Feb. 25, 1964 C. J. ATKINSON 3,122,603

BUSWAY PLUG CLAMP

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FIG. 1.

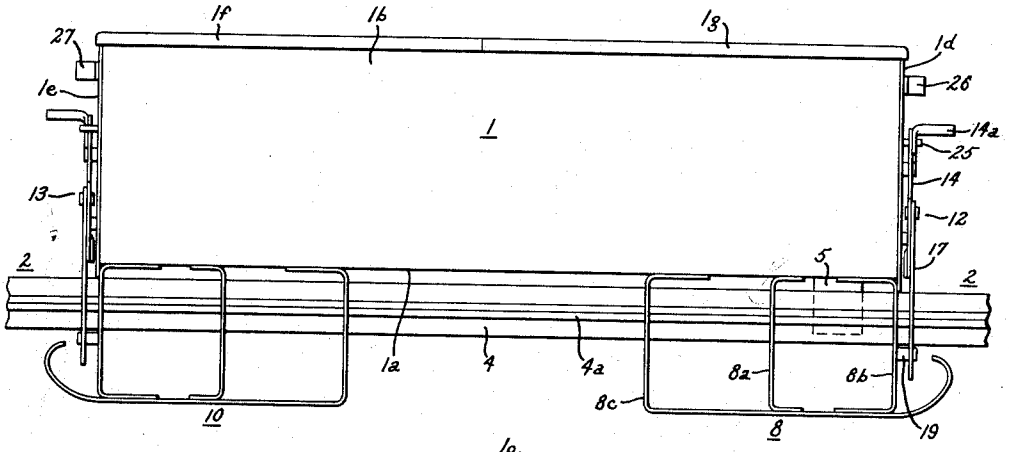
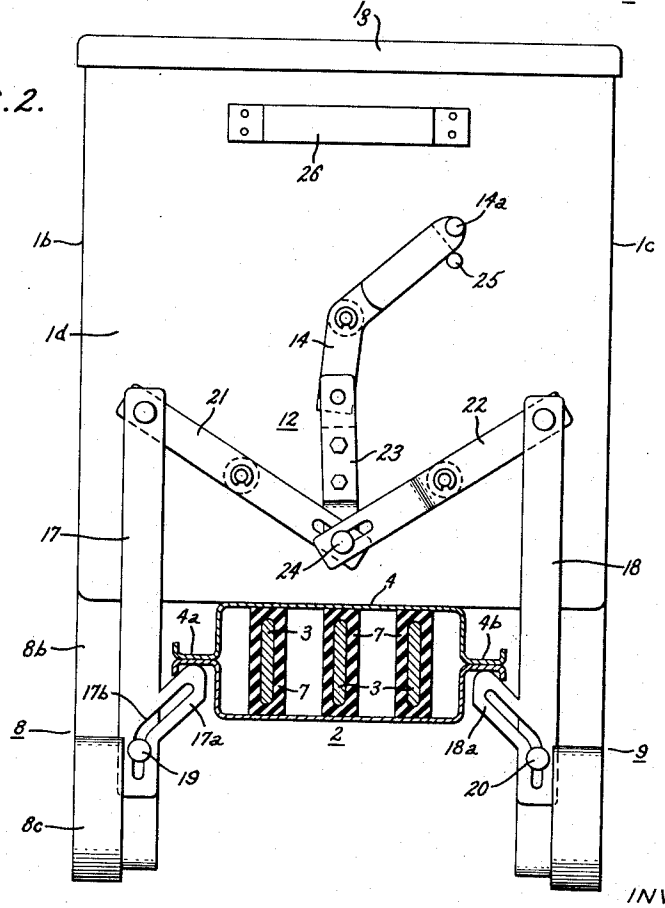


FIG. 2.



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FIG. 3.

