Sept. 18, 1956 I. D. KRUGER 2,763,844

ROTARY CONTACT FOR A COAXIAL LINE

Filed June 14, 1955 2 Sheets-Sheet 1

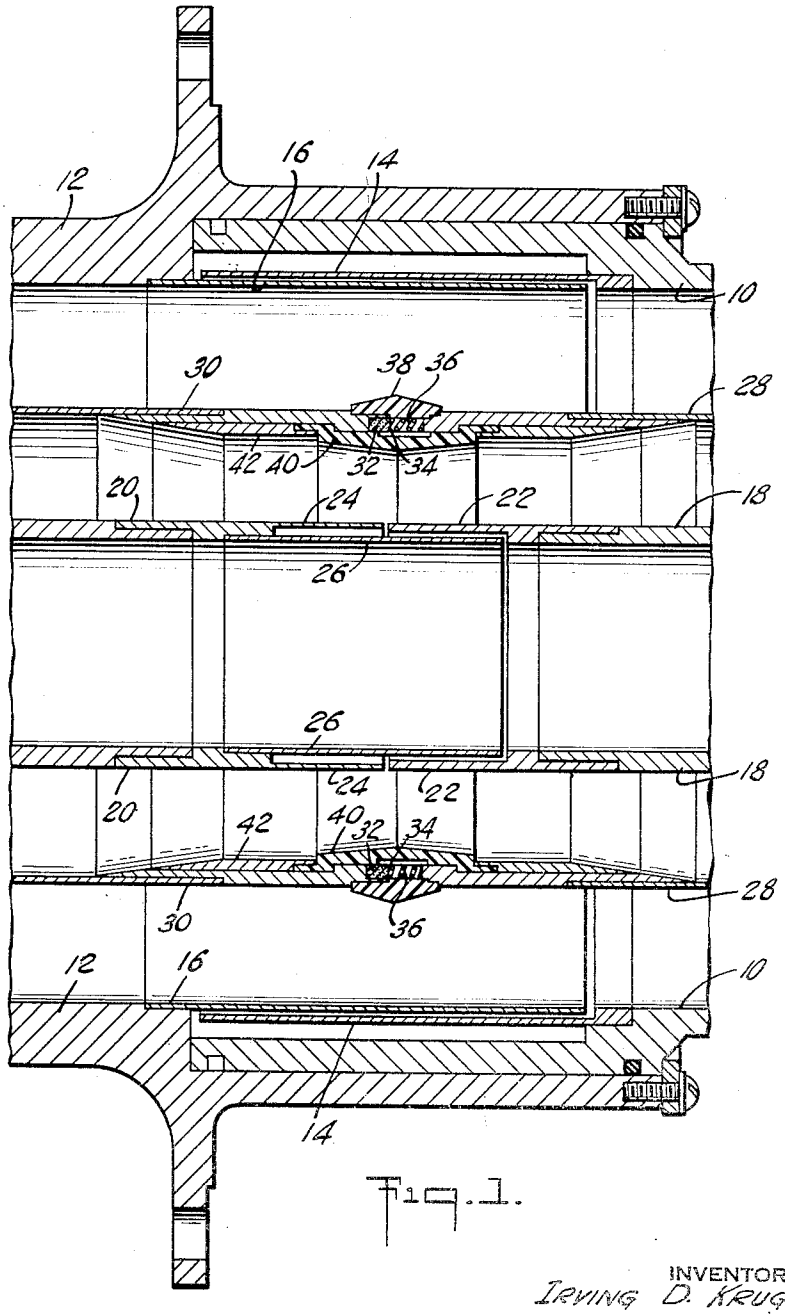


Fig. 1.

