Oct. 14, 1947. B. W. BENBOW 2,428,957

TRANSITION SECTION FOR ELECTRICAL TROLLEY APPARATUS

Filed Dec. 26, 1944

FIG. 1

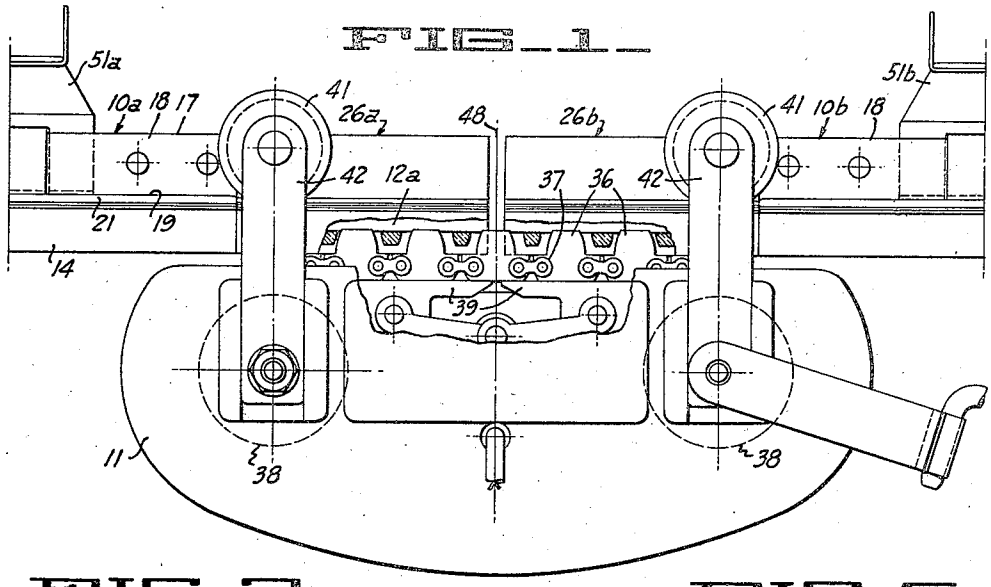


FIG. 3

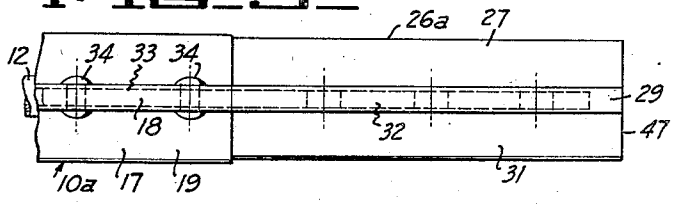
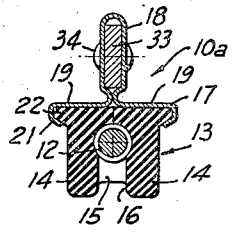
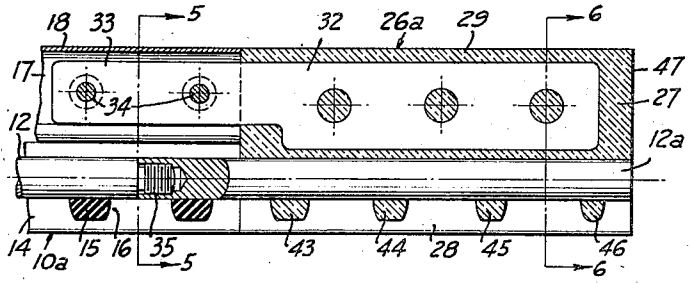


FIG. 5





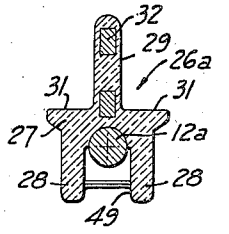


FIG. 2

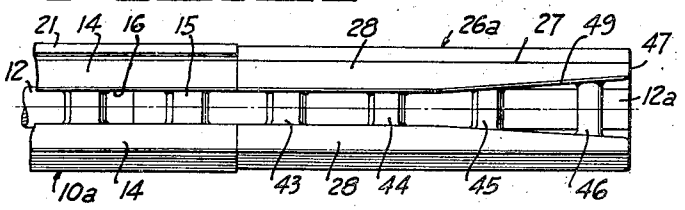


FIG. 4

FIG. 6

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Patented Oct. 14, 1947 2,428,957

UNITED STATES PATENT OFFICE

2,428,957

TRANSITION SECTION FOR ELECTRICAL TROLLEY APPARATUS

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Application December 26, 1944, Serial No. 569,785

3 Claims. (Cl. 191—22)

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This invention relates generally to electrical trolley apparatus such as is suitable for use with hoists, cranes, locomotives and the like.

