March 2, 1971 G. E. BECKER 3,566,534

PIVOTABLE DOLL LEG

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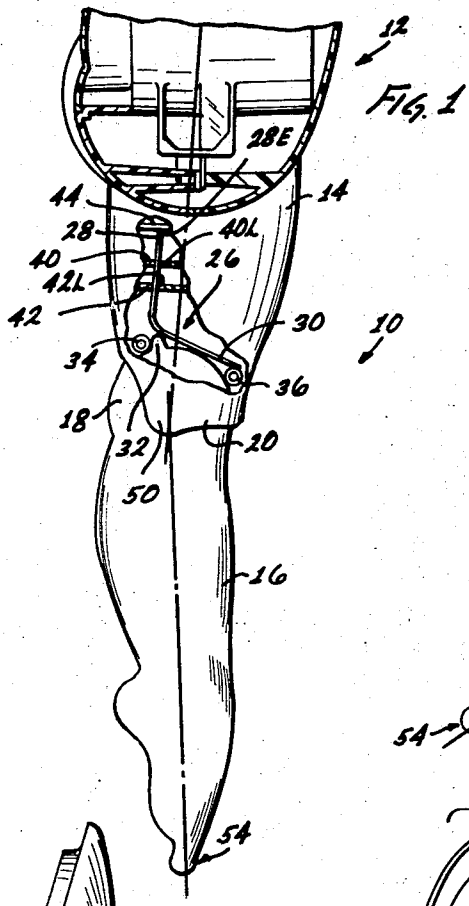