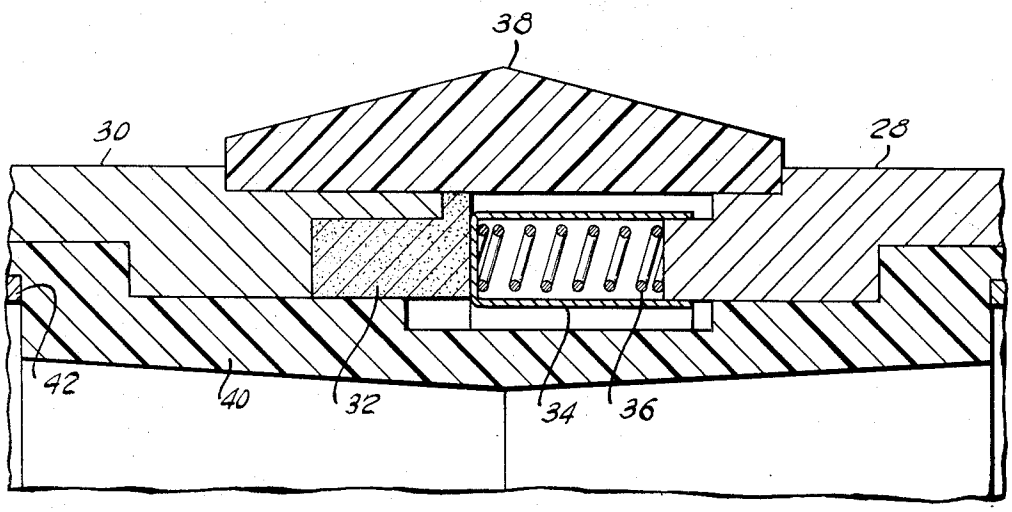
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Fig. 2.



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ROTARY CONTACT FOR A COAXIAL LINE

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4 Claims. (Cl. 333—97)

This invention relates to a rotary contact for a coaxial transmission line and, more particularly, a slip contact between two sections of coaxial transmission line which will allow relative rotary motion of the two sections while providing good electrical connection and a low standing wave ratio.

This invention contemplates a contact between the two sections being made by a lubricated conductive ring such as a sintered lubricant-impregnated ring rubbing against a folded metal foil. The foil is kept in positive contact with the sintered lubricant-impregnated ring by means of compression springs within the fold of the metal foil. The folded metal foil is looped over the inside and outside surfaces of the coaxial line, and, thus, if the contact is used in an intermediate section of a double coaxial line the electrical energy is conducted from the surface on which it is flowing in one section directly to the corresponding surface in the adjacent section. The entire contact is made up as an assembly locked together by means of insulating rings. These rings also serve to provide a seal for preventing any wear residue which might occur from the rubbing surfaces from falling into the coaxial line.

It is therefore an object of this invention to provide a rotary contact for a coaxial transmission line which allows relative rotary motion between two sections while providing good electrical connection and a low standing wave ratio.

It is a further object of this invention to provide a rotary contact for coaxial transmission line which employs two rubbing surfaces, but prevents any wear residue, which might occur at the rubbing surfaces, from falling into the coaxial line.

Other objects and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

Fig. 1 is a fragmentary sectional view of a double-coaxial line incorporating a rotary contact employing the principles of this invention; and

Fig. 2 is a fragment of Fig. 1 on an enlarged scale.

Referring now to the figures, there is shown a double coaxial line joint composed of three pairs of coaxially disposed tubes, each pair of tubes being of different diameter from the other pairs. The largest diameter pair of tubes is made up of tube **10** and tube **12**, which are rotatable with respect to each other about their common axis. Extensions **14** from tube **10** and **16** from tube **12** cooperate with each other to form a resonant coupling. The pair of tubes having the smallest diameter is made up of tube **18** and tube **20**. Extensions **22** from tube **18** and **24** and **26** from tube **20** also cooperate with each other to form a resonant coupling.

The rotary contact which forms the subject of this invention is used to couple the pair of tubes of intermediate diameter, made up of tube **28** and tube **30**. The rotary contact is composed of sintered lubricant-impregnated ring **32** which is attached to tube **30** and folded conductive foil **34** looped over the end of tube **28**, one end of conductive foil **34** being attached to the outer circumference of tube **28** and the other end of conductive foil **34** being attached to the inner circumference of tube **28**. A plurality of compression springs **36** are circumferentially disposed within the loop of foil **34**.

