June 19, 1956 H. E. JOHNSTON 2,751,565

SLIP RING DEVICE FOR ELECTRIC CABLE REEL

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FIG. 2.

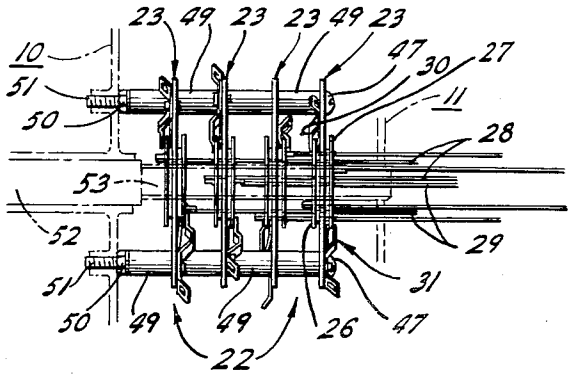
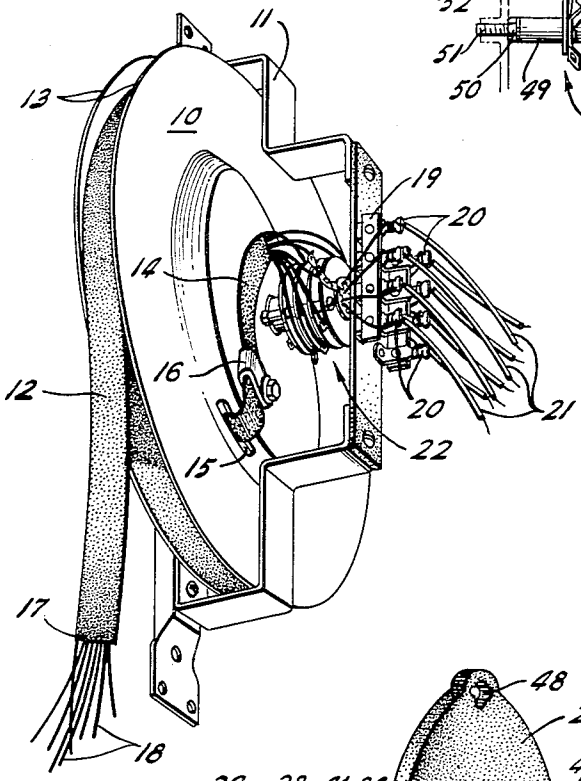


FIG. 1.



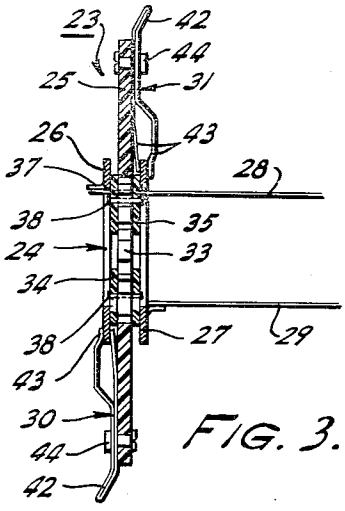


FIG. 3.

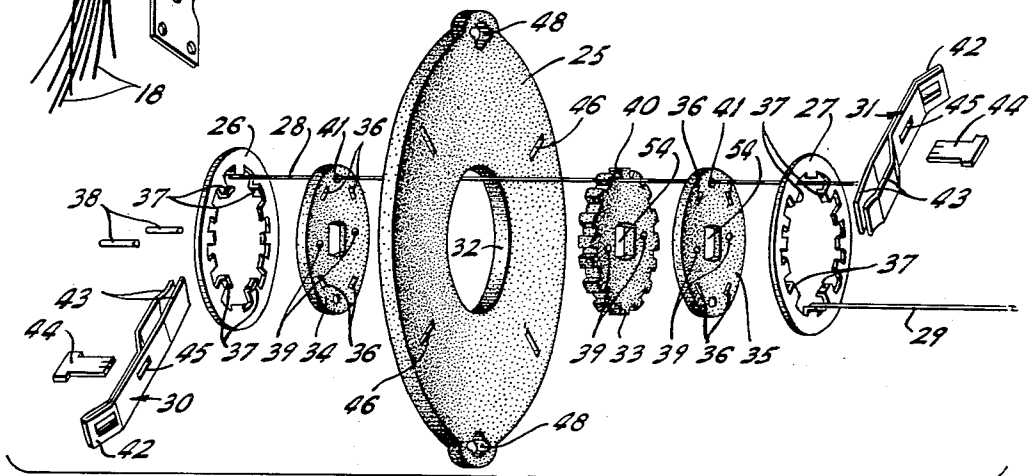


FIG. 4.

