Jan. 23, 1934. J. B. SARACENO 1,944,196

BALL JOINT ELECTRICAL CONNECTION

Filed June 27, 1932 2 Sheets-Sheet 1

FIG. 1

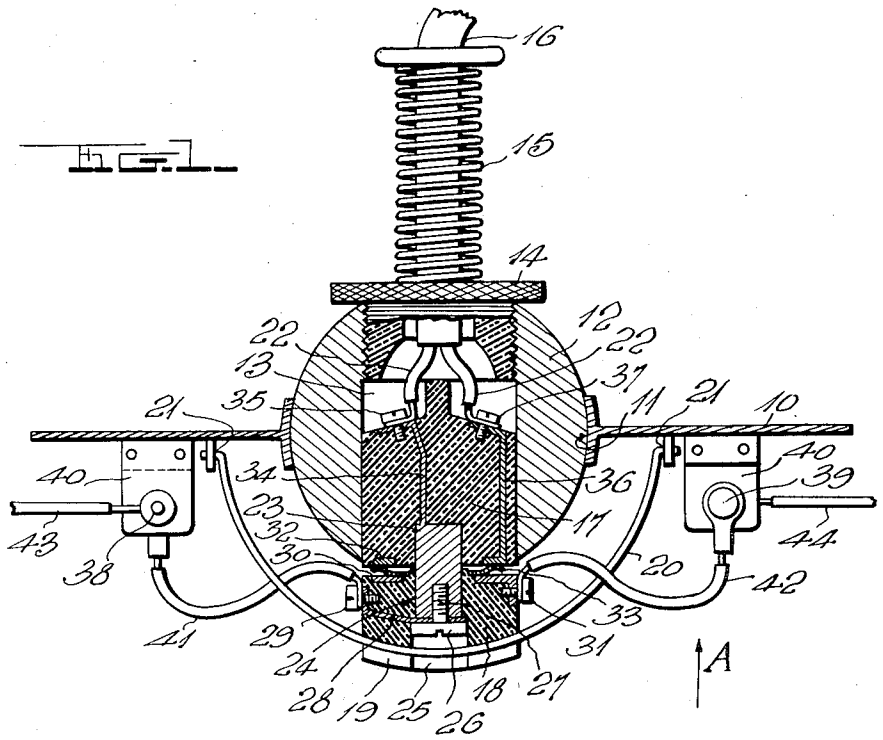

FIG. 2

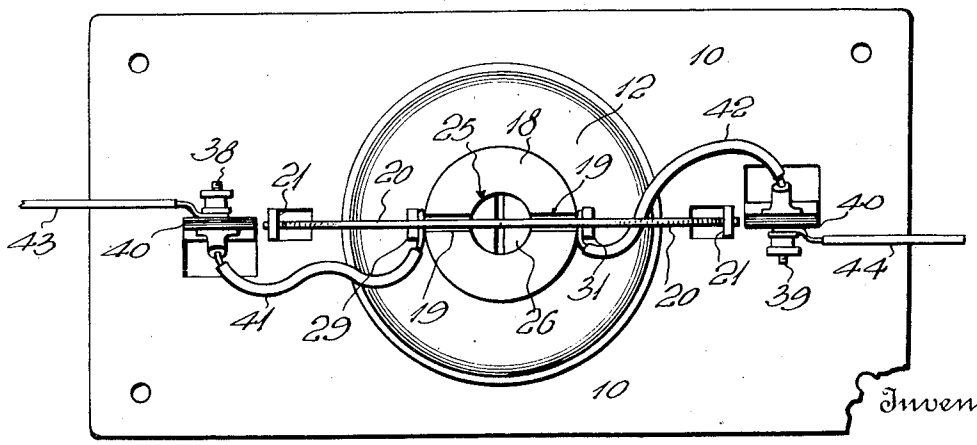

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FIG. 3

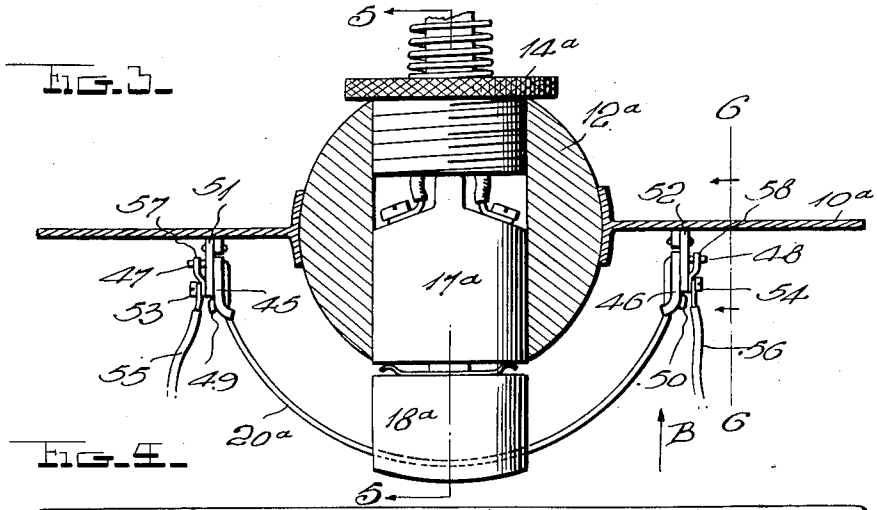


FIG. 4

