

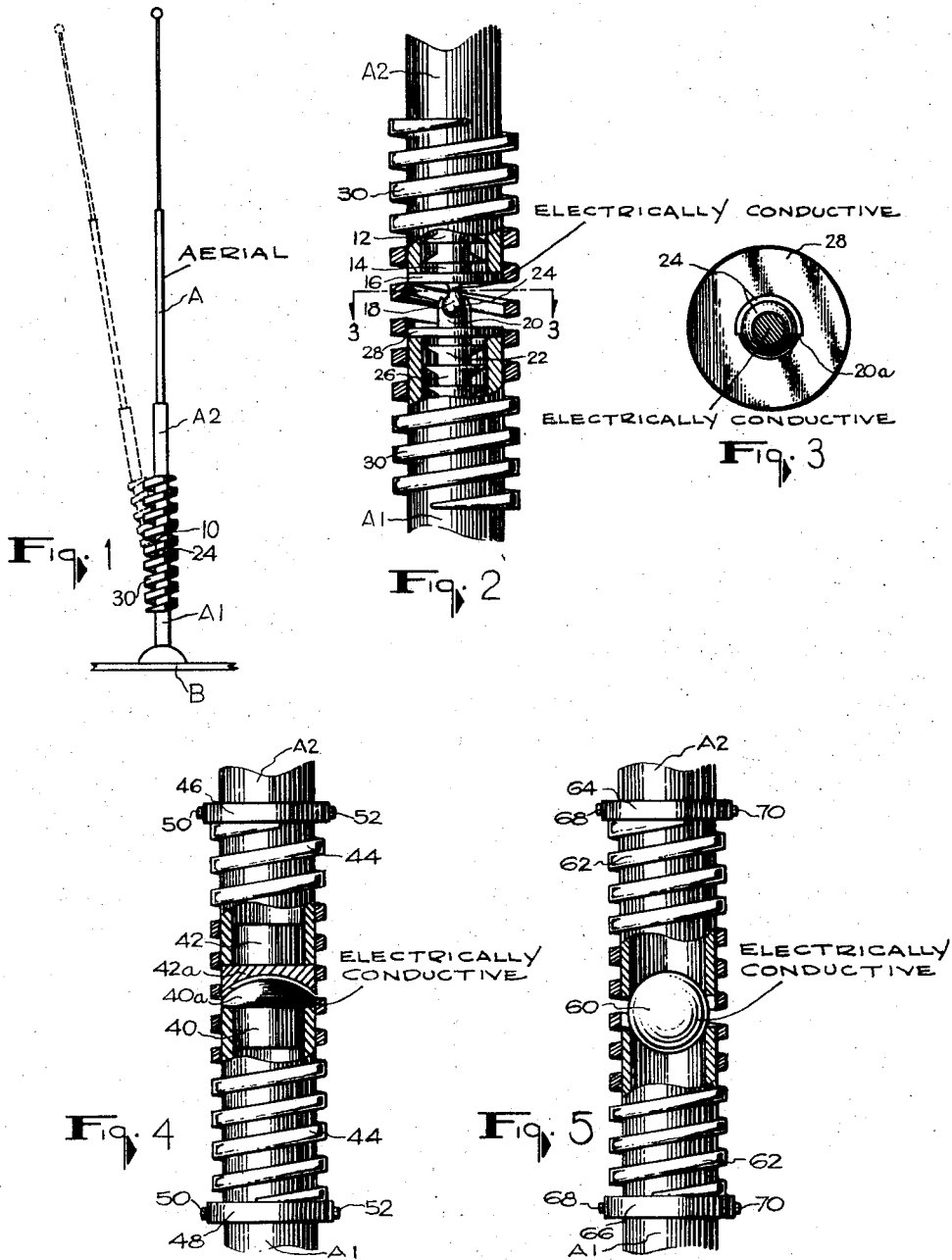
July 12, 1960

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2,945,084

FLEXIBLE CONNECTOR FOR AERIALS OR THE LIKE

Filed Jan. 24, 1958



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2,945,084

**FLEXIBLE CONNECTOR FOR AERIALS
OR THE LIKE**

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Filed Jan. 24, 1958, Ser. No. 711,018

7 Claims. (Cl. 174—86)

The present invention relates to connecting devices, and more particularly, to flexible connectors for radio aerials or the like wherein both mechanical and electrical connection must be established.

Various connectors have been designed to provide either mechanical or electrical connection between two elements. Furthermore, certain of the mechanical connectors include some form of resilient member which makes the juncture a flexible one. However, if both electrical and mechanical connection are to be made between two adjoining elements, severe difficulties are encountered if the joint is to be made flexible; particularly, it is difficult to maintain good electrical contact through the connector yet permit the desired pivotal or other relative motion between the two connected elements.

Accordingly, it is a general object of the present invention to provide a flexible connector for two elements, such as two sections of a radio aerial, where both good mechanical and electrical connection must be established and maintained over a prolonged period of time.

It is a feature of the invention to provide a connector of this general character which can be easily assembled to the elements or sections to be joined without the utilization of soldering or other techniques conventionally employed in obtaining good electrical connection.

