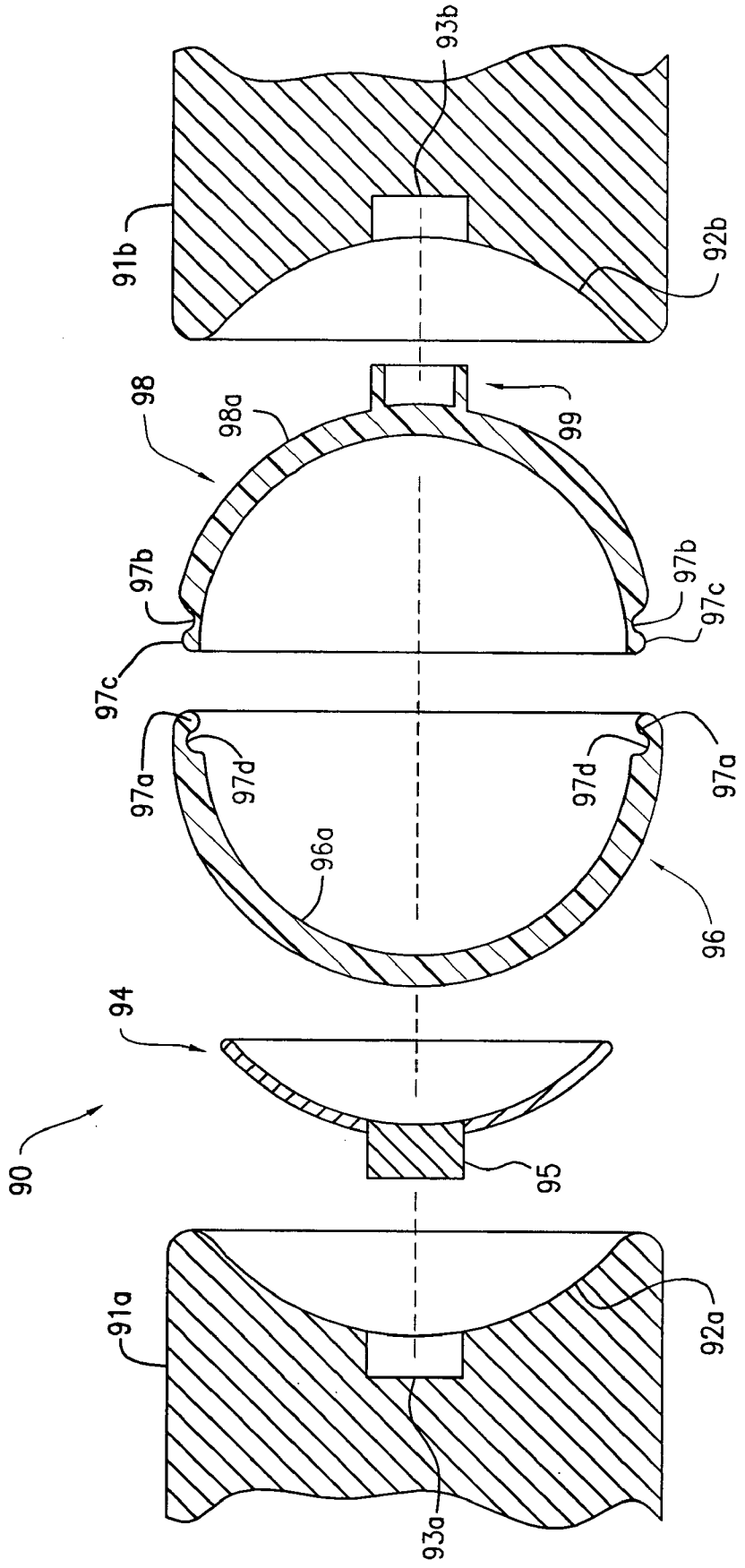
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FIG. 6a

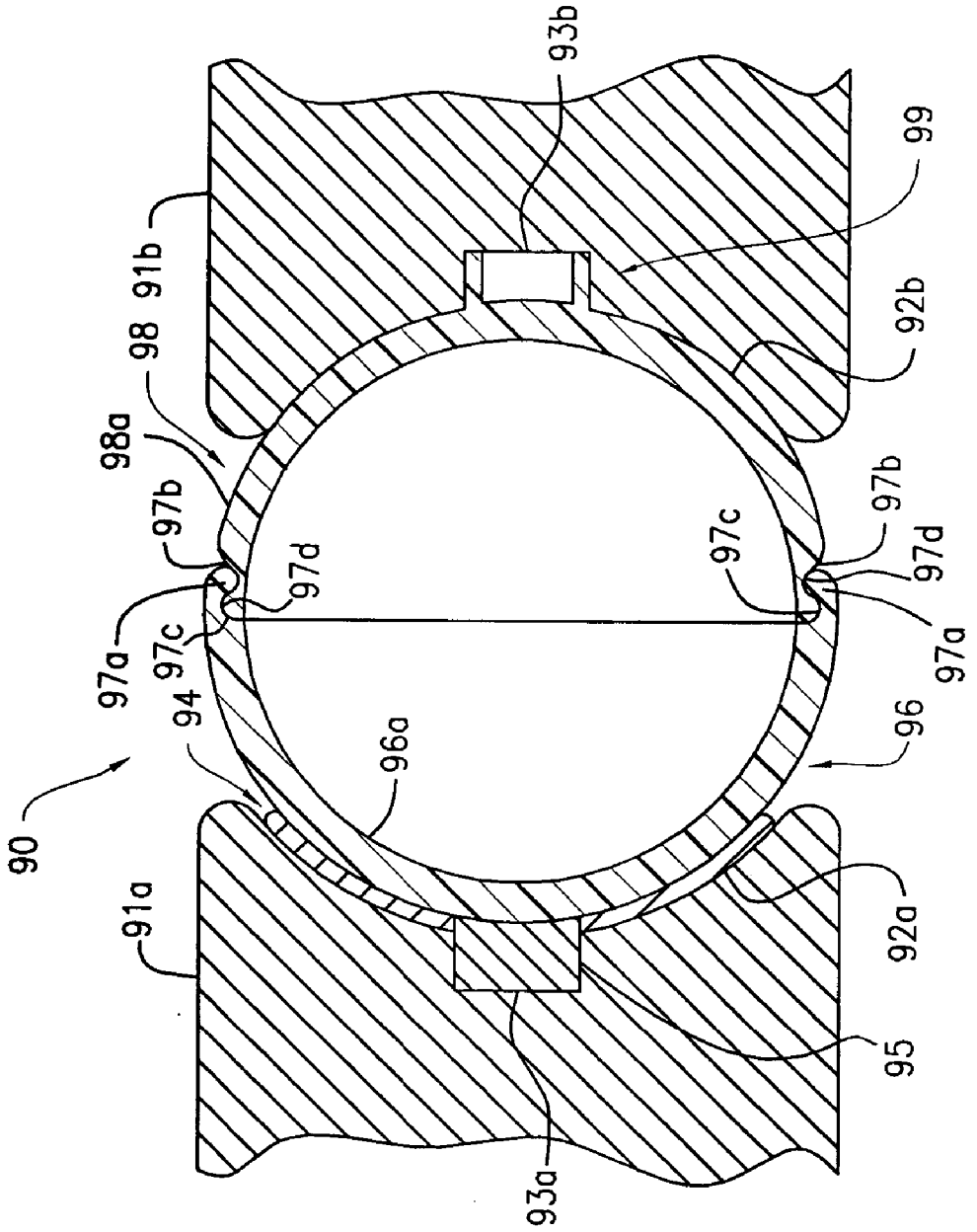
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FIG. 6b

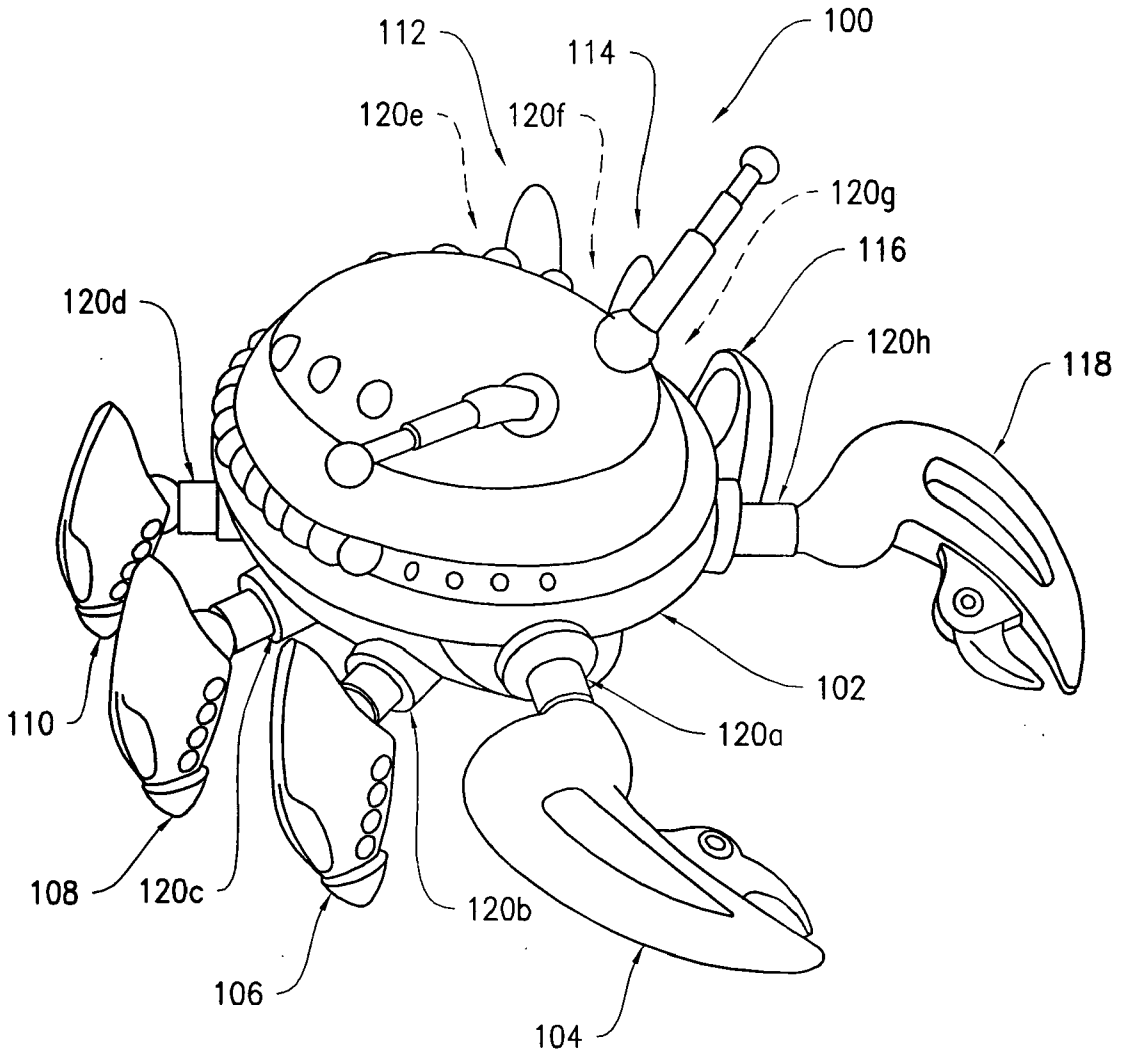
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FIG. 7