In my Patent No. 2,255,874, there is disclosed a novel type of electrical trolley apparatus utilizing a conductor assembly having a trolley wire or conductor enclosed within a sheath of insulating material, the sheath having spaced recesses in one side of the same which are separated by teeth-like bars of insulating material. The movable contacting device or trolley box utilized with the conductor assembly is provided with conducting teeth linked together to form an articulated endless chain, with the teeth entering the recesses to make electrical contact with the conductor. A plurality of the teeth engage the conductor at one time, thus insuring uninterrupted contact without arcing. The teeth-like insulating bars which separate the recesses together with the remainder of the sheath preclude accidental human contact with the live conductor. Improvements to this type of equipment are disclosed in my co-pending applications Serial No. 520 399, filed January 31, 1944, and Serial No. 569 784, filed December 26, 1944.

When installing apparatus of the above type on equipment such as cranes, it is frequently desirable to operate the trolley contacting device or devices over two or more conductor assemblies which are brought into general alignment, but which are not directly connected together. Thus where an industrial building is equipped with a plurality of cranes, each intended to operate principally over a designated floor section, one may desire to shift a crane carriage from its principal trackway, to the trackway of a crane for an adjacent section. To carry out such an operation the two crane bridge girders carrying the crane trackways are brought into alignment and locked together end to end, thus bringing the trolley conductors into alignment to permit the crane carriages together with their trolley contacting devices, to operate over the extended two-crane trackway. A somewhat similar operation is frequently carried out for transferring a crane carriage from one crane bridge to another, but which is referred to as "switching" as distinguished from establishing an "interlock," for the first described operation. In switching the ends of trolley conductors are brought into alignment, although one conductor forms the leg of a switch which can be shifted to enable trolley contacting devices to move over trolley conductors which are brought into alignment with the ends of the switching leg.

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It will be appreciated that trolley apparatus of the type first described involves certain problems when it is installed for "interlocking" and "switching" operations, due to the fact that the regularly spaced insulating teeth on the sheath, which cooperate with conducting teeth on the trolley device, necessitate accurate alignment and positioning of the adjacent conductor assemblies to enable the trolley contacting devices to pass smoothly from one conductor assembly to the next. The mechanical devices used to secure alignment are incapable of or cannot be relied upon to maintain alignment to a high degree of accuracy.

In general it is an object of the invention to provide an improved conductor assembly of the type described which can be used successfully for "interlocking" and "switching" operations.

Further objects of the invention will appear from the following description in which the preferred embodiments have been set forth in detail in conjunction with the accompanying drawing.

Referring to the drawing:

Fig. 1 is a side elevational view, partly in cross-section, illustrating apparatus incorporating the present invention.

Fig. 2 is a side elevational view, on an enlarged scale, partly in cross-section, showing a conductor assembly such as is incorporated in the apparatus of Fig. 1.

Fig. 3 is a top plan view of the assembly shown in Fig. 2.

Fig. 4 is a bottom plan view of the assembly shown in Fig. 2.

Fig. 5 is a cross-sectional detail taken along the line 5—5 of Fig. 2.

Fig. 6 is a cross-sectional detail taken along the line 6—6 of Fig. 2.

The apparatus shown in Fig. 1 consists generally of two conductor assemblies 10*a* and 10*b*, each of which is associated with the bridge girder of a crane. A contacting device 11, of the type disclosed and claimed in my Patent No. 2,255,874, is arranged to operate along one of the assemblies 10*a* or 10*b*, or from one assembly to the other, when the two are in alignment as illustrated.

Each of the conductor assemblies is preferably constructed as illustrated in detail in Figs. 2 to 6 inclusive. Thus the trolley conductor 12 is surrounded by the protective shroud 13 of insulating material, which in turn is carried by the backing 17 of relatively rigid construction. The insulating material is preferably somewhat resil-

ient in character, as for example vulcanized natural or synthetic rubber, or like synthetic material such as neoprene. Briefly the shroud includes the side portions 14 which are joined below their conductor 12 by the spaced bar-like portions 15. Portions 15 are preferably shaped substantially as shown in Fig. 2, to form in effect gear-like teeth. The spaces 16 between the teeth enable access for direct electrical contact with the conductor 12. A sheath of this type is disclosed in my Patent No. 2,255,874 for use with a contacting device 11 making use of conductor teeth linked together as an endless chain.

