

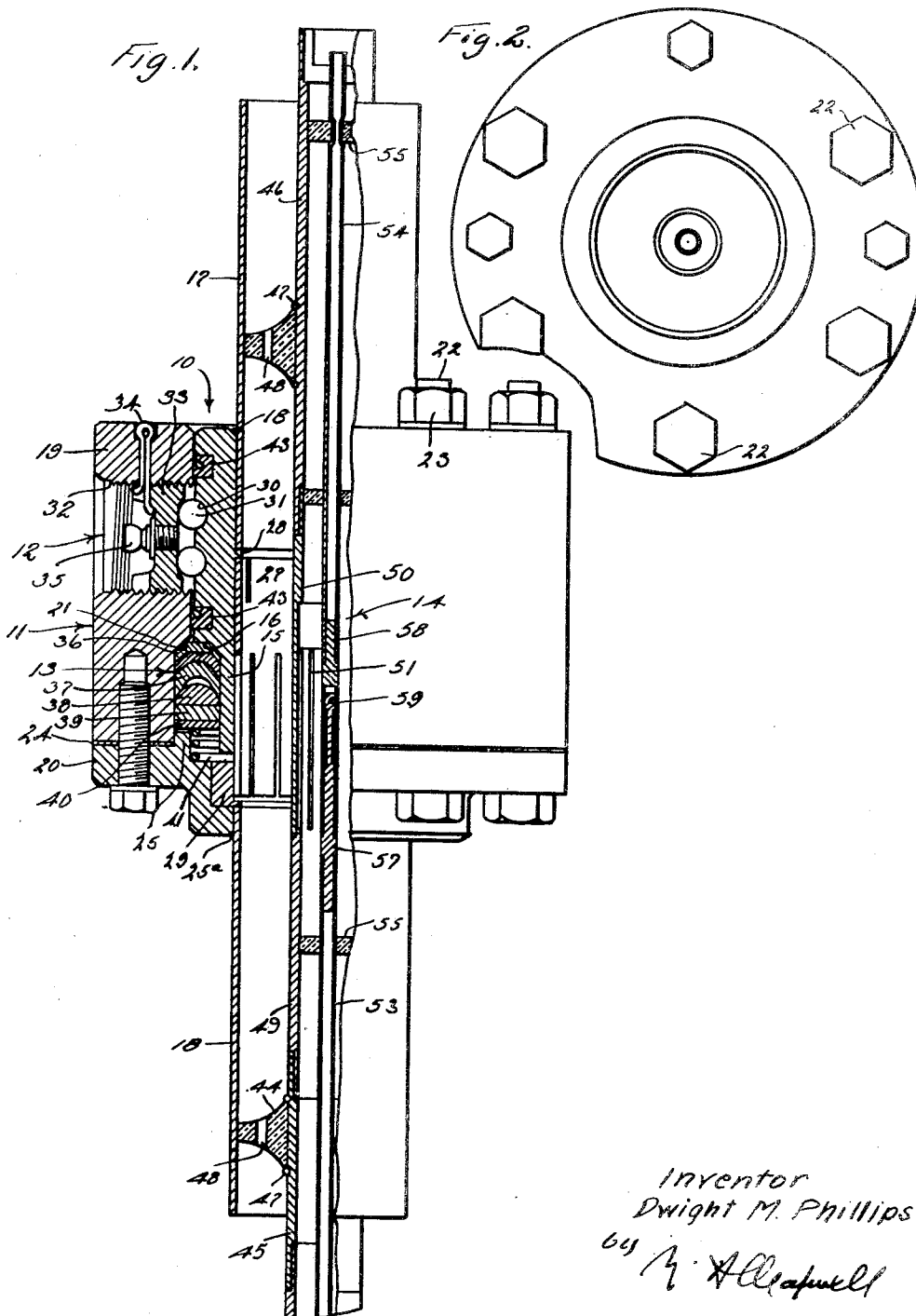
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D. M. PHILLIPS
ELECTRICAL SWING JOINT