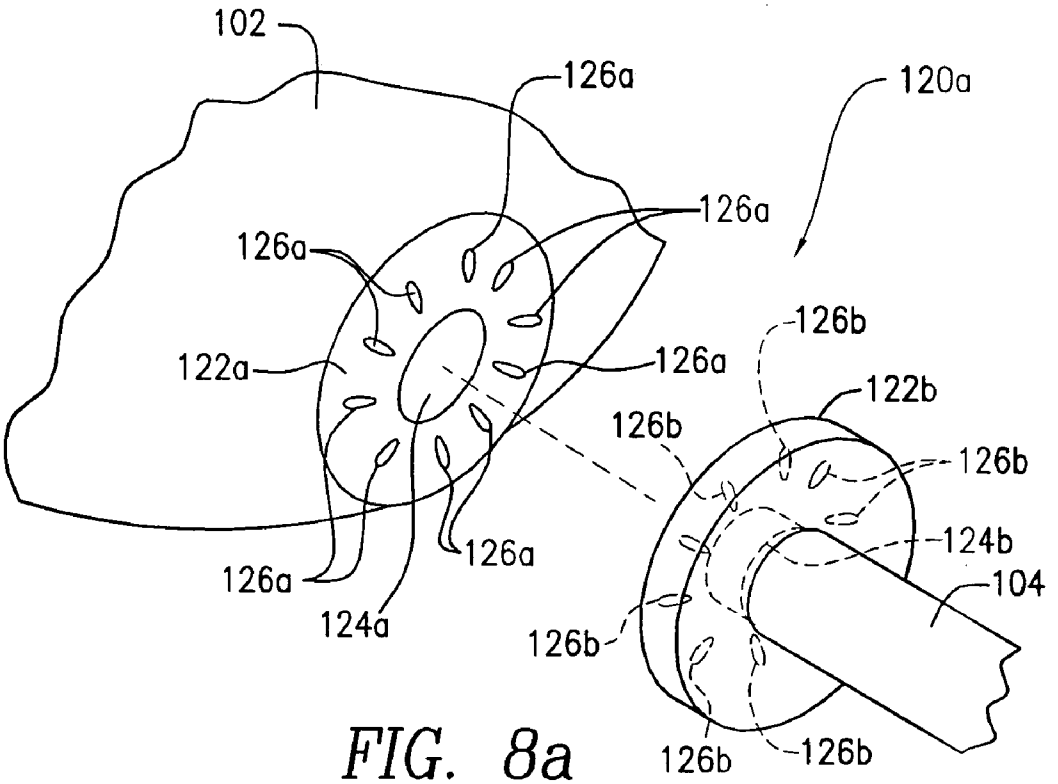
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FIG. 8a

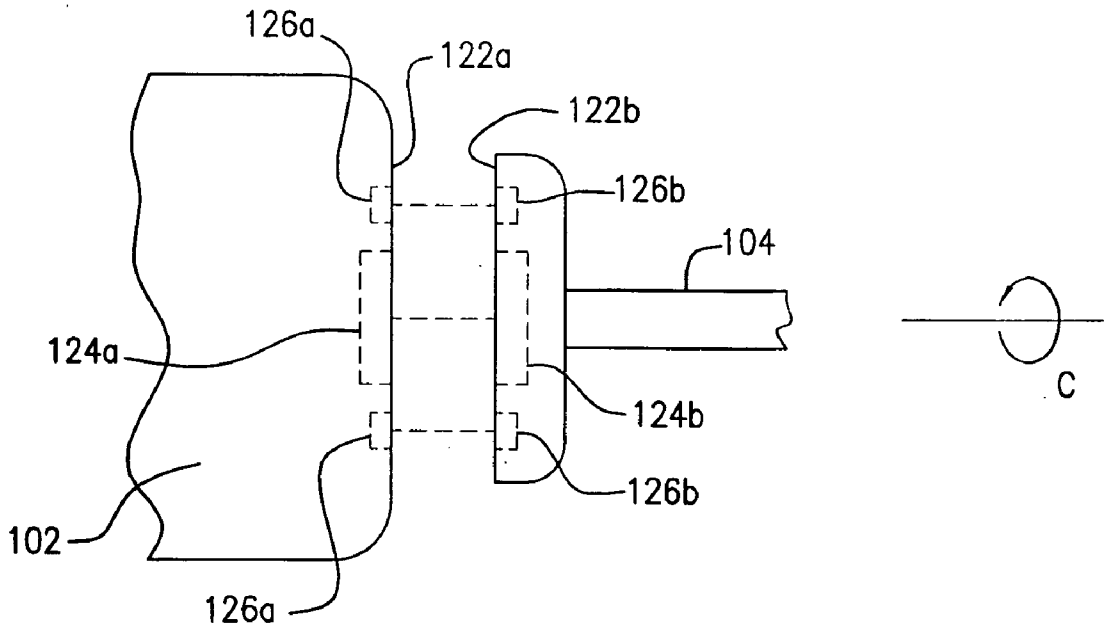
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FIG. 8b

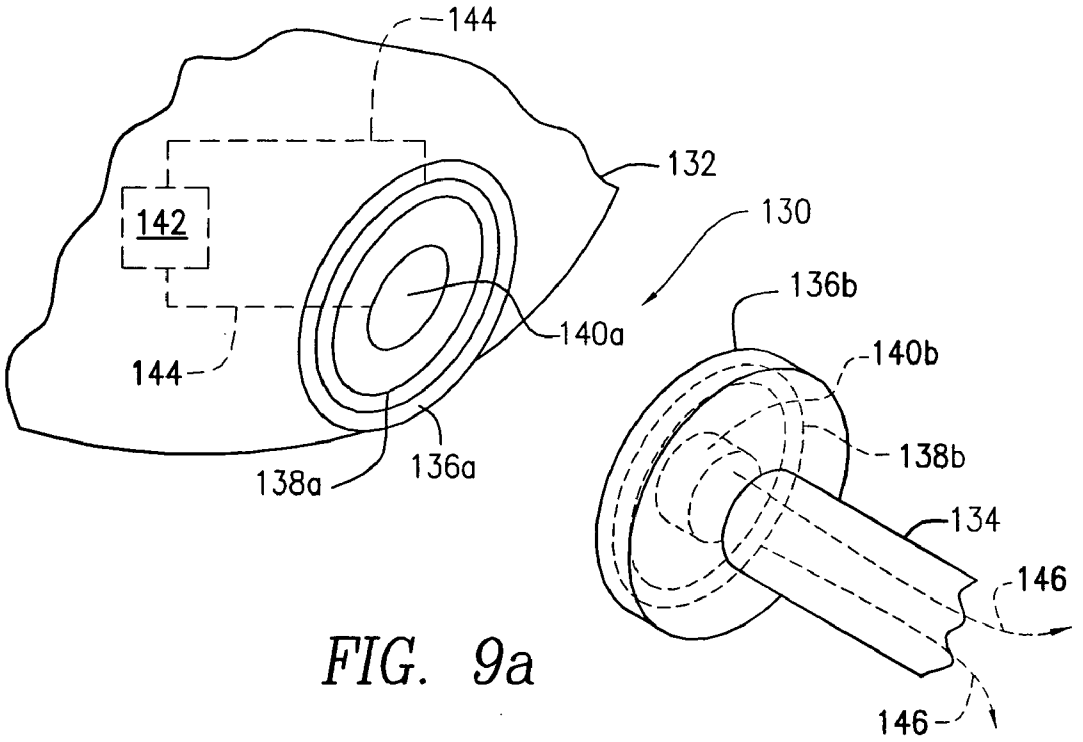
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FIG. 9a

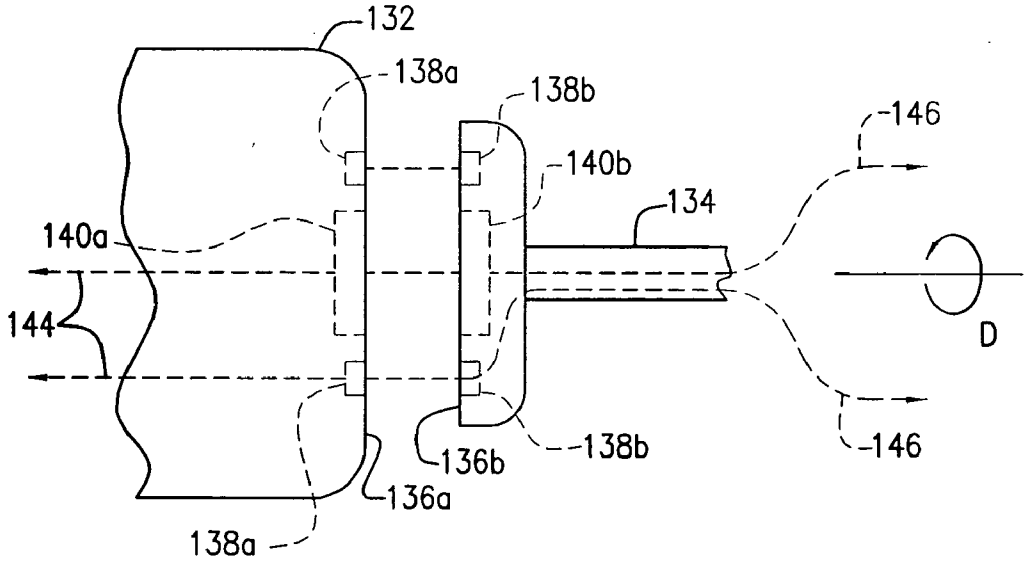
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FIG. 9b

