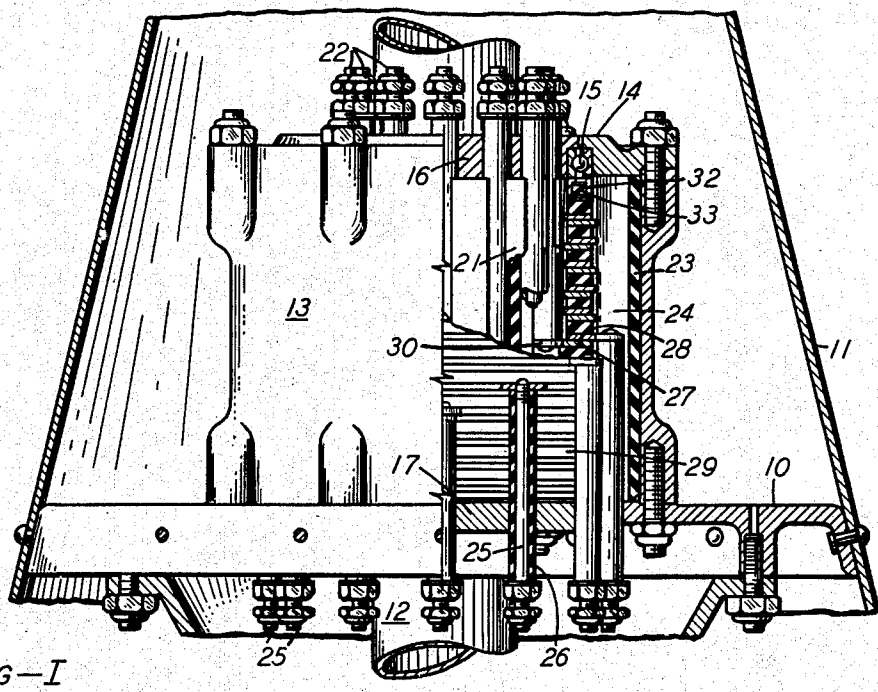
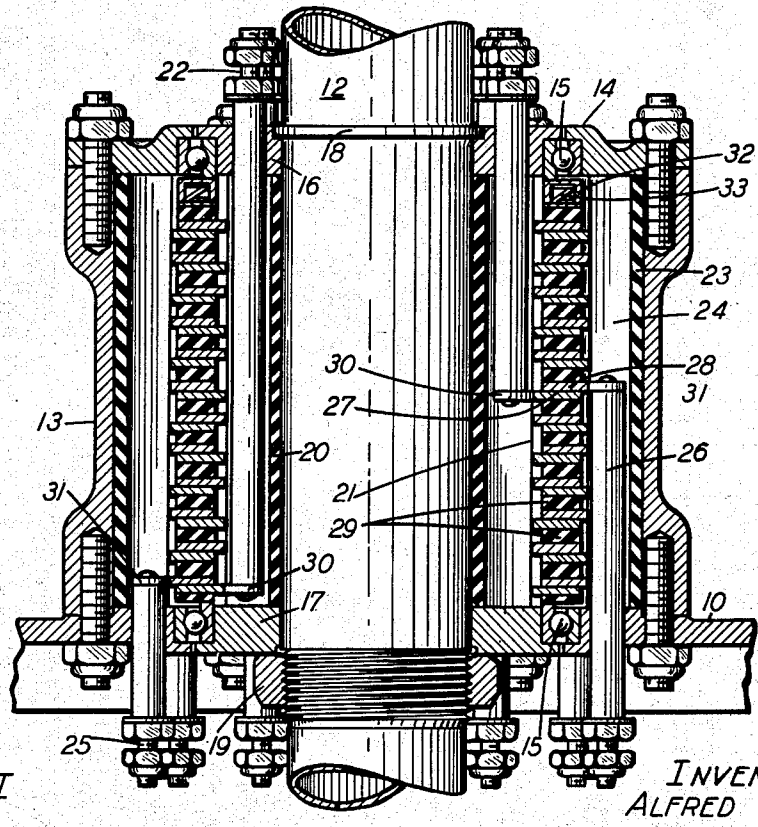
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MULTIPLE SLIP RING

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FIG—I



FIG—II

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MULTIPLE SLIP RING

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Application December 27, 1941, Serial No. 424,639

5 Claims. (Cl. 173—324)

This invention relates to improved multiple slip ring connectors especially adapted to carry a number of electrical circuits from a fixed member, such as the fuselage or floor of an airplane, into a rotating or angularly movable member, such as a machine gun turret. Especially in a power operated turret, quite a number of electrical and/or other types of connections for traversing and elevating controls, interphone lines, firing controls, etc., all of which have to be carried into the movable turret, although some of which may be servo or relay circuits energizing external or stationary driving mechanisms. These requirements hold true for either gunner occupied or remote control turrets, since in the latter case at least the gun firing and elevating controls must be carried past the traversing pivot.