2,452,144

Filed July 28, 1943

2 Sheets-Sheet 1



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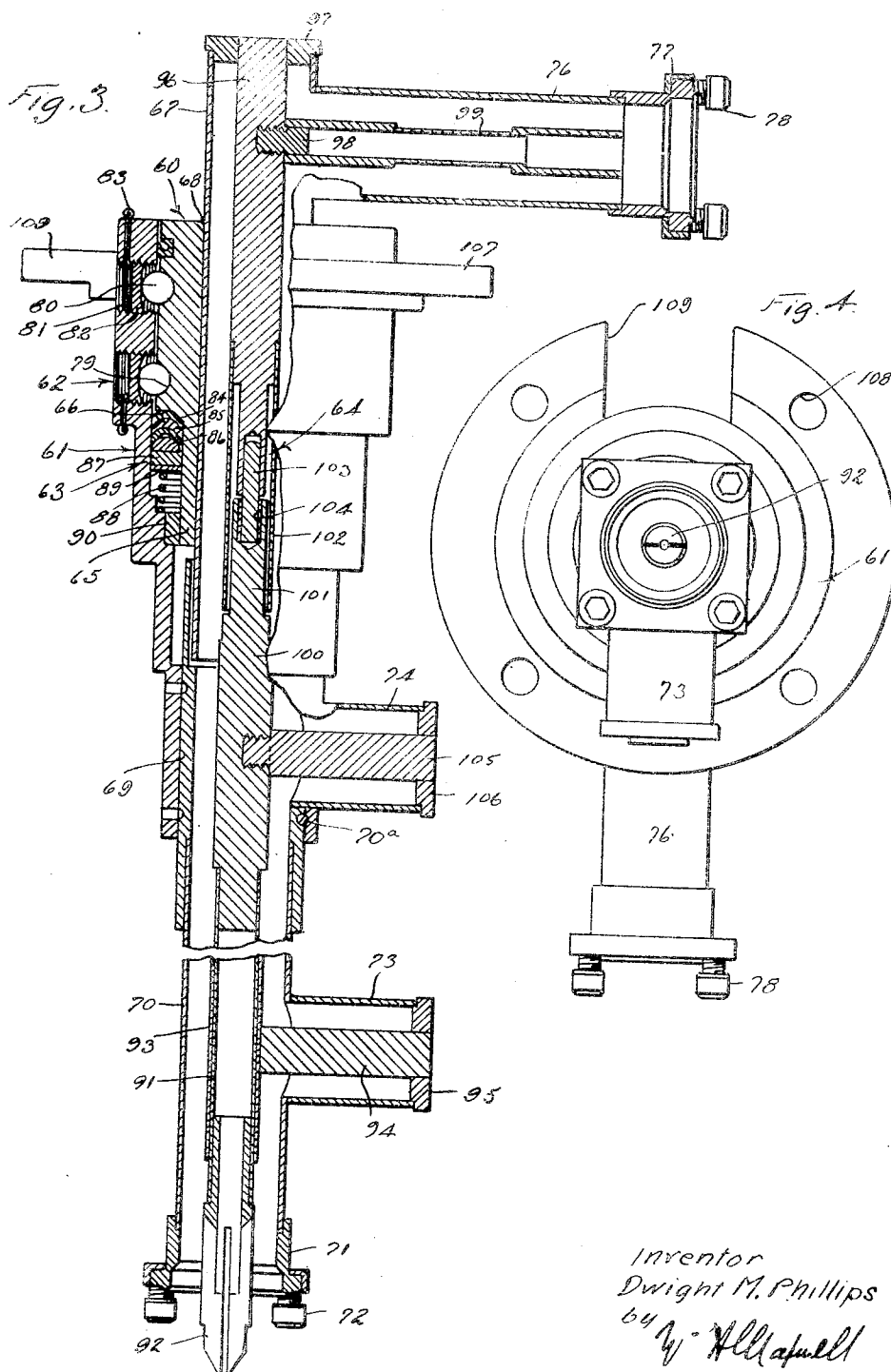
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UNITED STATES PATENT OFFICE

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ELECTRICAL SWING JOINT

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1 Claim. (Cl. 174—21)

1

This invention relates to electrical connections and relates more particularly to electrical swing joints. A general object of this invention is to provide a practical, dependable and long wearing electrical swing joint.

Another object of this invention is to provide an electrical swing connection for use in multi-tubular electrical conductors for handling high frequency current, etc.

Another object of this invention is to provide an electrical swing connection in which the parts are connected for free relative turning or swinging movement by positive, dependable, anti-friction means.

Another object of this invention is to provide an electrical swing connection for multi-tubular conductors that is effectively sealed so that the tubular conductors may carry gas or other fluid under pressure.