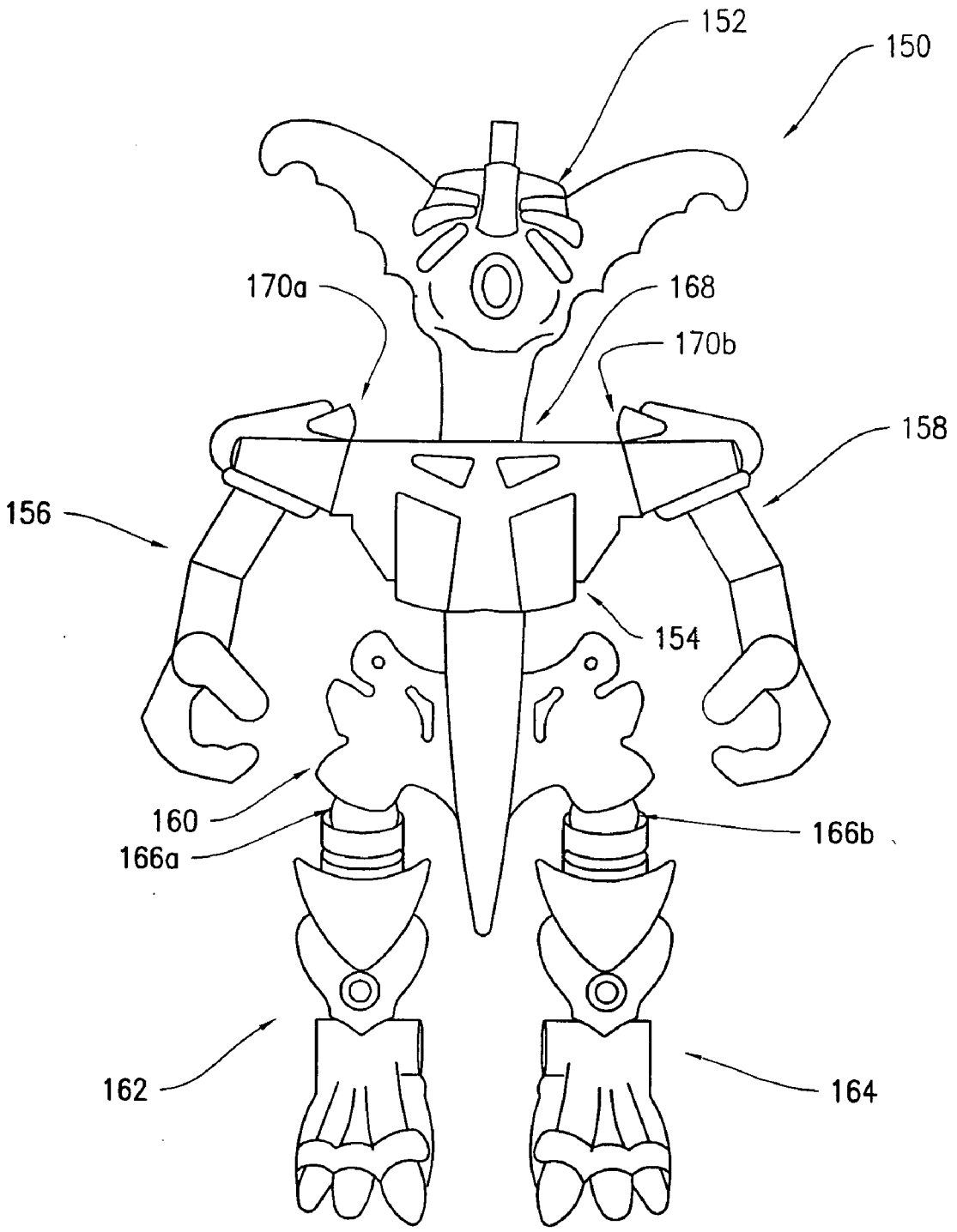

FIG. 10

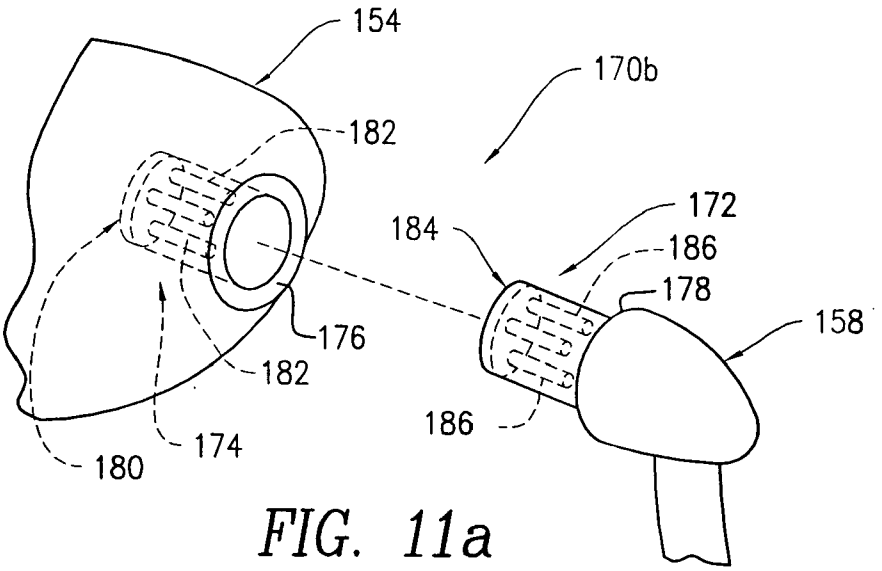

FIG. 11a

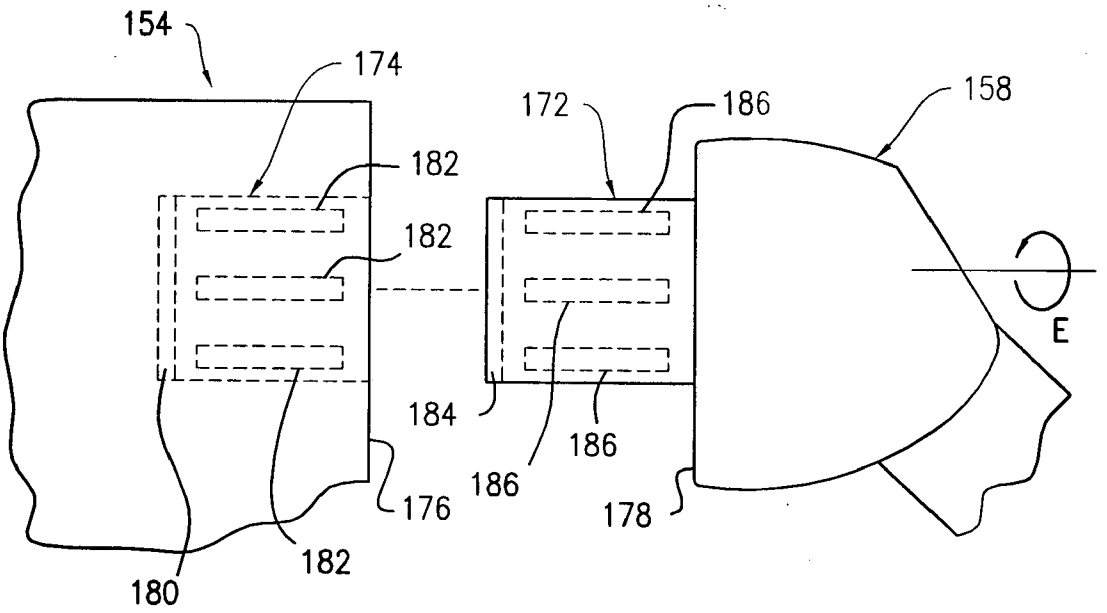

FIG. 11b

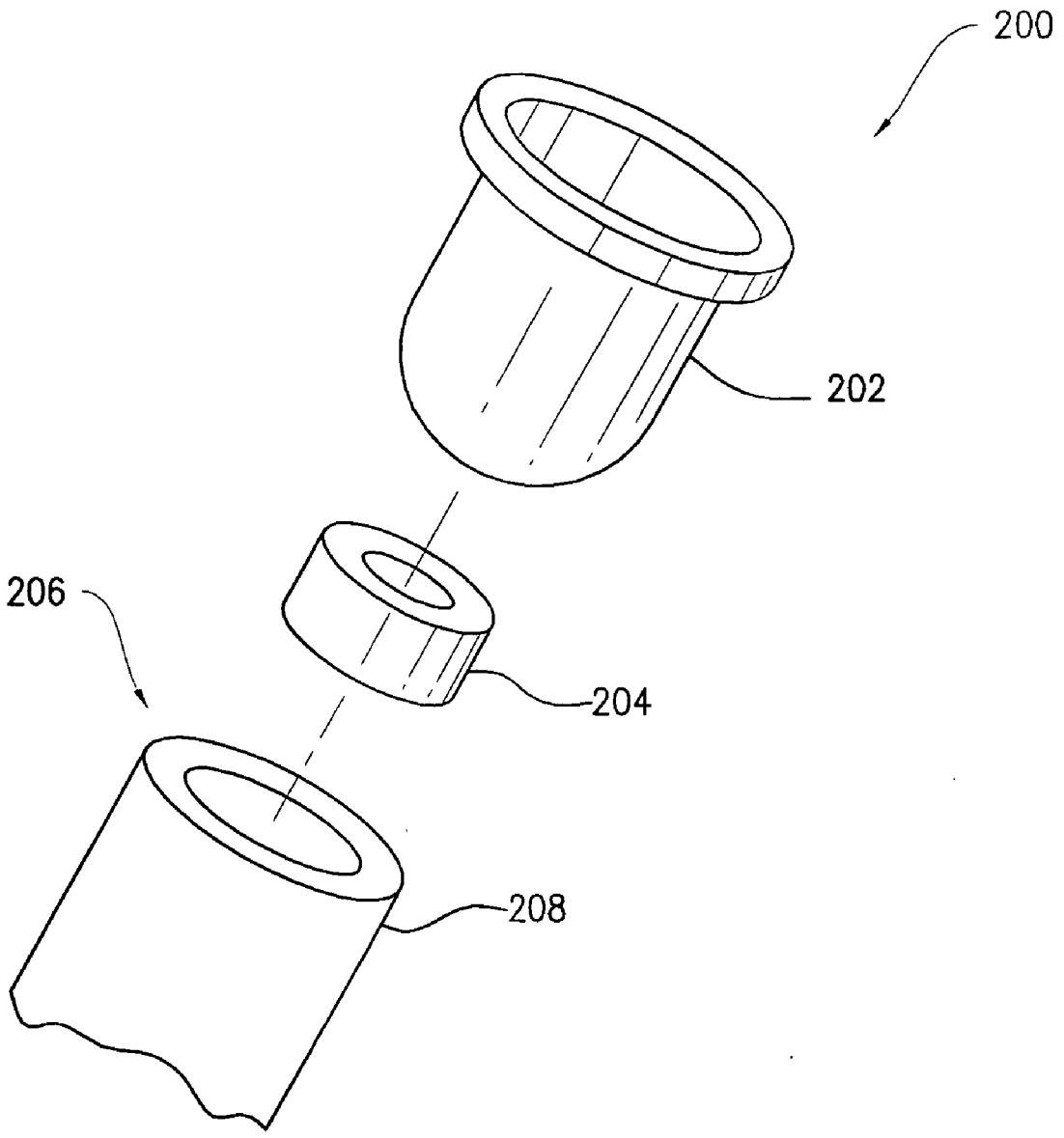

FIG. 12a

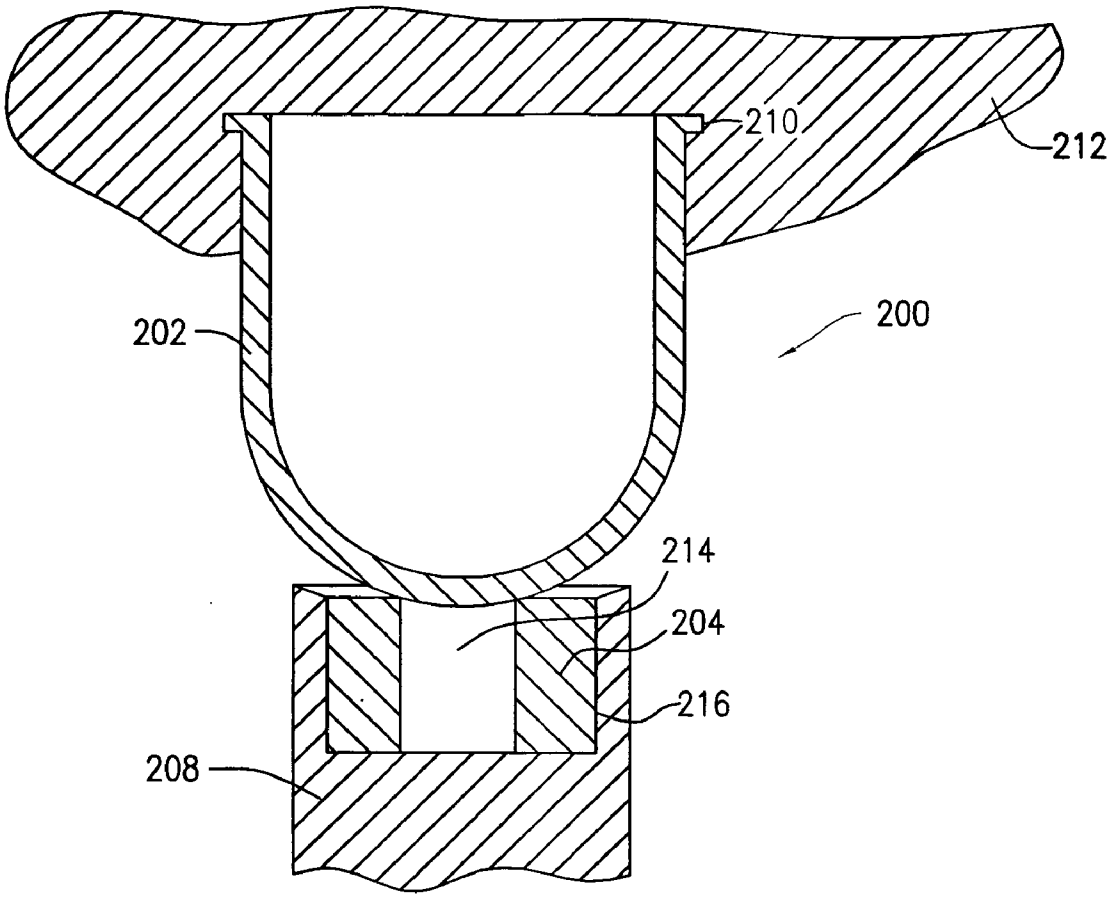

FIG. 12b

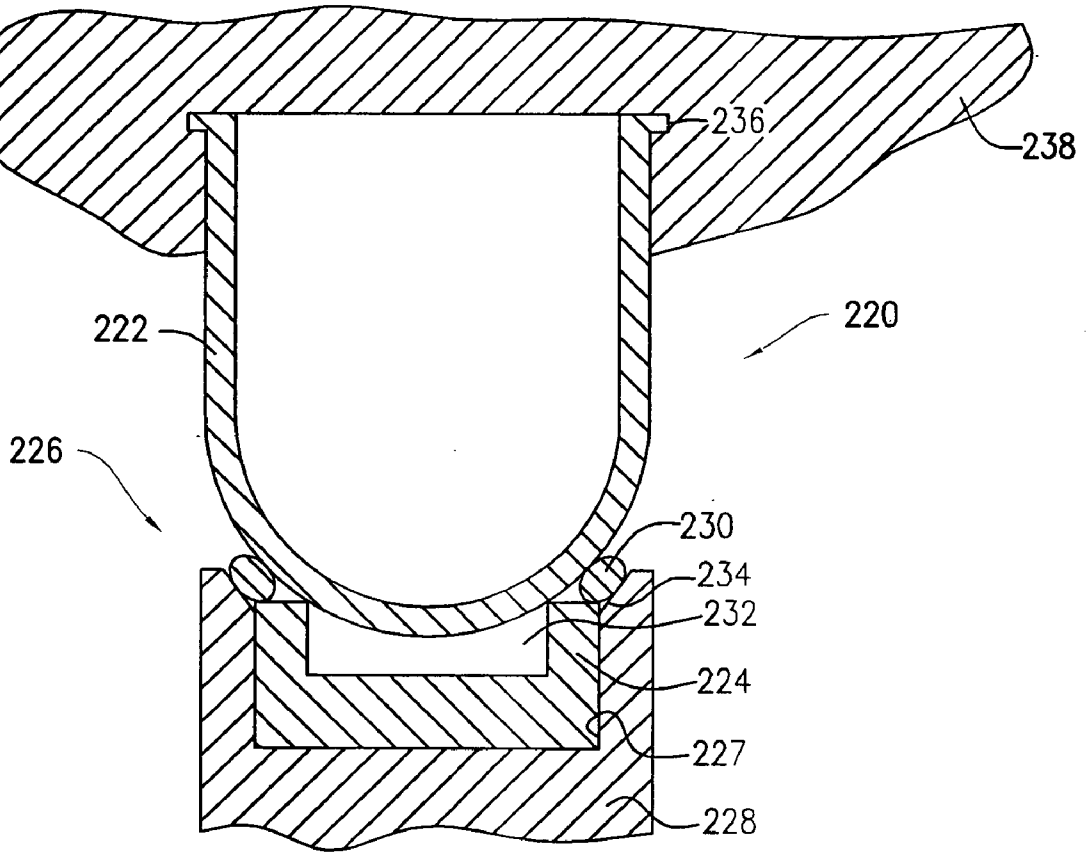