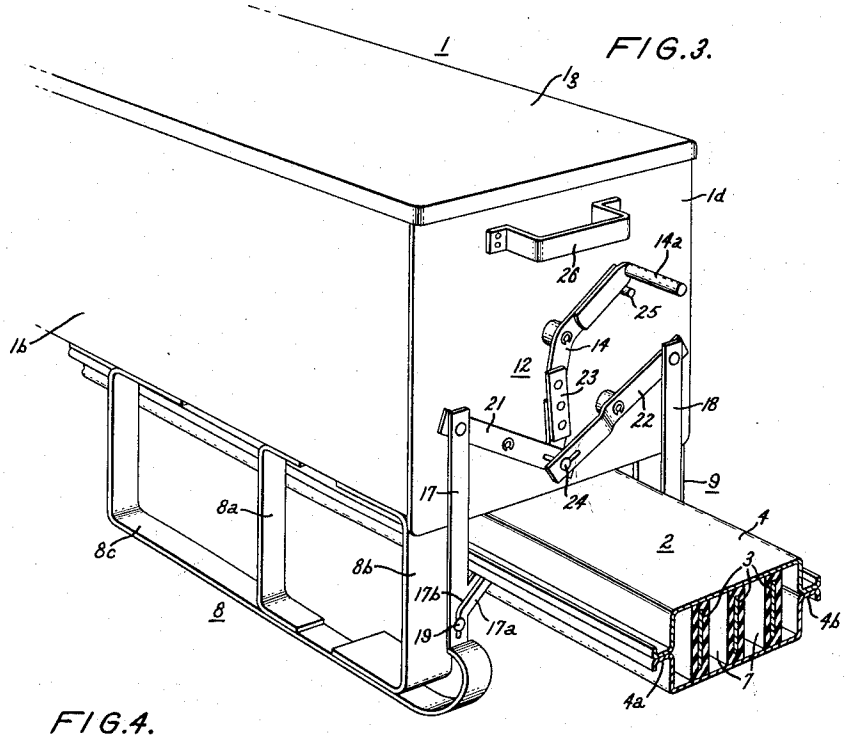
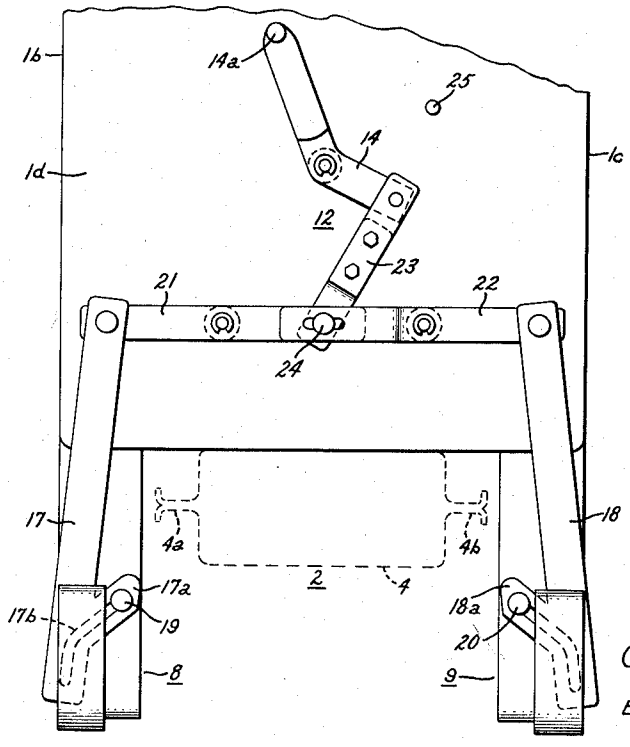


FIG. 4.



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3,122,603

BUSWAY PLUG CLAMP

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4 Claims. (Cl. 174—50)

This invention relates to power takeoff devices of the plug-in type which are removably mounted on the housings of busways of an electrical distribution system and it has for an object the provision of means for facilitating the attachment of the plug-in device to the housing and removal therefrom.

Conventional plug-in devices are provided with stab type contact members which engage the electrical bus bars inside the housing when the plug-in device is mounted on the busway in correct power take-off position. Usually the busway is suspended from an overhead support in an elevated position which is above the heads of workmen who mount the plug-in devices on the busway.

In the conventional practice of mounting plug-in devices on busways, the plug-in device is provided with four floating clamps commonly known as hanger hooks. These hooks are set in position manually. The plug-in device is then lifted to busway height, accurately positioned with respect to the stab openings in the housing and finally plugged into its operating position. After plugging in, the device must be held accurately in position at both ends while the hanger hooks are individually tightened by means of a screw driver. Owing to such factors as the height of the busway above the floor, the size and weight of the plug-in device, the necessity for accurate individual positioning and individual tightening of four separate hanger hooks, mounting a plug-in device by the conventional method is a very slow and difficult operation. Accordingly, a further object of this invention is the provision on the plug-in device of a simple clamping means that will enable installers to mount the plug-in device in a selected operating position on the busway without having to set the positions of and to tighten hanger hooks individually and to remove the plug-in device without having to loosen them individually.