Fig. 1

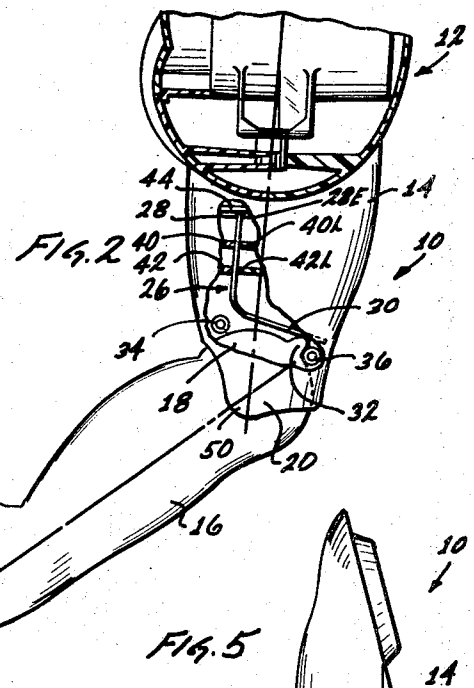


Fig. 2

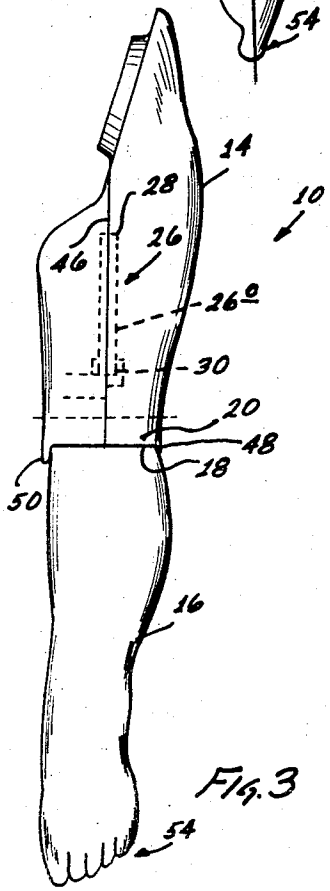


Fig. 3

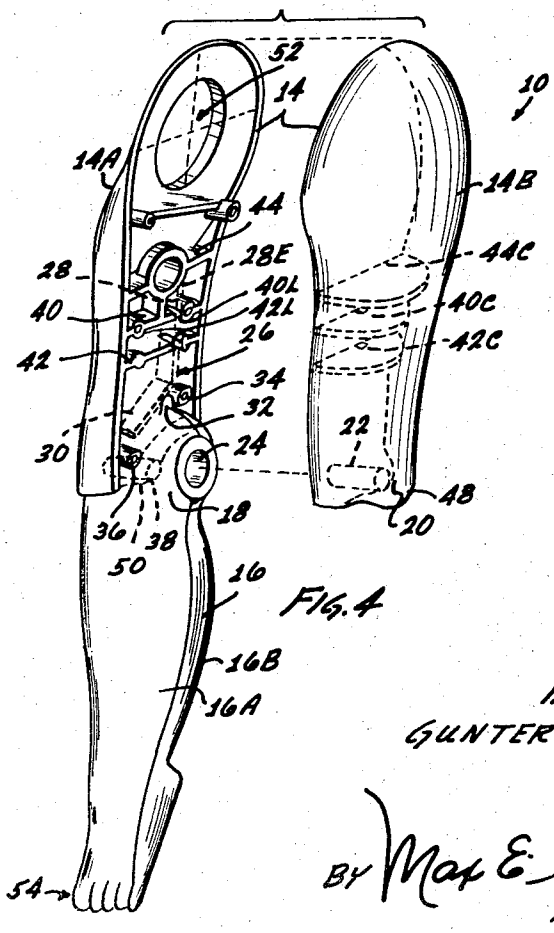


Fig. 4

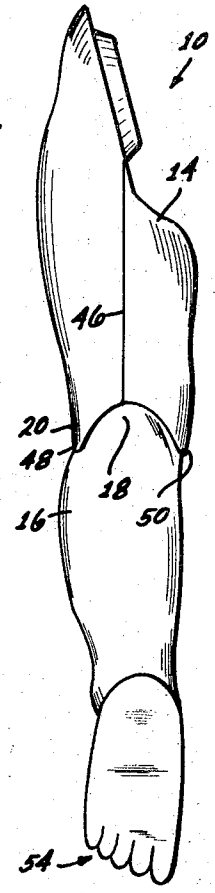


Fig. 5

INVENTOR
GUNTER E. BECKER

BY Max E. Slink
ATTORNEY

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PIVOTABLE DOLL LEG

Gunter E. Becker, 17213 Yukon Ave., Apt. H, Torrence, Calif. 90503

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U.S. Cl. 46—163 9 Claims

ABSTRACT OF THE DISCLOSURE

A doll leg which pivots at the knee between two orientations, and which retains either of the orientations. The leg includes an upper leg member, a lower leg member pivotally joined to the upper member, a protuberance at the top of the lower member, and a leaf spring having an inner end mounted on the upper leg member and an outer end portion extending tangential to the path taken by the protuberance as it moves when the lower leg member pivots.

BACKGROUND OF THE INVENTION

(1) Field of the invention

This invention relates to toys, and more particularly, to dolls.

(2) Description of the prior art

A wide variety of joints have been developed for use in the arms and legs of dolls to enable pivoting at the elbow or knee in an appendage of a close to natural appearance. Some of the doll appendages must also be capable of retaining the orientation to which they have been pivoted. An example of this is a ballerina doll whose leg can be manually pivoted between a straight position and a position where the leg is bent at the knee, and which must retain the position to which it has been moved. In order to provide a mass market for such dolls, the appendages, as well as other parts, must be designed with a minimum number of simple and easily assembled parts.

OBJECTS AND SUMMARY OF THE INVENTION

An object of the present invention is to provide a doll appendage of a type which can be pivoted between and retained in either of two positions, and which is capable of rapid low cost mass production.

Another object is to provide a sturdy doll leg of natural appearance, which uses a minimum of simple and easily assembled parts.

In accordance with the present invention, a doll appendage is provided which has a few simple and easily assembled parts, yet which has a natural appearance and allows pivoting between and retention in either of two positions. The appendage includes upper and lower appendage members which are pivotally joined. One of the appendage members has a protuberance and the other has a leaf spring with a portion that extends substantially tangentially along the path taken by the protuberance as the appendage pivots between its two positions.

In one embodiment of the invention, a doll leg is provided which can pivot between a straight and bent position, wherein the upper leg member has a hollow bottom for receiving the top of the lower leg member. The lower leg member has a protuberance at the top. A bent strip of spring material has an inner end mounted on the upper leg member, and an outer end portion extending along the path taken by the protuberance as the lower leg member pivots. The inner end of the spring is held in place on the upper leg member by a pair of elements that engage it on opposite sides to bias it toward a rotational position against the lower leg member, and by a third element that abuts the extreme inner end of the spring to prevent it from moving away from the lower leg member.

The novel features of the invention are set forth with particularity in the appended claims. The invention will best be understood from the following description when read in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partially sectional side elevation view of a leg constructed in accordance with the invention, showing it in a straight configuration;

FIG. 2 is a view similar to that of FIG. 1, showing the leg in a second, bent configuration;

FIG. 3 is a front elevation view of the leg of FIG. 1;

FIG. 4 is an exploded perspective view of the leg of FIG. 1; and

FIG. 5 is a rear elevation view of the leg of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a leg assembly **10** mounted on a doll **12** of a type which may represent a ballerina who can pivot her legs between the substantially straight position shown in FIG. 1 and a bent position shown in FIG. 2. The leg includes an upper leg member **14** and a lower leg member **16**, with its toes pointing downwardly to simulate the toe walking nad pirouetting of a ballerina. The leg can be manually pivoted between the two positions shown in the figures, and includes means for retaining the leg in either of the two positions to which it has been oriented.