INVENTOR.
HENRY E. JOHNSTON
BY
Brown, Denk & Synnestvedt
AGENTS

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SLIP RING DEVICE FOR ELECTRIC CABLE REEL

Henry E. Johnston, Philadelphia, Pa., assignor to Philco Corporation, Philadelphia, Pa., a corporation of Pennsylvania

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5 Claims. (Cl. 339—5)

The present invention relates to slip-ring devices. More specifically, the invention has to do with improvements in slip-ring structures of the kind which are used with reeling means for electric conductor cables and which are adapted to provide for continuity of circuit between sets of electric conductors associated with the rotor portion and with the stationary portion of the reeling means. While of broader applicability, the invention is particularly concerned with the provision of a slip-ring assembly which is especially suited for use with a spring actuated reel adapted to provide for withdrawal and retraction of the electric conductor cable of remote control arrangements for electrically operated apparatus, such as radio or television receivers.

In television receivers, for instance, it is advantageous to provide a remote control arrangement whereby a user, without leaving his viewing position, may readily control the receiver to set it in operation, to select the desired television channel, to effect fine tuning, to regulate the volume of the reproduced sound, and to adjust the contrast and brightness of the reproduced picture. In remote control arrangements of the above mentioned variety, the reel for the remote control cable is conveniently mounted on or in the receiver cabinet, and is provided with a slip-ring device capable of accommodating the multiplicity of electric conductors which are required to assure adequate operation of the several electrically operated instrumentalities employed to effect the above mentioned various adjustments of the television receiver from the remote viewing position. The fact that the slip-ring device must accommodate a multiplicity of electric conductors, gives rise to problems and difficulties in manufacturing and assembling the device, as well as in connecting the various conductors with such a device.

It is the primary object of the invention to provide a slip-ring device of improved simplified structure which overcomes the above mentioned manufacturing, assembling and connecting problems and difficulties.

Other and more specific objects of the invention have to do with improvements in the construction and cooperative relation of the component parts which go into the making of the improved novel slip-ring device.

In a slip-ring device constructed in accordance with the broader aspect of this invention, there is provided an outer disk member and an inner disk member, which members are generally concentric, the outer member rotatably embracing the inner member. The outer disk member is provided with brush contact means and with means for connection with the reel, and the inner disk member is provided with annular contact means and with means for holding said inner disk member fixed as against rotation with said outer disk members. In this manner, there is provided a rotor-stator unit with which sets of electrical conductors can be readily connected. Moreover, according to a more specific aspect of this invention, several such units are joined to constitute a slip-ring device capable of conveniently accommodating several sets of conductors. In carrying out this latter feature of the invention, means is provided to interconnect the outer disk members for connection with the reel to rotate bodily therewith, and other means is provided to interconnect the inner disk members and to hold them against rotation.

The novel features of the invention together with the foregoing and other objects and advantages thereof, will be best understood from the following description of the embodiment shown in the accompanying drawing, in which:

Figure 1 is a perspective view of a reel provided with a slip-ring device constructed in accordance with the invention;

Figure 2 is an enlarged side elevational view of the improved slip-ring device;

Figure 3 is an elevational sectional view, on an enlarged scale, taken through one of the individual slip-ring units; and

Figure 4 is an exploded perspective view illustrating the construction and mode of assembly of the component parts of the unit shown in Figure 3.

Referring more particularly to the drawing, the reel 10 as shown in Figure 1, is rotatably supported on a mounting bracket 11 and has an electric conductor cable 12 wound between spaced flanges 13 of the reel. The reel may be of any suitable known construction provided with a spring which is tensioned by rotation of the reel in one direction as the conductor cable is manually drawn off, and which acts on the reel to cause its reversed rotation automatically to draw in said cable when released. An example of a spring arrangement of the kind referred to is shown in U. S. Patent No. 1,288,511, issued December 24, 1918, to A. E. Clarke. The inner end portion 14 of the cable is extended to pass outwardly through an aperture 15 provided in one of the side walls of the reel. This extended end of the cable is fixedly secured to said side wall of the reel, as by means of a clamp 16. The other or outer end portion 17 of the cable is adapted to be attached to a suitable remote control device (not shown). As illustrated, the remote control cable is provided with a multiplicity of conductors 18. A terminal block 19 is conveniently provided on the mounting bracket, and this terminal block is advantageously supplied with a series of soldering lugs 20 for connection with another multiplicity of conductors 21 which lead to the instrumentalities to be remotely controlled. A slip-ring device designated in its entirety by the reference character 22, is used to establish and maintain continuity of circuit between the set of conductors 18 and the set of conductors 21.