FIG. 13

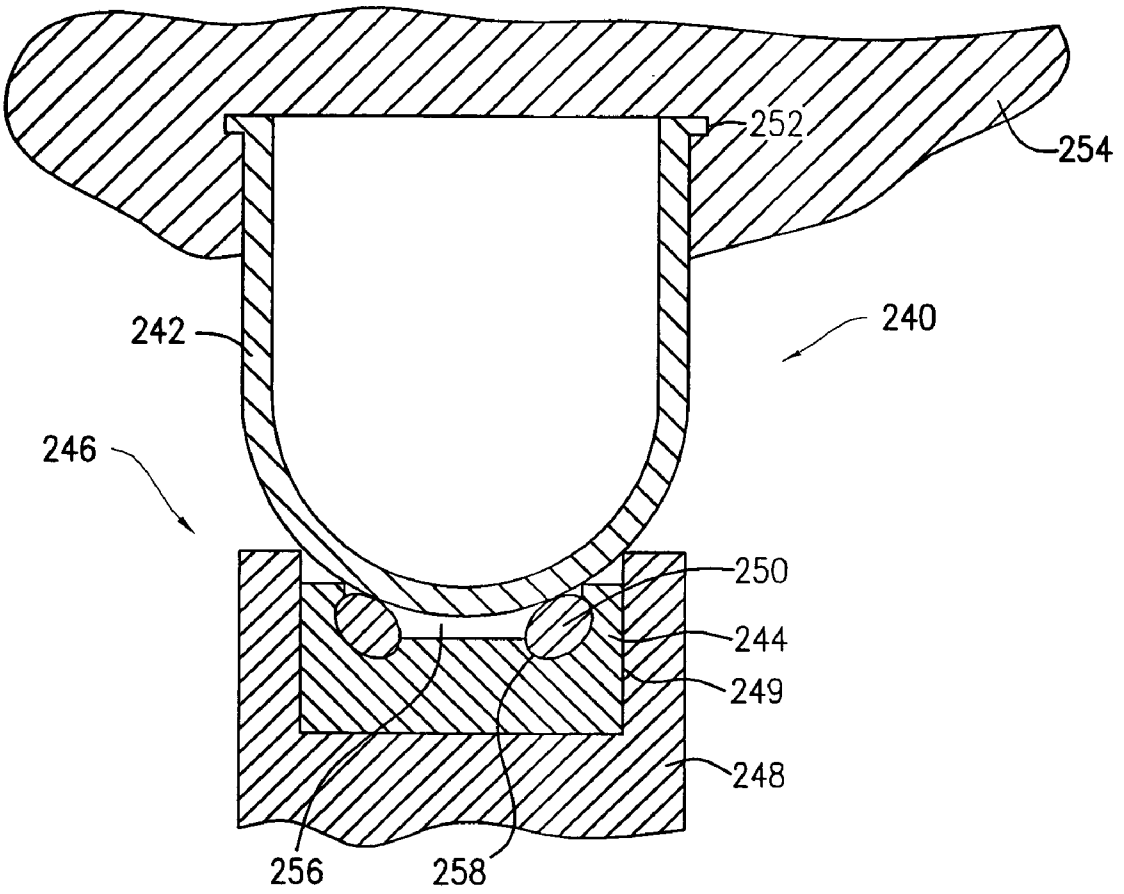

FIG. 14

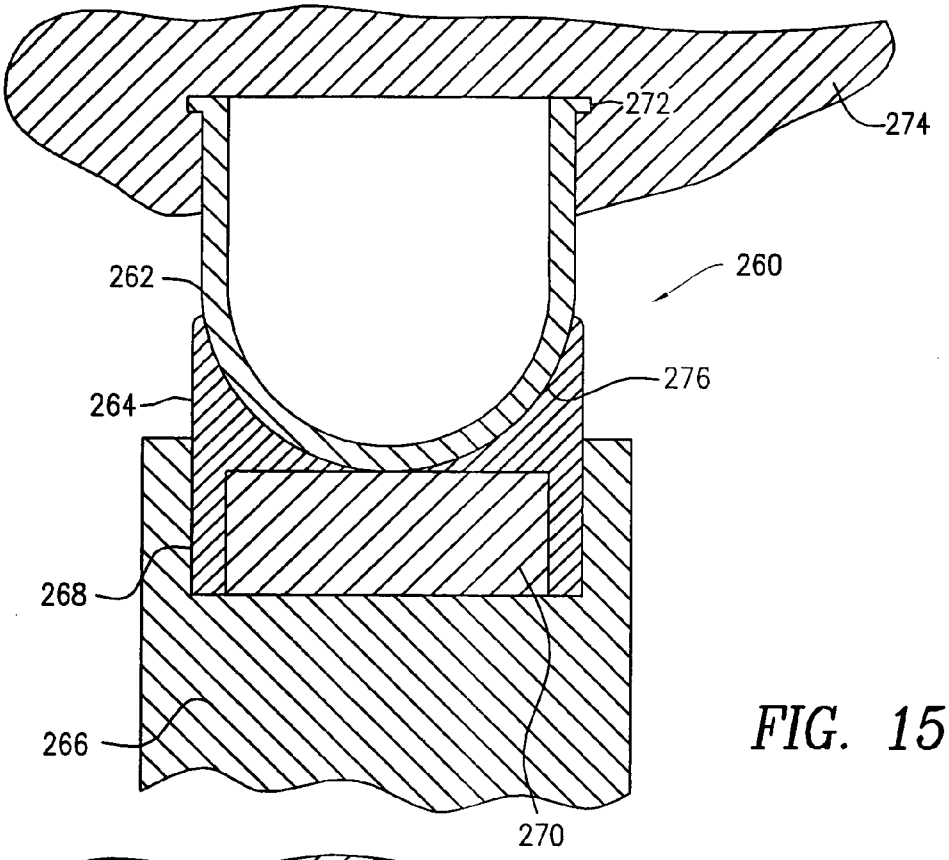
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FIG. 15

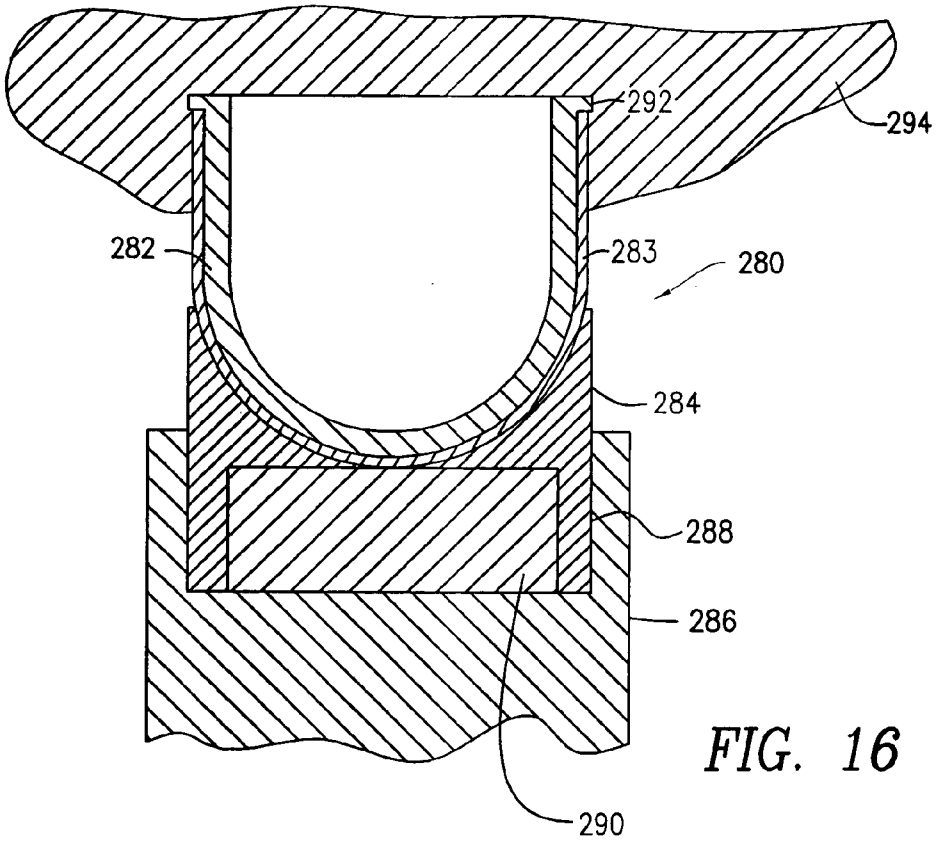
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FIG. 16

