March 5, 1957 R. GARDEL ET AL 2,783,587

DOLL ANKLE JOINT MECHANISM

Filed Oct. 5, 1955 2 Sheets-Sheet 1

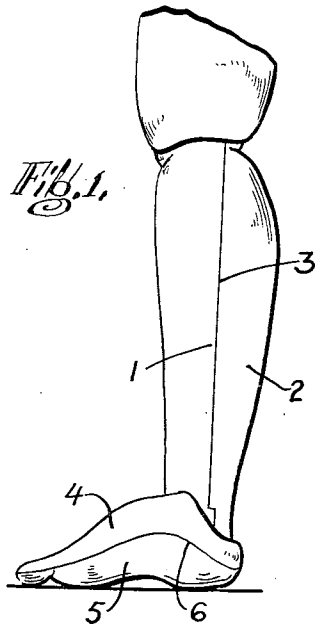


Fig. 1.

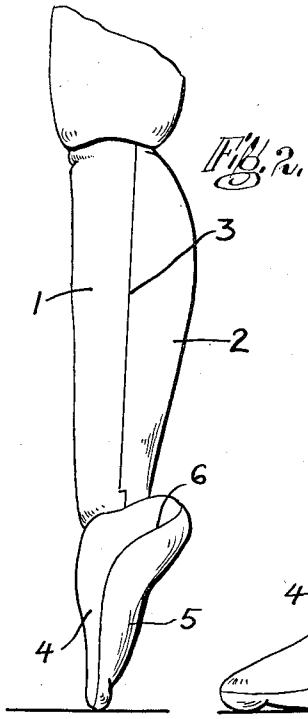


Fig. 2.

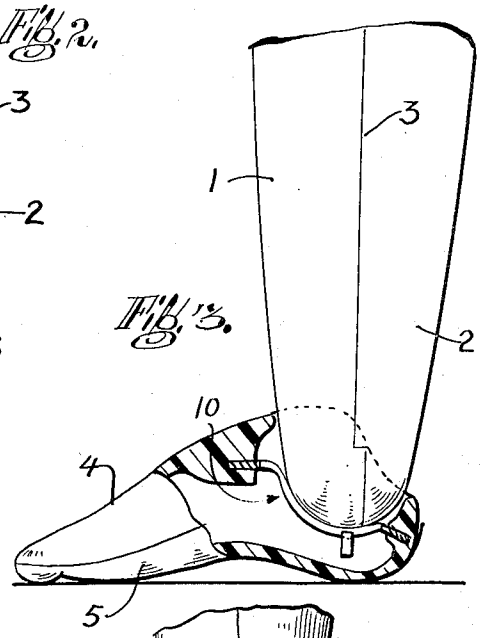


Fig. 3.

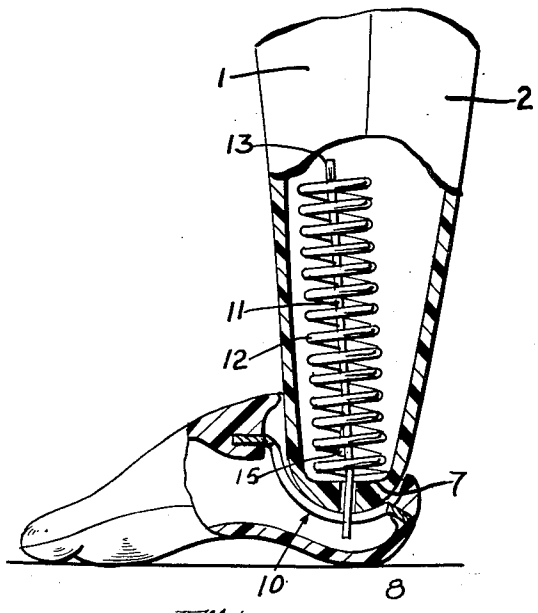


Fig. 4.

