My invention relates to improvements in the structure of dolls, manikins and similar figures, whereby the doll or manikin produced will have joint structures and other features which give a natural human movement and appearance to the various limbs or other joints.

The primary object of my invention is to provide structural features of such a nature that the doll or other figure can be manufactured in an inexpensive manner particularly by plastic molding.

Dolls have been and are being manufactured by plastic molding, but in all instances, as far as known, the various parts of the doll must be cemented or otherwise fastened together when the doll is assembled. This requires an elaborate assembly procedure and equipment so that the dolls produced in this way are considerably more expensive than they should be.

Manikins used by artists for models and other purposes are sometimes carved from wood or other materials, and provided with joints adapted to give the manikin a more or less natural or desired pose. While considerable quantities of such manikins are made and used, they are very expensive to make and in fact the cost is prohibitive for the use of such manikins as dolls.

Another object, therefore, of my invention is to provide construction whereby manikins of the type referred to may be made at a relatively low cost and at the same time have joints so that the manikin can be placed in any desired position, approximating the positions which the human body may assume.

A further object of my invention is to provide a natural movement structure for dolls, manikins and other figures including joints which may be readily manufactured by plastic molding and quickly assembled without the use of pins, springs, metal attachment members, hinge pins or cementing.

An important feature of my invention comprises certain joints for dolls and the like having structures adapted to provide a swivel joint effect, and additional structures adapted to provide a hinge joint effect, as for example, like the elbow or shoulder joints of a person, such joints including elements adapted to be pressed together into a snap-like fit and which will hold firmly without the use of pins or other retaining members.

My improved hinge joint structure in its preferred form advantageously comprises a disc-like or corresponding element adapted to fit in a slot, the walls of the slot and the disc-like element including complementary retaining and pivoting means so that when the disc-like element is pushed into the slot such means interlock and provide a hinge joint without the use of pins or other outside means.

Another feature of my invention includes the provision of structures of the type referred to having additional elements or structures providing a swivel action at the joint in combination with the hinge action, for simulating particular joints of the human body.

My improved natural movement doll structure includes other features and advantages as well as other modified forms, all of which are described more in detail hereinafter in connection with certain illustrative embodiments shown in the accompanying drawings forming a part of this application.

In the drawings:

Fig. 1 is a broken expanded view illustrating one form of joint construction, such for example, as that suitable for the shoulder, elbow or knee joints, in which the parts are separated with respect to each other and some of them shown in section.

Fig. 2 is a view similar to that of Fig. 1 showing the first two joint members at ninety degrees with respect to the showing in Fig. 1.

Fig. 3 is a broken view similar to that of Fig. 1 showing a modified form of the swivel portion of the joint.

Fig. 4 is a broken view showing a modified form of construction for the hinge and swivel elements of a joint generally of the type illustrated in Fig. 1.

Fig. 5 is a view taken on the line 5—5 of Fig. 4.

Fig. 6 is a sectional view of a slotted hinge joint member similar to that of Fig. 4, showing a modified structure for use in inserting the disc portion of the hinge joint.

Fig. 7 is a broken view of one part of a modified form of swivel joint structure.

Fig. 8 is an assembly view of a modified form of swivel joint structure showing the position of the element of Fig. 7.

Fig. 9 is a sectional view taken on the line 9—9 of Fig. 8.

Fig. 10 is a broken expansion view of a further modified form of hinge joint generally of the type of the hinge portion of the joint shown in Fig. 4.

Fig. 11 is a broken view partly in section of a modified form of combination hinge and swivel joint structure.

Fig. 12 is a broken view of an arm of a doll or manikin, partly in section, showing the use of the
joint structure of Figs. 4 and 5, as an elbow joint, the view of the joint structure being at 90° with respect to that of Fig. 4.

Fig. 13 is a broken elevational view of the arm of a doll constructed in accordance with the features of my invention, showing the natural-like structure resulting from the use of the joint structures of my invention.

Referring to Figs. 1 and 3 of the drawings, the joint structure therein shown comprises elements adapted to provide for hinge action and swivel action of the joint, such as the actions naturally occurring in various main parts of the body, for example, the ankle, knee, hip, elbow, shoulder, neck and other joints of a person.

The elements forming the hinge joints shown in Figs. 1 and 2, comprises a circular disc-like member 20 cast integral with a portion of the limb 21 or other part of the body structure for which the joint is intended. The relatively thick disc-like member 22 as shown in Fig. 2 is substantially circular in contour around most of its periphery, and is provided with upper and lower semi-spherical dents or recesses 22 which are diametrically opposite each other in upper and lower surfaces of the disc-like member 20.

