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(54) Title: MODULAR DOLL

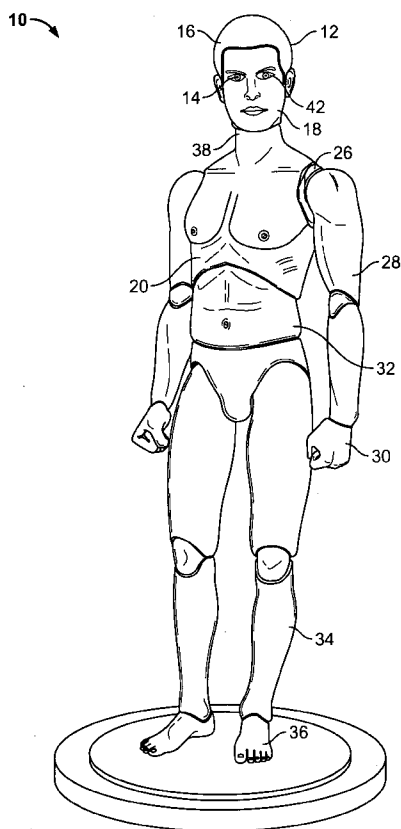


FIG. 1

(57) Abstract: Dolls, and more particularly articulating action figures, may have exchangeable moving eyes, exchangeable upper torso components, and exchangeable head components for adapting to a wide variety of characters and situations, hi particular, eyes may be exchanged for one another and may be aimed in particular directions. Exchangeable upper torso components may include a removable chest plate, which may be exchanged for larger or smaller sized chest plates to conform to a particular character. Finally, exchangeable head components may include a faceplate and interlocking skull as well as a hairpiece whereby the faceplate and hairpieces may be exchanged to portray particular characters.

WO 2009/032001 A1



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MODULAR DOLL

FIELD OF THE INVENTION

[0001] The present invention relates to dolls, and more particularly to dolls including, but not limited to, articulating action figures, having modular features such as exchangeable moving eyes, exchangeable upper torso components, and exchangeable head components.

BACKGROUND OF THE INVENTION

[0002] Conventional dolls, in particular 1/6th scale action figures, may be configured with realistic moving body parts such as heads, arms, hands, legs, and feet enabling the action figures to replicate life-like characters and situations. In the case of military-style action figures, the figures may be configured to hold weapons and may be posed in a number of fighting positions. Action figures may also include character-specific figures such as those modeled after movie actors. In that case, character realism may be a top priority for consumers. However, conventional action figures are generally configured to represent only one character, meaning that the hair color and length of the character may be fixed, the configuration of the chest may be fixed, and the position and color of the eyes may be fixed such that the character is accurately portrayed only in a limited number of situations. Amassing enough action figures to accurately portray different characters in different situations may require the collector to acquire numerous additional action figures, which have the desired features. It is therefore an object of the invention to provide action figures having modular components, which allow a given action figure to transform into a variety of characters without necessitating the purchase of new figures for each variation.

SUMMARY OF THE INVENTION

[0003] Modular action figure components may include exchangeable moving eyes which are pivotable by inserting a pin into a central opening in the eye, exchangeable upper

torso components including a back plate, a magnetically coupled chest plate and an anchor there between, and exchangeable head components including interlocking faceplates and skulls where a variety of different faceplates may be configured to fit on one or more standardized skulls. The components are exchangeable in that a component may be replaced with another component in one action figure, a component in one action figure may be used as a replacement in another action figure, or both.

[0004] The exchangeable moving eyes may be configured to appear reasonably lifelike with colored central surfaces that resemble pupils and iris. An opening may be bored through these colored portions to permit a pin to be externally inserted therein. In one instance, the opening may be bored through the dark, pupil portion of the eye. The pin may change the orientation to accurately depict the eyes when the action figure is in a particular pose. For example, if the figure is lying down and looking ahead, the eyes may be positioned upwardly to make it appear as though the action figure is looking forward rather than into the ground as a conventional action figure may appear. When the action figure is in a more conventional standing pose and looking straight ahead, the eyes may be positioned accordingly, and so on. The eyes may also be readily exchangeable such that when a different eye color, type or configuration is desired, the user may readily separate the action figure's head and exchange the existing eyes for another set of eyes.

[0005] The exchangeable upper torso components may include at least a chest plate, a back plate, and an anchor. The chest plate may have magnetic components therein and may be configured to represent the frontal portion of the chest. The chest plate may wrap around the front portion of the upper torso and may be sized to accurately represent the chest of the character to be portrayed. For example, in depicting a superhero, the chest may have exaggerated muscles, whereas when depicting a more conventional human, the chest may be more modestly sized. The upper torso may also be configured to represent a man or a woman and may be configured in different sizes to represent different types of men and women as well as being colored differently to account for skin color variations and different ethnicities. The magnetic aspect of the chest plate allows it to be easily and quickly exchanged with other sized chest plates to depict these different characters.

[0006] The back plate may be configured to represent the rear portion of the action figure's upper torso. In combination, the chest plate and back plate may be configured to

essentially form the externally visible upper torso of the action figure and may pivot about the abdomen. An anchor may be located between the chest plate and the back plate and may also be coupled to the abdomen and the shoulders to unite these components. When the chest plate and back plate are in place, the anchor may be externally invisible. The anchor may have magnets therein to attract and releasably couple the chest plate and may be configured to accept threaded fasteners to fixedly couple the back plate thereto. It is also contemplated that the back plate may, like the chest plate, be configured with magnets to allow it to be easily interchangeable about the anchor. In either scenario, the combination of the anchor and the back plate may pivotally couple and retain the shoulders thereto.

[0007] Referring to the exchangeable head components, at least a faceplate and skull may combine to form a head. Together, the faceplate and skull may provide support for the moving eyes there between. The faceplate may be configured with a substantially thin-walled construction and extend down to the jaw line of the doll. Further, the faceplate may have openings therein for displaying the moving eyes, and have conventional features such as a nose, mouth, and ears. The faceplate may be configured to represent a particular character and thus may be interchanged with respect to one or more skulls for faceplates depicting other characters.

