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O'Nan et al.

[11] **3,884,541**

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[54] **ASSEMBLY FOR CONNECTING A CURRENT TAKE-OFF UNIT TO A PLURALITY OF BUS BARS**

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[52] **U.S. Cl.** ..... **339/22 B**; 317/120; 174/71 B; 339/255 P

[51] **Int. Cl.** **H01r 13/60**

[58] **Field of Search** ..... 317/118, 120; 174/71 B, 174/88 B; 339/22 B, 255 P, 261, 266; 200/256

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[57] **ABSTRACT**

An assembly is provided to facilitate connecting of a current take-off unit to a plurality of bus bars as normally found in an electrical distribution system. The assembly includes pairs of jaw members disposed within a housing. The corresponding ends of each pair of jaw members project from the housing and clampingly engage a bus bar. The corresponding opposite ends of said pair of jaw members engage an elongated connector piece which projects from the housing and is adapted to be connected to the current take-off unit. The assembly is provided with a spring for providing adequate contact clamping pressure between the jaw members and the bus bar. An adjustable means is also provided for the jaw members for attaining a higher contact clamping pressure and thus a lower contact resistance even under severe operating loads. An insulating element substantially encompasses a portion of the pair of jaw members, a portion of the connector piece, the biasing spring, and the adjustable jaw member tightening means disposed within the housing. An adjustable adaptor member of nonconductive material is disposed within the housing and is in engagement with the jaw member tightening means whereby the latter may be manually adjusted relative to the jaw members to increase the clamping pressure thereof on the bus bar. The adaptor member has a portion thereof accessible from the housing exterior whereby manual force can be applied thereto to effect manual adjustment of the jaw member tightening means.