The member 20 shown in Figs. 1 and 2 cooperates with a ball-like portion 23 of a coupling member having a slot 24 extending through its left-hand end substantially sitting the member 20 with respect to thickness and contour, as evidenced by the showing in Fig. 2. The upper and lower surfaces forming the slot 24 are provided with a pimple or hemispherical projection 25 adapted to fit respectively into the recesses 22 and provide a pivot connection of the end 26 and pivot member forming a friction fit so that the parts 21 and 23 may be set at any desired angle.

When the elements of the joint structure as described are assembled, they have general relations as shown in Figs. 4, in which the projections 25 serve as the pivot for the hinge joint. According to one of the features of my invention, these and the associated structures are conveniently made by plastic molding, and more particularly by the holding of styrene plastics which have been found to be sufficiently rigid to form an ideal joint structure and which at the same time will permit of forcing the member 20 into the slot of the member 23 to a point where the projections 25 snap in and recover in the recesses 22. In this operation, it may be that the projections 25 are somewhat compressed in forcing the member 20 into the slot, and also that the top and bottom portions of the member 23 spread slightly until the projections 25 engage the recesses 22. In any case, a good hinge joint is provided without the use of pins or other separate retaining members, and the joint may include a stop like element 48 in Fig. 4.

Since many of the joints of the body not only have a hinge action, but also a swivel action, the member 23, as shown in Figs. 1 and 2, includes a substantially cylindrical section 26 provided with oppositely arranged pimplies or projections 27 adapted to engage in an annular recess 28 of a limb or body member 29, the recess being in the cylindrical wall of a cavity 30 extending into the end of the member 29. The member 29 is advantageously made of plastic the same as the members 21 and 23 and the overall diameter of the projections 27 is greater than the overall diameter of the cylindrical cavity 30. However, because of the nature of the plastic material, particularly styrene plastic, the end 26 may be forced into the cavity 30 until the projections 27 engage the annular recess 28. The members 26 or 27 desirably have a friction fit with the respective structures 30 and 28 so that the member 23 may be rotated axially with respect to the member 29 to any angular position desired and maintained in that position until changed. The angle of rotation may be limited by the means shown in Figs. 4 and 5. In pressing projections 27 in the cavity 30, they may be compressed to a certain extent, but will recover their normal shape in the recess 28 and retain the member 23 in the end of the member 29 against any reasonable pull thereon.

Fig. 3 illustrates a slightly modified form of swivel joint construction in which the member 23a, having the slot 24a, for the formation of the hinge joint, is otherwise similar to the member 23 in Figs. 1 and 2 except that the cylindrical end 26a has an ovoided enlarged head 31. The cylindrical portion 25a and the head 31, when made of styrene plastic material is adapted to be inserted into the cylindrical cavity 32 of the end of member cavity 33, in which the head 31 engages with a larger cavity 34 to form a shoulder 35. The head 31 is larger than the cylindrical cavity 32 but it may be forced into the cavity 32 to a point beyond the position of the shoulder 35 which engages the head and retains the member 33 on the end of the member 33 with a swivel joint. If desired, the swivel joint structure shown in Fig. 3 may be employed instead of the swivel joint structure shown in Figs. 1 and 2.

Figs. 4, 5 and 12 illustrate a joint structure somewhat similar to that shown in Figs. 1 and 2 but with certain modifications. In Figs. 4 and 12 the joint is illustrated, for example, as an elbow joint in which the lower end of the upper arm member 36 terminates in a ball-like structure 37 having a slot 38 like the slot 24 in member 23, the upper and lower walls of this slot respectively having opposite hemispherical centrally-arranged recesses 39 for receiving respectively the hemispherical projections 40 on a disc-like portion 42 of a coupling member 43.

The upper end of the lower arm 44 is provided with a cylindrical wall of which contains a recess 45 extending approximately half-way around the inner circumference of the wall, as indicated in Fig. 5. The coupling member 43 has a cylindrical portion 47 extending into the cavity 45 and a pimple or projection 46 engaging in the recess 46. The cylindrical portion 41 is substantially large enough to fit the cavity 45 so that when the portion 41 is forced into the cavity, the projection 48 is depressed, because of the characteristics of the plastic material, until it engages the recess 45 and serves to retain the coupler 43 in the end of the lower arm 44.