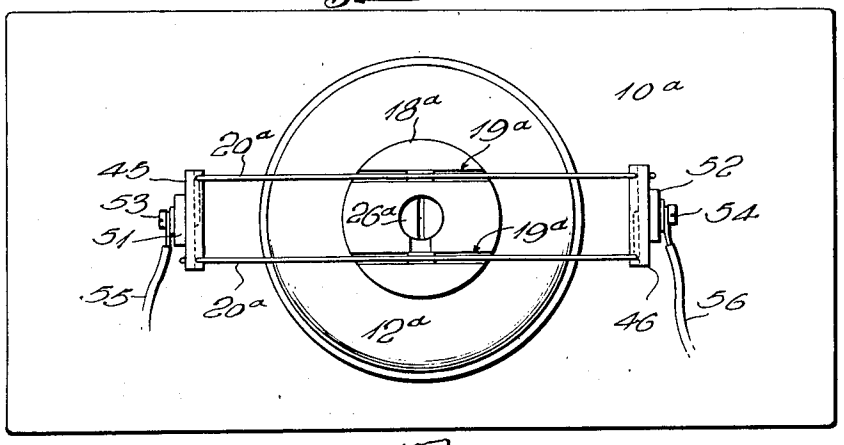


FIG. 5

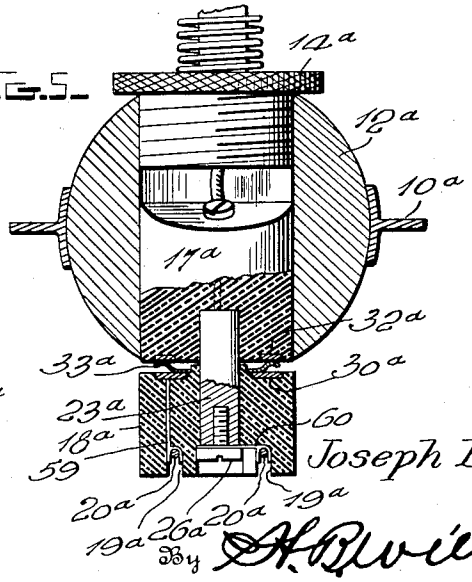


FIG. 6

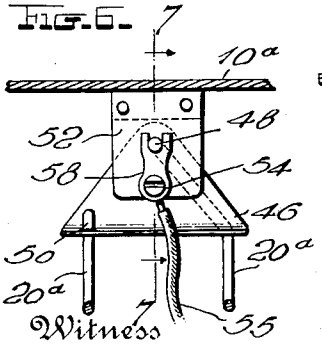
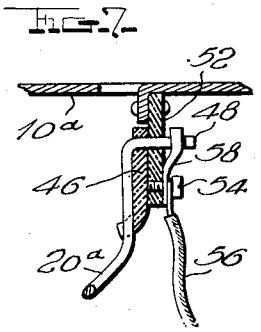


FIG. 7



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UNITED STATES PATENT OFFICE

1,944,196

BALL JOINT ELECTRICAL CONNECTION

Joseph Battista Saraceno, Bloomfield, Conn.

