To all whom it may concern:

Be it known that I, CHARLES CABANA, a citizen of the United States, residing in Buffalo, in the county of Erie and State of New York, have invented and useful Improvements in Ball-and-Socket Joints for Dolls, &c., of which the following is a specification.

This invention relates to a ball and socket joint for controlling the different members of dolls or other jointed toys, so that the same may be freely turned bodily as well as swung laterally toward and from each other in a manner superior to that hitherto employed for this purpose.

The object of the invention is to provide a very strong and durable joint, which will retain its smooth and noiseless action after considerable wear and yet be composed of parts that can be expeditiously stamped out and otherwise manufactured at low cost.

In the accompanying drawings:

Figure 1 is a front elevation, partly in section, of a doll having its different relatively movable members connected by ball and socket joints embodying my invention.

Fig. 2 is a vertical section taken on line 2—2, Fig. 1.

Fig. 3 is a fragmentary horizontal section, on an enlarged scale, taken on line 3—3, Fig. 1.

Fig. 4 is a side elevation of parts associated with the shoulder- joint of the doll.

Fig. 5 is a perspective of two oppositely extending gripping cups with their cooperating wedge pins.

Fig. 6 is a side elevation of cooperating gripping cups showing more clearly their overlapping construction.

Fig. 7 is a longitudinal section through one of said cooperating gripping cups.

Similar characters of reference refer to like parts throughout the several views.

My improved ball and socket joint is capable of use for connecting different members of a jointed toy which are movable relatively to each other and, in the drawings, the same is shown in connection with a doll which has a body or trunk 10, a head 11 connected with the top of the body, two thighs 12 connected at their upper ends with the lower part of the body, two legs 13 each connected at its upper end with the lower end of one of the thighs, two feet 14 each connected on its upper side with the lower end of one of the legs, two arms 15 each connected at its inner end with the upper part of one side of the body, two forearms 16 each connected at its inner end with the outer end of one of the arms, and two hands 17 each connected at its inner end with the outer end of one of the forearms.

Each of the members of the doll is preferably constructed of one piece of wood, papier maché or other suitable material, with the exception of the head which is preferably constructed of two pieces cemented together. Referring, for the present, to the shoulder joint of the doll, 18 represents a solid ball or globe, (shown detached in Fig. 4) provided on its inner or front end, integrally or otherwise, with a securing stem 20 which is received by a suitable hole 21 formed horizontally at the upper end of the body of the doll and on one of the sides thereof. Arranged to surround somewhat more than one half of the peripheral area of the ball, are two cooperating semi-spherical gripping cups 22 whose inner longitudinal edges 29 substantially bear against each other. These gripping cups are preferably constructed of stamped sheet metal and are provided with inner semi-spherical socket surfaces 23 which face inwardly toward each other and are arranged to slide around the outer surface of their companion ball 18. Preferably, concentric with the semi-spherical socket surface of each gripping cup and outwardly thereof is formed a semi-spherical ball surface 24 constituting the outer globular surface of the gripping cup stamping and this ball surface 24 is adapted to be received within a semi-spherical cavity 25 which is formed in the body of the doll and preferably concentric with the center of a solid ball 18. Each pair of gripping cups thereby acts as a ball and a socket, the inner surfaces constituting a socket and the outer surfaces constituting a ball; and similarly also the doll body 10 has both a ball and a socket, the cavity 25 forming the socket. By this construction is secured a compact, neat joint in which is eliminated all frictional contact between the body of the doll and the arm thereof which frictional contact is very objectionable inasmuch as these members are usually made of soft material which is readily scored or abraded so that if they bear against each other, there is produced a
squeaky joint having an erratic jerky action. This invention provides a construction in which the frictional contact in every case, is between parts made of different materials and one of said parts is always metal, so that a smoothly acting, noiseless joint is obtained. To prevent the front ends 26 of the gripping cups from cutting into the stem 20, a wear collar 27 is arranged around and suitably secured to said stem so as to abut against the adjacent surface of the ball 18.

In the extended position of the arm of the doll shown in the drawings, said arm may be rotated completely around on its longitudinal axis and it may be moved upwardly until, as the case may be, either one of the front edges 26 of the gripping cups bears against the wear collar 27 or until the arm 15 bears against the body 10 of the doll. So as to permit the arm to be lowered into a position parallel with the body 10, the inner end of said arm is preferably cut away on the lower side thereof at 25 and also each gripping cup is preferably provided with a notch 30 extending rearwardly from the front edge 26 along the longitudinal edge 29 of each cup. The adjacent notches 30 of the pair of companion inwardly facing gripping cups provide a clearance of said cups for the stem 20 of the ball so that the arm may be lowered into the position shown in elevation in Fig. 1.

Extending rearwardly from the semi-spherical portion of each gripping cup and preferably formed integrally therewith is a semi-cylindrical shank 31, and when two companion gripping cups are placed with their longitudinal flat edges 29 together, the two semi-cylindrical shanks form a cylindrical tube which is received within the recess 32 formed axially in the inner end of the arm. Preferably also the arm 15 of the doll is provided with a semi-spherical countersink 33 so as to conceal from view the major portion of the gripping cups. Each shank 31 is provided with an outwardly projecting, lateral retaining barb 34 which is preferably inclined somewhat, similarly to a fish hook tongue, so that when the gripping cups are placed together and pressed rearwardly into the recess 32 these retaining barbs may easily spring inwardly sufficiently to allow of this operation. To hold the shanks 31 of the gripping cups apart and thereby also drive the retaining bars outwardly into the walls of the recess 32, a tapered wedge 35 is provided which in this case, at the elbow joint of the doll, is preferably formed integrally at the front end of a stem 200 which in turn is secured to a ball 180 similar to the ball 18 aforesaid.