Insulating ring **38**, composed of tetrafluoroethylene surrounds the exterior of the rotary contact joint. Insulating ring **40**, also composed of tetrafluoroethylene, surrounds the interior of the rotary contact joint. Mode suppressor **42** acts as a retainer for insulating ring **40**.

In operation, tubes **10**, **18** and **28**, respectively, are connected to a stationary transmitter or receiver. Tubes **12**, **20**, and **30**, respectively, are connected to a rotating assembly, such as a rotating antenna. Three bands of high frequency energy are coupled between the stationary transmitter or receiver and the rotating antenna. The interior of tubes **18** and **20** serve as a waveguide for transmitting the highest frequency band. The space between the exterior of tubes **18** and **20** and the interior of tubes **28** and **30** serve as a first coaxial line for transmitting an intermediate frequency band, and the space between the exterior of tubes **28** and **30** and the interior of tubes **10** and **12** serve as a second line for transmitting the lowest frequency band.

The resonant coupling composed of extensions **14** and **16** of tubes **10** and **12** and the resonant coupling composed of extensions **22**, **24** and **26** of tubes **18** and **20** operate in a conventional manner.

In the rotary contact between tubes **28** and **30**, which forms the subject of this invention, compression springs **36** have one end butting up against the end of tube **28** and the other end thereof butting up against the fold of the conductive foil. This pushes the fold of the conductive foil in positive contact with sintered lubricant-impregnated ring **32**, providing a good electrcal connection therebetween. Insulating rings **38** and **40**, respectively, prevent any wear residue formed at the rubbing contact of the fold in foil **34** and oilite ring **32** from entering either the first or second coaxial lines. Mode suppressor **42**, besides retaining insulating ring **40**, also provides good matching for the first coaxial line in the vicinity of the rotary contact. With the use of the rotary contact and the mode suppressor, standing wave ratios under 1.3 to 1 are obtained.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. A rotary contact for a transmission line comprising first and second conductive tubes having circular cross-sections of substantially identical inner and outer diameters, a folded conductive foil looped over one end of said first tube and having one end thereof attached to the outer circumference of said one end of said first tube and the other end thereof attached to the inner circumference of said one end of said first tube, a plurality of compression springs circumferentially disposed within the loop of said foil, each of said springs having one end thereof pressing against said one end of said first tube and the other end thereof pressing against the fold of said foil, a lubricated conductive ring attached to one end of said second tube, and said first and second tubes being axially aligned relative to each other with said ring in contact with the fold of said foil.

2. A rotary contact in accordance with claim 1, further including first and second dielectric insulating rings, said first insulating ring being in contact with the inner surface of said first and second tubes and said second insulat-

ing ring being in contact with the outer surface of said first and second tubes.

3. A rotary contact in accordance with claim 1, further including third, fourth, fifth and sixth conductive tubes having circular cross-sections, said third and fourth tubes having substantially identical inner and outer diameters which are smaller than those of said first and second tubes, said third and fourth tubes being axially aligned relative to each other and being coaxial with said first and second tubes, said third tube having one end thereof in proximity to one end of said fourth tube, first resonant coupling means electrically coupling said third tube to said fourth tube, said fifth and sixth tubes having substantially identical inner and outer diameters which are larger than those of said first and second tubes, said fifth

and sixth tubes being axially aligned relative to each other and being coaxial with said first and second tubes, said fifth tube having one end thereof in proximity to one end of said sixth tube, and second resonant coupling means electrically coupling said fifth tube to said sixth tube.

4. A rotary contact in accordance with claim 3, further including first and second dielectric insulating rings, said first insulating ring being in contact with the inner surface of said first and second tubes and said second insulating ring being in contact with the outer surface of said first and second tubes.

No references cited.