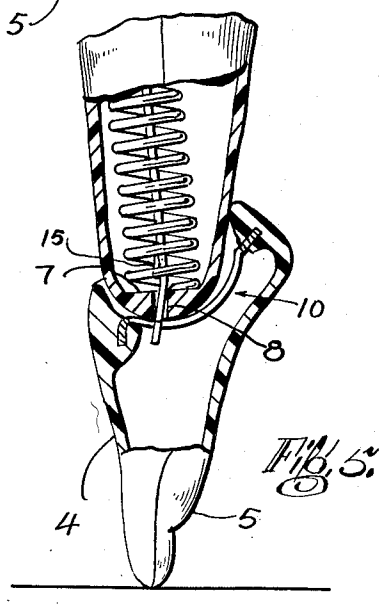


Fig. 5.

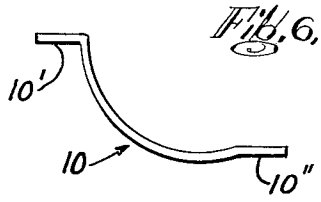
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Filed Oct. 5, 1955 2 Sheets-Sheet 2

Fig. 6.



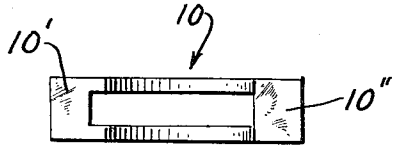


Fig. 7.

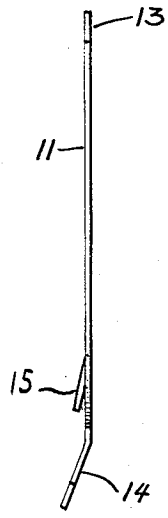


Fig. 8.

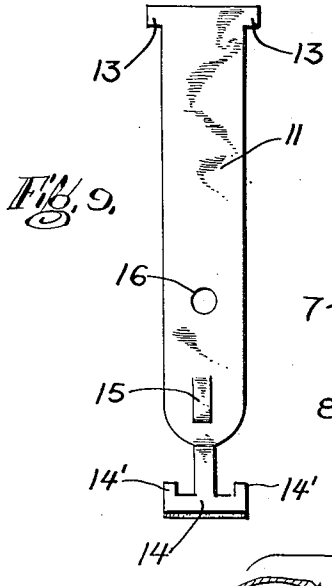


Fig. 9.

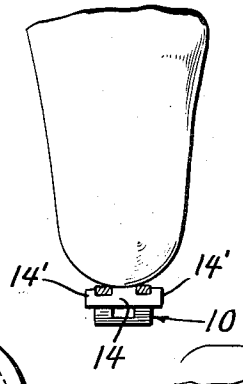


Fig. 10.

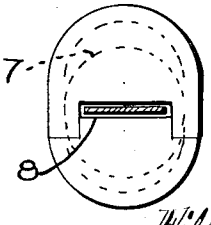


Fig. 11.

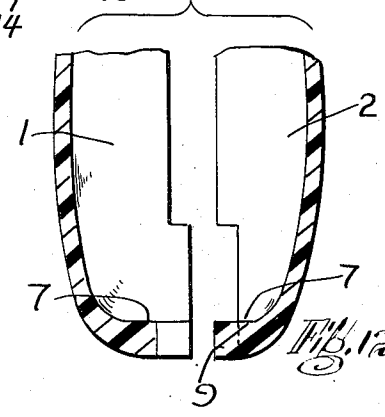


Fig. 12.

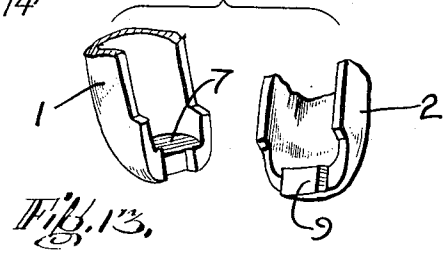


Fig. 13.

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2,783,587

DOLL ANKLE JOINT MECHANISM

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Application October 5, 1955, Serial No. 538,572

3 Claims. (Cl. 46—173)

This invention relates to a doll ankle joint mechanism, and particularly to such a mechanism which has the following advantages:

(*a*) It is of simple and sturdy construction.