A further object of this invention is to provide an electrical swing connection in which the several tubular conductors of the multiple system are dependably supported and insulated one from the other and their individual relatively turnable sections are effectively engaged for the transmission of electrical energy.

The various objects and features of my invention will be fully understood from the following detailed description of typical preferred forms and applications of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a longitudinal detailed sectional view of one form of the invention with a portion appearing in side elevation. Fig. 2 is an end view of the connection shown in Fig. 1. Fig. 3 is a longitudinal detailed sectional view of another form of the invention with a portion appearing in side elevation, and Fig. 4 is an end view of the connection illustrated in Fig. 3.

The form of the invention illustrated in Figs. 1 and 2 of the drawings may be said to comprise, generally, two outer or body sections 10 and 11 adapted to be connected with the parts of a tubular outer connecting means 12 for connecting the sections 10 and 11 for free relative turning, means 13 for sealing between the sections and means 14 for electrically connecting inner conductors for free relative turning.

The sections 10 and 11 form the body of the joint and constitute an annular assembly adapted to be connected in a tubular outer conductor. The section 10 may be considered the inner section and is a simple, tubular element. The inner section 10 may be integral and has an inner end

2

portion 15 of reduced external diameter. A shoulder 16 is provided on the exterior of the section 10 where the reduced portion 15 joins the body of the section. One part or length 17 of the outer tubular electrical conductor extends into the section 10. The conductor 17 closely fits within the section 10 and is electrically connected therewith by solder 18.

The outer section 11 is electrically connected with the other part or length 18 of the outer tubular conductor and telescopes over the inner section 10. In the preferred construction the outer section 11 is sectional comprising a main part 19 and a flange or cap 20. The main part 19 surrounds the inner section 10 with clearance. The end portion of the main part 19 which surrounds the reduced portion 15 of the inner section 10 is enlarged in internal diameter providing an annular shoulder 21 which lies in the same plane as the shoulder 16. The cap 20 is secured to the inner end of the main part 19 by screws or studs 22 which may pass longitudinally through openings of the body part 19 to extend from the outer end of the part. Nuts 23 are threaded on the projecting ends of the studs 22. A gasket 24 may be provided between the opposing faces of the body part 19 and cap 20. An annular rim 25 is provided on the inner side of the cap 20 and enters the body part 19. The conductor 18 enters the end of the cap 20 and is electrically connected with the cap by solder 25a, or the like.

Means is provided for electrically connecting the two lengths or parts 17 and 18 of the outer electrical conductor. This means includes a contact sleeve 27 pressed or force-fitted into the inner section 10.

A flange 28 on the wall of the section 10 may separate the opposing ends of the conductor 17 and the sleeve 27. A bearing and contact ring 29 is recessed in the wall of the cap 20. The contact sleeve 27 is longitudinally split from its outer end to be resilient and its resilient portion engages or bears within the ring 29 to complete the electrical connection between the sections 10 and 11. It will be seen that the conductors 17 and 18 electrically connected with the sections 10 and 11 are maintained in electrical conducting relation by the sleeve 27 contacting with the ring 29.

The means 12 for connecting the sections 10 and 11 for relative turning is an anti-friction means. The means 12 includes pairs of registering annular grooves formed in the interior of the section 11 and the exterior of the section 10 and constituting races 30. Series of balls 31 are

provided in the races 30. It will be seen how the engagement of the balls 31 in the spaced races 30 positively connects the section 10 and 11 for free relative rotation. If desired the parts may be proportioned so that the sections 11 have limited relative longitudinal play. A lateral opening 32 is provided in the wall of the part 19 and joins the two races 30 to facilitate the assembly of the balls 31 into the races. The opening 32 is normally closed by a threaded plug 33 and the plug is locked in the correct position by a cotter key 34. The inner end of the plug 33 is recessed so that the balls 31 may roll over it. A grease fitting 35 is provided in the plug 33 to facilitate the lubrication of the means 12.