Additionally, it is a feature to provide a flexible connector which is easily disconnected when required, but is not subject to accidental release under normal conditions.

An additional feature relates to the simplicity and consequent inexpensiveness of the connector, the same employing a minimum number of readily fabricated elements.

A further feature relates to the design and fabrication of the flexible connector so that the same presents an esthetically desirable appearance and is resistant to wear and environmental conditions wherefore both its appearance and utility are maintainable over a prolonged period of time.

These and other objects and features of the invention will become more apparent from a perusal of the following description of the accompanying drawing wherein:

Fig. 1 constitutes an elevational view of a conventional radio aerial having sections thereof joined by a flexible connector embodying the present invention,

Fig. 2 is an enlarged fragmentary view of the flexible connector shown in Fig. 1 with portions thereof broken away to illustrate interior details of construction,

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2,

Fig. 4 is a fragmentary view similar to Fig. 2 showing a modified embodiment of the invention, and

Fig. 5 is another view similar to Fig. 2 showing yet a further modification.

Generally, a structure embodying the present invention includes means for connecting the adjoining sections of a structure in a manner such that relative pivoting there-

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between can be attained. To maintain the joined sections in a desired relative disposition, yet permit the relative pivoting thereof, spring means of an appropriate shape and configuration are provided.

One embodiment of the invention is illustrated in Fig. 1 wherein the flexible connector, generally indicated at 10, is arranged to join two sections A_1 and A_2 of a radio aerial A of the telescopic type found conventionally on automobiles. As there shown, the lower section A_1 of the aerial is secured at its lowermost end to the body B of an automobile by a conventional rigid support that holds the lower section A_1 of the aerial in substantially a vertical position. Preferably, as shown, this lower section A_1 of the aerial is relatively short and the connector 10 is arranged to support the upper section A_2 of the aerial resiliently in vertical alignment thereabove. Thus, the telescopic portions of the upper section A_2 of the aerial can be withdrawn within one another in the normal fashion.

With added reference to Figs. 2 and 3, it will be seen that the aerial sections A_1 and A_2 adjacent the connector 10 constitute hollow tubes of like diameter. Into the upper tube section, A_2 , the barbed end 12 of a brass conductor 14 is inserted, the dimensions of the barbed end 12 being such that a pressed fit within the tube is obtained upon such insertion. The amount of such insertion is limited by engagement of the end of the tubular section A_2 with a flange 16 on the conductor 14. The other end of the described conductor 14 is formed in the shape of a protruding ball 18 that is arranged to enter a complementary socket 20 formed at one end of a second conductor 22 wherefore a ball and socket joint, generally indicated at 24 is provided. This second conductor 22 is otherwise substantially identical in structure to that described immediately above, having a barbed end 26 pressed into the interior of the other tubular section A_1 and limited in such insertion by a laterally-projecting flange 28. The described ball 18 and socket 20 are closely dimensioned so that a universal pivotal connection and electrical continuity are established therebetween. In order to bring the ball 18 into its pivotal engagement within the socket 20, the latter is open at one side, as best illustrated at 20a in Fig. 3. The formed juncture thus cannot be broken by an axial pull but can only be released through relative lateral motion of the two conductors 14 and 22 attached respectively to the aerial sections, A_2 and A_1 .

In order to hold the aerial sections A_1 and A_2 against such lateral movement, and more particularly, to hold them in axial alignment, as illustrated in Figs. 1 and 2, a coil spring 30 is arranged to embrace both sections A_1 and A_2 adjacent their pivotally-connected ends. Preferably, such spring 30 is of regular helical configuration and is formed from rectangular stock so that flat engagement is maintained with the outer surfaces of the tubular sections. Thus, while the spring 30 can be moved axially of the aerial sections A_1 and A_2 with the application of sufficient force, it is normally held frictionally against such movement, and the disposition of the spring in bridging relation over the ball and socket joint 24, as shown in Figs. 1 and 2, will be maintained unless considerable external force is applied thereto. As long as the spring 30 is maintained in its position, as illustrated, the tubular aerial sections A_1 and A_2 will be maintained in alignment and the ball and socket joint 24 will be held against disconnection. Preferably, the spring 30 is formed from spring steel so that it, like the previously described brass conductors 14 and 22, is capable of carrying electrical currents. Furthermore, the spring is preferably plated with chromium or other weather resistant conductive metal so that the conductivity of the spring and its in-

herent resilience will not be adversely affected by the weather. Furthermore, its appearance will be enhanced.

If the upper section A_2 of the aerial intercepts a propagated radio frequency wave so that radio frequency currents are established therein, such currents are conducted from this upper section A_2 of the aerial to the lower section A_1 through both the coil spring 30 and the internal brass conductors 14 and 22. Thus excellent conduction of the radio frequency currents is provided and this conduction is not deleteriously affected when the upper section A_2 of the aerial engages some obstruction so that it is bent, as illustrated in phantom lines in Fig. 1. Such bending is permitted by the ball and socket joint 24 which maintains its electrical conductivity as well as its mechanical juncture during such pivotal motion. The coil spring 30 also maintains its close pressed engagement with the exterior of the aerial sections A_1 , A_2 so that it too remains fully effective as a conductor under the described bent condition of the upper aerial section A_2 . When the obstruction is removed, the upper section A_2 of the aerial, under the restoring force of the coil spring, immediately reassumes its aligned disposition with the lower aerial section A_1 so that it is not permanently bent or otherwise harmed.