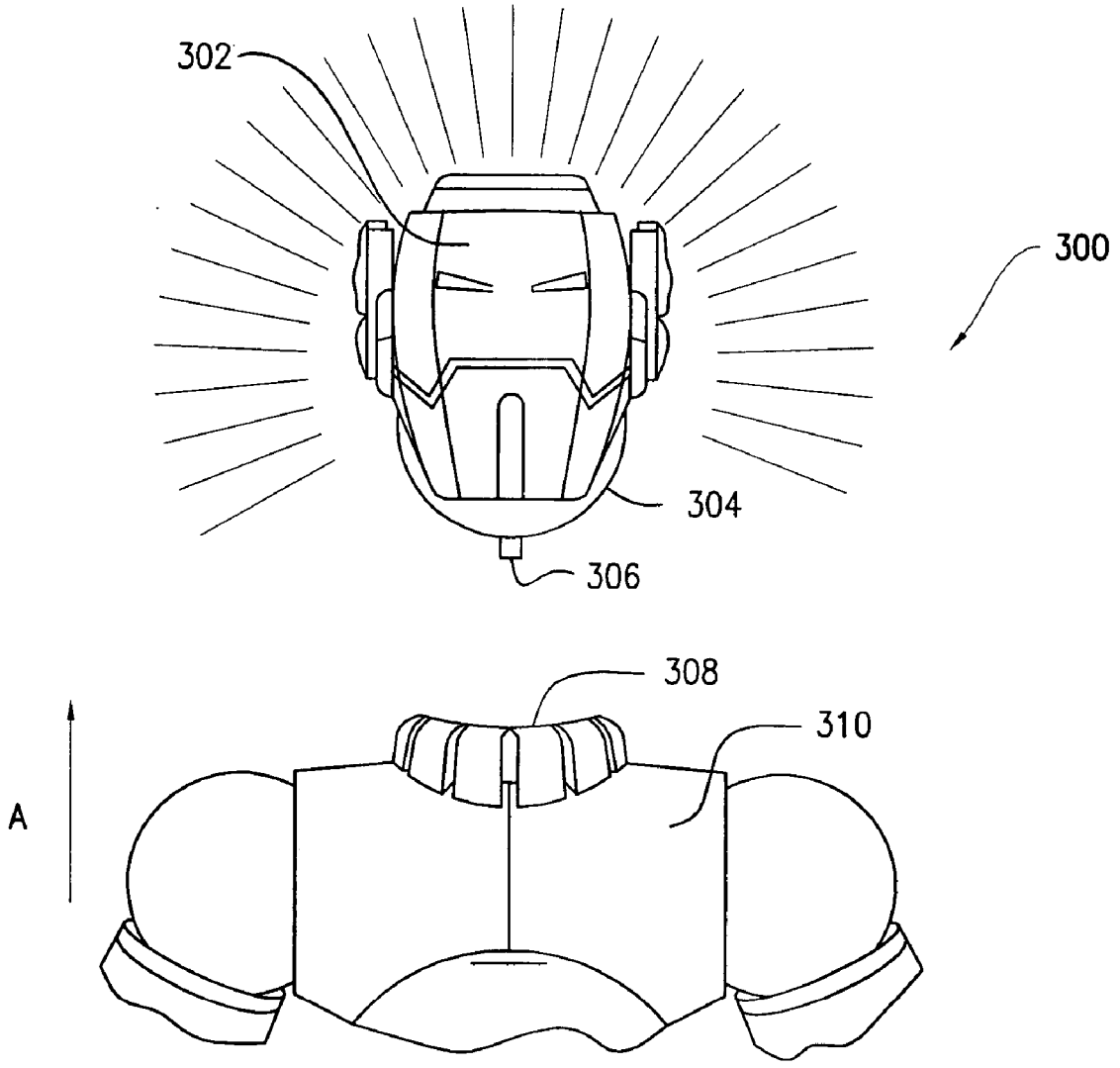

FIG. 17

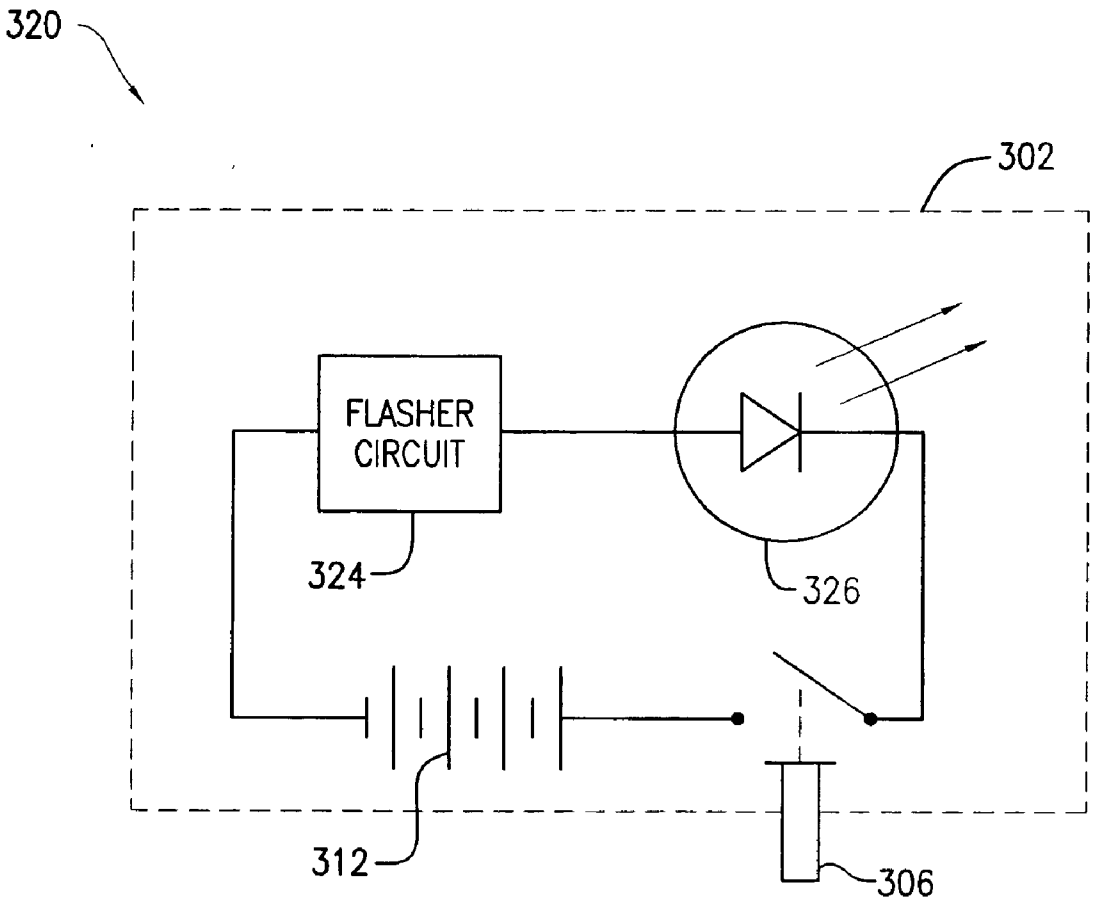

FIG. 18

MAGNETIC JOINTS AND TOY FIGURINES MADE THEREFROM

RELATED APPLICATIONS

[0001] This application is a continuation-in-part of U.S. patent application Ser. No. 11/182,212 filed Jul. 15, 2005, which is a continuation-in-part of U.S. Design patent application Ser. No. 29/223,384 filed Feb. 10, 2005; U.S. Design patent application Ser. No. 29/223,389 filed Feb. 10, 2005; U.S. Design patent application Ser. No. 29/223,385 filed Feb. 10, 2005; U.S. Design patent application Ser. No. 29/223,387 filed Feb. 10, 2005; U.S. Design patent application Ser. No. 29/223,386 filed Feb. 10, 2005; U.S. Design patent application Ser. No. 29/223,383 filed Feb. 10, 2005; U.S. Design patent application Ser. No. 29/223,392 filed Feb. 11, 2005; U.S. Design patent application Ser. No. 29/223,391 filed Feb. 11, 2005; U.S. Design patent application Ser. No. 29/223,397 filed Feb. 11, 2005; U.S. Design patent application Ser. No. 29/223,388 filed Feb. 11, 2005; U.S. Design patent application Ser. No. 29/223,395 filed Feb. 11, 2005; and U.S. Design patent application Ser. No. 29/223,393 filed Feb. 11, 2005, the entire disclosures of which are all expressly incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to the field of toy figurines, and, more particularly, to toy figurines having magnetic joints.

BACKGROUND OF THE INVENTION

[0003] Joints of various designs have, in the past, been developed for toy figurines to permit the selective attachment and removal of component parts, such as appendages and the like. An example of a joint for a toy figurine can be found in U.S. Pat. No. 5,295,889 to Ejima, which discloses a toy figurine having magnetically-coupled, ball-and-socket joints that allow appendages to be selectively attached to the figurine as desired. Another example of a joint for a toy figurine can be found in U.S. Patent Application Publication No. US 2004/0077259 to Barri, which discloses a toy figurine having joints in the form of magnetized pegs and corresponding sockets for receiving the pegs. Other examples of joints include U.S. Pat. No. 6,203,396 to Asmussen, et al. and U.S. Pat. No. 6,705,794 to Varner, et al., which disclose magnetically-coupled joints for mannequins with generally flat joint surfaces that allow for indexing of parts using protrusions and corresponding recesses (see the Asmussen, et al. Patent) or a pin and corresponding apertures (see the Varner, et al. Patent).

[0004] Existing joint designs suffer from a number of disadvantages. For example, in the case of the magnetically-coupled, ball-and-socket joints currently available in toy figurines, only a single socket is provided, and the ball is attached to a component of the figurine (e.g., to an appendage or other part). Thus, the ball is neither removable from the figurine nor interchangeable with another ball. As such, the user cannot substitute balls of desired colors, patterns, or designs to achieve a desired appearance, nor can the user quickly and conveniently construct figurines using a multitude of interchangeable components.

[0005] Moreover, while existing joint designs allow for indexing of parts, such designs do not allow for indexing using magnets and completely planar (flat) joint surfaces. Rather, a pin and corresponding apertures or a protrusion and corresponding recesses (or other mechanical arrangement) are required to effectuate indexing. Further, current joint designs for toy figurines do not allow power to be transmitted through a completely planar or flat joint interface. Accordingly, there is a need to provide magnetic joints for toy figurines that address the foregoing limitations.