Application June 27, 1932. Serial No. 619,537

6 Claims. (Cl. 173—324)

The invention relates to a new and improved ball joint electrical connection for the conventional fabric or rubber-covered cable used in connection with various electrical machines and appliances, and the principal object is to provide a new and improved construction which, while allowing the cable to move in all directions, will overcome danger of cable breakage in the zone of principal flexure.

A ball is mounted for universal movement in an opening in a support, said ball having a passage to receive the cable or conductor which leads to the machine or appliance, and in making provision for conducting current to said cable or conductor regardless of the various movements of the ball, a shoe is swiveled to said ball. This shoe is necessarily non-rotatable with respect to the ball, and a further object of the invention is to provide novel means for holding said shoe against rotation while permitting it to freely move in various directions, according to the movements of the ball.

A still further object is to provide novel means in which the provision for holding the above-named shoe against rotation, acts also as part of the current-conducting means leading to the above mentioned cable or conductor.

Yet another object is the provision of a construction which is rather simple and inexpensive, yet is efficient, reliable and long-lived.

With the foregoing in view, the invention resides in the novel subject matter hereinafter described and claimed, description being accomplished by reference to the accompanying drawings.

Fig. 1 is a sectional view partly in elevation showing one form of the invention.

Fig. 2 is an elevation looking in the direction of the arrow A of Fig. 1.

Fig. 3 is a view similar to Fig. 1 but showing a different construction.

Fig. 4 is an elevation of the structure shown in Fig. 3, looking in the direction indicated by the arrow B of the latter.

Fig. 5 is a detail sectional view partly in elevation substantially on line 5—5 of Fig. 3.

Fig. 6 is a detail sectional view on line 6—6 of Fig. 3.

Fig. 7 is a detail sectional view on line 7—7 of Fig. 6.

The general construction shown and described, may be considered as preferred. However, variations may be made within the scope of the invention as claimed.

In the construction shown in Figs. 1 and 2, the numeral 10 denotes an appropriate support intended to be stationarily mounted in any suitable way, said support having an opening 11 formed therethrough, in which a ball 12 is mounted for universal movement. The side wall of the opening 11 is of course suitably shaped to retain the ball 12 in place and if desired, ball bearings (not shown) may be employed for allowing unusually free movements of said ball. Preferably, the plate 10 and the ball 12 are of metal construction, and said ball is provided with an axial recess 13 of cylindrical form. Suitably secured in the outer end of this recess, is a plug 14 which carries a conventional spring wire protector 15 for the usual twin-wire, rubber or fabric covered conductor or cable 16. A strain relief knot (not shown) may of course be tied in this conductor or cable 16 at the inner end of plug 14 to take pull strain from the ends of the wires and the means with which they are connected. Suitably secured in the inner end of the recess 13, is an insulating plug 17. At the inner end of this plug 17, is an insulating shoe 18 which is swiveled to said plug 17, the inner end of said shoe being provided with a diametrical guide groove 19 in which a curved bail 20 is slidably received, the ends of this bail being pivoted at 21 to the support 10. The curvature of the bail 20 is substantially concentric with the ball 12 and the pivotal axis of said bail extends substantially through the center of said ball. Thus, when this ball moves to the right or left from the position shown in Fig. 1 or from a similar position, the shoe 18 will slide along the bail 20, and when said ball moves in other directions, the bail 20 will swing upon its pivots 21, said bail at all times holding the shoe 18 against rotation.