In certain industries, such, for example, as the motion picture industry and the television industry, frequent changes in location of the plug-in device on a distribution busway is required. Accordingly, another object of the invention is the provision on a plug-in device of simple clamping means that enables the plug-in device to be clamped to the busway or removed therefrom in a minimum time.

A still more specific object of the invention is the provision on a plug-in device of a clamping device by means of which the plug-in device may be quickly clamped into operating position on the busway and equally quickly unclamped therefrom without the use of any tools.

Still another object of the invention is the provision on a plug-in device of a clamping means that enables a plug-in device to be clamped to a busway or unclamped therefrom by the simple operation of moving an operating handle through a predetermined angle from one operating position to another.

In carrying the invention into effect in one form thereof, a pair of clamping assemblies are provided for each busway plug-in unit. On each of the end walls of the enclosure of the plug-in device is mounted one of these clamping assemblies. Each of these assemblies comprises an operating handle pivotally mounted on the end wall for pivotal movement between two limiting operating positions together with two clamping members each provided with a hook for engaging the housing of a busway. Means are provided on the enclosure of the plug-in device for

slidably mounting the clamping members in spaced apart relationship to straddle the busway housing on which the plug-in device is to be mounted and to guide the movement of the clamping members in a direction generally perpendicular to the base plate of the enclosure of the plug-in device and inwardly toward each other. A linkage interconnects the operating handle and the clamping members to effect clamping engagement of the clamping hooks with the busway housing in response to movement of the operating handle to one of its operating positions.

For a better and more complete understanding of the invention, reference should now be had to the following specification and to the accompanying drawings of which:

FIG. 1 is a view in front elevation of a plug-in unit provided with clamping means embodying the invention.

FIG. 2 is a view in end elevation of the plug-in device and clamping means of FIG. 1 showing the clamping means in the fully clamped position.

FIG. 3 is a view in perspective of the plug-in device and clamping means of FIGS. 1, 2 and 4 illustrating the clamping means in the fully clamped or closed position and

FIG. 4 is a partial end view illustrating the clamping means in the fully unclamped or open position.

Referring now to the drawing, a plug-in device 1 is illustrated as mounted on an electrical distribution busway 2. The busway is of the plug-in type and is provided with a plurality of bus bars 3. These are so mounted and arranged within the metal housing 4 of the busway that they are engaged by stab contacts 5 and with which the power take-off devices within the enclosure of the plug-in device are provided. Although only one stab contact 5 is illustrated in FIG. 1, it will be understood that another similar stab contact is directly behind the illustrated contact 5 and hence is not visible in FIG. 1. The bus bars 3 are supported by insulation 7 and are firmly and snugly held between the top and bottom halves of the busway housing 4. These upper and lower halves are provided with longitudinal extending lateral flanges which are securely held together by suitable fastening means (not shown). Usually the busway is mounted with the long dimension of the cross section disposed vertically so that the plug-in movement of the plug-in device is horizontal. The busway may be suspended from a ceiling or overhead support by means of hangers (not shown).

The plug-in unit 1 comprises a metal enclosure having a base plate 1*a*, side walls 1*b* and 1*c*, end walls 1*d* and 1*e* and a cover plate divided into two sections 1*f* and 1*g*. A power take-off device such as a switching device is mounted within the enclosure of the plug-in device. This switching device may be of any suitable type, e.g., it may be a molded case circuit breaker. Such a circuit breaker is connected to the stab contacts 5; thus it is connected to the bus bars 3 when the plug-in device is plugged into its operating position on the busway.

For the purpose of preventing damage to the stab contacts and to other externally mounted parts, the plug-in device is provided with protective frame work assemblies 8, 9 and 10 and a fourth assembly not illustrative in the drawing. These are individually located at either end and on either side of the longitudinal center line of the plug-in device enclosure. The frame work assembly 8 is illustrated as comprising two U-shaped brackets 8*a* and 8*b* made of steel strap or bar or other suitable material. These are secured to the base plate of the enclosure by any suitable fastening means, e.g., they may be bolted or welded thereto. Secured to the lower legs of the U-shaped members 8*a* and 8*b* and to the base plate of the enclosure is a third member 8*c* having an upright leg and a horizontal leg curved upwardly at one end so that it has a sled runner configuration. Preferably the frame

works 8, 9, 10 and the unillustrated fourth frame work are identical; consequently the preceding description of the framework assembly 8 applies to the others.