SUMMARY OF THE INVENTION

[0006] The present invention overcomes the disadvantages and shortcomings of the prior art discussed above by providing magnetic joints for toy figurines having various configurations that allow for the quick and easy assembly and disassembly of figurine components. In one embodiment of the present invention, the magnetic joint comprises a ball and a pair of sockets magnetically coupled to the ball, wherein the first socket is formed in a first figurine part and the second socket is formed in a second figurine part. Each socket includes a magnet embedded in the socket for magnetically coupling the socket to the ball. The joint allows for angulation and rotation of joined parts, as well as for quick and convenient assembly and disassembly of figurine components. The ball "floats" between the sockets, and can be removed by the user and substituted with another ball, as desired. A pair of friction inlays or O-rings can be provided between the ball and the sockets to provide sufficient friction when the joint is assembled to allow coupled figurine components to be retained in one or more desired positions.

[0007] In another embodiment of the present invention, the magnetic joint comprises a first socket formed in a first figurine component, a first hemispherical portion magnetically coupled with the first socket, a second hemispherical portion interconnected with the first hemispherical portion, and a second socket formed in a second figurine component and interconnected with the second hemispherical portion. A friction inlay could be provided between the first socket and the first hemispherical portion to provide sufficient friction when the joint is assembled to allow the first figurine component to be retained in one or more desired positions.

[0008] In another embodiment of the present invention, the magnetic joint comprises a pair of complementary, generally planar joint surfaces that are magnetically coupled to each other using complementary magnets embedded in the joint surfaces. Complementary central magnets could be embedded in central regions of the joint surfaces for coupling the joints together, and a plurality of satellite magnets could be disposed radially about each central magnet and embedded in the joint surfaces to allow coupled figurine components to be rotated and held in one or more predetermined positions (indexed). Complementary conductive regions, such as a central conductive region surrounded by an annular conductive region, could be provided on each joint surface for allowing electrical power to be transmitted through the joint.

[0009] In still another embodiment of the present invention, the magnetic joint comprises a peg and corresponding socket construction that cooperate to permit rotation of coupled figurine components. The peg and socket each include corresponding end magnets for retaining the peg in the socket. A plurality of corresponding indexing magnets are embedded in the peg and the socket for allowing the

joined parts to be retained in one or more predetermined positions (internally indexed) when the indexing magnets are rotated into alignment with each other.

[0010] In another embodiment of the present invention, the magnetic joint comprises a socket including a ring magnet, and a ferromagnetic, hemispherical portion magnetically coupled with the ring magnet. The ring magnet is attached to a first figurine component in a recess formed therein, while the ferromagnetic, hemispherical portion is attached to a second figurine component.

[0011] In still another embodiment of the present invention, the magnetic joint comprises a socket which includes a magnet having a recess, the magnet being attached to a first figurine component in a recess formed therein, a ferromagnetic, hemispherical portion attached to a second figurine component, and an O-ring positioned between the magnet and the ferromagnetic, hemispherical portion. The O-ring provides frictional engagement with the ferromagnetic, hemispherical portion, so that the first figurine component is retained in a desired position with respect to the second figurine component. The O-ring could be positioned in an annular channel formed in the magnet.

[0012] In another embodiment of the present invention, the magnetic joint comprises a flexible socket attached to a first figurine component and having a magnet positioned therein, and a ferromagnetic, hemispherical portion attached to a second figurine component and magnetically coupled with the flexible socket. An inner surface of the flexible socket frictionally engages the ferromagnetic, hemispherical portion to retain the first figurine component in a desired position with respect to the second figurine component. A coating could be provided on the ferromagnetic, hemispherical portion to facilitate frictional engagement with the socket.

[0013] In still another embodiment of the present invention, the magnetic joint comprises a socket attached to a first figurine component, a ferromagnetic, hemispherical portion attached to a second figurine component and magnetically coupled with the socket, and a switch extending through an aperture formed in the ferromagnetic, hemispherical portion, wherein the switch is activated when the first figurine component is coupled to or uncoupled from the second figurine component. The switch could be connected to an electrical circuit (e.g., a light-emitting diode (LED) and an associated flasher circuit), so that the electrical circuit is activated when the switch is activated.

[0014] Further features and advantages of the invention will appear more clearly upon a reading of the following detailed description of various exemplary embodiments thereof, which are given below by way of example only with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] For a better understanding of the present invention, reference is made to the following detailed description of the exemplary embodiments considered in conjunction with the accompanying drawings, in which:

[0016] FIG. **1** is a front elevational view of a toy figurine having magnetically-coupled joints according to a first embodiment of the present invention, wherein each joint includes a ball and a pair of sockets magnetically coupled to the ball;

[0017] FIG. **2** is a front elevational view of one of the magnetic joints for the toy figurine shown in FIG. **1**;

[0018] FIG. **3** is a cross-sectional view, taken along section line **3-3** of FIG. **2** and looking in the direction of the arrows, of the magnetic joint shown in FIG. **2**;

[0019] FIG. **4***a* is an exploded, cross-sectional view of another embodiment of the magnetic joints of the present invention, wherein friction inlays are provided between the sockets and the ball;

[0020] FIG. **4***b* is a perspective view of one of the friction inlays shown in FIG. **4***a;*

[0021] FIG. **4***c* is a cross-sectional view showing the components of FIG. **4***a* assembled;

[0022] FIG. **5***a* is an exploded, cross-sectional view of another embodiment of the magnetic joints of the present invention, wherein O-rings are provided between the sockets and the ball;

[0023] FIG. **5***b* is a cross-sectional view showing the components of FIG. **5***a* assembled;

[0024] FIG. **6***a* is an exploded, cross-sectional view of another embodiment of the magnetic joints of the present invention, including a two-piece, ferromagnetic ball which is coupled to only one of two socket members;

[0025] FIG. **6***b* is a cross-sectional view showing the components of FIG. **6***a* assembled;

[0026] FIG. **7** is a perspective view of a toy figurine having magnetic joints according to another embodiment of the present invention, wherein the joints include generally planar surfaces that allow for indexing;

[0027] FIG. **8***a* is a perspective view of one of the magnetic joints for the toy figurine shown in FIG. **7**;

[0028] FIG. **8***b* is a front elevational view of the magnetic joint shown in FIG. **8***a;*

[0029] FIG. **9***a* is a perspective view of another embodiment of the magnetic joints of the present invention, wherein each joint includes generally planar surfaces having conductive areas for allowing power transmission through the joint;

[0030] FIG. **9***b* is a front elevational view of the magnetic joint shown in FIG. **9***a;*

[0031] FIG. **10** is a perspective view of a toy figurine having magnetic joints according to another embodiment of the present invention, wherein each joint comprises an internally-indexed, magnetically-coupled peg and socket;

[0032] FIG. **11***a* is a perspective view of one of the magnetic joints for the toy figurine shown in FIG. **10**;

[0033] FIG. **11***b* is a front elevational view of the magnetic joint shown in FIG. **11***a;*

[0034] FIG. **12***a* is an exploded perspective view of another embodiment of the magnetic joints of the present invention, which embodiment includes a socket having an hemispherical portion;

[0035] FIG. **12***b* is a cross-sectional view showing the components of FIG. **12***a* assembled;

[0036] FIG. **13** is a cross-sectional view of another embodiment of the magnetic joints of the present invention, which embodiment includes a magnet having a recess, an hemispherical portion coupled to the magnet, and an O-ring positioned between the magnet and the hemispherical portion;

[0037] FIG. **14** is a cross-sectional view of another embodiment of the magnetic joints of the present invention, which embodiment is similar to the one shown in FIG. **13** except that an O-ring is positioned within an annular channel formed in the magnet;

[0038] FIG. **15** is a cross-sectional view of another embodiment of the magnetic joints of the present invention, which embodiment includes a flexible socket having a magnet positioned therein and an hemispherical portion;

[0039] FIG. **16** is a cross-sectional view of another embodiment of the magnetic joints of the present invention, which embodiment is similar to that shown in FIG. **15** except that the hemispherical portion includes a rubber coating;

[0040] FIG. **17** is a front elevational view of a portion of a figurine equipped with a magnetic joint and a switch for activating a lighting circuit within the figurine component; and

[0041] FIG. **18** is a schematic diagram showing the switch of FIG. **17** implemented in a light flasher circuit.

DETAILED DESCRIPTION OF THE DRAWINGS

[0042] Referring to FIG. **1**, there is shown a toy figurine **10** which includes a head **12**, an upper torso **14**, a lower torso **16**, arms **18**, **20**, and legs **22**, **24**. The arm **18** includes a bicep **26**, a forearm **28**, and a hand **30**. Similarly, the arm **20** includes a bicep **32**, a forearm **34**, and a hand **36**. The leg **22** includes a thigh **38**, a shin **40**, and a foot **42**. Similarly, the leg **24** includes a thigh **44**, a shin **46**, and a foot **48**. All of the foregoing parts are movably coupled to their adjoining parts by magnetic joints **50***a-n*.

[0043] FIG. **2** is a front elevational view of the magnetic joint **50***e* shown in FIG. **1**, it being understood that each of the magnetic joints **50***a-d* and **50***f-n* of FIG. **1** has the same construction as the magnetic joint **50***e*. With particular reference to FIGS. **2** and **3**, a ball **56** is positioned between a pair of magnetic sockets **52***a*, **52***b* (see FIG. **3**) formed in the upper torso **14** and the bicep **26**, respectively. The magnetic joint **50***e* allows for both angulation (indicated generally by arrow A) and rotation (indicated generally by arrow B) of the bicep **26** relative to the upper torso **14**. Each of the magnetic joints **50***a-d* and **50***f-n* shown in FIG. **1** is likewise adapted for such angulation and rotation. Importantly, the ball **56** can be completely disengaged from the upper torso **14** and the bicep **26**, and substituted with another ball having any desired color, pattern, or appearance, so as to enhance the entertainment value of the figurine. Further, it should be noted that more than two components can be joined to a single ball.

[0044] As shown in FIG. **3**, the ball **56** is positioned between the sockets **52***a*, **52***b* formed in the upper torso **14** and the bicep **26**, respectively. The sockets **52***a*, **52***b* are generally cup-shaped so as to conform to the shape of the ball **56**, and include magnets **54***a*, **54***b* embedded in central portions of the sockets **52***a*, **52***b*. The magnets **54***a*, **54***b* are magnetically attracted to the ball **56**, which can be manufactured from any suitable ferromagnetic material. The magnetic attraction of the magnets **54***a*, **54***b* to the ball **56** retains the sockets **52***a*, **52***b* in position against the ball **56** so as to couple the upper torso **14** to the bicep **26**. The sockets **52***a*, **52***b* can be disengaged from the ball **56** by pulling the upper torso **14** and the bicep **26** away from the ball **56**.