8 Claims, 8 Drawing Figures

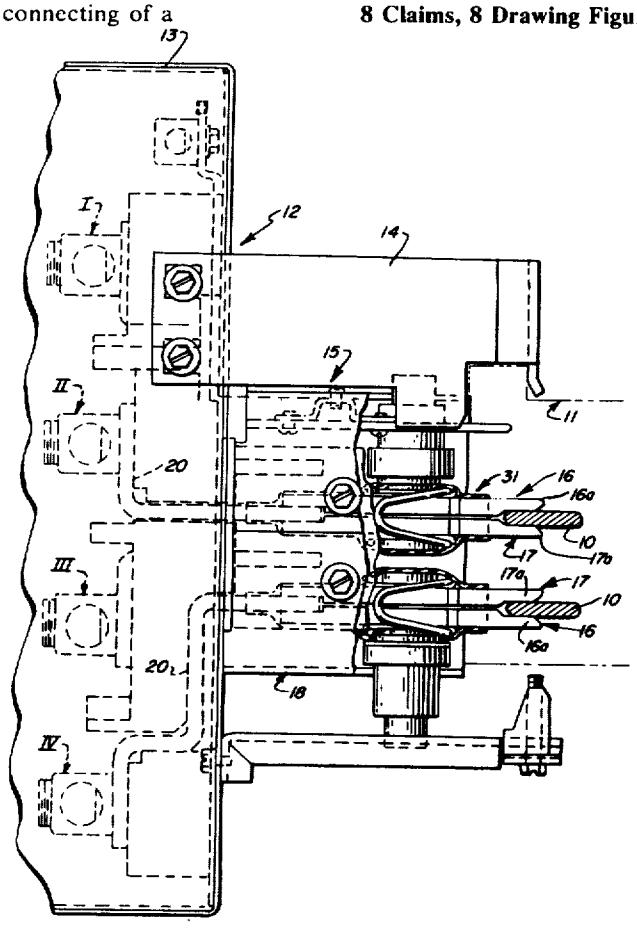


FIG. 6

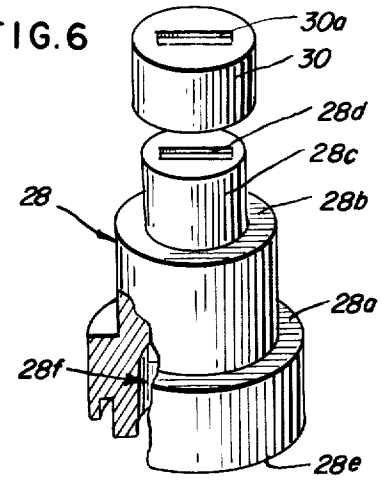


FIG. 7

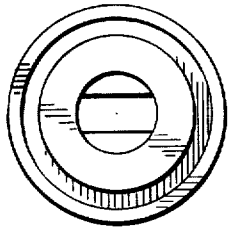


FIG. 1

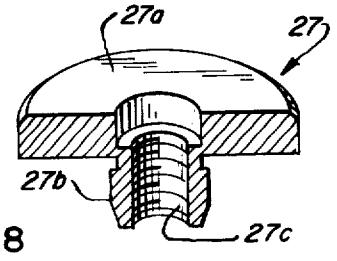


FIG. 8

FIG. 2

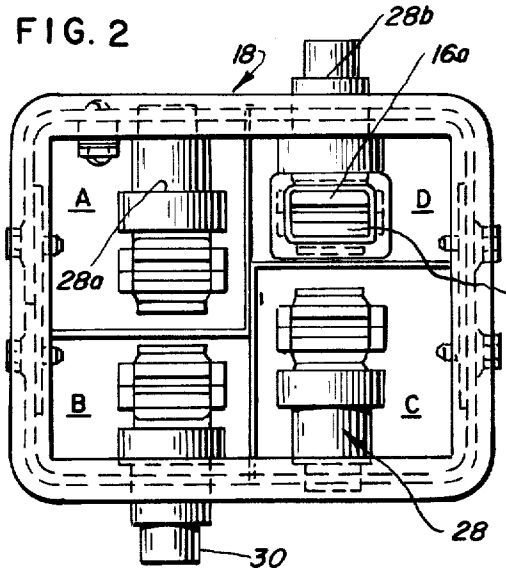


FIG. 5

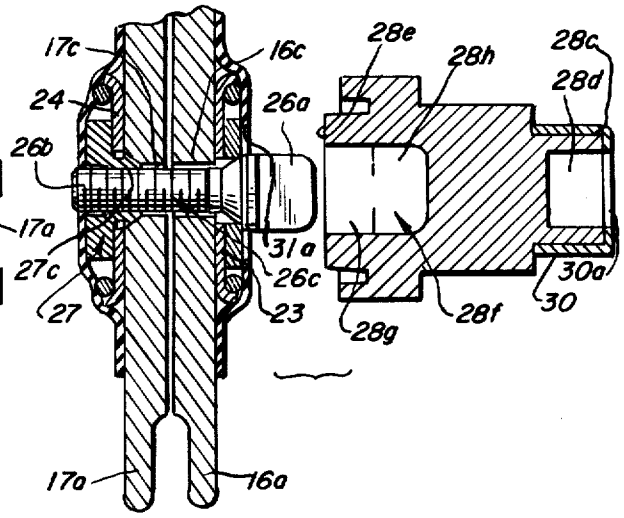


FIG. 3

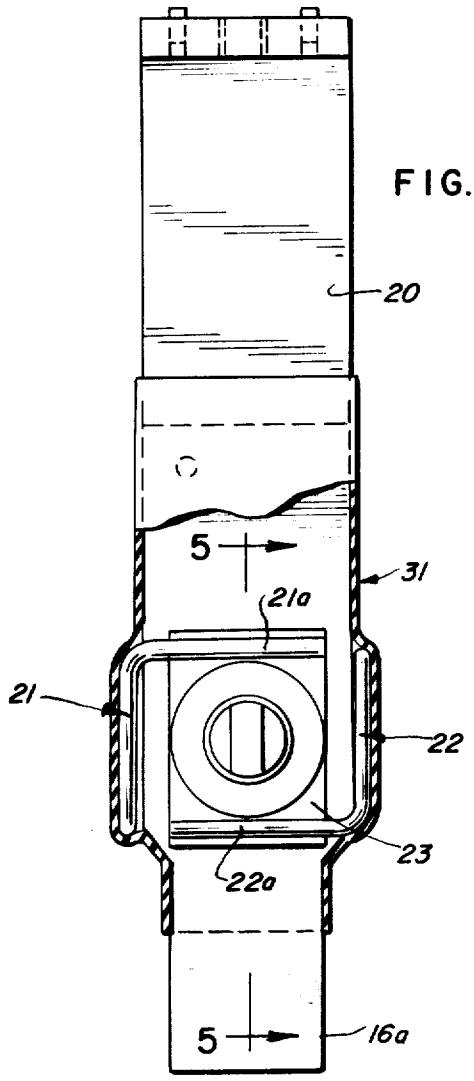
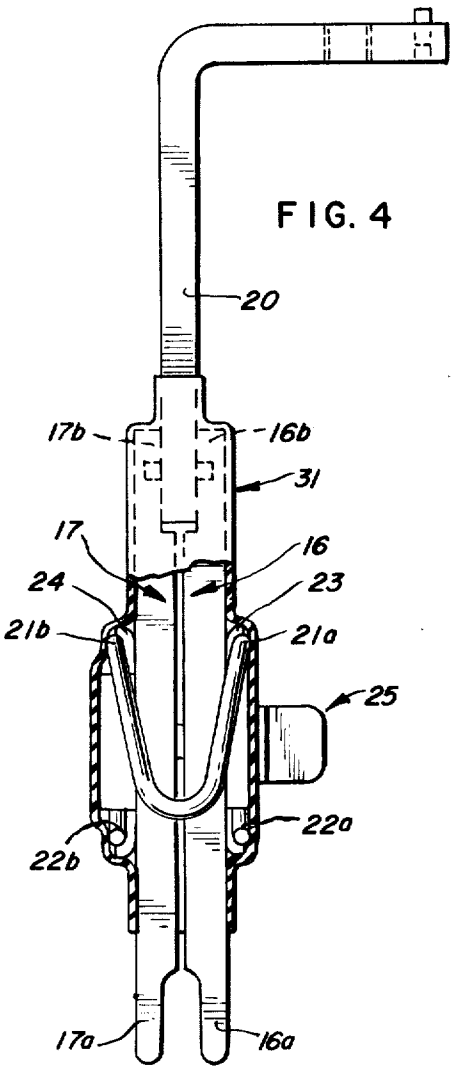


FIG. 4



ASSEMBLY FOR CONNECTING A CURRENT TAKE-OFF UNIT TO A PLURALITY OF BUS BARS

BACKGROUND OF THE INVENTION

In electrical distribution systems utilizing bus bars or runs disposed within elongated ducts, numerous current take-off units, such as plug housings, switch boxes, circuit breakers, etc., are connected to the bus bars at selected positions along the ducts. Heretofore the connecting of such units to the bus bars was an awkward and frustrating operation because the jaw members utilized to clamp the bus bars were not readily accessible for manual manipulation and/or the bite or clamp on the bus bars by the jaw members was not sufficient to attain a low contact resistance. Furthermore, manual adjustment of the jaw members oftentimes required special tools and frequently required substantial disassembly of the assembly and unit.

SUMMARY OF THE INVENTION

Thus, it is an object of the invention to provide an assembly of the type described which is of compact construction, may be readily manipulated into bus bar-clamping relation without requiring disassembly of the various components comprising the assembly and unit.

It is a further object of the invention to provide an assembly of the type described wherein the jaw members thereof may be manually adjusted without requiring special tools designed particularly for such purpose.

It is a further object of the invention to provide an assembly of the type described which is capable of being readily used with bus bars of various sizes and current carrying capacities.

It is a still further object of the invention to provide an assembly of the type described which will effectively and securely clamp the bus bars, thereby enabling a low contact resistance to be attained even when the distribution system is subjected to very severe operating loads.

It is a still further object of the invention to provide an assembly of the type described which provides various shock preventative features for persons installing or adjusting the various components of the assembly.

Further and additional objects will appear from the description, accompanying drawings, and appended claims.