The retaining barbs 34 are pressed into the arm of the doll by forcing forwardly the ball 180 with its wedge 35, after the gripping cups have been pressed rearwardly to the limit of their movement against the countersink 33. It is preferred that the two shanks 31 of the gripping cups when placed together will have a total diameter somewhat less than the diameter of the recess 32. In such a case it is not necessary that the retaining barbs 34 of the gripping cups be even slightly elastic, as said barbs will clear the bore of the arm of the doll, while the gripping cups are being moved longitudinally rearwardly against the surface of the countersink 33. And the barbs will not be engaged with the arm of the doll until the wedge 35 of the ball 180 forces them laterally outwardly. This permits the use of a brittle, inexpensive material for the gripping cups.

The semi-cylindrical shank 31 of each gripping cup is also preferably provided with an inwardly projecting, lateral abutting lip 36 which is preferably situated forwardly of the retaining barb 34. Interposed between the rear or outer face of the ball 18 and the inner or forward face of said abutting lip 36 is a helical friction spring 37 arranged longitudinally in the bores of the semi-cylindrical shanks 31 of the gripping cups and preferably of conical form with the enlarged end bearing against the surface of the ball. This friction spring may however be seated directly against the forward end of the wedge 35 if desired, instead of against the abutting lip 36 as shown. The conical shape of the friction spring permits of a very considerable spring pressure between the ball 18 and the gripping cups, without scoring the surface of the ball. This heavy spring pressure is required to hold rigidly the joints in their different adjustable positions and also to sustain the weight of the different members of the doll. The desired effect is effected by reason of the increased area of contact between the spring and the ball, so that while the total pressure which forces the ball forwardly is considerable yet the pressure of the spring against a unit area of the ball is quite small. It is apparent that this friction spring need not be purely conical but may, if desired, be rectangularly helical in the middle and flared at one or both of its ends.

The construction of the corresponding joints of both limbs of the doll are identical except as to sizes of the joints, which correspond to the members to which they are attached. For instance, the hip joint is constructed like the shoulder joint just described. Likewise the ankle and wrist joints are identical to each other and are similar to the aforesaid joints. The internal construction of the forearm and the leg however is somewhat different from the aforesaid joints, inasmuch as the ball of the hand joint is oppositely positioned. The spreading or
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1. The combination of two relatively movable members of a toy; one of which is provided with a recess; a ball mounted on the other member which member is provided with a cavity adjacent to and concentric with said ball; a gripping cup arranged within said recess and adapted to be received within said cavity and arranged to receive said ball.

2. The combination of two relatively movable members of a toy; one of which is provided with a recess; a ball mounted on the other member; a gripping cup arranged within said recess and provided with a retaining barb and with an abutting lip; and a friction spring arranged between the ball and said abutting lip.

3. The combination of two relatively movable members of a toy; one of which is provided with a recess; a ball mounted on the other member; a gripping cup arranged within said recess and provided with a retaining barb; and a wedge arranged adjacent to said retaining barb.

4. The combination of two relatively movable members of a toy; one of which is provided with a recess; a ball mounted on the other member; a gripping cup arranged within said recess and provided with a retaining barb; and a wedge arranged outwardly in said recess.

5. The combination of two relatively movable members of a toy; one of which is provided with a recess; a ball mounted on the other member; gripping cups arranged within said recess and provided with outwardly and laterally extending retaining barbs; and a wedge adapted to be driven between said cups so as to drive said retaining barbs outwardly.

6. The combination of two relatively movable members of a toy; one of which is provided with a recess; a ball mounted on the other member provided with a stem; a wear collar surrounding said stem; and a gripping cup arranged within said recess and arranged to engage with said ball.

7. The combination of two relatively movable members of a toy; one of which is provided with a recess and with a countersink concentric with said recess and arranged outwardly thereof; a ball mounted on the other member which member is provided with a cavity concentric with said ball; segmental gripping cups provided outward lateral retaining barbs and with abutting lips and arranged within said recess and arranged against said countersink; a friction spring arranged between said segmental gripping cups and between said ball and said abutting lips; a wedge adapted to be driven into said recess between said segmental gripping cups, so as to drive said retaining barbs outwardly, the segmental gripping cups being arranged to receive said ball and be received within said cavity.

8. The combination of two relatively movable members of a toy; one of which is provided with a recess and is divided in a plane extending through the axis of said recess; a
ball mounted on the other member; a gripping cup segment secured to each section of said first named member and provided with an outwardly extending retaining barb and arranged to receive said ball; and means for holding together the said sections of said first named member.

9. The combination of two relatively movable members of a toy, one of which is provided with a recess; a ball mounted on the other member; a gripping cup; and a conical helical spring arranged in said recess and bearing against the outer surface of said ball.

10. A ball and socket for connecting two relatively movable members of a doll comprising a ball secured to one of said members, a socket which receives said ball and which is composed of two sections, each of which has a cup shaped portion engaging the ball and a semi-tubular shank engaging with a recess in the other doll member, said shanks being provided with barbs engaging with the walls of said recess.

11. A ball and socket for connecting two relatively movable members of a doll comprising a ball secured to one of said members, a socket which receives said ball and which is composed of two sections each of which has a cup shaped portion engaging the ball and a semi-tubular shank engaging with a recess in the other doll member, said shanks being provided with barbs engaging with the walls of said recess.

12. A ball and socket for connecting two relatively movable members of a doll comprising a ball secured to one of said members, a socket which receives said ball and which is composed of two sections each of which has a cup shaped portion engaging the ball and a semi-tubular shank engaging with a recess in the other doll member, said shanks being provided with barbs engaging with the walls of said recess, and a spring arranged between said sections and bearing at one end against said shoulder and at its opposite end against said ball.

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CHARLES CÁBANA.