[0008] The skull may be configured to interlock with and provide support for the faceplate. While the skull may be configured to accept a variety of faceplates, and thus may be somewhat universal, at least two differently sized skulls may be possible, for example, separately sized skulls configured for men and women. The skull may be configured in many ways, including, but not limited to, resembling a bald head or including hair therein or for accepting a hairpiece or for accepting a scalp resembling a bald head.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The invention is generally shown by way of reference to the accompanying drawings in which:

FIG. 1 is a perspective view of the front of a male-type action figure having exchangeable moving eyes, exchangeable upper torso components, and exchangeable head components;

FIG. 2 is a perspective view of the rear of a male-type action figure having exchangeable moving eyes, exchangeable upper torso components, and exchangeable head components;

FIG. 3 is a first exploded view of exchangeable head components including a faceplate, a skull, and a hairpiece;

FIG. 4 is a second exploded view of exchangeable head components including a faceplate, a skull, and a hairpiece;

FIG. 5 is a perspective view of an exchangeable moving eye; and

FIG. 6 is an exploded view of exchangeable upper torso components including a chest plate, anchor, and back plate; and

FIG. 6a is an exploded view of the inside of a chest plate.

DETAILED DESCRIPTION OF THE INVENTION

[0010] Some embodiments are described in detail with reference to the related drawings. Additional embodiments, features and/or advantages will become apparent from the ensuing description or may be learned by practicing the invention. In the figures, which are not drawn to scale, like numerals refer to like features throughout the description. The following description is not to be taken in a limiting sense, but is made merely for the purpose of describing the general principles of the invention.

[0011] Referring to FIGS. 1 and 2, a male-type modular 1/6th scale action figure 10 is shown having a head 12 with exchangeable, substantially spherical, moving eyes 14, an exchangeable hairpiece 16, and an exchangeable faceplate 18. A skull 40 (FIG. 3) is interlocked with the faceplate. The action figure also has an upper torso including an exchangeable chest plate 20 magnetically coupled to an externally invisible anchor 22 (FIG. 6) and perimeterally abutting a back plate 24 (FIG. 2). The upper torso also includes the action figure's neck 38 that is formed by the combination of the chest plate and back plate. In addition to the explicitly exchangeable features, the action figure has

shoulders 26, arms 28, hands 30, an abdomen 32, legs 34, and feet 36, all of which may be configured to be exchanged as necessary.

[0012] As shown in FIG. 3, the action figure's head 12 may be split into three main components: an exchangeable faceplate 18, an exchangeable skull 40, and an exchangeable hairpiece 16. The head rests on and pivots about a head-locating rod 60. The faceplate and the skull shown here are configured to interlock together, however these components may be held together in other complimentary manners such as by interference fit or by, or in combination with, adhesive or by similar measures.

[0013] The faceplate 18 may be formed of poly vinyl chloride ("PVC") plastic and may be configured with a substantially thin-walled cross-section and may generally be formed to accurately depict a specific character or to represent a generic character and may accordingly be styled as necessary to include male or female forms. The faceplate may have therein a nose 50, ears 52, a mouth 54 and other components configured to represent the character. The faceplate also may be colored as necessary to represent different skin tone as well as the ethnicity of the character. As shown, the faceplate has eye openings 42 for displaying the moving eyes 14. Different faceplates may be configured to interchange with a given skull so that the user may only need one skull to depict several different characters. Also, there may be at least two correspondingly differently sized skulls configured to fit respectively within a male and a female faceplate so that all male faceplates may be interchanged with a male-type skull and likewise all female faceplates may be interchanged with a female-type skull. However, in other embodiments, additional skull and faceplate sizes are contemplated as necessary to accommodate additional characters. In yet further embodiments, a universal skull is contemplated for use with both male and female faceplates.

[0014] Referring now to FIG. 4, the inside of the faceplate 18 corresponding to the openings 42 may be configured to conformably accept the moving eyes 14. In this aspect, the openings may be concave and sized similar to the spherical eye surface so that the eyes may pivot smoothly within the openings. The overall interior 58 of the faceplate may also be configured to conformably accept the skull 40 in the aforementioned interlocking arrangement. In this aspect, the faceplate is substantially hollow and has

therein a locking tab 48 configured to interact with portions of the skull to removably interlock the faceplate and skull together.

[0015] The faceplate 18 may be configured to terminate at approximately the jaw line. Having the faceplate terminate at the jaw line, the action figure's head 12 may be pivotable about the neck 38 in connection with the head-locating rod 60, enabling the head to pivot in a more realistic way than if it were fixed to the neck and pivot (with the neck) about the torso. Here, referring back to FIG. 3, the neck is formed from the combination of the chest plate 20 and the back plate 24 and has therein the head-locating rod extending outwardly for placement in the head. Referring now to FIG. 4, the faceplate is configured with a lower opening 44 at its base 46 for accepting the rod, the rod configured to pivotally couple the head to the neck of the action figure. This lower opening also permits the head to freely pivot about the neck without the faceplate and neck unduly interfering. The faceplate may be injection molded and may be formed of different materials including, but not limited to, acrylonitrile butadiene styrene ("ABS"), high-density polyethylene, porcelain, resin, and other suitable plastics and metals.

[0016] The skull 40 may be formed of PVC and may be configured to interlock with the faceplate 18. Referring back to FIG. 3, the skull has a protruding member 56 configured to interlock with the locking tab 48 (FIG. 3) of the faceplate 18. In application, the skull is inserted into the faceplate and pressed downward in compression and then forward. Once the protruding member is underneath the locking tab, pressure is released from the skull to interlock the skull and faceplate. Disassembly is the opposite of assembly. The skull also has an opening 90 configured to interact with the head-locating rod 60 such that resistive pressure from the skull on top of the rod firmly holds the head into a desired position.

[0017] The skull 40 provides rearward support for the moving eyes 14 once the moving eyes are placed in the faceplate 18. The skull applies pressure sufficient to firmly display the eyes in the faceplate, but not so much as to prevent the eyes from being moved or so much as to scuff the surface of the eyes when they are moved. In another embodiment, the skull may be formed with a foam portion for conformably supporting the eyes in the faceplate. The skull may be injection molded and may be formed of different materials

including, but not limited to, ABS, high-density polyethylene, porcelain, resin, and other suitable plastics and metals.