For swiveling the shoe 18 and for conducting current to the wires 22 of the cable or the like 16 from said shoe 18, any suitable provision may be made, but the structure shown is preferred. A metal plug 23 is secured in a socket in the inner end of the plug 17 and projects from this plug into an opening 24 in the shoe 18, said opening 24 having an enlarged end 25 in which the head 26 of a screw 27 is received, said screw being threaded into the metal plug 23. Embedded in the shoe 18 and having its inner end disposed across the opening 24, in contact with the screw head 26, is a conducting strip 28 whose outer end is provided with a binding screw 29. Inset in the end of the shoe 18 toward the plug 17, is a contact ring 30 which carries a second binding screw 31. Another contact ring 32 is inset in the end of the

plug 17 toward the shoe 18, and a spring washer 33 contacts with the two rings 30 and 32. A conducting strip 34 is embedded in the plug 17 and is provided with a binding screw 35 for one of the wires 22, said strip 34 being soldered or otherwise secured to the metallic plug 23. Another conducting strip 36 which is electrically connected with the ring 32, is embedded in the plug 17 and is provided with a binding screw 37 for the other of the wires 22.

Two binding posts 38 and 39 are mounted on suitable insulators 40 which project inwardly from the support 10, and two slack, flexible, conducting wires 41 and 42 are connected with said binding posts 38 and 39 respectively, the conductor 41 being connected with the binding screw 29 and the conductor 42 being connected with the binding screw 31. The current supply wires 43 and 44 are also connected with the binding posts 38 and 39 respectively. From the wire 43, current flows through the binding post 38 and conductor 41 to the binding screw 29 and the conducting strip 28, from this strip through the screws 26—27 to the plug 23, and from this plug through the strip 34 and screw 35 to one of the wires 22, flowing on to the electrical machine or apparatus. The returning current flows through the other wire 22 to the binding screw 37, from this screw through the strip 36 to the contact ring 32, through the spring washer 33 to the contact ring 30, from this ring through the scrtw 31 and conductor 42 to the binding post 39, and from this binding post to the wire 44. This electrical path will remain undisturbed regardless of any movement which the ball 12 may have.

In the construction shown in Figs. 3 to 7 inclusive, the support 10^a carries a ball 12^a for universal movement, and this ball carries plugs 14^a and 17^a corresponding to the plugs 14 and 17 above described. The shoe 18^a which is swiveled to the inner end of the plug 17^a, is provided with two parallel guide grooves 19^a which slidably receive two parallel, curved bails 20^a whose curvature is substantially concentric with the ball 12^a. The ends of these bails 20^a are fixedly connected with two insulators 45 and 46 respectively, said bails being insulated from each other by means of said insulators. One end 47 of one of the bails 20^a and the opposite end 48 of the other of said bails, pass entirely through the insulators 45 and 46 and project beyond them to form pivots. The other ends of the two bails are secured to the insulators 45 and 46, as denoted at 49 and 50. The pivots 47 and 48 pass rotatably through openings in appropriate insulators 51 and 52 carried by the support 10^a. These insulators carry binding screws 53 and 54 for the current supply wires 55 and 56, and brushes 57 and 58 are provided to carry current from said screws to the pivots 47 and 48 respectively.

By appropriate means 23^a, including a screw 26^a corresponding to the screw 26, the shoe 18^a is swiveled to the plug 17^a. This shoe carries a contact ring 30^a, the plug 17^a carries another contact ring 32^a, and a spring washer 33^a contacts with said rings. A current-conducting brush 59 is embedded in the shoe 18^a in electrical connection with the contact ring 30^a and another conducting brush 60 is embedded in said shoe and is in electrical contact with the screw 26^a. The brushes 59 and 60 slidably engage the two bails 20^a respectively. Thus, one of these bails and the contact ring 30^a are included in one side of the current path, and the other of these bails and the screw 26^a are included in the other side of said path. Parts of this path not detailed or described, may be considered as identical with corresponding parts disclosed in connection with the form of construction illustrated in Figs. 1 and 2.

The bails 20^a swing about their pivots 27 when the ball 12^a moves in certain directions, and when said ball moves in other directions, the shoe 18^a slides along said bails, the brushes 59 and 60 always remaining in contact with said bails.