Various slip ring connections have been heretofore proposed, such as the collector rings used with dynamos and other electrical machinery, as well as swivel connectors for various other purposes, but such arrangements normally use brush or ball contacts, whereas my invention involves the use of a plurality of insulated pairs of conducting rings in surface contact with each other, with terminal posts from each member of each pair extending parallel to and equidistant from the axis of rotation to provide coaxial rings of connections above and below the housing enclosing the slip rings, one set of connections rotating with the turret and the other set being stationary and electrically connected to the corresponding terminal of the rotating set of connections, through one of the pairs of slip rings.

It is accordingly an object of this invention to provide an improved and simplified multiple slip ring connection wherein a plurality of pairs of relative rotatable rings serve to carry a number of circuits into or out of a freely rotatable structure.

It is a further object of this invention to provide an improved and simplified multiple slip ring connection adapted to be arranged concentric with the axis of rotation of the member, parallel terminal posts forming conveniently accessible rings of individual terminals for the movable and stationary electrical connections.

It is also an object of this invention to provide multiple slip ring connections of the type described wherein the electrical connections are disposed in concentric rings about a tubular bearing member whereby to leave the central part of said tubular member free for other mechanical or fluid connections to the rotating part of the assemblage.

It is a further object of this invention to provide an improved multiple slip ring connection of the type described wherein the several pairs of relatively movable rings are yieldingly maintained under predetermined engaging pressure and the movable assemblage is mounted in radial antifriction bearings.

Other and further objects of this invention will become apparent as the description of the invention proceeds.

The embodiment of this invention chosen for illustrative purposes is intended to convey power, interphone, and turret control circuits into a rotatable gun turret for airplanes, such for example as disclosed in my prior application Serial No. 362,067, filed October 21, 1940.

In the drawing:

Figure I is a fragmental side elevation of a device embodying the features of this invention, shown as mounted in a portion of a conical seat pedestal, the device being broken away in parts to show representative portions of the interior thereof.

Figure II is a somewhat enlarged central vertical section through the device of Figure I with parts thereof shown in elevation.

As shown on the drawing:

The specific embodiment chosen for illustrative purposes is shown as carried by a platform 10 supported in a conical shell 11 which forms a seat pedestal in my above identified application. A central tube 12 is adapted to rotate within the pedestal and provides centralized support for the seat, which in the turret mentioned is supported independently of the rotatable turret casing, but movable therewith, in order that the gunner may face in the direction the gun points. In the above mentioned turret rotation is not limited in either direction, so that the tube 12 likewise must be free to rotate and provides a central space for other types of connections if so desired.

The multiple slip ring device of this invention comprises a stationary housing 13 supported by the platform 10 concentric with the tube 12, the housing having an upper closure 14 applied thereto. Both the housing closure 14 and the platform 10 are bored to receive radial anti-friction bearings 15, the inner races of which are mounted on similar collars 16 and 17 which turn with the tube 12, the upper collar 16 seating against a shoulder 18 on the shaft, while a nut 19 bears against the lower collar 17 and clamps it against a drum like spacing sleeve 20 inter-

posed between the collars 16 and 17. The spacer sleeve 20 has a series of slots in its periphery to form pockets for and lands 21 between terminals 22 which rotate with the tube 12, and project upwardly through the collar 16.