[0018] Referring still to FIG. 3, the head 12 may be formed in at least three different configurations. In the first configuration shown in FIG. 3, a fixed hairpiece 16 is configured to interlock with the skull 40. In this embodiment, the skull will therefore be recessed with respect to the top of the faceplate 18 such that when the hairpiece is coupled to the skull, it substantially aligns with the top of the faceplate. The hairpiece here has protruding tabs 62 and cavities 66 for interlocking with skull cavities 70 (FIG. 4) and skull tabs 74 respectively. In this first configuration the hair is removable and exchangeable by pulling the interlocked hair and head apart from each other. In place of the hairpiece 16, a bald hairpiece may be substituted to resemble a bald head. Similarly, a hairpiece with loose hair may also be configured to interchange with the skull. In summary, at least three different types of scalps and hairpieces are contemplated, i.e. a fixed hair piece 16, a bald head, and loose hair. In the loose hair embodiment, the hair may be woven into or affixed to a suitable hairpiece. Similarly, the bald hairpiece may be configured to represent a scalp with little to no hair. All such embodiments may be configured to couple to a universal male or female skull such that the hairpieces may be easily interchanged.

[0019] In an alternative configuration, a skull may be configured as a one piece unit to resemble a shaved head and thus may be formed without a recess for accepting a hairpiece. In this case, interlocking tabs and cavities will not necessarily be needed. In yet another embodiment, hair may be sewn into a skull to resemble actual hair. In this case, the hair would be incorporated into the skull rather than interlockingly engaged.

[0020] Referring back to FIG. 1, the moving eyes 14 are sized to fit within openings 42 in the faceplate 18. Now referring to FIG. 5, the moving eyes are formed substantially spherically, and of ABS, with a laser printed image laid over a portion of the eyes corresponding to a pupil 80 and an iris 82. The laser printed image in this embodiment is located in a recessed opening 94. An approximately five-millimeter thick acrylic layer 90 is then placed over the colored image. The acrylic layer helps to protect the printed color image from being scuffed or torn while permitting a clear view of the printed image to the user. In this embodiment, the remainder of the eye body 92 is colored white to

resemble the white portions of an eye. In other embodiments, the colored image may be painted on the eye or applied to the eye in other manners. The colors of the different components of the eyes may also be varied as desired. The eyes may be injection molded and may be formed of different materials including, but not limited to, PVC, high-density polyethylene, porcelain, resin, and other suitable plastics and metals. In addition, the eyes may be formed with only frontwardly facing spherical surfaces and in yet further embodiments, the openings therein may also be configured in non-central locations, so long as the eyes are externally moveable through pin-like devices.

[0021] Still referring to FIG. 5, an opening 84 is centrally disposed in the eye 14 corresponding to the pupil 80. The opening has a depth and diameter sufficient to accept a pin, such as a toothpick, or another suitably sized object, therein for moving the eyes to a desired position. The diameter, depth, and configuration of the opening may be varied as necessary. Referring back to FIG. 2, the pin may be externally inserted through the opening 42 within the faceplate and into the opening 84 (FIG. 4) in the eye. Once inserted, the pin is then moved according to the desired orientation of the colored portion of each eye. After adjusting each eye, the pin may be removed. The eyes are held within the faceplate firmly to prevent the eyes from moving from their set position.

[0022] The eyes 14 may be exchanged by separating the faceplate 18 from the skull 40. In application, the skull and faceplate are pulled apart and the eyes, which were previously held in place by the pressure applied to the faceplate by the skull, may freely fall out. A new, possibly different colored, pair of eyes may then be inserted into the faceplate. The skull is then snapped into the faceplate to form at least the majority of head 12. If used, a hairpiece 16 or similar covering may be attached to the skull either before or after exchanging the eyes.

[0023] Referring now to FIG. 6, an anchor 22 is rigidly coupled to a back plate 24 through threaded fasteners. The anchor is also coupled to the abdomen 32 through a locating rod 98. The combination of the anchor and back plate also pivotally couples the shoulders 26 to the body. The anchor also incorporates two magnets 86 therein for releasably coupling the chest plate 20 (FIG. 6a).

[0024] The chest plate 20 shown in FIG. 6a is configured to couple about the anchor 22. The chest plate has two magnets 88 therein which correspond to the location of the

magnets 86 in the anchor. In this manner, the chest plate is readily coupled to the anchor and the contours of the anchor, shoulders, and neck 38 help to align the chest plate correctly on the action figure. Because of the magnetic coupling, the chest plate is readily removable from the action figure. This exchangeable chest plate permits the action figure to accommodate differently sized chests as the user may desire. For instance, a small chest may be used to correspond to one character while a large chest may quickly be exchanged to represent a different character such as a superhero. Similarly, the back plate may be configured with magnets therein so to be easily interchangeable so that the user may replace both the back plate and chest plate as desired. The chest plate, anchor, and back plate may be formed of PVC and may be injection molded. These components also may be formed of different materials including, but not limited to, ABS, high-density polyethylene, porcelain, resin, and other suitable plastics and metals.

[0025] Together, the exchangeable upper torso components, exchangeable moving eyes 14, and exchangeable head components provide the action figure with an extensive degree of modularity. For example, the eyes may be exchanged for color, pupil size, iris size, and other variations, a chest plate may be exchanged to correspond to characters having large, medium, or small builds and for women and men. Similarly, exchangeable head components may include a skull configured with no hair, sewn in hair, or with the capability to couple to hairpieces representing different style of hair, and a variety of exchangeable faceplates representing a number of different characters for each skull. Altogether, these features of the modular action figure permit numbers of variations to accommodate all different types of characters without necessitating the purchase of numerous different action figures.

[0026] Although the present invention has been described by way of example with references to the drawings, it is to be noted herein that various changes and modifications will be apparent to those skilled in the art. Therefore, unless such changes and modifications depart from the scope of the present invention, they should be construed as being included therein.