It will be noted that, as shown in Fig. 5, the recess 46 extends only about half-way around the circumference of the cavity 45, so that the swiveling action of the lower arm 44 with respect to the coupler 43 is limited to the arc provided by the recess 46. This arc is approximately that through which the lower portion of a person's arm may be rotated. A doll or manakin, therefore, having an elbow joint including the features shown in Figs. 4 and 5, will have a structure which will permit the lower arm to be moved to a variety of natural positions. For example, the doll's lower arm and hand may be swung on the hinge joint up toward the shoulder of the doll, or held out straight where a project-
ing stop 49 of the disc 42 abuts the shoulder 50 on the lower portion of the arm member 36. This position corresponds to that in which the arm is straight out but cannot be bent or hinged backwardly because of the stop 49. When the lower arm 44 is in its extreme upper position its upper end enters a recess 52.

The doll or manikin, the subject of the present invention, is provided with a skin of plastic or rubber 51, which simulates human skin. Figs. 4, 5 and 12 show how the skin 51 covers the elbow joint structure, and Fig. 13 shows how naturally the skin wrinkles inside the elbow joint as the hand is brought up and the lower arm pivoted on the projections 40 of the hinge portion of the joint.

Fig. 6 shows one portion of a hinge joint structure on a member 52, that is, the slotted ball portion 53 of the type of members 23 and 37 in Figs. 2, 4 and 12, in which only the lower surface 54 of the slot is shown, this surface and also the upper surface having a central hemispherical recess 55 for receiving projections such as the projections 40, shown in Figs. 4 and 12. In order to facilitate the assembly of the parts of the joint, the recesses 55 are continued at substantially their depth through the surface 54, and the corresponding opposite surface, to the edge of the ball-like member 53 in the form of a curved recess 56. When it is desired to assemble the disc-like member such as member 42, the projection 49 may be made to follow the recess 56 into the hemispherical recess 55, thereby lessening the pressure required to assemble the hinge joint.

Where the hinge joint is assembled in this way, and particularly after the skin is applied to the doll structure, there will be little or no likelihood that the hinge joints will be pushed apart because of the recesses 55. In fact these recesses, as for example that shown in Fig. 6, may extend in a direction substantially opposite to or at right angles to that upon which any pull or other strain is apt to be applied.

Figs. 7, 8 and 9 show an illustrative embodiment of a form of swivel joint suitable for use in connection with a doll arm or other member 65, the tip of the part 57 having a lateral opening 58. The female part of the joint is provided in a rounded end 65 of a coupler or other member 61, the end 60 having a tapered opening or cavity 62 adapted to receive the projection 57. The small end of the opening 62 terminates in a lateral slot 63 in the body and 61, as shown in Figs. 8 and 9. When the parts are made of plastic material of the type described, the male portion 57, together with the projection 59 on the end thereof, may be forced into the opening 62 with deformation of the projection 59 until the projection engages the slot 63 wherein it is free to recover and serve as a retaining means for the member 57.

The structure shown in Figs. 7, 8 and 9 provides a type of swivel joint which may be used in connection with any of the hinge joints described above or shown in Fig. 10, to provide a housing for the ball 81 and the neck 75 extending through the notch 62, as shown. The stop 82, together with the position of the ball 81 in the socket prevents the neck 75 from rotating backwardly beyond stop 82.

Fig. 10 shows a further modified form of hinge joint structure in which a limb end 73 is provided with a cylindrical member 65 having a rounded head, as shown, the cylindrical portion being capable of a snap-on connection with the end 64, as shown. The cylindrical portion also carries an internal hinge pin arrangement which has opposite hemispherical projections 66 extending through the outer surface of the member 65. These projections are adapted to engage matching hemispherical recesses 67 in the upper and lower walls of a slot 68 of a coupler or body member 69.

In the modification shown in Fig. 10, the hinge operates substantially in the manner illustrated in connection with Figs. 4 and 12, except that it is not necessary, with the structure shown in Fig. 10, to distort the projections on the internal portion of the hinge, since the projections 66 are formed as parts of metal sleeves 70, one of which is adapted to slide within the other, as shown. A spring 71 is mounted between the sleeves so as to retain them in their normal positions, as determined by stop flanges 72 engaging the inner wall of the member 65. When the member 65 is forced into the slot 68, the projections 66 are pressed in against the action of the spring 71, so that they move in freely until the projections 66 engage the recesses 67 and retain the parts of the hinge joint in their normal position.

Fig. 11 of the drawings shows a modified form of combination swivel and hinge joint in which, for example, a limb end 73 is provided with a laterally extended socket structure 74 having a rim cut to provide a recess inside a retaining flange 75, the surface of the flange being approximately parallel with the axis of the limb 73. A hemispherical cover 76, having a similar flange rim 77 projecting beyond a recess, is provided for engagement with the flange 75 in the manner shown, and to provide a ball-type hinge joint. When the parts are made of molded plastics, such as styrene or polystyrene plastics, the cover 76 may be snapped over the flange 75 into locking engagement, since the flange 77 engages in the recess formed by the flange 75 in turn engages in a corresponding recess in the cover 76.