The lower leg **16** has a rounded upper end **18** which is received in a hollow bottom end **20** of the upper leg member. As shown in FIG. 4, the pivotal connection of the leg members is accomplished by a shaft **22** of the upper member which projects through a bearing **24** in the lower member. The retention of the lower leg in either of the two orientations is accomplished by a spring **26** with an inner end portion **28** mounted on the upper leg member, and an outer end portion **30** which is biased against the lower leg member. The lower leg **16** has a protuberance **32** at its upper end. The outer end portion **30** of the spring extends substantially tangential to the path taken by the protuberance **32** as the lower leg pivots between the two positions to which it can be latched.

In the straight position of FIG. 1, the spring member presses against the protuberance **32** to urge the lower leg into the straight position. (In the nominally straight position of the leg, the length of the lower leg **16** as defined by a line connecting the axis of shaft **22** and the toes **54**, is a few degrees past a position in line with the length of the upper leg **14**, as defined by a line connecting the center **52** of the hip joint and the axis of shaft **22**.) The protuberance engages a stop **34** on the upper leg that limits pivoting past the straight position, so the leg is retained in the straight position. In the bent position of FIG. 2, the outer end portion **30** of the spring member presses against the protuberance **32** to urge it even further past the bent configuration. The protuberance **32** then engages stop **36** on the upper leg member, which prevents it from pivoting past the illustrated bent position. Accordingly, the lower leg member is retained in the bent position.

Both the upper and lower leg members **14**, **16** are constructed of two molded housing sections. The two sections **16A** and **16B** of the lower leg member are joined together prior to assembly of the entire leg. The two sections **14A** and **14B** of the upper leg member are joined together only after the bearing **24** of the lower leg member has received a shaft portion **38** on upper

housing portion **14A**, and the spring member **26** has been placed in the position shown in FIG. 4. Then, the other upper housing section **14B** is fastened in place, with the shaft portion **22** therein inserted into the bearing **24**. Thereafter, the outside of the leg is finished and the leg is inserted in the torso of the doll.

The spring member **26** is a strip of spring material which has been bent to an angle of about 120° between the inner and outer end portions. The inner end portion **28** extends largely along the length of the upper leg member, or in other words, with a major directional component along the length of the upper member. The outer end portion **30** extends with a major directional component perpendicular to the length of the upper leg member. The housing section **14A** is constructed so that the spring member can be inserted and held in place in a very simple manner. The housing section has a pair of holding elements or members **40, 42** with stepped sides that form ledges **40L, 42L**. The ledges **40L, 42L** engage the inner end portion **28** of the spring member on opposite sides to retain it in position. When the lower leg is in the straight position, with the protuberance **32** against stop **34**, the protuberance **32** and upper ledge **40L** both urge the spring member in a direction toward the lower ledge **42L**. Thus, the spring member **26** is supported at two positions on one of its sides (at ledge **40L** and protuberance **32**), and at one position (at **42L**) on the opposite side, at a location between the two other positions. These three points of support form a stable supporting structure to hold the spring member in position. An additional supporting member **44** is provided on the upper leg housing for abutting the extreme inner end **28E** of the spring. The member **44** resists upward movement of the spring member against the upward bias provided by the protuberance **32** as it bears against the spring member.

In assembling the doll leg, the spring member **28** may be installed prior to the installation of the lower leg member **16** on the upper housing portion **14A**. Even though the protuberance **32** of the lower leg member is not present, the spring member is retained in place. This is because the outer end **30** of the spring member is made long enough to abut the stop **36** on the upper housing portion. The stop **36** is located so that it holds the spring member in slight compression, such as by collapsing it to an angle such as 115° from its unstressed configuration where the inner and outer ends make an angle of 120°. After the spring member has been installed in the upper housing portion **14A**, the lower leg member **16** is installed in position.

Installation of the lower leg member is easily accomplished by inserting the shaft portion **38** partially into the bearing **24** in the lower leg member, with the lower leg member bent even further than the position of FIG. 2 so that the protuberance **32** is forward of the stop **36**. The lower leg is then rotated toward a straight position, and when it passes the stop **36** the shaft portion **38** can be inserted all the way into the bearing portion **24**. As the lower leg is being rotated from a position forward of stop **36** toward a position between the stops **34** and **36**, the protuberance **32** deflects the outer end of spring **26** so that the protuberance lies under the spring. This is possible because, as shown in FIG. 3, an outer edge **260** of the spring lies further out than the parting line **46** which is as far as the stop **36** projects.