The backing 17 for the sheath 13 can be made of pressed metal substantially as disclosed and claimed in my co-pending application Serial No. 569,784, filed Dec. 26, 1944. Briefly the sheet metal forming this backing is bent to substantially T-shaped form, to provide rib portions 18 and laterally extending track portions 19. The track portions have turned over or crimped edges 21, which serve to grip ribs 22 provided upon the upper side quarters of the shroud. The two metal walls forming the ribbed portion 18 are spaced apart to provide for greater rigidity, and to enable insertion of attaching devices as will be presently described.

Each of the assemblies 10*a*, 10*b* has attached to it an end transfer portion 26*a*, 26*b* of special construction. Referring to Figs. 2 and 6 the transfer portion 26*a* includes a body 27 formed of suitable insulating material, such as a molded phenolic condensate or like plastic product. The depending sides 28 of the body form a continuation of the side portions 14 of the assembly 10*a*. These portions are also connected by teeth such as will be presently described. The upper part of the body is formed to provide the rib 29 as an extension of the rib 18 of assembly 10*a*, and also to form parallel surfaces 31 which are on the same level as surfaces 19, and which form an extension of the same. Suitable means can be provided for attaching portion 26*a* to the assembly 10*a*. Thus a flat metal strip 32 is imbedded within the rib 29, and has a tongue-like extension 33 adapted to be accommodated within the rib 18 of the assembly 10*a*. Rivets or screws 34 can be extended through the rib 18 and the tongue 33, to retain these parts together.

The conductor 12*a* within transfer portion 26*a* is bonded fast to the molded body 27 and is coupled to the main conductor 12 as by means of a threaded connection 35. Conductor 12 is preferably free to turn or slide with respect to its sheath 13.

Before explaining the manner in which the teeth of portion 26*a* are formed, it should be pointed out that the contacting device 11 as disclosed in said Patent No. 2,255,874 makes use of a plurality of teeth 36 which are connected together by links 37, to form an articulated endless chain. The end loops of the chain are retained upon the sheaves 38, and the lower faces of the upper run of the teeth are contacted by a spring pressed bus bar 39. The teeth 36 are accommodated within the recesses 16 to make continuous electrical contact with the lower side of the conductor 12. Normally the spacing between teeth 15 is such that the teeth 36 enter and leave the recesses 16, without undue play between the teeth 15 and the teeth 36 such as would result if the recesses 16 had a width greatly in excess of the effective width of the teeth 36. In the present arrangement the teeth 36 in registry within associated recesses 16 are held in firm

yieldable contact with the conductor 12, by virtue of flanged tracking rollers or wheels 41 which engage the two parallel track surfaces 19. These rollers are journaled to the upper ends of straps 42, which in turn are mounted upon the housing of the contacting device 11.

It will be apparent that the number of teeth 36 which are in engagement with the conductor 12 at any one instant will depend upon the construction of the device 11. However in this instance it will be noted that six teeth are in contact, and that the span of these teeth is greater than the length of each of the end transfer portions 26*a* and 26*b*, but somewhat less than the combined length of portions 26*a* and 26*b*.

As shown in Fig. 2 the portion 26*a* is provided with four teeth separately numbered 43 to 46 inclusive. Tooth 46 is of a width greatly less than the teeth 15, as for example about one-half the width of teeth 15 as illustrated. Teeth 43, 44 and 45 are dimensioned to progressively decreasing widths intermediate teeth 15 and 46. Tooth 46 also has a rounded end portion. The distance between the centers of teeth 43 to 46 remains the same as for the teeth 15. The center of tooth 46 is located a distance from the end face 47 which is one-half the normal distance between centers of teeth 15, less one-half the mean gap 48, between adjacent portions 26*a*, 26*b*, as aligned in Fig. 1. In addition to making the teeth of portion 26*a* of progressively decreasing width, it is desirable to form the inner contour line 49 for the side portions 28 divergent near the end face 47, as shown by the bottom plan view of Fig. 4. This serves to accommodate a small amount of lateral misalignment as will be presently described.

Operation of the apparatus described above can be outlined as follows: Referring first to Fig. 1 it is assumed that the two assemblies 10*a* and 10*b* are mounted as by means of brackets 51*a* and 51*b* to the bridge girders of two adjacent crane installations of an industrial building. Generally two or more conductor assemblies will be carried by the bridge girders of one crane, with a contacting device 11 for each conductor assembly, in order to complete a single or polyphase electrical circuit to the crane motor or motors. When it is desired to secure conjoint use of two adjacent cranes, their bridge girders are aligned and locked together. This serves to bring the assemblies 10*a* and 10*b* in substantial alignment, with a gap 48 between the transfer portions 26*a*, 26*b*, the width of which is dependent somewhat upon the tolerances inherent in the locking mechanism. Now as the carriage of one crane is caused to traverse into the area covered by the second crane, the contacting device 11 must pass across the gap 48 without losing contact with the conductors 12, irrespective of some misalignment, and without interference between the teeth 36 and the insulating teeth. The construction described enables free passage of the contactor device 11 from one crane area to another, irrespective of some misalignment, by virtue of the structural features previously described. Assuming that the gap 48 is actually considerably less than its mean value, it is evident that the reduced width of the teeth 46 precludes accidental interference between this tooth and an approaching conducting tooth 36, because the approaching tooth 36 will still have sufficient space within which to enter in contact with conductor 12. In addition assuming for example that contacting device 11 is moving from left to right as viewed in Fig. 1, as a tooth