For the purpose of clamping the plug-in device to the busway 4, clamping assemblies 12 and 13 are mounted on the end panels 1*d* and 1*e* respectively of the plug-in device enclosure. The clamping assembly 12 comprises a bell crank 14 pivotally mounted on end panel 1*d* and is provided with an operating handle 14*a* together with a pair of clamp members 17 and 18 disposed to straddle a busway such as the busway 2 on which the plug-in device is to be mounted. As shown, the clamp member 17 comprises an elongated bar portion together with an integral hook portion 17*a* extending therefrom at a suitable angle that may be approximately 45 degrees. This angularly disposed hook portion is provided with a cam slot 17*b* and the clamping member 17 is movably mounted on the leg 8*b* of the protective frame work by means of a cam guide member 19. The clamping member 18 is identical with clamping member 17 and is similarly mounted on a leg of the protective frame work assembly 9 by means of a cam guide member 20. Both clamping hook members 17 and 18 are mounted so that the angularly disposed hook portions 17*a* and 18*a* extend inwardly toward each other.

Interconnecting the clamping members 17 and 18 and the handle operated bell crank 14 is a linkage system that comprises end overlapping levers 21 and 22 pivotally mounted on end panel 1*d* and a link member 23. One end of this link is pivotally connected by pin and slot connections to the overlapping levers 21 and 22 and its other end is pivotally connected to the end of the bell crank 14 opposite from the handle end. As seen most clearly in FIGS. 2, 3 and 4 each of the overlapping ends of levers 21 and 22 is provided with a slot and the adjacent end of link 23 is provided with a pin 24 that passes through and cooperates with both slots to provide a loose connection to permit rotation of levers 21 and 22 in response to rectilinear motion of link 23. In the fully clamped position of the clamping assembly the handle arm of bell crank 14 rests against a stop member 25. The clamping assembly 13 mounted on the opposite end panel 1*e* is identical with clamping assembly 14; accordingly, in order to avoid repetition a description thereof is omitted.

For the purpose of compensating for variations in manufacture and normal wear of the parts, adjustability is imparted to the clamping assembly by making the link 23 of two overlapping pieces secured together by bolts. The bolt holes in one of the pieces are enlarged to provide for sliding the pieces with respect to each other to obtain the desired effective length and then tightening the bolts.

Handles 26 and 27 are provided on the end panels for the purpoes of facilitating the efforts of the installers in lifting the plug-in device to the proper height and pushing it into its plugged in position.

With the foregoing understanding of the elements and their organization, the manner in which the plug-in device is clamped to a busway and unclamped therefrom will readily be understood from the following description.

Assuming that the plug-in device 1 is to be plugged into a plug-in type busway such as busway 2, the operating handle 14*a* on end panel 1*d* of the enclosure and its counterpart on the opposite end panel 1*e* are rotated to the unclamped or fully open position that is illustrated in FIG. 4. In this position the link 23 is in its maximum upward limiting position and the levers 21 and 22 are rotated about their pivots in counterclockwise and clockwise directions respectively so that both are in substantial alignment as illustrated in FIG. 4. As a result the clamping hook members 17 and 18 are in their maximum downward and outward retracted positions.

The plugging in operation is quickly accomplished and in a very simple manner by raising the plug-in device to the height of the busway, plugging its stab contacts into the stab openings in the busway and rotating the handle 14*a* and bell crank 14 in a clockwise direction toward the stop pin 25. This rotation of the bell crank depresses the link 23 which in turn effects clockwise rotation of lever 21 and counter clockwise rotation of lever 22. As a result, the clamping members 17 and 18 are moved upwardly, i.e., toward the cover plate and are simultaneously moved inwardly toward each other. As point *a* on the bell crank approaches dead center, the cam hooks 17*a* and 18*a* are brought securely against the underside of busway housing flanges 4*a* and 4*b*. After point *a* passes dead center, the bell crank snaps against the stop pin 25 and the cam hooks are locked in the fully clamped position. A similar operation of the clamping assembly 13 on end panel 1*e* moves and clamps the cam hooks of that assembly against the underside of the busway flanges.