In accordance with the present invention, and as best seen in Figure 2, the slip-ring device comprises a series of stacked slip-ring units 23. These individual units are interconnected and held in spaced face-to-face relationship and, thus connected, the units are mounted on that side of the reel through which end portion 14 of the conductor cable passes (see Figure 1). As is more clearly shown in Figure 3, each slip-ring unit includes two main portions 24 and 25, respectively. One portion 24 is adapted to constitute the stator element of the slip-ring unit and the other portion 25 is adapted to constitute the rotor element of said unit and, for that purpose, the two portions are arranged in nested concentric relation. A pair of contact rings 26 and 27 are rigidly mounted on the stator portion 24, one ring 26 being disposed adjacent one face of rotor portion 25 and the other ring 27 being disposed adjacent the other face of said rotor portion. A conductor wire 28 is electrically connected with one ring 26, and a second conductor wire

29 is electrically connected with the other ring 27. A pair of contact brushes 30 and 31 are fixed to the rotor portion 25, one brush 30 being disposed on one face of said portion and engaging the corresponding contact ring 26, the other brush 31 being disposed on the other face of said portion and engaging the corresponding contact ring 27.

The novel and improved manner of manufacturing and assembling the slip-ring device and of connecting it with the reel will now be described. Referring first to Figures 3 and 4, it will be seen that each slip-ring unit, in accordance with this invention, is made up of simple component parts which, mostly, are in the form of wafer-shaped elements. Thus, the outer portion 25 consists of a thin disk of non-conducting material which as clearly seen in Figure 4, is provided with a centrally disposed circular opening 32. The inner or central portion 24 is composed of generally circular elements and, in addition to contact rings 26 and 27, comprises a central element or core 33 and a pair of side disks 34 and 35, one on each side of said central element or core. The central element or core 33 is made of non-conducting material and is of a size to occupy and fill the central opening in portion 25. The side disks 34 and 35 are also made of non-conducting material and conveniently serve to support the contact rings 26 and 27, respectively. For that purpose, each side disk is conveniently provided with slotted openings 36 to receive prong-like projections 37 on the associated contact ring. Rivet pins 38 adapted to pass through apertures 39 in the core 33 and side disks 34 and 35, are used to attach said disks to the core. The conductor wire 28 connected with contact ring 26 is disposed to pass through the assembled core and side disks and, for that reason, the peripheral edge of the core is conveniently notched as at 40, and the marginal portion of each side disk is conveniently perforated as at 41, to accommodate said wire.

Each of the contact brushes 30 and 31 is advantageously formed of a strip of suitable conducting material, the strip being bent upon itself to provide a terminal end 42 and a pair of contact fingers 43. These fingers are such that they straddle the rim of the associated contact ring and bear upon the opposite sides of the latter. The contact brushes are conveniently secured on portion 25 by means of suitable fasteners 44 made to pass through apertures 45 in said brushes and through corresponding apertures 46 in said portion.

From Figure 4, it will be readily understood that a complete slip-ring unit as illustrated in Figure 3, is easily assembled by placing core 33 within the central aperture of portion 25, securing contact rings 26 and 27 to their respective supporting disks 34 and 35, riveting said core and disks together, engaging the fingers of contact brushes 30 and 31 with their corresponding contact rings and securing said brushes to portion 25.

In constructing a slip-ring device as shown in Figure 2, the desired number of slip-ring units, each completely assembled as shown in Figure 3, are put together by passing bolts 47 through suitable openings 48 (see Figure 4) in the portion 25 of each of said units and through tubular rigid spacers 49 inserted between the units. Suitable fastening elements such as nuts 50 are used to lock the entire assembly in a unitary rugged structure which is affixed to the reel by engaging extended screw-threaded ends 51 of the bolts with the side of said reel. When affixed to the reel, the conductors in cable 12 can be readily soldered or otherwise electrically connected to the terminal end of the appropriate contact brushes, and the conductor wires leading from their respective contact rings can be likewise connected to the appropriate soldering lugs on terminal block 19 to complete the circuits between the set of conductors 18 and the set of conductors 21. In practice, it is desirable and advantageous to arrange brushes 30 and 31 and conductor wires 28 and 29 at different angular positions on the successive

slip-ring units, as is shown in Figure 2. By arranging the brushes and wires in this fashion, the electrical connection between said brushes and conductors 18 and between said wires and soldering lugs 20, is greatly facilitated.