The sealing means 13 is provided to prevent the loss of fluid, say gas under pressure, from between the sections 10 and 11 and to prevent foreign matter from entering the connection. The means 13 includes a sealing ring assembly surrounding the reduced end portion 15 of the section 10. This sealing ring assembly comprises an outer ring 36 of brass, or the like, arranged against the shoulders 16 and 21. A series of chevron packing rings 37 of synthetic rubber or other sealing material is provided in front of the ring 36. A forward ring 38 of brass, or the like, is arranged in front of the rings 37 and has a convex face cooperating with the foremost sealing ring. A lubricant retaining ring 39 of felt, or the like, is provided in front of the ring 38 and a metal spacer ring 40 is arranged against the outer side of the grease retaining ring 39. Means is provided for holding the sealing ring assembly actuated. This means comprises a spring 41 arranged under compression between the ring 40 and the end wall of the cap 20. It will be seen how the sealing rings 37 effectively prevent the leakage of fluid under pressure outwardly from between the sections 10 and 11 and how the ring 39 prevents lubricant from the means 12 from entering the tubular conductors.

The sealing means 13 further includes rings 43 of synthetic rubber, or the like, set in grooves in the periphery of the inner section 10 at opposite sides of the spaced races 30. The sealing rings 43 have diagonal grooves entering their outer corners. The square sealing rings 43 closely fit their respective grooves and are effective in preventing the inward passage of fluid and particles between the sections 10 and 11.

The connection of the invention may be employed with one, two or more inner tubular conductors. In the case illustrated there are two inner conductors. The sections of one of these inner tubular conductors are supported in the conductors 17 and 18 by spaced insulators 44. The insulators 44 are pressed or tightly fitted in the outer conductors 17 and 18 and are broadened toward their interiors to have extensive cooperation with the sections 45 and 46 of the inner or intermediate conductor. The conductors 45 and 46 have rotary engagement with the insulators 44. Split spring rings 47 are engaged in grooves in the conductors 45 and 46 at opposite sides of the insulators 44 to limit or prevent endwise movement of the conductors. Openings or passages 48 are provided in the insulators 44 to permit the flow of gas through the outer conductor assembly. The sections 45 and 47 of the intermediate tubular conductor are electrically connected by elements of the inner contact means 14.

The contact means 14 includes a tubular inner contact 49 on the conductor 45 and a contact

sleeve 50 on the conductor 46. The contact 49 has a reduced end portion provided with longitudinal slots 51 which make it resilient and the sleeve 50 closely fits about this reduced resilient portion to remain in electrical connection therewith. The contact 49 and the sleeve 50 turnably or swingably engage one with the other so that the conductors 45 and 46 may turn with respect to one another.

The innermost conductor sections 53 and 54 are supported within the intermediate conductors for independent turning. Longitudinally spaced ring-like insulators 55 are tightly fitted within the conductors 45 and 46 to be fixed thereto and engage around the innermost conductors 53 and 54. The conductors 53 and 54 may be crimped to provide shoulders at the opposite sides of the insulators 55. This prevents or limits longitudinal shifting of the conductors 53 and 54.

The inner contact means 14 further includes a contact insert 57 fixed in the end portion of the conductor 53 and a complementary contact insert 58 fixed in the end of the conductor 54. A socket 59 in the insert 58 closely receives the reduced forward end of the insert 57. This maintains the inner conductors 53 and 54 in electrical connection. The contact inserts 57 and 58 are relatively turnable to permit relative turning movement between the conductors 53 and 54.

The embodiment of the invention illustrated in Figs. 3 and 4 of the drawings may be said to comprise, generally, two body sections 60 and 61, means 62 connecting the sections 60 and 61 for relative turning, means 63 for sealing between the sections 60 and 61, and means 64 for electrically connecting the inner conductors.

The sections 60 and 61 form a tubular body assembly. The section 60 is the inner part and is a simple, tubular member provided with a reduced end portion 65. An external annular shoulder 66 is formed on the section 60 at the end of the reduced portion 65. The section 61 forms the outer member of the body assembly and is an elongate tubular element. The section 61 surrounds the section 60 with clearance and continues a substantial distance beyond the inner end of the section 60.