[0045] FIG. **4***a* is an exploded, cross-sectional view of another embodiment of the magnetic joints of the present invention, indicated generally at **60**, for coupling a first figurine portion **62***a* to a second figurine portion **62***b*. The joint **60** includes friction inlays **65***a*, **65***b* positioned between sockets **72***a*, **72***b* (formed in portions **62***a*, **62***b*, respectively) and a ball **66**. The friction inlays **65***a*, **65***b* include cup-shaped portions **68***a*, **68***b* which conform to the shape of the ball **66**. Magnets **64***a*, **64***b* extend through apertures **67***a*, **67***b* formed in the cup-shaped portions **68***a*, **68***b*, and are positionable within recesses **73***a*, **73***b* formed in the centers of the sockets **72***a*, **72***b*. The magnets **64***a*, **64***b* could include rounded faces **69***a*, **69***b*, respectively, which conform to the shape of the ball **66**. The inlays **65***a*, **65***b* could be interconnected with the sockets **72***a*, **72***b* in any known manner, such as by gluing or by means of a friction fit. Importantly, the inlays **65***a*, **65***b* provide sufficient friction against the ball **66** when the joint **60** is assembled (see FIG. **4***c*) to retain the figurine portions **62***a*, **62***b* in a desired position with respect to each other, while allowing for rotation and angulation. As shown in FIG. **4***b*, which is a perspective view of one of the friction inlays **65***a* (the opposite friction inlay **65***b* being identical thereto), the magnet **64***a* extends through the aperture **67***a* formed in the cup-shaped portion **68***a* of the inlay **65***a*. The magnet **64***a* could be permanently attached to the cup-shaped portion **68***a* (e.g., by gluing), or could be removable therefrom. Further, it should be noted that the inlays **65***a*, **65***b* could be manufactured from rubber or other suitable material.

[0046] FIG. **5***a* is an exploded, cross-sectional view of another embodiment of the magnetic joints of the present invention, indicated generally at **80**, wherein O-rings **88***a*, **88***b* are positioned between generally cup-shaped sockets **89***a*, **89***b* and a ball **86**. The sockets **89***a*, **89***b* are formed in figurine components **82***a*, **82***b* (which could be any desired components of a figurine), and include magnets **84***a*, **84***b* positioned in recesses **83***a*, **83***b* formed in the sockets **89***a*, **89***b*. When the magnetic joint **80** is assembled (see FIG. **5***b*), the O-rings **88***a*, **88***b* bear against the ball **86** when the sockets **89***a*, **89***b* are coupled to the ball **86**, so that the figurine components **82***a*, **82***b* can be retained in a desired position with respect to each other after being moved by a user. The O-rings **88***a*, **88***b* can be made from any suitable material.

[0047] FIG. **6***a* is an exploded, cross-sectional view of another embodiment of the magnetic joints of the present invention, indicated generally at **90**, for joining first and second figurine components **91***a*, **91***b* (which could be any desired components of a figurine). The joint **90** includes a first socket **92***a* formed in the first figurine component **91***a*, a second socket **92***b* formed in the second figurine component **91***b*, a friction inlay **94**, a first hemispherical portion **96**, and a second hemispherical portion **98**. The socket **92***a* includes a recess **93***a* for receiving a magnet **95** formed in the friction inlay **94**, and the friction inlay **94** could be

permanently attached to the socket **92***a* (such as by gluing) or temporarily by means of a friction fit. The socket **92***b* includes a recess **93***b* for receiving a protrusion **99** formed on the second hemispherical portion **98**. The second hemispherical portion **98** can be permanently attached to the second socket **92***b* in any suitable manner, such as by gluing, etc.

[**0048**] The first hemispherical portion **96** includes an annular lip **97***a* that is configured to be received by an annular external recess **97***b* formed on an external surface **98***a* of the second hemispherical portion **98**. Similarly, the second hemispherical portion **98** includes an annular lip **97***c* that is configured to be received by an annular recess **97***d* formed on an internal surface **96***a* of the first hemispherical portion **96**. The lips **97***a*, **97***c* and recesses **97***b*, **97***d* cooperate to interconnect the first hemispherical portion **96** to the second hemispherical portion **98**. The first hemispherical portion **96** is preferably manufactured from a ferromagnetic material, so as to facilitate magnetic attraction to the magnet **95**. When the joint **90** is assembled (see FIG. **6***b*), magnetic attraction between the magnet **95** and the first hemispherical portion **96** couples the first figurine component **91***a* to the first hemispherical portion **96**, allowing for rotation and angulation of the first figurine component **91***a*. The friction inlay **94** provides sufficient friction to retain the first figurine component **91***a* in a desired position.

[**0049**] FIG. **7** is a perspective view of a toy figurine, indicated generally at **100**, having a body portion **102**, a plurality of appendages **104-118**, and a plurality of magnetic joints **120***a-h* made in accordance with another embodiment of the present invention for the purpose of coupling the appendages **104-118** to the body portion **102**. The magnetic joints **120***a-h* include complementary, generally planar (i.e., flat) joint surfaces **122***a*, **122***b* (see FIGS. **8***a*-**8***b*) that allow for rotation and indexing. The magnetic joints **120***a-h* allow, for example, the plurality of appendages **104-118** to be selectively attached to and removed from the body portion **102**, and rotated and indexed when attached to the body portion **102**.

[**0050**] FIG. **8***a* is perspective view of the magnetic joint **120***a* shown in FIG. **7**, each of the magnetic joints **120***b-h* of FIG. **7** having the same construction as the joint **120***a*. The complementary, generally planar joint surfaces **122***a*, **122***b* include complementary magnets **124***a*, **124***b* positioned within central regions of the joint surfaces **122***a*, **122***b*, such that attraction between the magnets **124***a*, **124***b* retains the joint surfaces **122***a*, **122***b* against each other when the joint **120***a* is assembled. Several indexing magnets **126***a*, **126***b* are positioned in a radial array about the magnets **124***a*, **124***b* to allow the appendage **104** and the body portion **102** to be indexed by means of magnetic attraction exerted between the magnets **126***a*, **126***b* when the magnets **126***a*, **126***b* are rotated into alignment (see arrow C in FIG. **8***b*). The magnets **124***a*, **124***b* and **126***a*, **126***b* could be embedded in the joint surfaces **122***a*, **122***b*, or otherwise attached thereto. It should be noted that the magnets **126***a*, **126***b* could be substituted with protrusions and corresponding recesses to allow for indexing.

[**0051**] FIG. **9***a* is a perspective view of another embodiment of the magnetic joints of the present invention, indicated generally at **130**, for coupling a first figurine component **132** to a second figurine component **134**. The joint **130** comprises a pair of complementary, generally planar joint surfaces **136***a*, **136***b* having annular conductive regions **138***a*, **138***b* surrounding central conductive regions **140***a*, **140***b*. The annular conductive regions **138***a*, **138***b* or the central conductive regions **140***a*, **140***b*, or both, could be magnetic to retain the joint surfaces **136***a*, **136***b* in position against each other. An electrical circuit **142** in the first figurine component **132** (e.g., a battery positioned in a torso portion of a figurine) is in electrical communication with the annular conductive region **138***a* and the central conductive region **140***a* via leads **144**. When the joint surface **136***a* is coupled with the joint surface **136***b*, the annular conductive region **138***a* makes electrical contact with the annular conductive region **138***b* and the central conductive region **140***a* makes electrical contact with the central conductive region **140***b* to allow power to be transmitted from the circuit **142** through the joint **130** and into the second figurine component **134**. Leads **146** in the second figurine component **134** are connected to the annular conductive region **138***b* and the central conductive region **140***b* to transfer electrical power to a circuit in the second figurine component **146** (e.g., to a light or motor). As shown in FIG. **9***b*, the joint **130** allows for rotation of the second figurine part **134** with respect to the first figurine part **132**, indicated generally by arrow D. Thus, the joint **130** allows for power transmission therethrough, while simultaneously allowing for rotation of the magnetically coupled parts. It should be noted that the conductive regions **138***a*, **138***b* and **140***a*, **140***b* could be provided in any desired shapes and at any desired locations of the joint surfaces **136***a*, **136***b* without departing from the spirit or scope of the present invention.

[**0052**] FIG. **10** is a perspective view of a toy figurine, indicated generally at **150**, having a head **152**, an upper torso **154**, arms **156**, **158**, a lower torso **160**, legs **162**, **164**, magnetic joints **166***a*, **166***b* removably coupling the legs **162**, **164** to the lower torso **160**, and another set of magnetic joints **170***a*, **170***b* according to another embodiment of the present invention removably coupling the arms **156**, **158** to the upper torso **154**. A magnetic joint **168** could be provided for removably coupling the head **152** to the upper torso **154**, or the head **152** could be permanently coupled to the upper torso **154**. The magnetic joints **170***a*, **170***b* are internally indexed and allow for rotation and indexing of the arms **156**, **158** with respect to the upper torso **154**.

[**0053**] FIGS. **11***a*-**11***b* are perspective and front elevational views, respectively, of the magnetic joint **170***b* shown in FIG. **10**, the magnetic joint **170***a* being identical thereto in construction. The joint **170***b* comprises a peg **172** formed on the arm **158**, which is insertable into a socket **174** formed in the upper torso **154**. A shoulder **176** surrounding the socket **174** abuts a shoulder **178** disposed about the peg **172** when the peg **172** is inserted into the socket **174**. The socket **174** includes an end magnet **180** and a plurality of indexing magnets **182** disposed along the longitudinal axis of the socket **174** and about the circumference of the socket **174**. The peg **172** includes a corresponding end magnet **184** and a plurality of corresponding indexing magnets **186** disposed along the longitudinal axis of the peg **172** and about the circumference of the peg **172**. When the peg **172** is inserted into the socket **174**, magnetic attraction between the end magnets **180**, **184** retains the peg **172** in the socket **174**, so as to couple the arm **158** to the upper torso **154** while allowing for rotation of the arm **158** with respect to the upper torso **154** (as indicated generally by arrow E).

[0054] The indexing magnets **182** of the socket **174** are magnetically attracted to the indexing magnets **186** of the peg **172** to allow the arm **158** to be rotated and held in one or more predetermined positions (i.e., indexed). It should be noted that the indexing magnets **182**, **186** could be replaced with corresponding protrusions and recesses to allow for indexing. Moreover, either set of the indexing magnets **182**, **186** could be replaced with a ferromagnetic material, so that only a single set of magnets is required to provide indexing. Still further, one of the end magnets **180**, **184** could likewise be replaced with a ferromagnetic material so that only a single magnet is required to retain the peg **172** in the socket **174**. Additionally, in each of the embodiments of the magnetic joints of the present invention, the magnets could be poled (e.g., one set of magnets could correspond to a south magnetic pole, and another set of magnets could correspond to a north magnetic pole), so as to further facilitate indexing of the joined components.

[0055] The magnetic joints of the present invention could be used to couple figurine components in any desired configuration. For example, the arm **26** (see FIG. **1**) could be formed by coupling the bicep **26** to the forearm **28** using the joint **50***f*, and the forearm **28** to the hand **36** using the joint **50***g*. The arm **26** could then be coupled to upper torso **14** using the joint **50***e*. Similarly, the arm **20** could be formed by coupling the bicep **32** to the forearm **34** using the joint **50***c*, and the forearm **34** to the hand **36** using the joint **50***d*. The arm **20** could then be coupled to upper torso **14** using the joint **50***b*. The head **12**, upper torso **14**, and lower torso **16** could be interconnected using the joints **50***a* and **50***h*, respectively. The legs **22** could be formed by coupling the thigh **38** to the shin **40** using the joint **50***m*, and the shin **40** could be coupled to the feet **42** using the joint **50***n*. The leg **22** could then be coupled to the lower torso **16** using the joint **50***l*. Similarly, the legs **24** could be formed by coupling the thigh **44** to the shin **46** using the joint **50***j*, and the shin **46** could be coupled to the feet **48** using the joint **50***k*. The leg **24** could then be coupled to the lower torso **16** using the joint **50***i*. Thus, as can be readily appreciated, any desired combination of components could be interconnected in any desired fashion using the magnetic joints of the present invention. Further, any desired combination of the various embodiments of the magnetic joints of the present invention could be implemented in a toy figurine.