The housing 13 and its closure 14 contain an insulating shell 23 having slots or channels 24 in its inner surface to receive stationary terminals 25 which project down through the partition or platform 10. Both the terminals 22 and 25 are provided with insulating sleeves 26 and are of variable length, preferably being stepped in progressive or spiral order to facilitate assembly. Each pair of the terminals 22 and 25 are respectively secured to a rotating slip ring 27 and a stationary ring 28 in contact with each other, the several pairs of rings 27 and 28 being insulated from adjacent pairs by insulating rings 29 and having ears 30 and 31 for the attachment of the terminals, the ears extending into the slots of the sleeve 20 and shell 23 respectively. The rotating rings 27 engage the spline like lands 21 and are driven thereby. The stack like arrangement of pairs of slip rings 27 and 28 and insulating rings 29 are arranged so that insulating rings 29 are provided above and below the end rings, and a channel like ring 32 confines a spring or series of springs 33 bearing on the topmost insulating ring. The lowermost ring 29 rests on the inner race of the lower bearing 15 and the channel-like ring 32 bears against the inner race of the top bearing, so that the several pairs of slip rings 27 and 28 are held together by yielding pressure while the rotating rings 27 are forced to move as a unit by the ears 30 and splines extending into the slots in the sleeve 20, while the stationary rings 28 are held by the ears 31 and splines extending into the slots in the shell 23.

As previously mentioned, the terminals 22 and 25 are of varying length to reach the different pairs of slip rings 22 and 28, one extreme being indicated at the left of Figure II, while several intermediate lengths are shown in the sectioned part of Figure I.

This arrangement produces a compact assemblage of multiple slip rings having a maximum contact area which reduces the contact pressure required to minimize electrical resistance, and consequently reduces the frictional resistance of the slip ring connections. It will be noted that the bearings 15 are not subjected to the axial pressure set up by the spring load on the slip ring assembly, which load is carried by the collars 16 and 17 which rotate with the tube 12 and rings 27.

Having thus described my invention and the present preferred embodiments thereof, I desire to emphasize the fact that many modifications may be resorted to in a manner limited only by a just interpretation of the following claims.

I claim:

1. A multiple electrical connector adapted to connect the interior of a rotating turret with the supporting body therefor, comprising a mast rotatable with said turret, a housing associated with the body and disposed concentrically about said mast, a series of pairs of stationary and rotatable contact rings, insulating rings disposed between adjacent pairs of contact rings, a series of progressively stepped terminals disposed parallel with said mast and rotatable therewith, each of said terminals being fastened to one of said rotary contact rings, and a second complementary set of progressively stepped terminals also disposed parallel to said mast and extending oppositely to said first mentioned terminals, said second complementary set of terminals being each fastened to one of said stationary contact rings.

2. A multiple electrical connector adapted to carry a series of electrical circuits into a rotatable body, comprising an annular stack of pairs of alternately rotatable and stationary slip rings, insulating rings disposed above, below, and between adjacent pairs of slip rings, complementary series of terminals concentrically arranged within and without said annular stack of rings and respectively connected to the rotatable and stationary rings, and supporting and clamping means engaging said stack of rings, said means therebetween including yielding means so constructed and arranged as to establish a predetermined contact pressure between said pairs of rotatable and stationary slip rings.

3. A multiple electrical connector adapted to carry a series of electrical circuits into a rotatable body, comprising an annular stack of pairs of alternately rotatable and stationary slip rings, insulating rings disposed above, below, and between adjacent pairs of slip rings, and supporting and clamping means engaging said stack of rings, said means including anti-friction bearing supports for the movable members which supports also engage the opposite ends of the stack of slip and insulating rings.

4. A multiple electrical connector adapted to carry a series of electrical circuits into a rotatable body, comprising an annular stack of pairs of alternately rotatable and stationary slip rings, insulating rings disposed above, below, and between adjacent pairs of slip rings, and supporting and clamping means engaging said stack of rings, said means including anti-friction bearing supports for the movable members which supports also engage the opposite ends of the stack of slip and insulating rings, and yielding means so constructed and arranged as to establish a predetermined contact pressure between said pairs of rotatable and stationary slip rings.

5. A multiple electrical connector adapted to carry a series of electrical circuits into a rotatable body, comprising an annular stack of pairs of alternately rotatable and stationary slip rings, insulating rings disposed above, below, and between adjacent pairs of slip rings, insulating shells disposed inside and outside said stack of rings, said shells being longitudinally slotted on the surfaces facing said rings, and terminals disposed in the slots in said shells, being connected to the slip rings and extending upwardly and downwardly therefrom whereby to provide binding posts for the various electrical circuits connected through the pairs of slip rings.

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