In accordance with one embodiment of the invention, an assembly is provided for connecting a current take-off unit to one or more bus bars. The assembly comprises a hollow housing and a plurality of jaw members arranged in pairs and disposed within the housing. Each jaw member of a pair has one end thereof protruding from the housing and clampingly engaging a bus bar. The opposite end of the jaw member is secured to an elongated connector piece which in turn is connected to the current take-off unit. A spring engages the pair of jaw members and maintains same in proper relative position so that the jaw members can be readily moved into clamping relation with the bus bar. An adjustable jaw member tightening means is provided which cooperates with each pair of jaw members and tightens same into proper bus bar-clamping relation so as to attain a low contact resistance. An insulating element substantially encompasses the portion of the jaw members, connector piece, spring and jaw member tightening means disposed within the housing. A hollow adaptor piece is disposed within the housing and engages the jaw member tightening means. The adaptor piece has a portion thereof which is accessible from the housing exterior whereby a manual turning force can be applied thereto causing the adaptor piece and the jaw member tightening means to turn as a unit.

DESCRIPTION

For a better understanding of the invention, reference should be made to the drawings wherein

FIG. 1 is a fragmentary side elevational view, partially in section, showing one form of the improved assembly interconnecting a current take-off unit and a plurality of bus bars, the latter being disposed in a bus duct depicted in phantom lines.

FIG. 2 is a right-side elevational view of the assembly of FIG. 1 and showing four pairs of jaw members.

FIG. 3 is an enlarged fragmentary top plan view of one pair of the jaw members disposed within the assembly housing and having a portion of the insulating element removed.

FIG. 4 is a left-side elevational view of the jaw members of FIG. 3 and with the adaptor piece and a portion of the insulating element therefor removed.

FIG. 5 is a fragmentary sectional view taken along line 5—5 of FIG. 3 and showing the adaptor piece therefor in a disengaged relation.

FIG. 6 is an exploded perspective view of the adaptor piece shown in FIG. 5.

FIG. 7 is an elevational view of the concealed open end of the adaptor piece of FIG. 6.

FIG. 8 is an enlarged perspective sectional view of one component of the assembly shown in FIG. 1.

Referring now to the drawings and more particularly to FIG. 1, a portion of an electrical distribution system is shown which may be embodied in a commercial building or manufacturing facility. In such a distribution system a plurality of bus runs or bars 10 of suitable conductive material are disposed within an elongated bar duct 11, shown in phantom lines. The relative positions of the bus bars 10 within the duct are maintained by suitable insulating brackets or the like, not shown, mounted therein in a manner well understood in the art. The number of bus bars disposed within a given duct and the cross-sectional configuration of the bus bars may vary from that shown without departing from the scope of the disclosed invention.

The current take-off unit 12 may take various forms such as a plug housing, a switch box, a circuit breaker or the like. The unit 12 shown in FIG. 1 is a plug housing having a series of plugs I, II, III and IV disposed within a box or cabinet 13, the latter normally being fastened to the busway or duct and given auxiliary support by means of drop rods, brackets, or the like, secured to a ceiling or wall. A hook-like member 14 may be provided which protrudes from the cabinet 13 and is adapted to engage a portion of the duct 11.

Interposed the cabinet 13 and the duct 11 is an assembly 15. In the illustrated embodiment, assembly 15 includes a plurality of jaw members 16 and 17 of substantially like construction arranged in pairs and disposed within a housing 18. The interior of the housing, as seen in FIG. 2, is formed into four compartments A, B, C and D, one compartment being provided for each pair of jaw members. The size and configuration of the housing 18 may vary from that shown and will depend upon the number of bus bars to be connected to the

unit **12** and the positioning of the unit relative to the bus bars.

The jaw members **16** and **17** of each pair have corresponding ends **16***a* and **17***a* thereof protruding from the housing **18** and in clamping relation with the corresponding bus bar **10**, as seen in FIG. **1**. The opposite corresponding ends **16***b* and **17***b* of the jaw members are secured to one end of a connector piece **20**. The connector piece is of conductive material and extends into the cabinet **13** of unit **12** and is connected to one of the plugs I, II, III or IV. The shape of the piece **20** will depend upon the location of the plug within the cabinet.

Resiliently engaging the exterior of the pair of jaw members **16** and **17** at approximately their midlengths are biasing springs **21** and **22**. Each spring in the illustrated embodiment is of like construction and exerts a bar-clamping bias on the ends of the jaw members. The ends **21***a* and *b* or **22***a* and *b* of the spring engage corresponding retainers **23** and **24** disposed on opposed exterior surfaces of the pair of jaw members. The springs maintain the jaw members in proper relative position so as to facilitate moving of the jaw members into bus bar-clamping relation.