What is claimed is:

1. An exchangeable moving eye system for dolls comprising:
exchangeable eyes with openings therein;
a head configured to removably contain the eyes;
wherein the openings in the eyes are configured to receive externally insertable pins for orientating the eyes.
2. The exchangeable moving eye system for dolls of claim 1, wherein:
the head comprises:
a faceplate with openings configured to display the eyes; and
a skull coupled to the faceplate and configured to provide support for the eyes.
3. The exchangeable moving eye system for dolls of claim 2, wherein:
the skull and faceplate are interlocked together.
4. The exchangeable moving eye system for dolls of claim 3, wherein:
the faceplate is formed of PVC; and
the skull is formed of PVC plastic.
5. The exchangeable moving eye system for dolls of claim 3, wherein:
the faceplate has a substantially thin-walled composition.
6. The exchangeable moving eye system for dolls of claim 1, wherein:
each exchangeable eye comprises:
an ABS base; and
an acrylic layer;
wherein a colored material is positioned underneath the acrylic layer in each eye.
7. The exchangeable moving eye system for dolls of claim 6, wherein:
the colored portion of each eye is a laser printed decal located at least five millimeters underneath the outermost portion of the acrylic layer.
8. The exchangeable moving eye system for dolls of claim 1, wherein:
the eyes are substantially spherical
9. The exchangeable moving eye system for dolls of claim 1, wherein:
the system is configured for use in connection with 1/6th scale action figures.
10. A exchangeable moving eye system for dolls comprising:

two substantially spherical, exchangeable eyes having colored portions with openings therein, the eyes comprised of an ABS base and an acrylic layer wherein the colored portions are located underneath the acrylic layer;

a head configured to removably contain the eyes, the head comprising a faceplate formed of PVC and a skull formed of PVC wherein the skull and faceplate are interlocked together;

wherein the openings in the colored portions of the eyes are configured to receive externally insertable pins for orientating the eyes.

11. A exchangeable moving eye system for dolls comprising:

moving eyes having colored portions therein;

a faceplate with openings configured to display the eyes;

a skull configured to interlock with the faceplate;

means for retaining the eyes between the faceplate and skull; and

means for adjusting the orientation of the eyes.

12. A method of orientating moving eyes in dolls comprising:

inserting a pin into an opening in an eye within the doll's head;

moving the pin to orientate the eye to a desired direction; and

removing the pin from the eye.

13. A method of exchanging moving eyes in dolls comprising:

separating an interlocked skull and face plate by grasping the skull and faceplate and pulling the two components apart;

removing a first set of moving eyes between the skull and faceplate;

exchanging the first set of moving eyes with a second set of moving eyes by placing the second set of moving eyes between the skull and faceplate; and

interlocking the skull and faceplate.

14. An upper torso for dolls comprising:

an exchangeable chest plate;

a back plate; and

an anchoring member with front and rear portions;

wherein the back plate is coupled to the rear portion of the anchoring member; and

wherein the chest plate is magnetically coupled to the front portion of the anchoring member.

15. The upper torso for dolls of claim 14, wherein:

the back plate and the chest plate are configured to perimetrically align and form a neck portion.

16. The exchangeable upper torso for dolls of claim 15, wherein:

the anchor is coupled to an abdominal portion of the doll.

17. The exchangeable upper torso for dolls of claim 16, wherein:

the back plate and anchor pivotally couple shoulder members.

18. The exchangeable upper torso for dolls of claim 17, wherein:

the anchor contains magnets configured to attract magnets contained within the chest plate.

19. The exchangeable upper torso for dolls of claim 18, wherein:

the back plate is formed of PVC;

the chest plate is formed of PVC; and

the anchor is formed of PVC.

20. The exchangeable upper torso for dolls of claim 19, wherein:

the back plate is coupled to the anchor with threaded fasteners; and

the anchor is pivotally coupled to an upper torso locating rod, the upper torso locating rod pivotally coupled to the abdomen.

21. The exchangeable upper torso for dolls of claim 19, wherein:

the back plate is magnetically coupled to the anchor; and

the anchor is pivotally coupled to an upper torso locating rod, the upper torso locating rod pivotally coupled to the abdomen.

22. The exchangeable upper torso for dolls of claim 20, wherein:

the back plate and chest plate combine to form an upper torso including a neck portion;

wherein the neck portion is configured to accept a head-locating rod, the head-locating rod configured to pivotally located a head about the neck.

23. The exchangeable upper torso for dolls of claim 22, wherein:

the chest plate is interchangeable with chest plates of different configurations to alter the appearance of the doll.

24. The exchangeable upper torso for dolls of claim 23, wherein:

the back plate is interchangeable with back plates of different configurations to alter the appearance of the doll.

25. The exchangeable upper torso for dolls of claim 23, wherein:

the chest plate and back plate couple to form a substantially seamless upper torso of the doll.

26. An upper torso for dolls comprising:

An exchangeable chest plate having magnetic couplers therein, the chest plate configured to wrap around a front portion of the doll body and configured to conform to an abdominal portion of the doll body;

a back plate configured to wrap around a rear portion of the doll body and configured to conform to an abdominal portion of the doll body; and

an anchor pivotally coupled to the abdominal portion of the doll body, the anchor coupled to the back plate with threaded fasteners and coupled to the chest plate with magnetic couplers.

27. An upper torso for dolls comprising:

a back plate;

an exchangeable chest plate;

an anchor;

means for coupling the back plate, chest plate, and anchor plate together to form the upper torso.

28. A modular head for dolls comprising:

moving eyes;

a faceplate configured with openings to display the moving eyes; and

a skull configured to fit within the faceplate and support the moving eyes;

wherein the skull and faceplate are removably interlocked together.

29. The modular head for dolls of claim 28, wherein:

the faceplate has a predominately thin walled construction.

30. The modular head for dolls of claim 29, wherein:

the faceplate is formed of PVC; and
the skull is formed of PVC.

31. The modular head for dolls of claim 30, wherein:
the skull comprises a head configured with hair thereon.
32. The modular head for dolls of claim 30, wherein:
the skull comprises a head with a smooth scalp configured to resemble a shaved head.
33. The modular head for dolls of claim 30, wherein:
the skull comprises a head configured to accept a hair piece thereon; and
a hairpiece coupled to the head.
34. The modular head for dolls of claim 33, wherein:
the hairpiece is configured to retain hair sewn therein.
35. The modular head for dolls of claim 33, wherein:
the hairpiece is configured to resemble a bald scalp.
36. The modular head for dolls of claim 33, wherein:
the hairpiece is configured with a molded, hair-like surface.
37. A modular head for dolls comprising:
an exchangeable thin-walled faceplate;
an exchangeable skull configured to interlock with the faceplate;
exchangeable moving eyes with centrally disposed openings therein;
wherein the faceplate and skull are interlocked together about the moving eyes.
38. A modular head for dolls comprising:
an exchangeable substantially thin-walled faceplate;
an exchangeable skull;
means for coupling the substantially thin-walled faceplate to the skull;
moving eyes with centrally disposed openings therein;
means for securing the moving eyes between the substantially thin-walled faceplate
and the skull.
39. A modular doll comprising:
a body;
an upper torso having an exchangeable, magnetically coupled chest plate;
a modular head having an exchangeable, interlocked face and skull;

exchangeable moving eyes having colored portions with openings therein, the openings configured to accept a pin therein for orientating the eyes;