(*b*) It is easy to install during manufacture of the doll.

(*c*) It provides articulation of the foot to the leg, such that the foot is held, by frictional engagement, in any adjusted position between a flat-footed walking position and a "toe-dancing" position.

(*d*) The engagement of the foot in every position is firm and does not change appreciably with time or wear.

(*e*) After the foot has been initially attached to the leg, it cannot be removed or become maladjusted (without at least partial destruction of the leg and/or foot).

It is the object of the invention to provide an improved mechanism which exhibits the above, and other, advantages.

A practical embodiment of the invention is shown in the accompanying drawings, wherein:

Fig. 1 represents a side elevation of a doll leg having the foot held in walking position;

Fig. 2 represents a similar view of the doll leg having the foot turned to "toe-dancing" position;

Fig. 3 represents a side elevation, on a larger scale, of the foot and lower leg in walking position, part of the foot being broken away to provide a vertical sectional view;

Fig. 4 represents a view similar to Fig. 3 with part of the leg being also broken away to provide a vertical sectional view;

Fig. 5 represents a view similar to Fig. 4, with the foot turned to "toe-dancing" position, as in Fig. 2;

Figs. 6 and 7 represent, respectively, side and plan views of the foot bracket;

Figs. 8 and 9 represent, respectively, edge and front elevations of the connecting rod;

Fig. 10 represents a vertical section through the foot bracket, showing its engagement with the connecting rod, the foot being omitted and the lower leg being shown in full lines;

Fig. 11 represents a bottom plan view, looking up, of the end of the leg, the mechanism being omitted;

Fig. 12 represents a vertical section through the lower leg portions, shown separated, and

Fig. 13 represents a perspective view of the same portions.

Referring to the drawings, the doll leg is shown as comprising molded front and back sections **1** and **2**, respectively, cemented together along the suture line **3** in a customary manner. The foot is conveniently made also of two parts, the upper part **4** and lower part **5** being joined along the suture line **6**. The inner bottom surfaces of the leg sections constitute, when the sections are fastened together, an approximately circular abutment **7** having an elongated slot **8** opening downwardly from the middle of said abutment. For reasons set forth below, it is desirable to have more than half of the abutment **7**

formed in one leg section (for example, the section **1**) and less than half formed in the complementary section (e. g., **2**). This result may be achieved as shown most clearly in Figs. 11, 12 and 13, by extending the leg walls and adjacent abutment surfaces of the section **1** well past the line constituting the longitudinal axis of the slot **8** and by cutting away to a corresponding extent the leg walls and adjacent abutment surfaces of the section **2**, while having a rectangular "tooth" **9** projecting from the latter into the open space between the extended surfaces of the section **1**; said projection having its length limited sufficiently to leave the slot **8** completely open (Fig. 11).

The mechanical parts, as distinguished from the anatomical, comprise the foot bracket **10**, the connecting rod **11** and the spring **12**. The bracket **10** is formed from a flat strip of metal, longitudinally slotted throughout most of its length and bent to the shape shown in Fig. 6 wherein most of the slotted part is arcuate while the ends **10'** and **10''** remain flat. The slot may extend a short distance into the end **10'** as shown in Fig. 7. The bracket **10** is rigidly mounted in the foot by having its ends set or cemented into the inner portion of the upper foot part **4** (Figs. 3, 4 and 5) in such a position that the bracket extends in the front-and-back direction across the ankle opening of said foot part. The instep and heel edges of said opening lie preferably at points corresponding to projections upward and rearward, respectively, of the arc formed by the bracket.

The connecting rod **11** is also formed from a flat strip of metal, having laterally projecting stops **13** at the top, an inverted T-shaped projection **14** at the bottom and an outwardly sprung locking leaf **15**. For shipping and assembly purposes it is desirable to provide also a hole **16** above the leaf **15**. The spring **12** is preferably a helical spring of uniform diameter and considerable stiffness under compression; it should terminate in a substantially closed ring, at least at the top, and its inner diameter should be only slightly greater than the width of the strip **11**. The upper end of the spring is designed to bear against the stops **13**. The projection **14** is so shaped and proportioned that the stem can lie freely across the width of the slot in the bracket **10** while the arms, with their upstanding lugs **14'**, embrace said bracket (as shown in Fig. 10) in such a manner as to prevent any axial rotation of the connecting rod **11**.