Also disposed at approximately midlength of each jaw member of a pair is a device **25** which is manually adjustable and is adapted to tighten the jaw members into a high contact-clamping pressure with respect to the bus bar and thus result in a low contact resistance. As seen in FIG. **5**, the device includes a bolt **26** having an enlarged facetted head **26***a* disposed at one end and protruding from one side of the pair of jaw members. The opposite end **25***b* of the bolt is threaded into a splined nut **27** carried on the opposite side of the pair of jaw members. The shank **26***c* of the bolt **26** extends through aligned openings **16***c* and **17***c* formed in the jaw members.

The splined nut **27**, as seen more clearly in section in FIG. **8**, has an enlarged annular end portion **17***a* which rests against the exterior surface of the retainer **24**. An externally splined sleeve portion **27***b* extends from the concealed surface of portion **27***a* and is in press-fit relation within the opening **17***c* formed in jaw member **17**. Sleeve portion **27***b* is internally threaded to receive the threaded end **26***b* of the bolt **26**. The central opening **27***c* formed in annular end portion **27***a* is preferably countersunk. The thickness of the annular end portion approximates the thickness of the material forming the springs **21** and **22**.

Manual adjustment of the bolt **26** is effected through an adaptor piece **28**, shown more clearly in FIGS. **5–7**. The adaptor piece is formed of a nonconductive material and has a tapered exterior configuration provided with a plurality of concentrically disposed ledges or shoulders **28***a* and **28***b*. The small end **28***c* of the piece is closed except for a slot-like pocket **28***d* formed therein. The pocket is sized to accommodate the tip of a screwdriver or the like. To reinforce the end **28***c* so as to withstand the external turning force manually applied thereto, an inverted cup-shape cap **30** may be affixed to the end **28***c* of the adaptor piece **28**. The cap is provided with a slot **30***a* which coincides with the open end of the pocket **28***d* formed in the end **28***c* of the adaptor piece **28**. In certain instances the exterior of the small end portion of the adaptor piece and cap may have a facetted exterior surface rather than a cylindrical shape, thereby enabling the adaptor piece to be turned by a wrench. In either instance the adaptor piece may be readily adjusted from outside the housing **18**.

The opposite or enlarged end **28***e* of piece **28** provides an opening to a cavity **28***f* formed within the piece interior. The portion **28***g* of the cavity adjacent the end **28***e* thereof has a cylindrical configuration. The portion **28***h* of the cavity adjacent the closed end thereof has a narrow cross-sectional configuration which is adapted to accommodate the facetted protruding end **28***a* of bolt **26**. The axial lengths of both cavity portions **28***g* and **28***h* are such that the bolt **26** can be turned and moved longitudinally relative to the piece **28** to a tightened or loosened position relative to the jaw members.

As seen in FIG. **2**, the adaptor pieces **28**, one being provided for each pair of jaw members, are disposed within the housing **18**. Besides functioning as a means for effecting manual turning of the bolt **26**, the adaptor piece **28** also serves as a means of spacing the jaw members within an interior compartment A, B, C or D. As seen in FIG. **2** the piece disposed within compartment A has the small end portion **28***c* thereof disposed within a suitable first opening formed in a top wall of the housing. The opening is sized so that only end portion **28***c* will fit therein. Thus, the exterior ledge **28***b* of the piece engages the interior surface of the portion of the housing wall circumjacent the opening. The same arrangement, in the illustrated embodiment, is to be found in compartment C.

On the other hand, the adaptor pieces disposed in compartments B and D each has the smaller end **28***c* thereof and the portion of the piece exterior disposed between ledges **28***a* and **28***b* extending through a second opening formed in the adjacent top and bottom walls of the housing. Thus, the ledge **28***a* on the piece exterior engages the interior surface of the portion of the housing wall circumjacent the second opening. Thus, as seen in FIG. **2**, the pairs of jaw members disposed in compartments A and C are spaced a greater distance from the top and bottom walls, respectively, of the housing **18** than the pairs of jaw members disposed in compartments D and B.