36 first contacts the conductor portion 26b, its location remains under the control of one of the larger teeth 43 or 44 of portion 26a. However as more teeth contact the conductor of portion 26b, the progressively larger teeth of this portion take control over positioning of teeth 36, until the last tooth is retracted from the conductor of portion 26a. It will be evident that this arrangement makes possible free passage of the contacting device 11 from one crane area to another, across a gap 48 between conductor assemblies which in practice may vary as much as say ⅛ of an inch plus or minus, where the normal distance between the teeth 15 is of the order of $\frac{7}{16}$ inch. Should there be some misalignment between the conductor assemblies, as viewed in plan, free passage of the contacting device 11 is facilitated by virtue of the divergent contour lines 49.

It will be evident from the foregoing that my invention makes possible use of shrouded trolley conductors of the type previously described, in installations requiring so-called "switching" or "interlock" operations. As previously explained in switching operations conductor assemblies are likewise generally aligned, as in the case of interlock operations.

I claim:

1. In electrical trolley apparatus for use with equipment such as cranes, where adjacent ends of trolley conductors are aligned for passage of a trolley contacting device, a conductor assembly including a conductor and a surrounding sheath of insulating material, said sheath being formed to provide a plurality of recesses in one side of the same for enabling access to the conductor, the recesses being separated by regularly spaced teeth-like portions of insulating material, an end portion of the sheath at the end of the conductor having a plurality of said teeth formed with progressively decreased width in the direction of the length of the conductor, said end portion serving to facilitate transfer of a contacting device from said assembly to a like formed adjacent aligned assembly.

2. In electrical trolley apparatus for use with equipment such as cranes where adjacent ends of trolley conductors are aligned for passage of a trolley contacting device and where the trolley contacting device is provided with articulated conducting teeth adapted to contact the conductor at spaced intervals, a main conductor assembly including a trolley conductor and a surrounding sheath of insulating material, the sheath having regular spaced recesses extending through one side of the same to enable the conducting teeth of the trolley device to make engagement with the conductor, the recesses being separated by regularly spaced teeth-like bars of insulating material, an end transfer portion attached to one end of the main conductor assembly and forming an extension of the same, the transfer portion including a conductor portion forming an extension of the main conductor, a body of insulating material forming an extension of the sheath of the main conductor assembly, one side of the body of insulating material being provided with spaced recesses extending through

one side of the same to enable the conducting teeth of the trolley device to make engagement with the conductor, the recesses being separated by teeth corresponding to the teeth of the main sheath and having a distance between centers corresponding to the distance between centers of the teeth on the main sheath, the teeth of the transfer portion being of progressively decreased width in a direction toward the end of the same thereby facilitating transfer of the trolley device to an adjacent aligned transfer portion and main conductor assembly.

3. In electrical trolley apparatus for use with equipment such as cranes where adjacent ends of trolley conductors are aligned for passage of a trolley contacting device and where the trolley contacting device is provided with articulated conducting teeth of uniform pitch adapted to contact the conductor at spaced intervals and connected together to form an endless chain, a main conductor assembly including a trolley conductor and a surrounding sheath of insulating material, the sheath having regularly spaced recesses extending through one side of the same to enable an aligned number of the conducting teeth of the trolley device to make simultaneous engagement with the conductor, the recesses being separated by regularly spaced teeth-like bars of uniform pitch and formed of insulating material, an end transfer portion attached to one end of the main conductor assembly and forming an extension of the same, the transfer portion including a conductor portion forming an extension of the main conductor, a body of insulating material forming an extension of the sheath of the main conductor assembly, one side of the body of insulating material being recessed to enable the conducting teeth of the trolley to make engagement with the conductor, the recess being interrupted by a tooth extending laterally of the conductor extension and having a width substantially less than the width of the teeth of the main conductor assembly, the distance between the center of said tooth and the nearest tooth of the main conductor assembly being a multiple of the distance between centers of teeth of the main conductor assembly, and being substantially less than the total length of said aligned conducting teeth.

BURTIS W. BENBOW.

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