After the lower leg **16** has been installed on upper housing section **14A**, the other upper housing section **14B** can be installed. As shown in FIG. 4, the housing section **14B** has three counter elements **40C, 42C**, and **44C** which assume positions even with the sides of the elements **40, 42, 44** to hold the spring in place.

In order to provide a realistic appearance for the leg in both its straight and bent positions, the upper end **18** of the lower leg member is rounded to provide the appearance of a knee when the leg is bent. The upper leg member has portions **48, 50** at either side that extend below the pivot point of the leg (which is along the axis of bearing **24**), to simplify the joints while concealing the pivoting apparatus from view. At the front of the upper leg member its lower edge extends almost horizontally along the middle of the knee. However, at the rear of the leg, the lower edge of the upper member rises to a position above the axis of pivoting, to receive the rounded upper portion of the lower leg member when it is in the bent position.

Thus, the invention provides a pivoting leg structure of close to natural appearance, which pivots and retains two pivoting positions to which it can be moved. The structure uses a minimum of simple parts, particularly the spring member **26** which, being constructed of steel or other rugged spring material, is not easily formed in a complex shape. However, the assembly of the leg can be rapidly and easily accomplished for low cost mass production of the doll.

Although particular embodiments of the invention have been described and illustrated herein, it is recognized that modifications and variations may readily occur to those skilled in the art and, consequently, it is intended that the claims be interpreted to cover such modifications and equivalents.

What is claimed is:

1. A doll appendage comprising:
a first appendage member;
a second appendage member having an end portion pivotally joined to said first member to enable pivoting of said second member between first and second positions with respect to said first member;
a protuberance extending from said end portion of said second member; and
a spring member having an inner end portion mounted on said first appendage member and an elongated outer end portion extending substantially tangential to the path taken by said protuberance as said second member pivots between said first and second positions.

2. The doll appendage described in claim **1** wherein:
said spring member comprises a strip of spring material bent between said inner and outer portions; and
said first appendage member includes a pair of holding members engaging opposite sides of said strip at different locations along the length of said inner end portion, to urge said spring member to rotate in a direction to press its outer end portion against said protuberance.

3. The doll appendage described in claim **2** wherein:
said first appendage member includes an element for abutting the extreme inner end of said spring member to limit movement of said spring member away from said second appendage member.

4. The doll appendage described in claim **1** wherein:
said first appendage member is elongated and includes two housing sections each extending substantially along the length of the member for joining together to form the outside of said appendage member, a first of said housing sections having means for pivotally engaging said second appendage member;
said spring member comprises a strip of spring material of predetermined width, said strip bent between said inner and outer end portions; and
said first housing section has a pair of holding members with ledges spaced along said inner end portion of said spring member and located on either side thereof to urge said outer end portion of said spring member toward said protuberance, said holding members having portions for abutting one edge of said spring member so that the opposite edge projects past the boundaries of said first housing section, to enable spring deflection by said second appendage member as it is installed on said first housing section.

5. A leg for a doll comprising:
an upper leg member;
a lower leg member having an upper portion pivotally joined to said upper leg member, to enable pivoting of said lower member between a first position substantially aligned with said upper leg member and a second position angled from said first position;
a protuberance extending from said upper portion of said lower leg member;
first and second stop means for engaging said protuberance to prevent rotation of said lower leg member past said first and second positions, respectively; and
a spring member having an inner end portion mounted on said upper leg member and an elongated outer end portion for engaging said protuberance to urge it toward said first and second stop means when said lower leg member is in said first and second positions, respectively.

6. The doll leg described in claim 5 wherein:
said upper portion of said lower leg member is rounded; and
said upper member has a hollow lower portion for receiving said rounded upper portion of said leg member, said hollow lower portion having walls extending to a position below the pivot point of said members at the forward part of the leg and only to a position above the pivot point of said leg members at the back of the leg.

7. The doll leg described in claim 5 wherein:
said spring member comprises a strip of spring material bent at an angle between said inner and outer end portions, said inner end portion etxending with a major directional component along the length of said upper leg member and said outer end portion extending with a major directional component prependicular to the length of said upper leg member.

8. The doll leg described in claim 7 wherein:
said upper leg member includes a plurality of spring holding elements, including elements abutting the sides of said spring member along said inner end portion thereof and an element abutting the extreme end of said inner end portion.

9. The doll leg described in claim 8 wherein:
said outer end portion of said spring has a length sufficient to bear against one of said stop members, to retain said spring member in place prior to installation of said lower leg member.

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LOUIS G. MANCENE, Primary Examiner
D. L. WEINHOLD, JR., Assistant Examiner