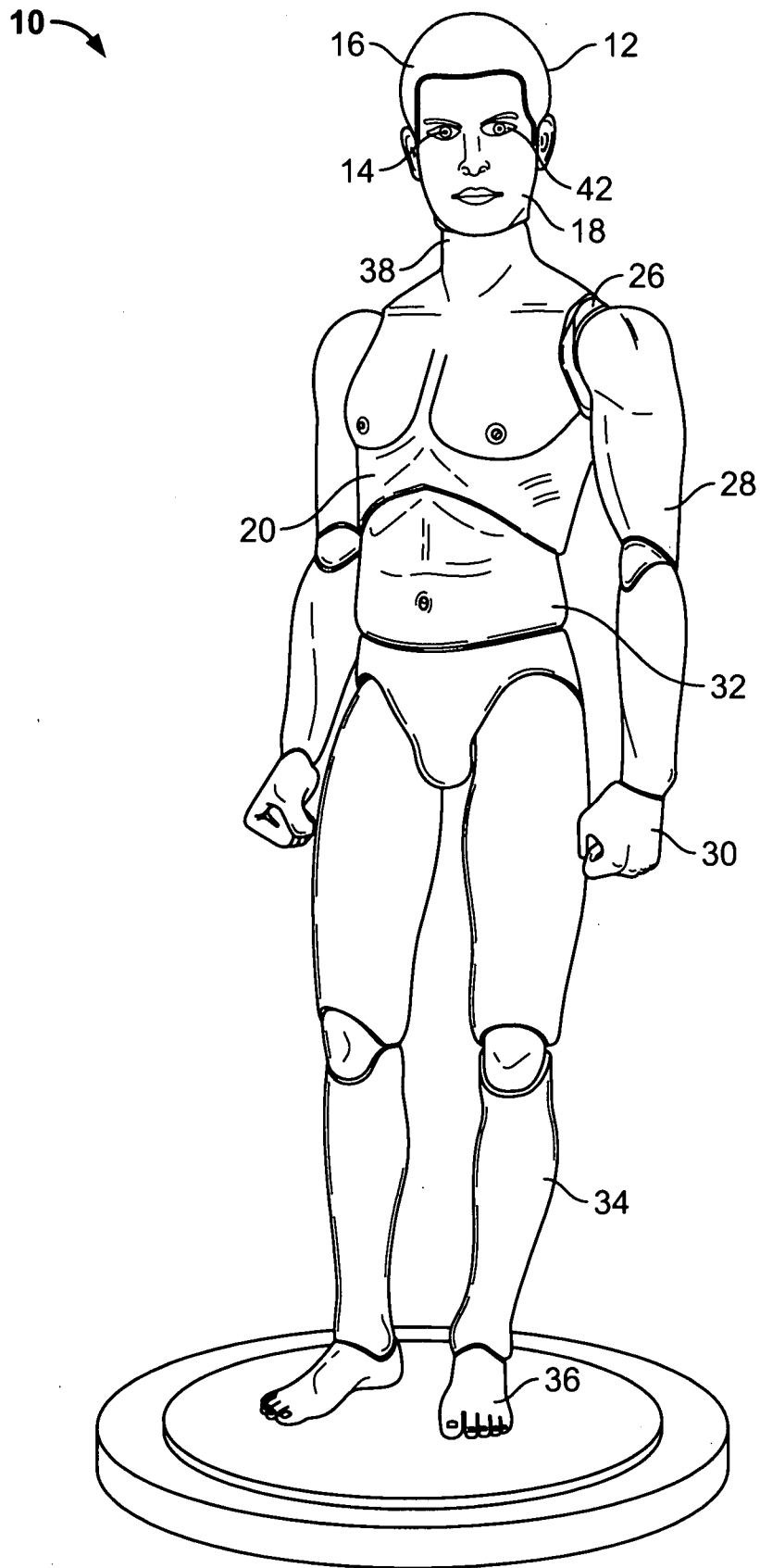


FIG. 1

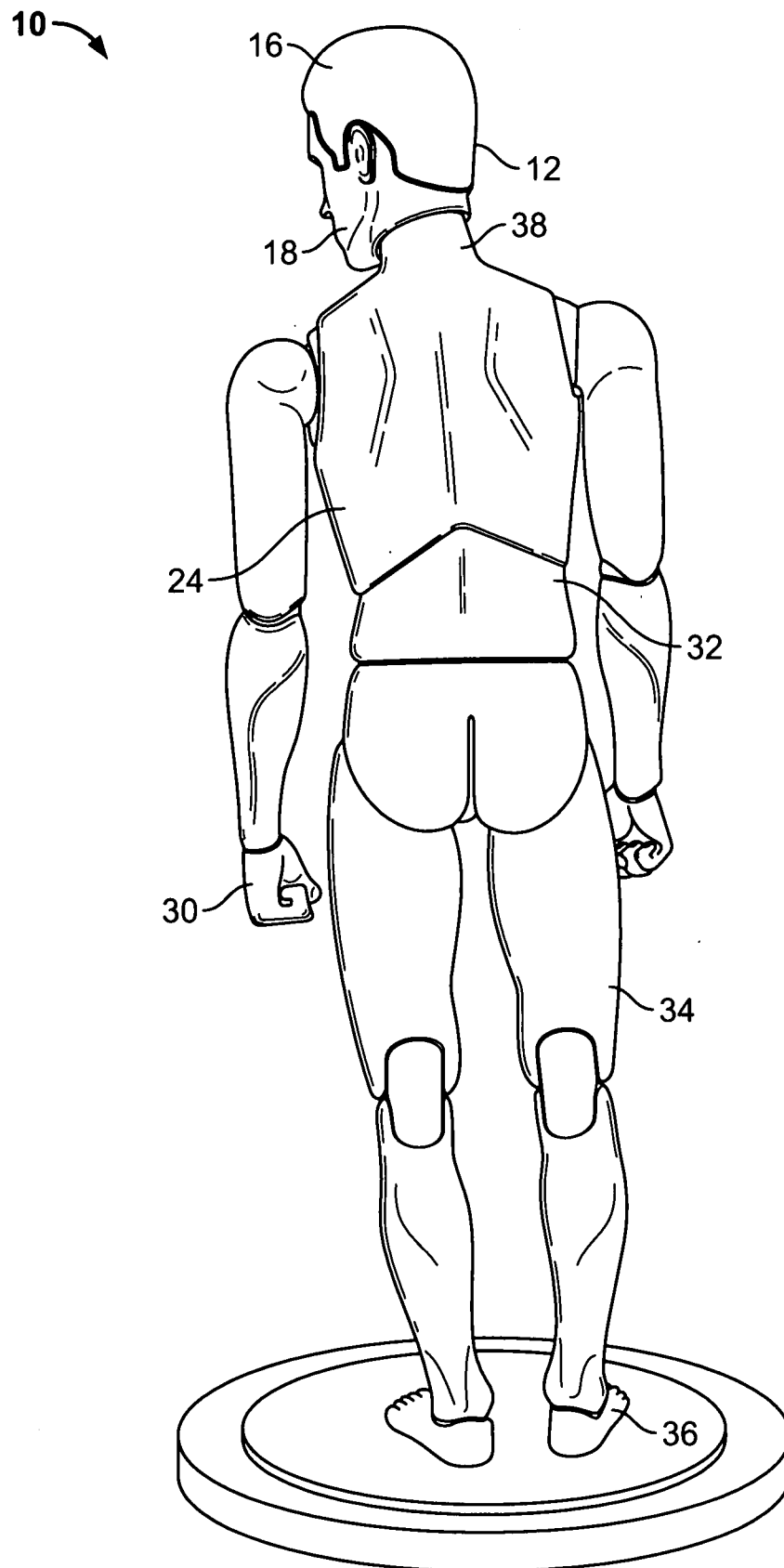


FIG. 2

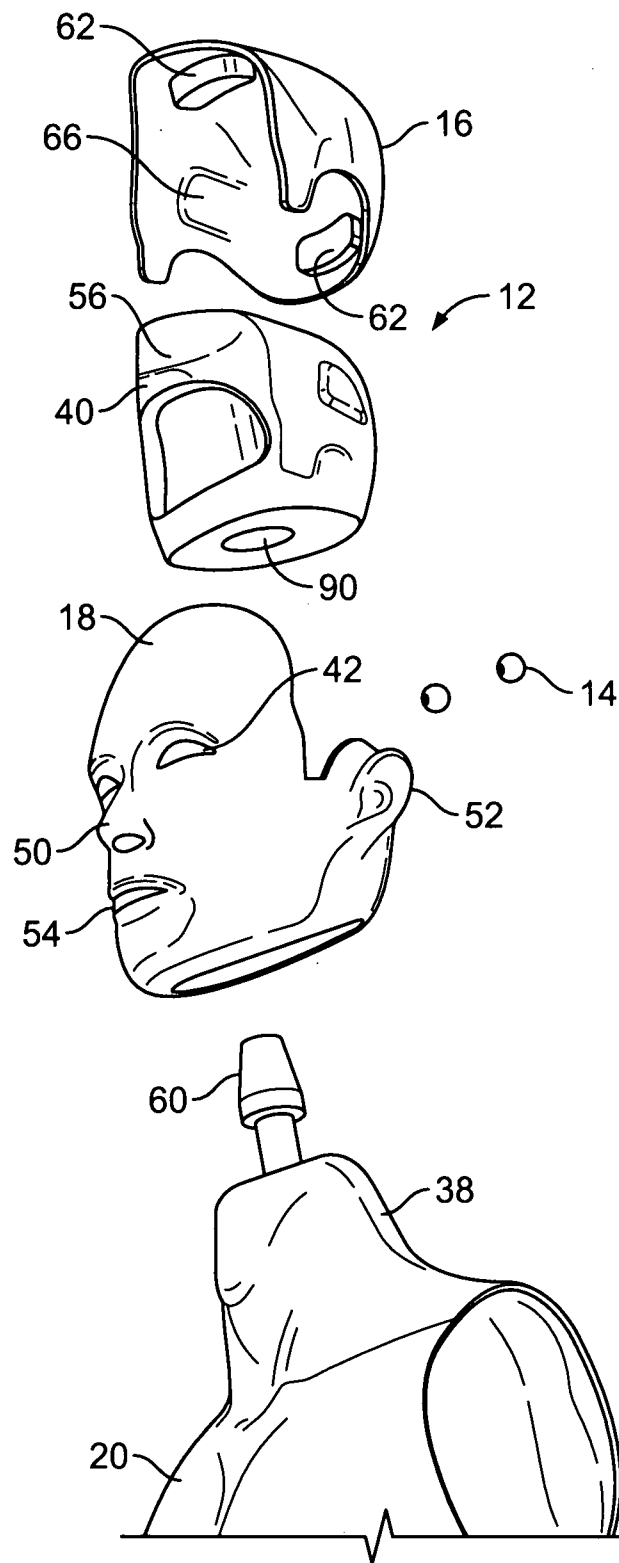


FIG. 3

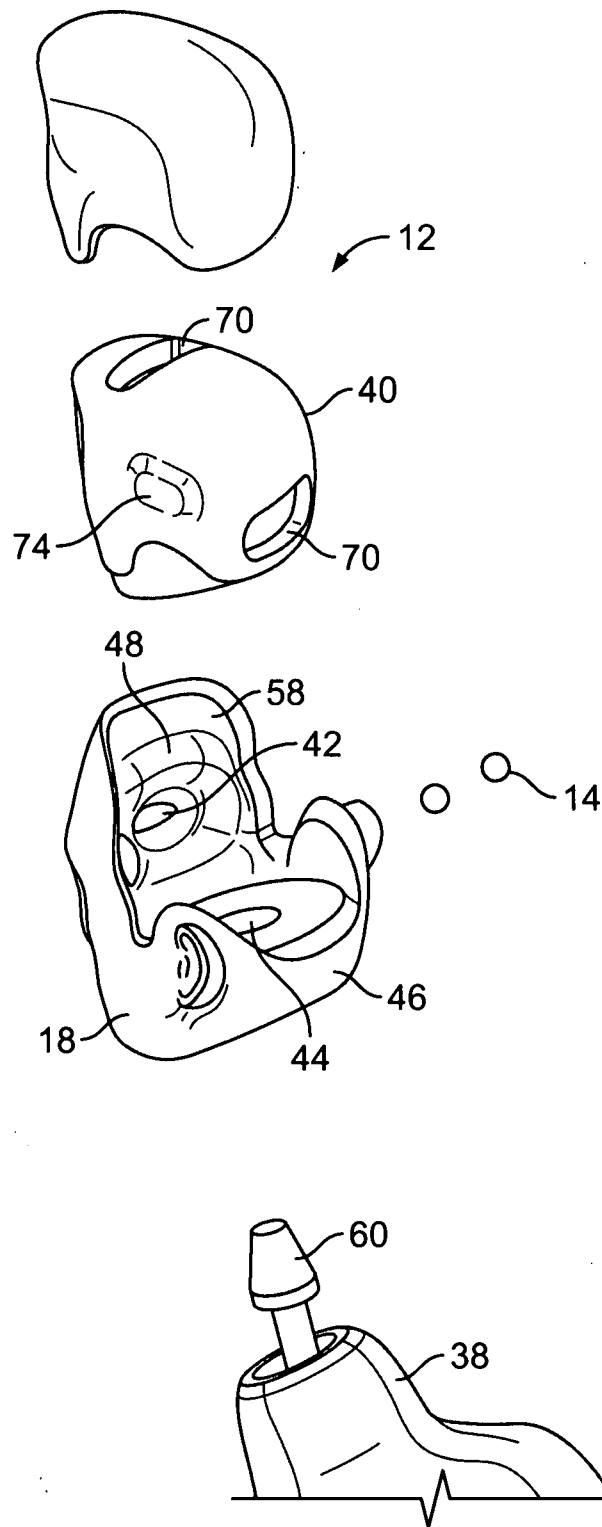


FIG. 4

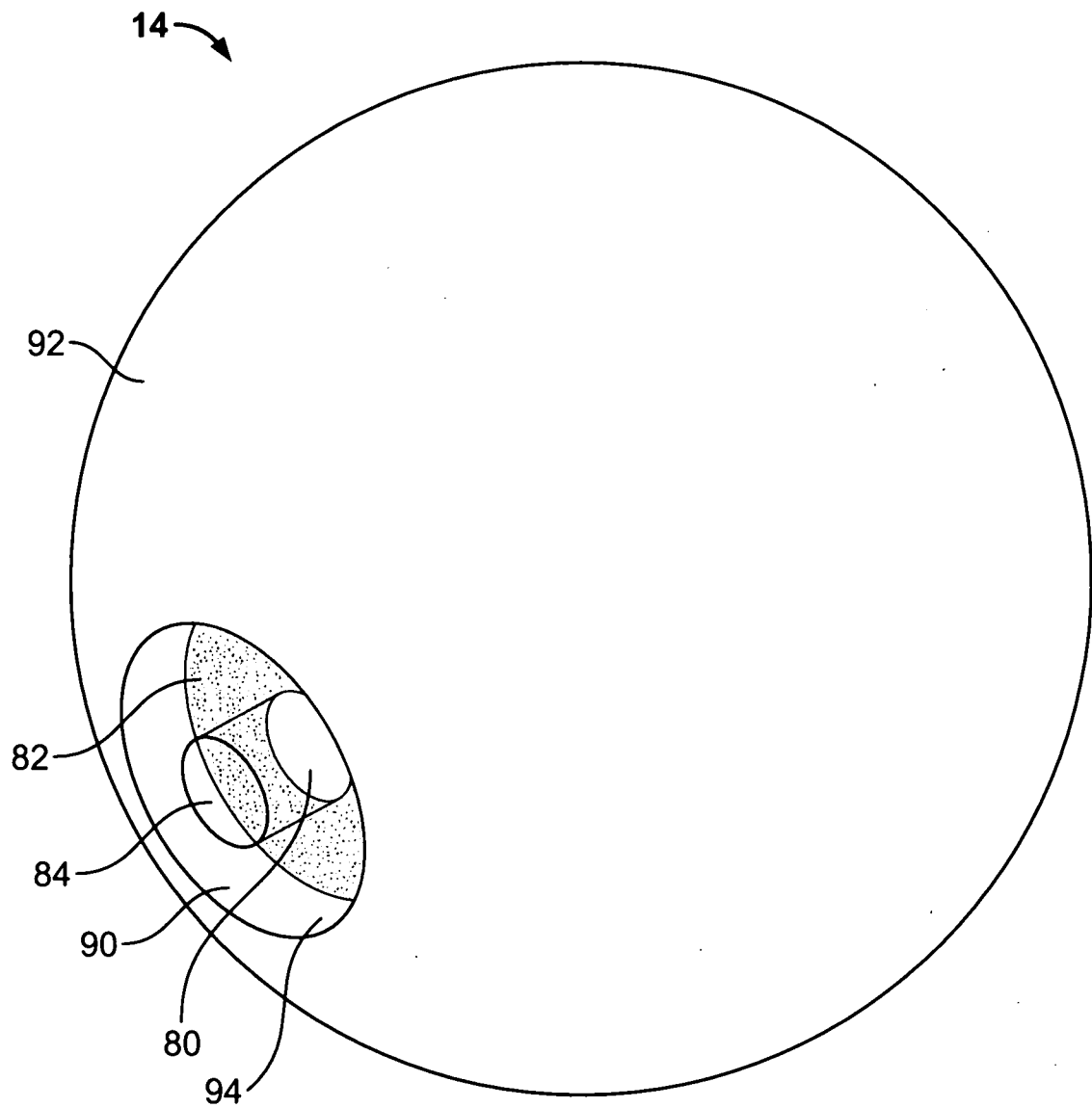


FIG. 5

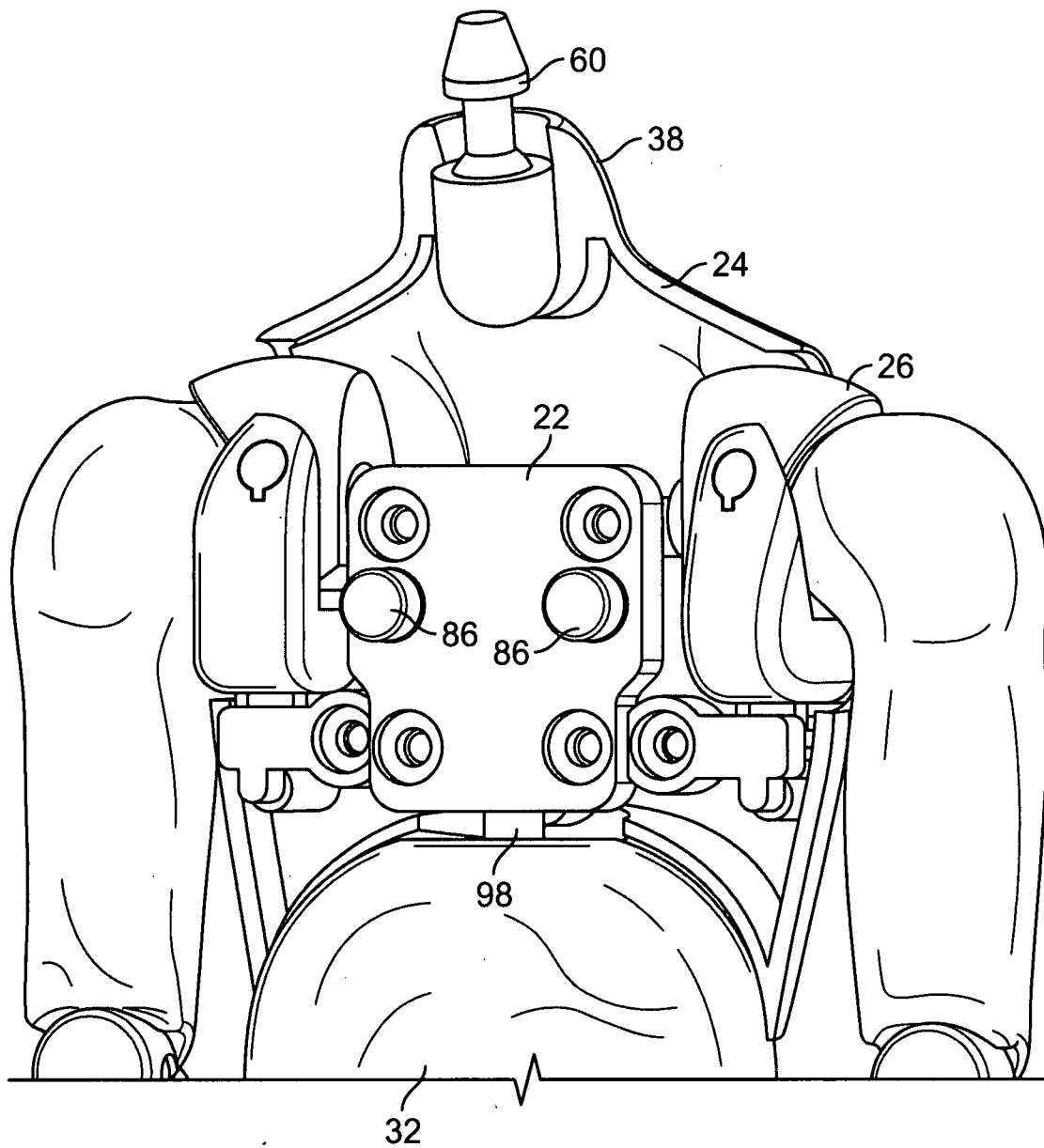


FIG. 6

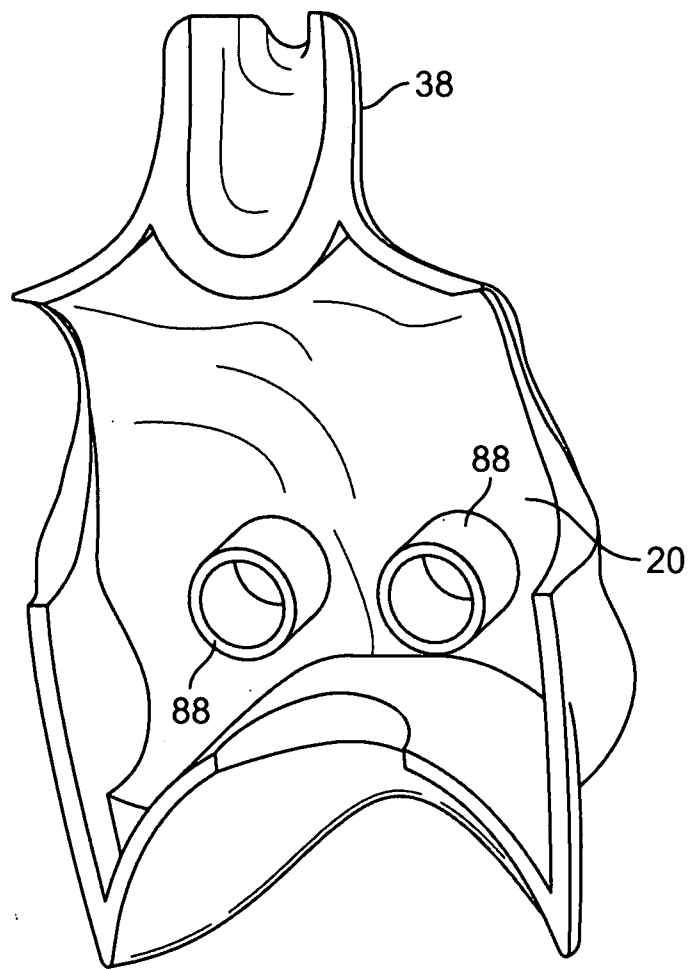


FIG. 6A

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US07/19612

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A63H 3/12 (2008.01)

USPC - 446/321

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC(8) - A63H 3/12 (2008.01)

USPC - 446/319, 321, 376-378, 383, 384, 389, 391, 392

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Patbase

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 3,571,968 A (SAMO) 23 March 1971 (23.03.1971) see entire document	1, 6, 8-9 ----- 2-5, 7, 10, 37-39
X --- Y	US 7,186,212 B1 (MCMULLEN) 06 March 2007 (06.03.2007) see entire document	11, 13, 28-36 ----- 2-5, 10, 37-39
X --- Y	US 4,038,775 A (SATO) 02 August 1977 (02.08.1977) see entire document	14-18, 27 ----- 39
Y	US 6,220,923 B1 (LIN) 24 April 2001 (24.04.2001) see entire document	7

☐ Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

11 March 2008

Date of mailing of the international search report

15 APR 2008

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents

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