A description of the installation of the described flexible connector 10 on an existing automobile aerial will indicate the ease of any installation with a connector embodying the present invention. If the aerial is in one section only, as is found on the conventional automobile, a saw cut can be made at a point slightly above the support to thereupon divide the aerial into two sections A_1 and A_2 , such as described and shown in Fig. 1. Thereafter, each of the brass conductors 14, 22 are pressed into their respective ends of the upper and lower sections of the aerial and the ball 18 is brought laterally into the embrace of the socket 20. The coil spring 30 can now be brought over the upper section A_2 of the aerial and downwardly until it reaches the position illustrated in Fig. 1 whereat it embraces portions of the upper and lower sections A_1 and A_2 adjoining the juncture thereof, to thus quickly complete the entire installation.

If, for any reason, disconnection is desired, the procedure is reversed, the coil spring 30 being raised onto the upper section A_2 of the aerial until it is entirely above the joint and the upper aerial section can then be moved laterally to effect withdrawal of the ball 18 from its socket 20. It should be noted that the ease of assembly as well as disassembly is attributable in part to the elimination of the need for soldering or similar operations, as conventionally employed when an electrical connection is to be made.

Quite obviously, the invention may be embodied in various other specific forms than that described immediately above. One modification is shown in Fig. 4, wherein the brass conductors 40, 42 take the form of pins that are pressed into the respective sections, A_1 and A_2 , of the aerial and have heads formed on the ends thereof with mating convex and concave surfaces, as indicated at 40a and 42a. Thus, endwise engagement of these connectors 40, 42 establishes the desired electrical continuity and also permits the desired bending or pivoting of the upper aerial section A_2 relative to the lower A_1 . However, it will be clear that the relationship of these brass conductors 40, 42 does not secure the upper aerial section A_2 to the lower A_1 and additional means are provided to hold the two aerial sections together. A coil spring 44, generally of the type disclosed in the first embodiment of the invention, is adapted to embracingly encompass the two aerial sections A_1 , A_2 adjacent the point of juncture and the opposite extremities of this coil spring are secured to ring-like collars 46, 48 having radial threaded openings therein for the reception of set screws 50, 52 which can be readily turned into pressed

engagement with the aerial sections to secure the same together, as desired.

Yet a further modification of the invention is illustrated in Fig. 5 wherein the mating brass conductors shown in either of the first two embodiments of the invention are replaced by a single, conductive ball 60 that is arranged for disposition between the two tubular aerial sections A_1 and A_2 . The diameter of the ball 60 is slightly greater than the inner diameter of the tubes so that pressed engagement of the ends of the tubes against slightly spaced portions of the ball is established, as clearly shown in Fig. 5. The ball 60 can thus conduct radio-frequency current from one aerial section to the other and also provides a universal pivotal connection therebetween, wherefore, the upper aerial section A_2 can be bent relative to the lower section A_1 without breaking the desired electrical contact. A coil spring 62 surrounds the aerial sections A_1 and A_2 and is provided at its ends with collars 64, 66 in the same fashion as the previously described embodiment of the invention so that set screws 68, 70 may be turned through radial openings in such collars into engagement with the tubular sections to maintain the desired contact with the interposed ball 60.

Yet other alterations and/or modifications can obviously be made without departing from the spirit of the present invention, and the foregoing description of several embodiments of the invention are to be considered as purely exemplary and not in a limiting sense; and the actual scope of the invention is to be indicated by reference to the appended claims.

What is claimed is:

1. A flexible connector for tubular aerial sections or the like which comprises a pair of conductors formed for pressed insertion in the respective aerial sections, said conductors having complementary surfaces arranged for engagement in a manner such that universal pivotal movement therebetween is enabled, and spring means embracing both aerial sections adjacent the pivotal connection for maintaining the sections resiliently in substantial alignment.

2. A flexible connector according to claim 1 wherein each of said conductors has a barbed end for insertion into the respective aerial section.

3. A flexible connector according to claim 1 wherein said conductors are formed to provide a ball and socket joint to enable the pivotal movement therebetween.

4. A flexible connector according to claim 3 wherein the socket portion of said ball and socket joint is open at one side to enable lateral withdrawal of the ball therefrom.

5. A flexible connector for aerial sections or the like which comprises means arranged for interposition between the ends of adjoining aerial sections to provide electrical continuity therebetween and enable relative pivotal movement of the aerial sections, a coil spring surrounding the aerial sections adjacent said interposed means, and means for connecting opposite ends of said spring to respective ones of the aerial sections.

6. A flexible connector according to claim 5 wherein said interposed means includes a pair of conductors attached respectively to the two aerial sections and having complementary convex and concave engaging surfaces formed thereon.

7. A flexible connector according to claim 5 wherein said interposed means includes a ball-shaped conductor.

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