I claim:—

1. A ball joint electrical connection comprising a support having an opening therethrough, a ball, means for mounting said ball for universal movement in said opening, said ball having a passage to receive a flexible conductor, a curved bail at the inner side of said support, means for pivotally mounting said bail on said support the curvature of said bail being substantially concentric with said ball, the pivotal axis of said bail extending substantially through the center of said ball, a shoe having a guide portion slidably engaged with said bail, a swivel connection between said shoe and said ball, and current-conducting means carried partly by said ball and partly by said shoe and adapted to conductively co-operate with the above mentioned flexible conductor.

2. A ball joint electrical connection comprising a support having an opening therethrough, a ball, means for mounting said ball for universal movement in said opening, said ball having a passage to receive a pair of flexible conductors, a curved bail at the inner side of said support, means for pivotally mounting said bail on said support the curvature of said bail being substantially concentric with said ball, the pivotal axis of said bail extending substantially through the center of said ball, a shoe having a guide portion slidably engaged with said bail, current-conducting pivot means swiveling said shoe to said ball, co-acting contact means carried by said ball and shoe and including an annular contact surrounding said pivot means, and current-conducting means connected with said pivot means and said contact means, said contact means and current-conducting means being adapted to conductively co-operate with the above mentioned pair of flexible conductors.

3. A ball joint electrical connection comprising a support having an opening therethrough, a ball means for mounting said ball for universal movement in said opening, said ball having a passage to receive a pair of flexible conductors, a curved bail at the inner side of said support, means for pivotally mounting said bail on said support the curvature of said bail being substantially concentric with said ball, the pivoted axis of said bail extending substantially through the center of said ball, a shoe having a guide portion slidably engaged with said ball, current-conducting pivot means swiveling said shoe to said ball, co-acting contact means carried by said ball and shoe and including an annular contact surrounding said pivot means, current conducting means carried by said shoe and connected with said pivot means and said contact means, binding posts fixedly mounted on said support, two slack flexible conductors connected with said binding posts, and means for connecting said slack conductors with said shoe in conducting relation with said conducting means, said contact means, said conducting means and said two slack conductors being adapted to conductively co-operate

with the first mentioned pair of flexible conductors.

4. A ball joint electrical connection comprising a support having an opening therethrough, a ball, means for mounting said ball for universal movement in said opening, said ball having a passage to receive a pair of flexible conductors, two parallel curved current conducting bails at the inner side of said support, the curvature of said bails being substantially concentric with said ball, insulators with which the end portions of said bails are fixedly connected and by which said bails are insulated from each other, means pivotally mounting said insulators on said support on an axis extending substantially through the center of said ball, a shoe having a guide portion slidably engaging said bails, means swiveling said shoe on said ball, current-conducting brushes carried by said shoe and slidably contacting with said bails respectively, and means for conducting current from said brushes to the above mentioned pair of flexible conductors.

5. A ball joint electrical connection comprising a support having an opening therethrough, a ball, means for mounting said ball for universal movement in said opening, said ball having a passage to receive a pair of flexible conductors, two parallel curved current-conducting bails at the inner side of said support, the curvature of said balls being substantially concentric with said ball, insulators with which the end portions of said bails are fixedly connected and by which said bails are insulated from each other, one end of one bail and the other end of the other bail being extended beyond said insulators to provide pivots, bearings in which said pivots are mounted, said bearings being carried by said support, current-conducting brushes contacting with said pivots respectively, a shoe having a guide portion slidably engaging said bails, means swiveling said shoe on said ball, current-conducting brushes carried by said shoe and engaging said bails respectively, and means for conducting current from these brushes to the above mentioned pair of flexible conductors.

6. In an electrical connection, the combination of a support having a ball socket, a ball retained by said socket, a longitudinally curved bail adjacent the ball, means for pivotally mounting said bail in substantially concentric relation with said ball, a shoe carried by said bail and having a guide portion engaging and slidable lengthwise of said bail, and co-acting current conducting elements carried by said ball and said shoe.

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