It is to be understood, of course, that the shape of the adaptor piece may vary from that shown and will depend upon the relative location of the pair of jaw members within a given compartment.

An insulating sleeve **31** encompasses the midportion of the jaw members of a pair and the ends **16***b* and **17***b* thereof; the springs **21** and **22**; the retainers **23** and **24**; and nut **27**. The sleeve is shaped to conform substantially to the exterior configuration of components encompassed thereby. A suitable opening **31***a* is formed in the sleeve to accommodate the bolt end **26***a*.

The pair of jaw members **16** and **17**, the pair of springs **21** and **22**, the spring retainers **23** and **24**, the splined nut **27**, the connector piece **20** and the insulating sleeve **31** form a unit which is preferably factory assembled within the housing **18**.

Thus, it will be seen that an assembly has been provided which is of simple, compact construction, and will provide a secure connection between a current take-off unit and one or more bus bars. The tightening or releasing of the pairs of jaw members, carried within the assembly housing, with respect to the bus bars may be readily accomplished externally of the housing with a conventional tool. The assembly incorporates numer-

ous insulating means to prevent accidental shock being incurred by the person installing or adjusting various components of the assembly.

We claim:

1. In an electrical distribution system, an assembly for connecting a current take-off unit to a plurality of bus bars; said assembly comprising a housing and pairs of jaw members mounted within said housing and protruding outwardly therefrom; each pair of jaw members having corresponding ends for clampingly engaging a bus bar; an elongated connector piece secured to the opposite corresponding ends of said jaw members and adapted to be connected to the current take-off unit; first means for resiliently retaining said jaw members in a bus bar-clamping relation; adjustable second means for tightening said jaw members into said bus bar-clamping relation; an insulating element substantially encompassing a portion of said jaw members, said first and second means, and a portion of said connector piece disposed within said housing, and an elongated third means having at least a portion thereof disposed within said housing and engaging said second means, said third means having a segment thereof accessible from the housing exterior whereby manual adjustment of said third means is effected from said housing exterior.

2. The assembly of claim 1 wherein the adjustable second means of said pair of jaw members includes an elongated first piece disposed transversely of and extending through said jaw members, said first piece having one end thereof threadedly connected to a second piece on one jaw member and a second end thereof projecting from the second jaw member of the pair and in adjustable engagement with said third means.

3. The assembly of claim 1 wherein the third means of each pair of jaw members includes an elongated hollow adaptor element having an open one end and an opposite end, said opposite end being provided with means accessible from the housing exterior whereby manual turning force applied thereto effects adjustment of said second means to either a tightened or loosened position relative to the pair of jaw members, the interior of said adaptor element being contoured and accommodating a portion of said second means whereby said second means and said adaptor element are adapted to turn as a unit and said second means is movable longitudinally of the adaptor element.

4. The assembly of claim 2 wherein the second end of said first piece is provided with a facetted peripheral segment, and said third means of each pair of jaw members includes an elongated hollow adaptor element having one end thereof accessible from the housing exterior for the application thereto of a manual turning force, and an open second end thereof through which the one end of said first piece extends into the interior of said hollow element, said interior being contoured to accommodate the facetted peripheral segment of said first piece one end whereby said second means and said adaptor element turn as a unit when the manual turning force is applied to the accessible end of said adaptor element.

5. The assembly of claim 3 wherein said adaptor element is formed of nonconductive material, and said housing is provided with an opening through which extends an exposed end portion of said hollow element.

6. The assembly of claim 5 wherein the exterior of said hollow element is provided with a shoulder impassable relative to the housing opening and engaging the interior surface of the housing circumjacent the opening.

7. The assembly of claim 6 wherein the exterior of said hollow element is provided with a plurality of shoulders arranged in longitudinally spaced relation disposed intermediate the ends of said hollow element, the outward projection of said shoulders relative to the longitudinal axis of the adaptor element being progressively greater starting with the shoulder closest to the exposed end of said element.

8. The assembly of claim 1 wherein the interior of said housing is formed into a plurality of compartments, one pair of jaw members being disposed within each compartment.

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