In operation, the rigidly interconnected outer portions 25 of the slip-ring unit rotate with rotation of the reel but the inner central portions of said unit are held against rotation. For that purpose, as is represented in dot-and-dash lines in Figure 2, the stationary shaft 52 about which the reel rotates, is provided with a multi-sided extension 53 which passes through corresponding opening 54 (see Figure 4) in the core 33 and side disks 34 and 35 of each of said central portions, so that as rotor portions 25 of the slip-ring device rotate with the reel, the contact brushes ride about the contact rings which are stationarily held with the central stator portions 24 of the device. In this respect, it is to be noted that the connecting wires 28 and 29 attached to the contact rings 26 and 27, respectively, project through the fixed central portions of the slip-ring units so that said wires, in fact, become integral parts of said central portions and, thus, are not disturbed by rotation of the outer portions of said units.

From the foregoing description, it will be appreciated that the invention makes it possible to provide a slip-ring device which is characterized by its unusual simplicity of construction and assembly. The fact that a slip-ring device constructed in accordance with the invention, is made up of stacked individual slip-ring units each of which includes associated stator and rotor elements is most advantageous because it results in the production of a self contained structure, that is, a structure which eliminates complicated and obstructive supports for either the stator or the rotor elements.

I claim:

1. In a slip-ring device for an electric cable reel of the type which is rotatable about a stationary shaft, a slip-ring unit comprising a rotor and a stator; said rotor ininclding a non-conducting supporting member having opposite side faces, contact brushes attached to said side faces, and means for connecting said member with said reel to rotate therewith, said supporting member having a circular opening; said stator including a non-conducting disc structure composed of an inside disc sandwiched between two outside discs, said inside disc being mounted in said opening and said outside discs projecting axially beyond said side faces of said supporting member, conducting rings of an outer diameter greater than the diameter of said disc structure, said rings being mounted on said outside discs and engaged by said brushes, and means for connecting said disc structure with said stationary shaft to be thereby held against rotation with said supporting member.

2. In a slip-ring device for an electric cable reel of the type which is rotatable about a stationary shaft, a slip-ring unit comprising an inner disc structure and an outer member, said structure and member being constructed of non-conducting material, the outer member having opposite side faces and a circular open portion engaging the peripheral edge portion of the inner disc structure and thereby supporting said inner disc structure concentrically with respect to said outer member, said disc structure having outwardly facing portions projecting axially beyond said side faces of said member, a pair of current conducting rings of an outer diameter greater than the diameter of said disc structure, one of said rings being attached to one of said facing portions, the other of said rings being attached to the other of said facing portions, a pair of contact brushes attached to said side faces of the outer member and slidably engaging said current conducting rings, means for connecting the outer member with the reel to rotate therewith, and means for connecting the inner disc structure with the stationary shaft to be thereby held against rotation with said outer member.

3. In a slip-ring device for an electric cable reel, a

slip-ring unit as set forth in claim 2, in which each of the mentioned conducting rings has a conductor extended therefrom, and the conductor of one ring passes through the inner disc structure.

4. A slip-ring device for an electric cable reel of the type which is rotatable about a stationary shaft, comprising a stack of relatively spaced slip-ring units, each of said units including an inner disc structure and an outer member, said structure and member being constructed of non-conducting material, the outer member having opposite side faces and a circular open portion engaging the peripheral edge portion of the inner disc structure and thereby supporting said inner disc structure concentrically with respect to said outer member, said disc structure having outwardly facing portions projecting axially beyond said side faces of said member, a pair of current conducting rings of an outer diameter greater than the diameter of said disc structure, one of said rings being attached to one of said facing portions, the other of said rings being attached to the other of said facing portions, a pair of contact brushes attached to said side faces of the outer member and slidably engaging said current conducting rings, means interconnecting

the outer members of said units for connection with the reel to rotate therewith, and means for interconnecting the inner disc structures of said units and connecting said structures with the stationary shaft to be thereby held against rotation with said outer members.

5. A slip ring device as set forth in claim 4, in which each current conducting ring of each of the units has a conductor extending through the inner disc structure of each of the successive units in the mentioned stack.

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