[0056] Referring now to FIGS. **12***a* and **12***b*, a magnetic joint **200** constructed in accordance with another embodiment of the present invention is shown. The joint **200** includes a hemispherical, ferromagnetic portion **202**, a socket **206**, and a ring magnet **204** positioned in the socket **206**. The ring magnet **204** is mounted in a recess **216** of a first figurine component **208** (see FIG. **12***b*). The ring magnet **204** is glued or otherwise permanently mounted to the first figurine component **208**. The ferromagnetic, hemispherical portion **202** includes an annular lip **210** (see FIG. **12***b*) which facilitates permanent attachment of the ferromagnetic, hemispherical portion **202** to a second figurine component **212**. The second figurine component **212** is molded about the ferromagnetic, hemispherical portion **202**. Optionally, the ferromagnetic, hemispherical portion **202** could be glued to the second figurine component **212**. The ring magnet **204** couples the first figurine component **208** to the second figurine component **212** by means of magnetic attraction. An aperture **214** of the ring magnet **204** receives a portion of the ferromagnetic, hemispherical portion **202** when the first figurine component **208** is coupled with the second figurine component **212**, so that the ferromagnetic, hemispherical portion **202** is "seated" within the aperture **214**. It should be noted that some amount of frictional engagement exists between the ring magnet **204** and the ferromagnetic, hemispherical portion **202**. If additional frictional engagement is desired, the hemispherical portion **202** could include a surface treatment or a coating, such as the coating discussed below with respect to FIG. **16**.

[0057] Referring to FIG. **13**, a magnetic joint **220** constructed in accordance with another embodiment of the present invention is shown. The joint **220** includes a ferromagnetic, hemispherical portion **222**; a socket **226**, which includes a magnet **224** having a recess **232**; and an O-ring **230** positioned between the ferromagnetic, hemispherical portion **222** and the magnet **224**. The magnet **224** is mounted in a recess **227** of a first figurine component **228**. The magnet **224** is glued or otherwise permanently mounted to the first figurine component **228**. The ferromagnetic, hemispherical portion **222** includes an annular lip **236** which facilitates permanent attachment of the ferromagnetic, hemispherical portion **222** to a second figurine component **238**. The second figurine component **238** is molded about the ferromagnetic, hemispherical portion **222**. Optionally, the ferromagnetic, hemispherical portion **222** could be glued to the second figurine component **238**. The magnet **224** couples the first figurine component **228** to the second figurine component **238** by means of magnetic attraction. The recess **232** of the magnet **224** receives a portion of the ferromagnetic, hemispherical portion **222** when the first figurine component **228** is coupled with the second figurine component **238**, so that the ferromagnetic, hemispherical portion **222** is "seated" in the recess **232**. The O-ring **230** is positioned proximal to an annular bevel **234** formed in the first figurine component **228**. The O-ring **230** facilitates frictional engagement between the first figurine component **228** and the ferromagnetic, hemispherical portion **222**, so that the first figurine component **228** is retained in a desired position with respect to the second figurine component **238**.

[0058] Referring to FIG. **14**, a magnetic joint **240** constructed in accordance with another embodiment of the present invention is shown. The joint **240** includes a ferromagnetic, hemispherical portion **242**; a socket **246**, which includes a magnet **244** having a recess **256** and an annular channel **258**; and an O-ring **250** positioned in the annular channel **258** between the ferromagnetic, hemispherical portion **242** and the magnet **244**. The magnet **244** is mounted in a recess **249** of a first figurine component **248**. The magnet **244** is glued or otherwise permanently mounted to the first figurine component **248**. The ferromagnetic, hemispherical portion **242** includes an annular lip **252** which facilitates permanent attachment of the ferromagnetic, hemispherical portion **242** to a second figurine component **254**. The second figurine component **254** is molded about the ferromagnetic, hemispherical portion **242**. Optionally, the ferromagnetic, hemispherical portion **242** could be glued to the second figurine component **254**. The magnet **244** couples the first figurine component **248** to the second figurine component **254** by means of magnetic attraction. The recess **256** of the magnet **244** receives a portion of the ferromagnetic, hemispherical portion **242** when the first figurine component **248** is coupled with the second figurine component **254**, so that the ferromagnetic, hemispherical portion **242** is "seated" in the recess **256**. The O-ring **250** facilitates frictional engage-

ment between the first figurine component **248** and the ferromagnetic, hemispherical portion **242**, so that the first figurine component **248** is retained in a desired position with respect to the second figurine component **254**.

[**0059**] Referring to FIG. **15**, a magnetic joint **260** constructed in accordance with another embodiment of the present invention is shown. The joint **260** includes a ferromagnetic, hemispherical portion **262**, a flexible socket **264**, and a magnet **270** positioned within the flexible socket **264**. The socket **264** could be manufactured from a suitable, flexible material, such as plastic, rubber, polyvinyl chloride (PVC), and the like. The socket **264** is mounted in a recess **268** formed in a first figurine component **266** (e.g., by gluing or other suitable means of attachment), and includes an inner surface **276** which bears against the ferromagnetic, hemispherical portion **262** to provide frictional engagement therewith. Such engagement retains the first figurine component **266** in a desired position with respect to a second figurine component **274**. The magnet **270** magnetically couples the first figurine component **266** to the second figurine component **274**. The ferromagnetic, hemispherical portion **262** includes an annular lip **272** which facilitates permanent attachment of the ferromagnetic, hemispherical portion **262** to the second figurine component **274**. The second figurine component **274** is molded about the ferromagnetic, hemispherical portion **262**. Optionally, the ferromagnetic, hemispherical portion **262** could be glued to the second figurine component **274**.

[**0060**] Referring to FIG. **16**, a magnetic joint **280** constructed in accordance with another embodiment of the present invention is shown. The joint **280** includes a ferromagnetic, hemispherical portion **282**, a flexible socket **284**, a magnet **290** positioned within the flexible socket **284**, and a coating **283** formed on the ferromagnetic, hemispherical portion **282**. Both the coating **283** and the socket **284** could be manufactured from a suitable, flexible material, such as plastic, rubber, polyvinyl chloride (PVC) and the like. The socket **284** is mounted in a recess **288** formed in a first figurine component **286** (e.g., by gluing or other suitable means of attachment). The magnet **290** magnetically couples the first figurine component **286** to a second figurine component **294**. The ferromagnetic, hemispherical portion **282** includes an annular lip **292** which facilitates permanent attachment of the ferromagnetic, hemispherical portion **282** to the second figurine component **294**. The second figurine component **294** is molded about the ferromagnetic, hemispherical portion **292**. Optionally, the ferromagnetic, hemispherical portion **292** could be glued to the second figurine component **294**. The coating **283** facilitates frictional engagement with the socket **284**, so as to retain the first figurine component **286** in a desired position with respect to the second figurine component **294**.

[**0061**] Referring now to FIG. **17**, a magnetic joint **300** constructed in accordance with another embodiment of the present invention is shown. The joint **300** includes a ferromagnetic, hemispherical portion **304** attached to a head **302** of a figurine, an electrical switch **306** extending through an aperture in the ferromagnetic, hemispherical portion **304**, and a socket **308** attached to a torso **310** and magnetically coupled to the ferromagnetic, hemispherical portion **304**. The head **302** can be removed from the torso **310** by pulling the head **302** away from the torso **310**, as shown by arrow A. When the head **310** is removed from the torso **310**, the switch **306** is activated, causing the head **302** to light up. Illumination is facilitated by the circuit **320** shown in FIG. **18**, which is positioned within the head **302**. When the switch **306** is activated, a flasher circuit **324**, powered by a battery **312**, is activated, causing the light emitting diode (LED) **326** to flash. The LED **326** could be substituted with any other suitable light source, such as an incandescent lamp. The flasher circuit **324** could include any suitable, commercially-available lamp or LED flasher circuit. Additionally, the switch **306** could be configured to activate any other circuit, such as a buzzer or sound effects circuit. Moreover, the circuit **320** could be configured so that both removal and attachment of the head **302** of FIG. **17** to the torso **310** causes the LED **326** to flash.

[**0062**] It should be noted that the joint **300** of FIG. **17** could be implemented in any desired location of a figurine, such as between an arm and a torso, a leg and a torso, etc. Additionally, the switch **306** of FIG. **17** and its associated circuitry shown in FIG. **18** could be implemented using any of the magnetic joints disclosed herein. Moreover, the hemispherical portion **304** (see FIG. **17**) could include a coating or other surface treatment (such as the coating **283** discussed above with respect to FIG. **16**) to provide additional frictional engagement between the hemispherical portion **304** and the socket **308** (see FIG. **17**). Further, an O-ring or other frictional engagement means (such as the friction inlays **65***a*, **65***b* shown in FIG. **4***a* and described above) could be included to provide additional frictional engagement between the hemispherical portion **304** and the socket **308** of FIG. **17**.

[**0063**] It will be understood that the embodiments described herein are merely exemplary and that a person skilled in the art may make many variations and/or modifications without departing from the spirit and scope of the present invention. All such variations and modifications are intended to be included within the scope of the present invention.

What is claimed is:

1. A magnetically-coupled joint for a toy figurine, comprising a ferromagnetic, hemispherical portion attached to a first figurine component; a socket attached to a second figurine component, said socket including a magnet coupled to said ferromagnetic, hemispherical portion to thereby couple said first figurine component to said second figurine component; and means for frictional engagement positioned between said ferromagnetic, hemispherical portion and said socket, said means for frictional engagement retaining said first figurine component in a desired position with respect to said second figurine component.

2. The magnetically-coupled joint of claim 1, wherein said magnet further includes a recess formed therein.

3. The magnetically-coupled joint of claim 2, wherein a portion of said ferromagnetic, hemispherical portion extends into said recess when said ferromagnetic, hemispherical portion is coupled to said magnet.

4. The magnetically-coupled joint of claim 3, wherein said means for frictional engagement includes an O-ring.

5. The magnetically-coupled joint of claim 4, wherein said magnet further includes an annular channel and said O-ring is positioned in said annular channel.

6. The magnetically-coupled joint of claim 1, wherein said socket is flexible.

7. The magnetically-coupled joint of claim 6, wherein said means for frictional engagement further includes an inner surface of said socket which bears against said ferromagnetic, hemispherical portion.

8. The magnetically-coupled joint of claim 6, wherein said means for frictional engagement further includes a coating formed on said ferromagnetic, hemispherical portion, said coating positioned between said ferromagnetic, hemispherical portion and said socket.

9. The magnetically-coupled joint of claim 1, wherein said ferromagnetic, hemispherical portion further includes an annular lip extending about an end of said ferromagnetic, hemispherical portion.

10. The magnetically-coupled joint of claim 9, wherein said second figurine component is molded about said annular lip and a portion of said ferromagnetic, hemispherical portion.

11. The magnetically-coupled joint of claim 1, wherein said magnet includes a ring magnet.

12. The magnetically-coupled joint of claim 11, wherein said ring magnet further includes an aperture for receiving a portion of said ferromagnetic, hemispherical portion when said ring magnet contacts said ferromagnetic, hemispherical portion.

13. The magnetically-coupled joint of claim 1, wherein said ferromagnetic, hemispherical portion includes a switch extending through an aperture formed in said ferromagnetic, hemispherical portion.

14. The magnetically-coupled joint of claim 13, wherein said switch is activated when said first figurine component is coupled to or removed from said second figurine component.

15. The magnetically-coupled joint of claim 13, further comprising an electrical circuit connected to said switch.

16. The magnetically-coupled joint of claim 15, wherein said electrical circuit further includes a light-emitting diode and an associated flasher circuit, said light-emitting diode being flashed by said flasher circuit when said switch is activated.

17. The magnetically-coupled joint of claim 13, wherein said electrical circuit is positioned within said first figurine component.

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