For mounting the connecting rod **11** and spring **12** in a doll leg, the spring is placed on the rod and compressed upward to a point where it can be held by a removable pin (not shown) inserted through the hole **16**. The lower end of the spring is then brought to bear against the abutment **7** at the bottom of the section **1** and the rod is pulled down farther, against the force of the spring, until the pin lies below the bottom of the leg section, with the rod lying in the slot **8**. Because the abutment **7** bears against more than half of the base of the spring, there is no serious tendency for the spring and rod to jump out of this partially assembled position. The leg section **2** is then fitted onto the section **1**, the tooth **9** taking its place to complete the formation of the slot **8**. A finished foot, having the bracket **10** mounted therein is then applied to the projecting end of the rod **11** by passing the projection **14** through the slot in the bracket and then rotating the foot 90° so that the arms of the projection will embrace the bracket, as previously explained. With the parts held in this position, the pin is removed from the hole **16**, permitting the spring to draw the connecting rod into the leg and thus draw the bracket **10** strongly against the rounded bottom end of the leg, as clearly shown in Figs. 3, 4, 5 and 10. The locking leaf **15** projects far enough laterally from the connecting rod to prevent the latter from being drawn out again through the slot **8**, so that the parts are permanently assembled,

i. e., the foot cannot be removed without breaking the leg or at least breaking away part of the lateral wall of the slot **8**. In its assembled condition, the rod **11** normally cannot be pulled down far enough to permit the projection **14** to be disengaged from the foot bracket; even if it could in some cases be pulled far enough, there is no convenient way (without special tools) to hold it extended, against the strong pull of the spring, while turning and freeing the foot.

The operation of the mechanism is evident from the foregoing description and from examination, particularly of Figs. 1 to 5. The center of curvature of the arcuate part of the foot bracket is located at a point corresponding approximately to the axis of the human ankle joint. In any adjusted position, an appreciable portion of said arcuate part of the bracket always rests firmly against the correspondingly curved lower end of the leg and is held there tightly by the force of the spring. The engagement of the arms of the projection **14** with the lower (convex) surface of the foot bracket produces a concentration of friction in a small area (or line). Such interfitting and frictional engagement of the parts eliminates any tendency of the foot to rock and ensures holding it positively in any desired position. In the standing position (Figs. 1, 3 and 4) the motion may be limited by contact of instep edge of the foot opening with the front surface of the leg, while motion in the opposite direction (Figs. 2 and 5) may be limited by contact of the heel edge with the back surface of the leg.

It will be understood that various changes may be made in the form, construction and arrangement of the several parts without departing from the spirit and scope of the invention.

What we claim is:

1. A doll ankle joint mechanism comprising, a leg member having an internal abutment and a rounded bottom surface, and being provided with a slot extending substantially vertically through its bottom, a foot member having an ankle opening adapted to receive the lower end of the leg member, a bracket extending across said opening in a front-and-back direction and having upper and lower arcuate surfaces, a connecting means passing through the leg slot and having means for frictionally engaging the lower arcuate surface of said bracket, and means within the leg member and cooperating with said abutment for holding said connecting means in a position such that the upper arcuate surface of said bracket rests in frictional engagement with the rounded bottom surface of the leg member.

2. In a doll ankle joint mechanism, a foot-to-leg connecting means comprising an elongated metal strip having means for engaging a spring, an inverted T-shaped projection at its lower end, and a laterally projecting resilient locking leaf permitting movement of the strip upward through a slot and preventing movement of the strip downward through the same slot.

3. In a doll ankle joint mechanism, a connecting means according to claim 2 which includes a perforation above the locking leaf, and a helical spring surrounding said strip and under compression between the spring-engaging means and a removable stop passing through said perforation.

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