The body sections 60 and 61 are interposed in an outer tubular conductor assembly. A conductor 67 passes through the inner section 60 and is secured thereto by solder 68. The conductor 67 extends beyond the inner end of the section 60. A contact insert 69 enters the inner end of the section 61 and is secured to the section 61 by solder 70, or the like, in registering openings in the section and insert. The contact insert 69 engages about the protruding inner end of the conductor 67 and is in engagement therewith or in such close relation thereto that it provides a path for the transmission of electrical energy. A conductor section 70 is secured in the outer end of the insert 69 and extends longitudinally from the insert. A coupling socket or flange 71 is provided on the outer end of the conductor 70. The flange 71 is provided with screws 72 to facilitate the connection of the conductor 70 with other conducting elements. A tubular lateral 73 extends from the conductor 70. A similar tubular lateral 74 is secured in an opening in the contact insert 69 and extends outwardly through an opening 75 in the wall of the body section 61. The outer conductor 67 which is associated with the body section 60 has an elongate tubular lateral 76 provided at its outer end with a coupling or flange 77. The flange 77 is equipped with screws 78 to

facilitate the connection of the lateral 76 with other conducting equipment.

The means for connecting the sections 60 and 61 for relative turning or rotary movement is an anti-friction means. The means 62 includes two sets of registering annular grooves formed in the periphery of the section 60 and the interior of the section 61 and shaped to constitute annular ball races 79. Series of balls 80 are provided in the races 79 to connect the sections 60 and 61 for free relative turning. Radial openings 81 are provided in the wall of the section 61 to join the races 79. The radial openings 81 permit the ready insertion of the balls 80 into the races 79. Threaded plugs 82 close the openings 81 and are secured against loss by cotter keys 83. It will be seen that the spaced series of balls 80 engaged in the raceways 79 connect the sections 60 and 61 for free relative turning and maintain the sections in the concentric relation.

The means 63 serves to seal between the inner section 60 and the other section 61. The packing means 63 comprises a packing ring assembly engaged around the reduced portion 65 of the inner section 60. The sealing ring assembly includes an inner ring 84 of metal, or the like, bearing against the shoulder 66 and a series of chevron sealing rings 85 engaged against the inner ring. An outer ring 86 of metal, or the like, engages the outermost ring 85 and a lubricant retaining ring 87 of felt, or the like, is engaged against the ring 86. Means is provided for maintaining the sealing ring assembly in the actuated condition. This means comprises a spring 88 engaged under compression between the internal wall of the section 61 and a ring 89 which bears against the grease retaining ring 87. In the construction illustrated the self-lubricating bearing ring 90 of lubricant impregnated bronze, or the like, is set in the section 61 at the outer end of the spring 88 and engages about the section 60.

The inner conductor assembly includes a tubular conductor 91 extending within the conductor 70 and provided at its outer end with a contact 92 for cooperation with a complementary contact (not shown). A sleeve 93 rotatably fits around the conductor 91 and carries a lateral conductor rod 94. The rod 94 extends outwardly through the lateral 73 and its outer end is engaged in a plug 95 closing the outer end of the lateral. A conductor rod 96 extends longitudinally through the conductor 67 and has its outer end engaged in a plug 97 closing the outer end of the conductor 67. A lateral pin 98 projects from the conductor 96 and carries a tubular conductor 99. The conductor 99 extends outwardly within the lateral 76 and is adapted for connection with another conductor (not shown).

The means 64 serves to electrically connect the relatively turnable conductors 91 and 96. The means 64 includes a contact insert 100 fixed to the inner end of the conductor 91 and extending longitudinally toward the conductor 96. The insert 100 has a reduced inner portion 101. A contact sleeve 102 is fixed on the inner end of the conductor 96 and engages around the portion 101 to provide a path for the transmission of electrical energy between the conductors 96 and 91. A steel pin 103 is fixed in the end of the conductor 96 and turnably engages in a bushed opening 104 in the insert 101 to maintain the parts in the coaxial relation. The contact insert 101 is provided with a lateral conductor rod 105. The rod 105 extends outwardly through the lateral 74 and its outer end is engaged in a plug 106 closing the outer end of the lateral 74.

The outer body section 71 may be provided with a radial mounting flange 107 to facilitate the mounting of the body assembly. The flange 107 may have spaced openings 108 for the reception of securing parts and is interrupted by a notch 109 to make the outer opening 81 and its plug 82 readily accessible.

Having described only typical preferred forms and applications of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claim.

Having described my invention, I claim:

An electrical connection including two tubular sections, outer tubular conductors rigid with the sections with their ends spaced apart, means connecting the sections for relative turning, a contact sleeve between the ends of the conductors and fixed in one section and engaging in the other section, and means for sealing between the sections including an assembly of chevron type sealing rings sealing between telescoping parts of the sections and in communication with the space between the ends of the conductors to be actuated by fluid pressure from said conductors.

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