Cover 76 is provided with a notch 80 cut through its rim beyond the position of the flange 75 and adapted to receive and accommodate the cylindrical neck 78 which is integral with the end of a limb or other member 80 which is to be hinged and swiveled with respect to the member 73. The neck 78 terminates in a hollow section of a ball 81 which is normally mounted inside the socket 74 and cover 76 and retained therein because of its much greater size in comparison to that of the slot 78, after the cover 76 is snapped onto the flange 75. The cover 76 is provided inside with a hook-like stop 82 for limiting the degree of relative swiveling of the parts 73 and 80. This stop cooperates with a notch 83 in the rim of the ball 81, the edge of which is cut-off determining the angle through which the parts 73 and 80 may be rotated with respect to each other.

In assembling the joint shown in Fig. 11, the ball 81 is inserted in the cover 76 with the notch 83 engaging the boss hole 85 and the neck 78 extending through the notch or slot 78. This assembly is then snapped onto the socket structure 74 with the flange 77 overlying the flange 75, as shown. The stop 82, together with the position of the ball 81 in the socket prevents
substantial movement of the ball 81 to right or left. The cut-out or notch 83 may extend through any desired angle, depending upon the degree of swiveling necessary for the particular joint.

The hinging action of the joint shown in Fig. 11 is obtained by rotating the cover 76 together with the neck 79 and member 80 about the flange 75 on the engaging surfaces of the socket structure, this rotation, of course, being on the axis of the socket structure which is illustrated at an angle of about 90° to the axis of the member 73. Means is provided for restricting the degree of rotation or hinging action by providing a stop 84 integral with the socket structure 74 and extending into the cover 76 for engaging the neck 79. This stop may be placed at any selected location and two such stops may be employed which will engage the neck 79 when the member 80 is moved to rotate the cover 76. The joint therefore may be used as a knee, elbow or other joint in the structures of figures of the type to which the present invention relates.

In making the elements of the various joints, it is generally desirable to make them so that they frictionally engage each other, thereby providing a joint which may be used to hold the respective parts in any set position desired by the use of the doll, manikin or other figure.

In the manufacture of certain figures, it is desirable to have shoulder, neck, thigh and body joints, and it is to be understood that the joint structure described herein may be used in such positions as well as for the various limb joints. It is also to be understood that certain of the parts and structures may be rearranged or positioned so that they may be readily molded from plastic materials by processes of compression, injection or other types of molding. While styrene or polystyrene plastics are preferred, other suitable plastics may be used, such as polyethylene plastics, methyl methacrylate plastics, cellulose acetate and ethyl cellulose.

What I claim is:

1. A molded plastic joint structure for dolls, manikins, and the like figures, comprising a first molded plastic part having a rounded disc-shaped end portion, a second molded plastic part having a rounded slotted end portion, said disc-shaped end portion being mounted in said slot and its surfaces engaging the respective opposite surfaces of the slot, at least one pair of the engaging surfaces including an integral retaining and pivoting means consisting of a projection on one of the surfaces engaging in a recess in the other surface, said means being substantially centrally located with respect to the disc-shaped end, one of said parts having a substantially cylindrical opposite end portion having an integral projection on its cylindrical surface, a third molded plastic part having a substantially cylindrical cavity in one end into which said cylindrical end is fitted for rotation, the cylindrical wall of said cavity having a peripheral recess in which the projection on the cylindrical end is retained and which it is moved upon relative rotation of the parts, said parts being held together in their assembled relationship solely by the engagement of said integral projections in the respective recesses.

2. A molded plastic joint structure for dolls, manikins, and the like figures, comprising a first molded plastic part having a rounded disc-shaped end portion, a second molded plastic one piece part having a rounded slotted end portion, said disc-shaped end portion being mounted in said slot and its surfaces engaging the respective opposite surfaces of the slot, at least one pair of the engaging surfaces including an integral retaining and pivoting means consisting of a projection on one of the surfaces engaging in a recess in the other surface, said means being substantially centrally located with respect to the disc-shaped end portion, said parts being held in assembled relationship solely by said retaining and pivoting means, a third molded plastic part having an end cavity therein, one of said first-mentioned parts having an extending portion mounted in the end cavity in said third part and being axially rotatable therein, an integral projection on the side wall of said extending portion engaging in a recess in the side wall of said cavity, and means for limiting the degree of relative rotation between said projection and said third part, said integral projection in cooperation with said recess being the sole means for retaining said extending portion in locked engagement with said third part.

FRANK P. MONAGHAN.

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