To move the plug-in device to a new location it is necessary only to rotate the operating handles in the reverse direction, i.e., away from the stop pins and withdraw the stab contacts from engagement with the bus bars. The plug-in device is then moved to the new location and the procedure described above is repeated.

Thus the plug-in device may be quickly clamped into plugged in position on a busway or quickly unclamped therefrom with a minimum of time and effort and without the use of any tools.

Alterations and modifications may be made in the above described construction without departing from the true spirit of the invention or from the scope of the annexed claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In combination,
   (1) an enclosure for a busway plug-in device having a base plate and end walls,
   (2) a pair of clamping assemblies for clamping said enclosure to a busway housing with said base plate against a wall of said housing,
   (3) each of said clamping assemblies being mounted on a different one of said end walls and comprising
      (*a*) an operating handle pivotally mounted on the associated end wall for movement between two limiting positions,
      (*b*) a pair of clamping members provided with hooks for engaging said housing,
      (*c*) means on said enclosure slidably mounting said clamping members in spaced apart relationship to straddle said busway housing and to provide for movement of said members having a component generally perpendicular to said base plate, and
      (*d*) a linkage mounted on said end wall interconnecting said clamping members and said operating handle to effect clamping engagement of said clamping members with said busway housing in response to movement of said operating handle to one of said limiting positions.

2. In combination
   (1) an enclosure for a busway plug-in device having a base plate and end walls,
   (2) a pair of clamping assemblies for clamping said enclosure to a busway housing with said base plate against a wall of said housing,
   (3) each of said clamping assemblies being mounted on a different one of said end walls and each comprising
      (*a*) an operating handle pivotally mounted on the associated end wall for movement between two limiting operating positions,
      (*b*) a pair of clamping members each provided with a hook for engaging said busway housing,
      (*c*) means on said enclosure slidably mounting said clamping members in spaced apart relationship to straddle said busway housing and to pro-

vide for movement of said members having a component generally perpendicular to said base plate and a second component generally parallel thereto and

(*d*) a linkage mounted on said end wall interconnecting said clamping members and said operating handle to effect movement of said hook members toward each other and toward said housing thereby to effect clamping engagement of said hooks with said busway housing in response to movement of said operating handle to one of said limiting positions.

3. In combination,

(1) an enclosure for a busway plug-in device having a base plate and end walls,

(2) a pair of clamping assemblies for clamping said enclosure to a busway housing with said base plate against a wall of said housing,

(3) each of said clamping assemblies being mounted on a different one of said end walls and comprising

(*a*) an operating handle pivotally mounted on the associated end wall for movement between two limiting positions,

(*b*) a pair of clamping members each comprising a bar member having a hook extension for engaging said housing, said extension being provided with a cam slot,

(*c*) means for slidably mounting said clamping members in spaced apart relationship to straddle said busway housing and to provide for movement of said members having a component generally perpendicular to said base plate and a second component generally parallel thereto comprising a pair of cam guides, one for each of said slots, and means on said enclosure mounting said cam guides in cooperative relationship with said cam slots and

(*d*) a linkage interconnecting said clamping members and said operating handle to effect movement of said hook extensions toward each other and toward said housing thereby to effect clamping engagement of said hooks with said busway in response to movement of said operating handle to one of said limiting positions.

4. In combination with a busway plug-in device having side walls and end walls, a pair of assemblies for clamping said plug-in device to a busway housing provided with longitudinally extending lateral flanges, each of said assemblies being mounted on a different one of said end walls and each comprising

(1) a pair of operating levers pivotally mounted on the associated end wall with an end portion of one of said levers overlapping an end portion of the other.

(2) elongated slots in said overlapping end portions,

(3) a bell crank pivotally mounted on said end wall for rotation through a limited range,

(4) a connecting link provided at one end with a pin engaging said slots and having its other end pivotally connected to one arm of said bell crank,

(5) a pair of clamping members each having an end pivotally connected to a different one of the non overlapping ends of said operating levers and each of said clamp members having a hook extension at its opposite end for engaging said flanges and

(6) means on said plug-in device for slidably mounting said clamping members in spaced apart relationship for straddling said busway housing to provide for engagement of said hook extensions in clamping relationship with said housing flanges in response to rotation of said bell crank to one of its limiting positions.

No references cited.